



**Final**

## **Record of Decision for Parcel E**

**Hunters Point Naval Shipyard  
San Francisco, California**

**December 2013**

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Prepared under:

**Naval Facilities Engineering Command  
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## List of Attachments

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- Attachment 1. [Administrative Record Index](#) *(provided on CD only)*
- Attachment 2. [References](#) *(provided on CD only)*
- Attachment 3. [Responsiveness Summary](#)
- Attachment 4. [Applicable or Relevant and Appropriate Requirements](#)
- Attachment 5. [Responses to Comments on Draft Record of Decision](#)



## Acronyms and Abbreviations

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|                   |                                                                       |
|-------------------|-----------------------------------------------------------------------|
| ARARs             | applicable or relevant and appropriate requirements                   |
| ARIC              | area requiring institutional controls                                 |
| BERA              | baseline ecological risk assessment                                   |
| bgs               | below ground surface                                                  |
| BRAC              | Base Realignment and Closure                                          |
| CCSF              | City and County of San Francisco                                      |
| CDPH              | California Department of Public Health                                |
| CERCLA            | Comprehensive Environmental Response, Compensation, and Liability Act |
| COCs              | chemicals of concern                                                  |
| COECs             | chemicals of ecological concern                                       |
| COPCs             | chemicals of potential concern                                        |
| COPECs            | chemicals of potential ecological concern                             |
| <sup>137</sup> Cs | cesium-137                                                            |
| CSM               | conceptual site model                                                 |
| DDE               | dichlorodiphenyldichloroethene                                        |
| DDT               | dichlorodiphenyltrichloroethane                                       |
| DTSC              | Department of Toxic Substances Control                                |
| EOS               | Parcel E open space (reuse area)                                      |
| EPA               | U.S. Environmental Protection Agency                                  |
| FFA               | Federal Facility Agreement                                            |
| FS                | Feasibility Study                                                     |
| HHRA              | human health risk assessment                                          |
| HI                | hazard index                                                          |
| HPALs             | Hunters Point ambient levels                                          |
| HPNS              | Hunters Point Naval Shipyard                                          |
| HQ                | hazard quotient                                                       |
| HRA               | Historical Radiological Assessment                                    |
| ICs               | institutional controls                                                |
| IR                | Installation Restoration                                              |
| LUC RD            | land use control remedial design                                      |

## Acronyms and Abbreviations *(continued)*

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|                   |                                                                  |
|-------------------|------------------------------------------------------------------|
| MNA               | monitored natural attenuation                                    |
| MOA               | Memorandum of Agreement                                          |
| msl               | mean sea level                                                   |
| MU                | multi-use (reuse area)                                           |
| Navy              | Department of the Navy                                           |
| NAPL              | nonaqueous-phase liquid                                          |
| NCP               | National Oil and Hazardous Substances Pollution Contingency Plan |
| NPL               | National Priorities List                                         |
| NRDL              | Naval Radiological Defense Laboratory                            |
| OMP               | Operations and Maintenance Plan                                  |
| pCi/g             | picocuries per gram                                              |
| PCBs              | polychlorinated biphenyls                                        |
| <sup>226</sup> Ra | radium-226                                                       |
| RACR              | Remedial Action Completion Report                                |
| RAOs              | remedial action objectives                                       |
| RD                | remedial design                                                  |
| RI                | Remedial Investigation                                           |
| RME               | reasonable maximum exposure                                      |
| RMP               | risk management plan                                             |
| ROCs              | radionuclides of concern                                         |
| ROD               | Record of Decision                                               |
| SARA              | Superfund Amendments and Reauthorization Act                     |
| SFPUC             | San Francisco Public Utilities Commission                        |
| SLERA             | screening-level ecological risk assessment                       |
| SVE               | soil vapor extraction                                            |
| SVOCs             | semivolatile organic compounds                                   |
| TCE               | trichloroethene                                                  |
| TPH               | total petroleum hydrocarbons                                     |
| Triple A          | Triple A Machine Shop, Inc.                                      |
| VOCs              | volatile organic compounds                                       |
| Water Board       | San Francisco Bay Regional Water Quality Control Board           |
| µg/L              | micrograms per liter                                             |
| §                 | Section                                                          |

## Section 1. Declaration

---

This Record of Decision (ROD) presents the selected remedy for Parcel E at Hunters Point Naval Shipyard (HPNS) in San Francisco, California. HPNS was placed on the National Priorities List (NPL) in 1989 (U.S. Environmental Protection Agency [EPA] ID: CA71170090087). The remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 (Title 42 United States Code Section [§] 9601, et seq.); and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 Code of Federal Regulations Part 300). This decision is based on the Administrative Record Index for this site<sup>1</sup>. The Administrative Record Index is included in the electronic version of the ROD as [Attachment 1](#). The Department of the Navy (Navy) and EPA jointly selected the remedy for Parcel E. The California Department of Toxic Substances Control (DTSC) and the San Francisco Bay Regional Water Quality Control Board (Water Board) concur on the remedy for Parcel E. The Navy provides funding for site cleanups at HPNS. The Federal Facility Agreement (FFA) for HPNS documents how the Navy intends to meet and implement CERCLA in partnership with EPA, DTSC, and the Water Board.

Parcel E is one of six parcels (Parcels A through F) originally designated for environmental restoration. In September 2004, the Navy divided Parcel E into two parcels (Parcels E and E-2) to facilitate CERCLA administrative closure of the Parcel E-2 Landfill and its adjacent areas<sup>2</sup>. In February 2013, the Navy further divided Parcel E into two parcels (Parcels E and UC-3) to facilitate CERCLA administrative closure of Crisp Road, which will serve as a future utility corridor, and the adjoining railroad right-of-way<sup>3</sup>. This ROD addresses only Parcel E.

Parcel E includes two future land use districts: the Shipyard South Multi-Use District and Shipyard Shoreline Open Space. The Shipyard South Multi-Use District will include athletic and recreational facilities, office and industrial spaces, mixed commercial areas, institutional use, and residential areas. The Shipyard Shoreline Open Space will include recreational areas and ancillary commercial use.

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<sup>1</sup> **Blue text** identifies detailed site information available in the Administrative Record and listed in the References Table ([Attachment 2](#)). This ROD is also available on CD, whereby blue text serves as a hyperlink to reference information. The excerpts referenced by the hyperlinks are part of the ROD. The hyperlink will open a text box at the top of the screen. A blue box surrounds applicable information in the hyperlink. To the extent inconsistencies may exist between the referenced information attached to the ROD via hyperlinks and the information in the basic ROD itself, the language in the basic ROD controls.

<sup>2</sup> Discussions within this ROD (as well as the Revised RI Report, FS Report, and the radiological addendum to the FS Report) that reference documents published prior to September 2004 refer to the portion of Parcel E that excludes Parcel E-2.

<sup>3</sup> The division of Parcel E into Parcels E and UC-3 was documented in the Proposed Plan in February 2013. Discussions within this ROD that reference documents published prior to February 2013 refer to the portion of Parcel E that excludes Parcel UC-3.

Environmental investigations began at Parcel E in 1984. A Draft Final Remedial Investigation (RI) Report for Parcel E was completed in 1997. The Final Revised RI Report for Parcel E was completed in 2008. The Final Feasibility Study (FS) Report was completed in 2012. This ROD documents the final remedial action for Parcel E and does not include or affect any other sites at HPNS.

### 1.1. SELECTED REMEDY

The CERCLA remedial action selected in this ROD is necessary to protect the public health, welfare, or the environment from actual or potential releases of hazardous substances from Parcel E. The selected remedy for Parcel E addresses the following contaminated media:

- **Soil** – metals, pesticides, polychlorinated biphenyls (PCBs), dioxins/furans, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), and volatile organic compounds (VOCs)
- **Soil Gas** – VOC contamination in soil and groundwater has also resulted in contamination of soil gas at several locations in Parcel E, including Building 406, where the most laterally extensive soil gas contamination is located
- **Shoreline sediment** (i.e., shallow sediment subject to erosion or deposition within the intertidal shoreline zone) – metals, pesticides, and PCBs
- **Groundwater** – metals, PCBs, TPH, and VOCs
- **Nonaqueous-phase liquid (NAPL)** – NAPL at the Former Oily Waste Ponds (referred to as Installation Restoration [IR] Site 03 [IR-03]) contains metals, PCBs, SVOCs, TPH, and VOCs that are a source to soil and groundwater contamination (radionuclides, although not attributed to the NAPL source, are potentially present in soil at IR-03)
- **Radiologically Impacted Media** – soil, shoreline sediment, and structures at various Parcel E locations (referred to as radiologically impacted sites) may contain radiological contamination, including IR-02 and IR-03, where the most laterally extensive radiological contamination is present (radiological contamination in groundwater, although not identified during previous investigations, is potentially present at IR-02 and IR-03)

The selected remedy consists of the following actions to address risks posed by contaminated media:

#### *Soil, Soil Gas, and Shoreline Sediment*

- Remove and dispose of contaminated soil in selected areas (referred to as Tier 1, Tier 2, and TPH locations<sup>4</sup>) that contain nonradioactive chemicals (including metals, PCBs, SVOCs, and TPH<sup>5</sup>) at concentrations exceeding risk-based levels, as well as separate and dispose of materials and soil with radiological contamination found in these areas

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<sup>4</sup> Soil removal is proposed in selected areas where nonradioactive chemicals are present at concentrations that exceeded the remediation goals. Tier 1 locations contain COCs at concentrations greater than 10 times the remediation goals. Tier 2 locations contain COCs at concentrations greater than 5 times the remediation goals. TPH locations contain TPH (commingled with CERCLA-regulated chemicals) at concentrations exceeding the petroleum source criterion (3,500 mg/kg). Please see [Section 2.5.3](#) of this ROD for further information.

<sup>5</sup> These chemical groups comprise the Tier 1, Tier 2, and TPH locations proposed for removal. Dioxins and furans are not included in this list because these chemicals are not found at concentrations greater than 5 times the remediation goals.

- Treat VOC contamination in soil and soil gas at Building 406 by using in-situ soil vapor extraction (SVE)
- Install durable covers (consisting of either asphalt or soil) throughout Parcel E to prevent exposure to remaining contaminants in soil (the soil cover at IR-03 and the northwest portion of IR-02 would also include a protective liner to minimize water seeping into contaminated soil)
- Remove and dispose of contaminated shoreline sediment and install shoreline protection consisting of natural materials (such as sand) and large rocks to prevent exposure to remaining contaminants in shoreline sediment (and to integrate with the durable covers at onshore areas)
- Monitor and maintain the different parts of the selected remedies to ensure they are working properly (also applies to actions for groundwater and NAPL at IR-03)
- Use institutional controls (ICs) to restrict specific land uses and activities on Parcel E (also applies to actions for groundwater and NAPL at IR-03)

### ***Groundwater***

- Treat VOC contamination in groundwater at inland plumes using injected biological nutrients (or potentially a mixture of biological nutrients and zero-valent iron) to accelerate the breakdown of VOCs to nontoxic compounds
- Install a below-ground barrier in the northwest portion of IR-02 to control discharge of contaminated groundwater (containing primarily metals and PCBs) into San Francisco Bay (below-ground barrier would work, in combination with protective liner installed under the soil cover in this area, to limit contaminant migration)
- Monitor groundwater concentrations and plumes to support the selected remedies, including documenting the beneficial impact to groundwater quality following implementation of the selected remedies (e.g., the ongoing degradation of VOC contamination by natural processes)

### ***NAPL at IR-03***

- Remove or treat contaminated materials at the Former Oily Waste Ponds (primarily NAPL, but also including associated soil and groundwater contamination)
- Install below-ground barrier to control discharge of NAPL and contaminated groundwater into San Francisco Bay (below-ground barrier would work, in combination with protective liner installed under the soil cover in this area, to limit contaminant migration)
- Treat VOC and TPH contamination in groundwater using injected biological nutrients to accelerate the breakdown of chemicals to nontoxic compounds

***Radionuclides (also referred to as radiologically impacted media)***

- Perform surveys in areas with potential radiological contamination (including structures, former building sites, and buried storm drain and sewer lines), and separate and dispose of materials and soil with radiological contamination found during the surveys (the final radiological cleanup has been initiated under a time-critical removal action in all of Parcel E areas, except IR-02 and IR-03, and is scheduled to be completed in 2015)
- Perform the following activities throughout IR-02 and IR-03: (1) scan the entire area for radioactivity to a depth of at least 1 foot; (2) separate and dispose of materials and soil with radiological contamination found during the surveys; (3) construct, inspect, and maintain a 2-foot-thick soil cover (as provided by the selected remedy for soil) to prevent exposure to remaining contaminants (the soil cover at IR-02 and IR-03 would also include a demarcation layer to mark the boundary between the existing surface and the soil cover); (4) use ICs (specific to radionuclides) to restrict specific land uses and activities (e.g., to ensure the integrity of the soil cover and demarcation layer); and (5) monitor groundwater to demonstrate, consistent with the findings of previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health and the environment

**1.2. STATUTORY DETERMINATIONS**

The selected remedy is protective of human health and the environment, complies with federal and state statutes and regulations that are applicable or relevant and appropriate to the remedy, and is cost-effective. The selected remedy uses permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. It provides the best balance of tradeoffs relative to the five balancing criteria and properly considers the two modifying criteria<sup>6</sup>. The selected remedy satisfies the statutory preference for treatment<sup>7</sup> as a principal element through the treatment of VOC contamination in portions of Parcel E and the treatment of the NAPL source at the Former Oily Waste Ponds. Statutory five-year reviews pursuant to CERCLA § 121 and the NCP will be conducted because the remedy will leave contamination in place at Parcel E above concentrations that allow for unlimited use and unrestricted exposure.

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<sup>6</sup> As defined in the NCP (Title 40 Code of Federal Regulations § 300.430[f][1][i]), the five primary balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. State and community acceptance are modifying criteria that shall be considered in remedy selection.

<sup>7</sup> As defined in the NCP (Title 40 Code of Federal Regulations § 300.5), "treatment technology" means any unit operation or series of unit operations that alters the composition of a hazardous substance or pollutant or contaminant through chemical, biological, or physical means so as to reduce toxicity, mobility, or volume of the contaminated materials being treated. Treatment technologies are an alternative to land disposal of hazardous wastes without treatment.

### 1.3. DATA CERTIFICATION CHECKLIST

The following information is included in [Section 2](#) of this ROD. Additional information can be found in the Administrative Record file for this site:

- Chemicals of concern (COCs) and chemicals of ecological concern (COECs) and their concentrations ([Sections 2.3 and 2.5](#)).
- Baseline risk represented by COCs and COECs ([Section 2.5](#)).
- Remediation goals established for COCs and COECs and the basis for these goals ([Sections 2.5 and 2.7](#)).
- Principal threat wastes ([Section 2.6](#)).
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater ([Section 2.4](#)).
- Potential land and groundwater use that will be available at Parcel E as a result of the selected remedy ([Section 2.9.3](#)).
- Estimated capital costs, annual operation and maintenance, and total present-worth costs; discount rate; and the number of years over which the remedy cost estimate is projected ([Section 2.8](#)).
- Key factors that led to selecting the remedy (e.g., a description of how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision; [Section 2.9.1](#)).

**1.4. AUTHORIZING SIGNATURES**

This signature sheet documents the Navy's and EPA's co-selection of the remedy in this ROD. This signature sheet also documents the State of California's (DTSC and Water Board) concurrence with this ROD.

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Keith S. Forman  
Base Realignment and Closure Environmental Coordinator  
Base Realignment and Closure Program Management Office West  
Department of the Navy

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Date

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Michael M. Montgomery  
Assistant Director of Federal Facilities  
and Site Cleanup Branch, Region 9  
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Date

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Denise M. Tsuji  
Unit Chief  
California Environmental Protection Agency  
Department of Toxic Substances Control

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Date

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Bruce H. Wolfe  
Executive Officer  
California Environmental Protection Agency  
San Francisco Regional Water Quality Control Board

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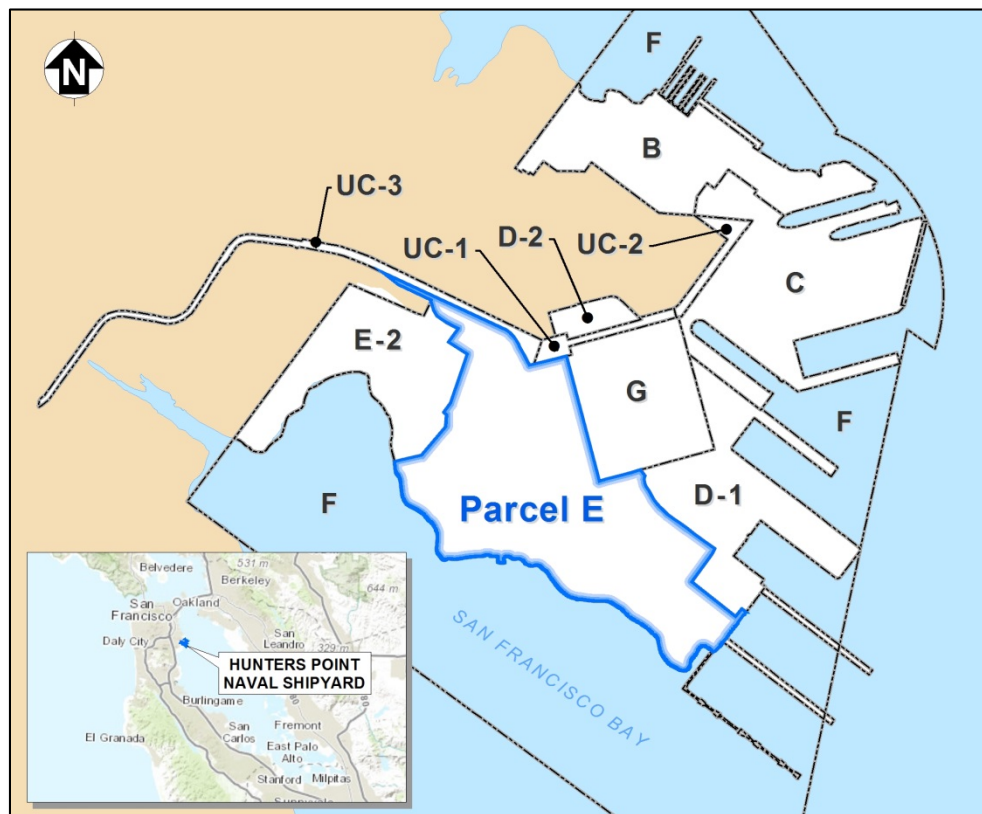
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## Section 2. Decision Summary

### 2.1. SITE DESCRIPTION AND HISTORY

HPNS is located in southeastern San Francisco on a peninsula that extends east into San Francisco Bay (see [Figure 1](#)). HPNS consists of 866 acres: 420 acres on land and 446 acres under water in the San Francisco Bay. In 1940, the Navy obtained ownership of HPNS for shipbuilding, repair, and maintenance activities. After World War II, activities at HPNS shifted to submarine maintenance and repair. HPNS was also the site of the Naval Radiological Defense Laboratory (NRDL).

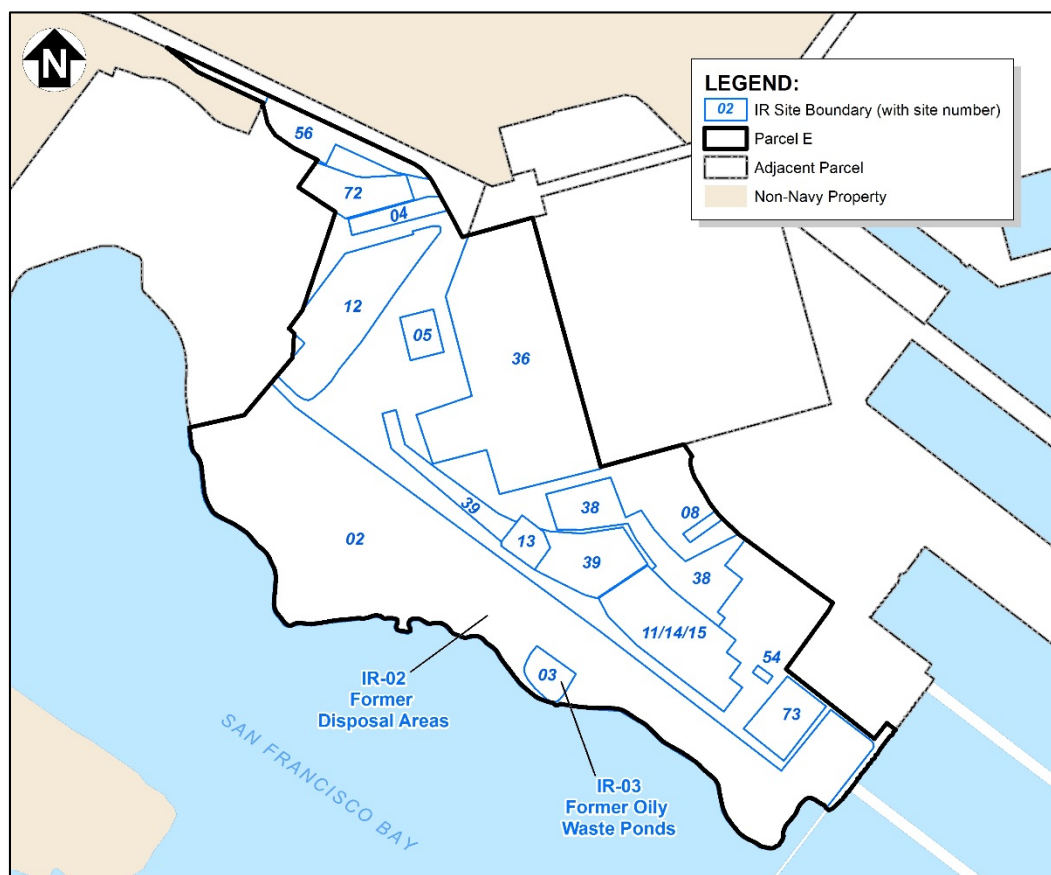


**Figure 1. Facility and Parcel E Location Map**

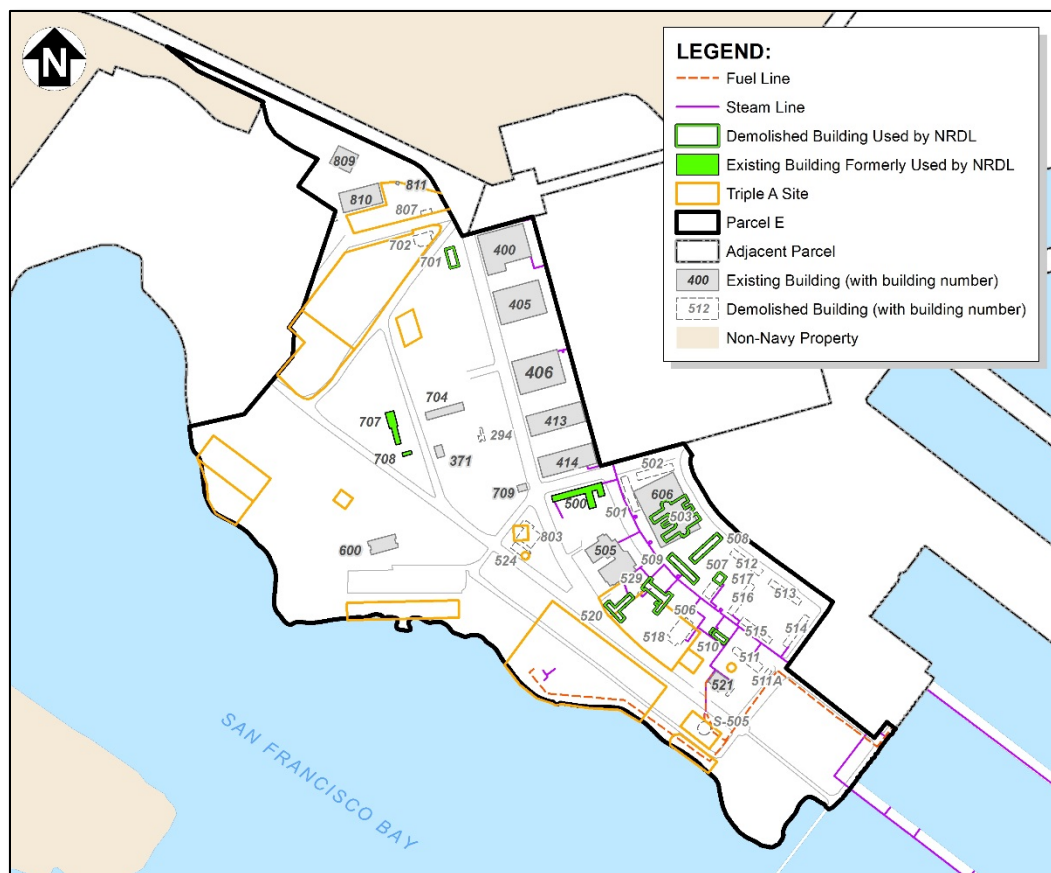
HPNS was deactivated in 1974 and remained relatively unused until 1976. Between 1976 and 1986, the Navy leased most of HPNS to Triple A Machine Shop, Inc. (Triple A), a private ship repair company. In 1987, the Navy resumed occupancy of HPNS. Because past shipyard operations left hazardous substances on site, HPNS property was placed on the NPL in 1989 pursuant to CERCLA, as amended by SARA. In 1991, HPNS was designated for closure pursuant to the Defense Base Closure and Realignment Act of

1990. Closure activities at HPNS involve conducting environmental remediation and making the property available for nondefense use.

**Parcel E<sub>(1)</sub>**, which includes about 128 acres of shoreline and lowland coast along the southwestern portion of HPNS (see [Figure 1](#)), contains 17 existing buildings, 25 former buildings, and 1 ship berth. Historically, most of Parcel E was used as an industrial support area, including a warehouse (Building 406) where chlorinated solvents were spilled and Former Oily Waste Ponds (referred to as IR-03) where waste oil was stored from 1944 to 1974. Shoreline areas at Parcel E (referred to as IR-02) were used to store construction and industrial materials, as well as to dispose of industrial waste and construction debris. The NRDL used several Parcel E buildings during the 1950s and 1960s. During its occupancy of HPNS, Triple A allegedly disposed of hazardous wastes at various locations at HPNS, including possibly discharging waste oil within Parcel E using below-ground fuel and steam lines. Areas with historical activities that may have resulted in contamination were identified by reviewing historical records and categorized as **IR sites<sub>(2)</sub>**. The potential contamination at the IR sites was evaluated through a series of investigations, which are described in [Section 2.3](#). [Figure 2](#) identifies the IR sites within Parcel E, and [Figure 3](#) identifies the Parcel E areas with historical shipyard operations, including NRDL buildings and Triple A sites.

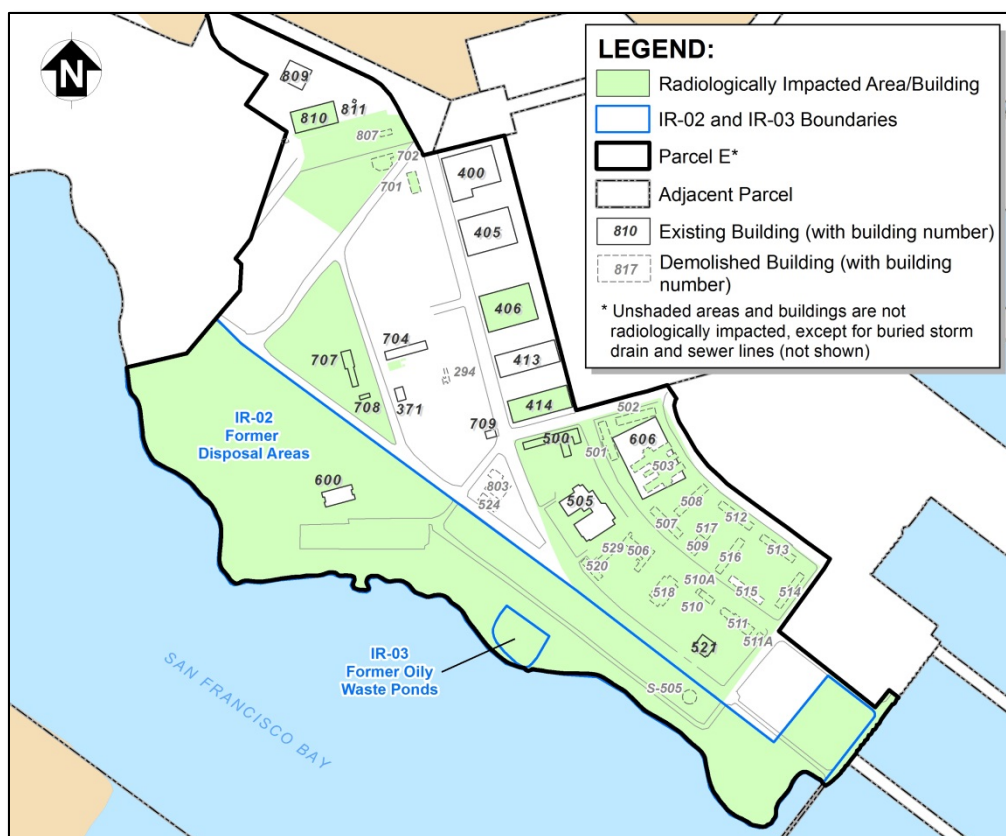


**Figure 2. IR Sites at Parcel E**



**Figure 3. Areas with Historical Shipyard Operations at Parcel E**

A history of radiological operations by the Navy at HPNS is presented in Volume II of the Historical Radiological Assessment (HRA). The review of previous radiological activities, cleanup actions, and release surveys identified no imminent threat or substantial risk to tenants or the environment of HPNS or the local community. The HRA identified **radiologically impacted areas**<sup>(3)</sup> at Parcel E (see Figure 4), which have the potential for radioactive contamination based on historical information or are known to contain or have contained radioactive materials.

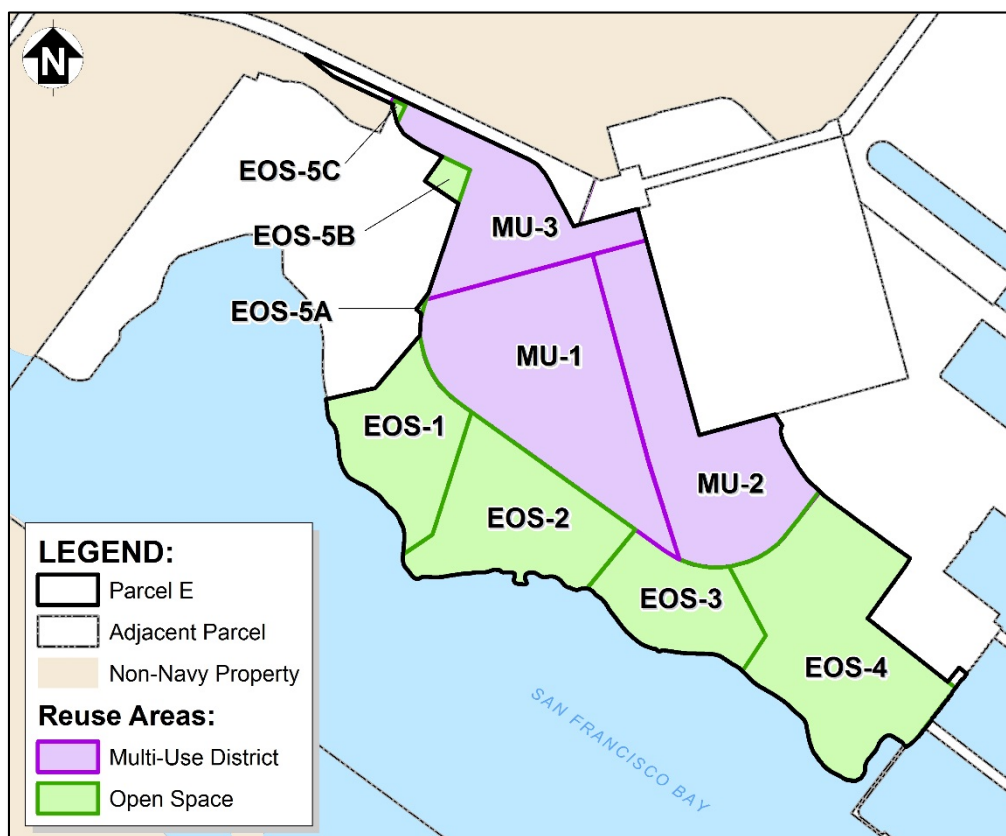


**Figure 4. Radiologically Impacted Areas**

Two general sources of potential radioactive contamination exist at Parcel E: research activities at various buildings formerly occupied by NRDL and historical waste disposal activities that occurred along the shoreline (IR-02 and IR-03). The NRDL performed practical and applied research on radiation decontamination methods and on the effects of radiation on living organisms and natural and synthetic materials. NRDL primarily conducted research activities within the former 500 series buildings and within the Building 707 Triangle Area. NRDL activities at these buildings may have discharged small amounts of low-level radioactive liquids into sanitary sewer, storm drain, and septic sewer lines; as a result, sanitary sewer, storm drain, and septic sewer lines throughout Parcel E are radiologically impacted. Historical activities in IR-02 and IR-03 included the disposal of radioluminescent commodity items (such as dials, gauges, and deck markers) in conjunction with the disposal of other construction debris and industrial wastes.

The [2010 redevelopment plan for HPNS](#)<sup>(4)</sup> identifies two future land use districts located partially in Parcel E: the Shipyard South Multi-Use District and the Shipyard Shoreline Open Space District. For evaluation purposes in the FS Report, the portions of these two land use districts within Parcel E were subdivided into eight reuse areas (see [Figure 5](#)). The Shipyard South Multi-Use District encompasses the central and northern portion of Parcel E, and was divided into reuse areas MU-1, MU-2, and MU-3. The Shipyard Shoreline Open Space District encompasses the shoreline area and the southern portion of Parcel E

and was divided into reuse areas EOS-1 through EOS-5. EOS-5, which is contiguous with future open space areas within adjoining Parcel E-2, is shown on [Figure 5](#) as EOS-5A, EOS-5B, and EOS-5C). [Section 2.4](#) further describes the current and future land use of Parcel E.



**Figure 5. Reuse Areas**

## 2.2. SITE CHARACTERISTICS

Land at HPNS consists of relatively level lowlands constructed by excavating portions of surrounding hills and placing nonengineered fill materials<sup>8</sup> along the margin of San Francisco Bay. The remaining land is a moderate to steep sloping, northwest-trending ridge. Parcel E is located in the lowlands with surface elevations ranging from 0 to 12 feet above mean sea level (msl). Ground surface elevations across most of Parcel E range from 7 to 10 feet above msl; elevations within the narrow intertidal shoreline zone range from about 0 to 4 feet above msl.

The [hydrostratigraphy](#)<sup>(5)</sup> of Parcel E consists of four distinct units: the shallow A-aquifer, several aquitard zones, the deeper B-aquifer, and underlying bedrock water-bearing zone. An aquitard zone separates the A- and B-aquifer across most of Parcel E, except for a small area along the northern border of Parcel E

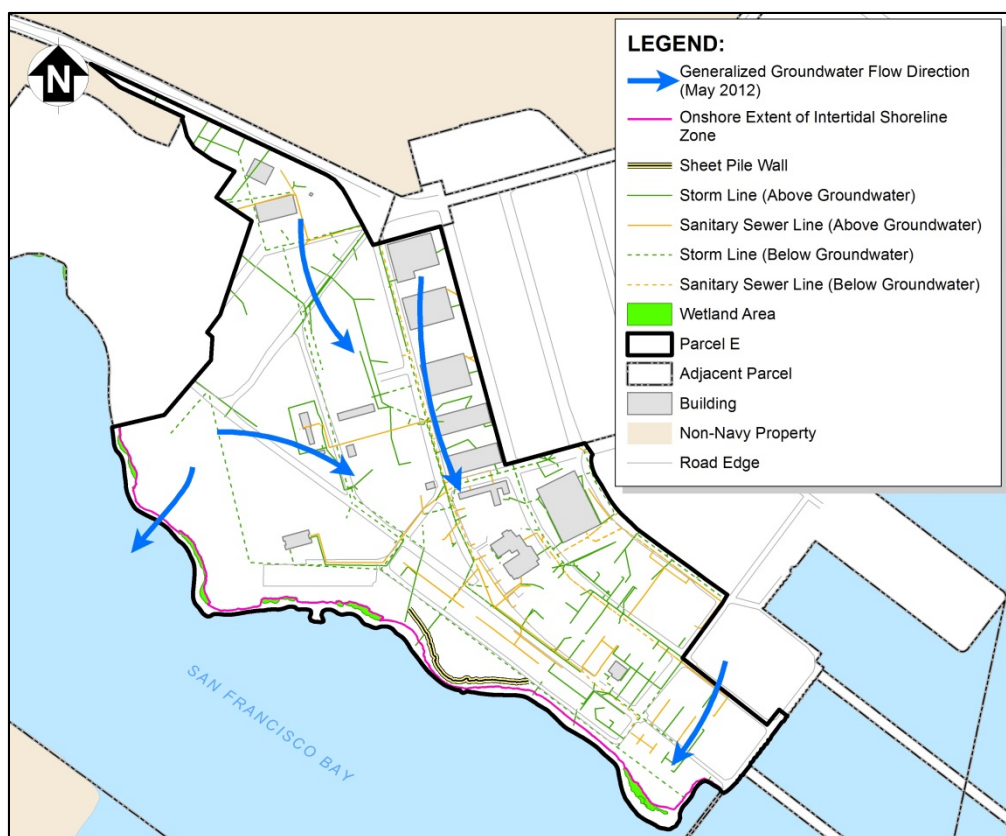
<sup>8</sup> The nonengineered fill materials that were derived from serpentinite bedrock contain minerals with relatively high concentrations of certain metals, including arsenic, iron, manganese, mercury, nickel, and vanadium.



(adjacent to Crisp Road within Parcel UC-3). The presence of additional aquitard zones within B-aquifer sediments isolates the uppermost portions of the B-aquifer from the lower portions of the B-aquifer. Groundwater is not currently used for any purpose at Parcel E. Groundwater in the A-aquifer is not suitable as a potential source of **drinking water**<sup>(6)</sup>. Based on an evaluation of site-specific conditions relative to pertinent regulatory criteria, groundwater in the B-aquifer has a moderate potential to be used as a future source of drinking water; however, the potential use of B-aquifer groundwater is subject to local regulatory controls.

The City and County of San Francisco (CCSF) regulates the installation and use of water wells within city boundaries under Article 12B of the CCSF Health Code. Under the Health Code, San Francisco Public Utilities Commission (SFPUC) administers the withdrawal and use of groundwater within the CCSF, including the South San Francisco Groundwater Basin in which Parcel E is located. The South San Francisco Basin is generally inadequate to supply a significant amount of groundwater for municipal supply (primarily due to low yield). As such, the SFPUC does not provide for the use of groundwater from the South San Francisco Basin. CCSF currently obtains its municipal water supply from the Hetch Hetchy watershed in the Sierra Nevada and plans to continue using the Hetch Hetchy watershed as a drinking water source in the future.

**Groundwater flow patterns**<sup>(7)</sup> within the A-aquifer (see [Figure 6](#)) at Parcel E are complex because they are potentially affected by a groundwater divide in the northwest portion of IR-02 and submerged utility lines throughout Parcel E (which, if leaking, may allow groundwater to infiltrate into them). The natural flow of groundwater toward San Francisco Bay from the topographically high area of the former Parcel A is disrupted by the groundwater divide along the northwest portion of IR-02. The effect of the submerged utility lines on A-aquifer groundwater flow patterns has been reduced because these lines are inactive and are in the process of being removed (to address potential radiological contamination).



**Figure 6. Parcel E Site Features**

**Parcel E ecology**<sup>(8)</sup> includes terrestrial habitat, aquatic environments, and transitional wetlands. All of these ecological areas have been disturbed by human activities such as excavation, filling, and development, and support relatively few plant species. Birds, mammals, and reptiles have been observed in this parcel. No threatened or endangered species are known to inhabit Parcel E or its immediate vicinity. The existing wetlands within the intertidal shoreline zone (see [Figure 6](#)) provide habitat for wintering and migrating wildlife; however, their value in terms of social significance, effectiveness, and opportunity is low because the wetlands are located on manmade land that has been disturbed by human activities and contains chemical contamination.

### 2.3. PREVIOUS INVESTIGATIONS AND REMOVAL ACTIONS

Parcel E contains several environmental investigation sites identified at HPNS during the Initial Assessment Study conducted by the Navy in 1984. Since that time, the Navy has performed multiple environmental investigations at Parcel E to further evaluate 21 IR sites associated with former shipyard operations. The Navy has also performed several treatability studies that involved testing of technologies to reduce VOCs in groundwater and soil. The Navy has collected extensive information during these investigations and studies, as well as during ongoing environmental monitoring programs for groundwater.

The Revised RI Report (May 2, 2008), FS Report (August 31, 2012), and radiological addendum to the FS Report (August 31, 2012) summarize the results of the environmental investigations at Parcel E and document the site conditions. The previous investigations provide sufficient information to evaluate site risks, develop remedial alternatives, and support the remedy decision made in this ROD.

The Navy has also performed several removal actions at Parcel E to minimize potential exposure to hazardous chemicals. The previous excavations successfully removed significant amounts of contamination from Parcel E but some contamination remains. [Table 1](#) summarizes the investigations, treatability studies, and removal actions performed at Parcel E.

**Table 1. Previous Investigations, Treatability Studies, and Removal Actions**

| Date(s)      | Investigation/Study/Removal Action <sup>a</sup>            | Investigation/Treatability Study/Removal Action Activities                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1984         | Initial Assessment Survey                                  | The Initial Assessment Study was based on reviews of records and interviews of previous workers at the site. Based on the findings of the study, five of the eight sites (IR-02, IR-03, IR-04, and IR-05) were recommended for further evaluation.                                                                                                                                                                                                             |
| 1987         | Confirmation Study and Verification Step                   | Activities included a geophysical survey; subsurface exploration using exploratory borings; and soil, groundwater, and air sampling. The study verified the presence of hazardous waste contamination at IR-02, IR-03, IR-04, IR-05, and IR-11.                                                                                                                                                                                                                |
| 1987         | Area Study                                                 | The study consisted of soil sampling to evaluate the potential presence of ACM. ACM was detected in subsurface soil at IR-11/14/15, IR-12, and IR-36 that was attributed to naturally occurring asbestos derived from the serpentinite bedrock.                                                                                                                                                                                                                |
| 1988         | Fence-to-Fence Survey                                      | Conducted to inventory suspected and known hazardous wastes and materials. The survey report concluded tenants generally managed hazardous wastes and materials in ways that did not pose an immediate environmental threat to HPNS.                                                                                                                                                                                                                           |
| 1988 to 1989 | Solid Waste Air Quality Assessment Test                    | Focused evaluation of meteorological conditions, ambient air quality, surface gas emissions, and subsurface gas migration at the Parcel E-2 Landfill, but also included limited investigation at Parcel E sites IR-02, IR-03, IR-12, and IR-14. Subsurface methane gas was detected in isolated pockets at IR-03 and in the southern portion of IR-12; however, no available information suggested that subsurface methane was migrating from these locations. |
| 1988         | RI Phase 1 Reconnaissance                                  | Evaluated hydrogeologic conditions and identified waste boundaries using GPR, electromagnetic survey, and test pits to delineate the extent of waste depositions in fill material. Results were used to identify data needs for subsequent RI activities.                                                                                                                                                                                                      |
| 1988         | Basewide Removal of PCB-Containing Electrical Transformers | Forty-eight transformers were removed from Parcel E and disposed of off site.                                                                                                                                                                                                                                                                                                                                                                                  |
| 1988         | Removal of Soil at IR-08 PCB Spill Area                    | About 1,255 cubic yards of soil with PCBs was excavated from a PCB spill area, which underlies the southeast portion of Building 606.                                                                                                                                                                                                                                                                                                                          |



**Table 1. Previous Investigations, Treatability Studies, and Removal Actions** *(continued)*

| Date(s)              | Investigation/Study/<br>Removal Action <sup>a</sup> | Investigation/Treatability Study/Removal Action Activities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1989 to 1990         | Preliminary Assessment                              | Additional areas where leaks or spills of chemicals were suspected or identified were evaluated and recommended for further action during the site inspection. The following Parcel E sites were evaluated as part of this assessment and recommended for further action: IR-12 through IR-15, IR-36 North, IR-36 South, IR-36 West, IR-38, IR-39, IR-40, IR-52, IR-54, IR-56, and portions of facilitywide utility systems. IR-12 and IR-15 were carried forward directly to the RI phase (IR-14/IR-15 were combined with IR-11), and the remaining sites were carried forward to the site inspection phase. |
| 1991                 | Removal of Floating Product at IR-03                | About 25 gallons of floating petroleum product on the water table and 70 gallons of subsurface waste oil were recovered by pumping and disposed of off site.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1991 to 1992         | Intertidal Sediment Study                           | Sediment samples were collected in the intertidal zone, and the resulting data were used to identify COPECs in the Phase 1A ERA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1991 to 1992         | Phase I Radiological Investigation                  | The surface confirmation radiation survey detected elevated gamma activity in a centralized area of IR-02 Northwest that extended across the IR-02 Central boundary; these results indicated the presence of radium-containing devices.                                                                                                                                                                                                                                                                                                                                                                       |
| 1991 to 1994         | Removal and Closure of ASTs and USTs                | Ten USTs were located in Parcel E: 2 were closed in place and 8 were removed. Parcel E also contained 32 ASTs, including Tank S-505, a 630,000-gallon tank at IR-02 Southeast. In total, 12 of 32 ASTs (including Tank S-505) were removed.                                                                                                                                                                                                                                                                                                                                                                   |
| 1991 to 1995         | Sandblast Waste Fixation                            | More than 4,900 tons of sandblast waste was collected from locations around HPNS, temporarily stockpiled at Parcel E, and sent to an asphalt plant for recycling.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1992 to 1996         | RI Report                                           | Based on the results from more than 4,700 soil and 1,200 groundwater samples, the RI Report recommended that all Parcel E sites be carried forward to an FS. Additionally, the report noted that additional soil and groundwater samples should be collected to better define the nature and extent of contamination at the parcel. The Parcel E RI also included a baseline ERA and HHRA.                                                                                                                                                                                                                    |
| 1992, 1994, and 1996 | Facilitywide Ambient Air Monitoring                 | Results indicated that concentrations of asbestos, metals, and VOCs were not present or present at very low concentrations that were similar to regional background concentrations. As a result, no further actions or studies for ambient air at HPNS were recommended.                                                                                                                                                                                                                                                                                                                                      |
| 1993                 | Phase II Radiological Investigation                 | Investigation delineated the subsurface distribution of radium-containing devices in the disposal area at IR-02 Northwest and IR-02 Central. A removal action was recommended to address radiological contamination in this area. The removal action at IR-02 Northwest and IR-02 Central was performed from 2005 to 2007.                                                                                                                                                                                                                                                                                    |
| 1993 to 1994         | Site Inspection                                     | Based on soil and groundwater sample results, the Site Inspection Report recommended further evaluation of IR-36, IR-38, IR-39, IR-40, IR-52, IR-54, and IR-56 as part of the RI phase. The report also recommended that the utility sites (IR-45, IR-47, and IR-50) be investigated further in the RI phase.                                                                                                                                                                                                                                                                                                 |

**Table 1. Previous Investigations, Treatability Studies, and Removal Actions** *(continued)*

| Date(s)      | Investigation/Study/<br>Removal Action <sup>a</sup>                                              | Investigation/Treatability Study/Removal Action Activities                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1993 to 1994 | Site Assessment                                                                                  | Evaluated areas that had not been previously investigated under the IR Program because of lack of access or documentation. The assessment recommended further investigation at three areas in Parcel E (subsequently identified as IR-11, IR-72, and IR-73).                                                                                                                                                                                                                                                        |
| 1996         | Removal of Soil from IR-11/14/15                                                                 | About 36 cubic yards of arsenic- and mercury-contaminated soil was excavated from an area east of Building 521 at IR-11/14/15.                                                                                                                                                                                                                                                                                                                                                                                      |
| 1996 to 1997 | Phase III Radiological Investigation                                                             | The investigation included surveys and swipe sampling at former NRD buildings at Parcel E. Based on the investigation results, the report recommended (1) further investigation and potential excavation at former Buildings 509 and 517, where anomalous gamma activity was measured; (2) excavation of a potential buried point source behind Building 529; and (3) further investigation of Building 707 and its concrete pad.                                                                                   |
| 1996 to 1997 | Removal of Sediment from the Storm Drain System                                                  | More than 1,200 tons of sediment and debris was removed from storm drain lines across HPNS, including from storm drain lines in Parcel E, to reduce the potential for chemicals to be transported to San Francisco Bay.                                                                                                                                                                                                                                                                                             |
| 1996 to 1998 | Installation of Sheet Pile Wall and Low-Permeability Cap at the Former Oily Waste Ponds in IR-03 | A 900-foot-long sheet pile wall was installed to a maximum depth of 27 feet below ground surface to reduce the potential for oil to migrate from IR-03 to San Francisco Bay. A geosynthetic clay liner with a 1-foot topsoil layer was placed over the area to minimize rainfall infiltration.                                                                                                                                                                                                                      |
| 1997 to 1998 | Parcel E FS Report                                                                               | Based on the data presented in the RI Report, the FS Report identified and evaluated remedial alternatives for Parcel E. However, the FS Report was not finalized because the Department of the Navy and regulatory agencies identified additional tasks to better characterize the nature and extent of contamination at Parcel E. These tasks were performed as part of data gaps investigations from 2000 through 2003, and results of these investigations were used in Revised RI and FS Reports for Parcel E. |
| 1998 to 1999 | Phase IV Radiological Investigation                                                              | Investigation involved collecting and analyzing 38 concrete and 38 soil samples from the Building 707 concrete pad area. Based on results from the investigation, a removal action was recommended to address elevated radioactivity at the concrete pad. The removal action at Building 707 was performed as part of the basewide radiological removal action that was initiated in 2009.                                                                                                                          |
| 1999 to 2000 | Parcel E Validation Study and Protective Soil Concentrations Technical Memorandum                | Results of the study concluded cadmium, copper, lead, nickel, selenium, and zinc posed a potential unacceptable risk to wildlife at Parcel E. Protective soil concentrations were subsequently derived for these chemicals and used to evaluate risk to wildlife in the Revised Parcel E RI Report.                                                                                                                                                                                                                 |
| 2000 to 2002 | Groundwater Data Gaps Investigation                                                              | Water level measurements and results of a tidal study were used to refine the Parcel E hydrogeological conceptual model, and three rounds of groundwater monitoring data were used to develop a basewide groundwater monitoring program and to refine the nature and extent evaluation presented in the Revised RI Report.                                                                                                                                                                                          |

**Table 1. Previous Investigations, Treatability Studies, and Removal Actions (continued)**

| Date(s)      | Investigation/Study/Removal Action <sup>a</sup>               | Investigation/Treatability Study/Removal Action Activities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2000 to 2002 | SVE Treatability Study                                        | A SVE treatability study was performed inside and immediately northwest of Building 406. The SVE system, which consisted of 3 SVE wells and 15 vapor monitoring wells, removed about 7 pounds of VOCs, with over 90 percent of the VOC mass attributed to TCE.                                                                                                                                                                                                                                                                                                                                                                                                                |
| 2001         | Removal of Soil with Non-VOCs at IR-08                        | About 1,550 cubic yards of PCB- and PAH-contaminated soil was excavated from four remediation areas at IR-08.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 2001         | Radiological Investigation of Parcel E Shoreline              | Several areas contained gamma activity at levels exceeding background, most notably in the Metal Reef Area in IR-02 Southeast. A removal action was recommended to address radioactive materials in this area. The removal action at the Metal Reef Area was performed from 2005 to 2007.                                                                                                                                                                                                                                                                                                                                                                                     |
| 2001 to 2002 | Wetland Delineation and Wetland Functions Assessment          | About 0.73 acres of tidal wetland areas were identified along the Parcel E shoreline. The functions and values assessment found that the value of these wetlands is low, and the most significant function of these wetlands to be seasonal wildlife use for wintering and migrating birds.                                                                                                                                                                                                                                                                                                                                                                                   |
| 2002         | Standard Data Gaps Investigation                              | Data from this investigation were used in the Revised Parcel E RI Report to identify potential source areas of contamination, evaluate the nature and extent of soil contamination in each reuse area, and evaluate risk to human health and the environment.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 2002 to 2004 | Waste Consolidation and Removal                               | Industrial process equipment was decontaminated and waste was consolidated throughout Parcel E, including removal of waste material stored in or near buildings and removal or encapsulation of ACM. Eight ASTs located at Building 521 were also removed.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 2002 to 2005 | Parcels E and E-2 Shoreline Investigation and Risk Assessment | Shoreline investigation and associated ERA identified a potential risk to benthic invertebrates, birds, and mammals from exposure to metals and total PCBs in surface and subsurface sediments along the shoreline. Based on these results, source control measures were recommended for the Parcel E shoreline, particularly in IR-02 Northwest.                                                                                                                                                                                                                                                                                                                             |
| 2002 to 2003 | Phase V Radiological Investigation                            | At Parcel E, 21 buildings or former building locations were evaluated as part of Phase V. Investigation activities consisted of conducting surveys, collecting samples, and performing remedial activities. Several areas with elevated levels of radioactivity were reported. Future investigation and cleanup were recommended for several sites, including Building 406; the area around former Buildings 506, 520, and 529; the Building 707 concrete pad and drains; the Shack 80 site; and IR-04.                                                                                                                                                                       |
| 2003 to 2004 | HRA                                                           | The HRA identified 33 areas in Parcel E as radiologically impacted. These sites included small areas such as former building foundation footprints and fill areas that may contain dials, gauges, deck markers, or sandblast waste. The HRA also identified basewide utility systems as impacted sites, including the underground storm drain and sanitary sewer lines. The HRA reported that no radiological contamination was suspected in groundwater at Parcel E, except at IR-02 and areas where storm drains are present; these areas have a low potential for groundwater contamination. The HRA concluded that further evaluation of the impacted sites was required. |

**Table 1. Previous Investigations, Treatability Studies, and Removal Actions (continued)**

| Date(s)         | Investigation/Study/Removal Action <sup>a</sup>                                           | Investigation/Treatability Study/Removal Action Activities                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2003 to 2004    | Parcel E Shoreline Debris Removal                                                         | Bricks and other industrial debris along the Parcel E shoreline were collected for disposal. About 468 cubic yards of non-RCRA hazardous waste debris (poles with creosote), about 400 cubic yards of nonregulated nonhazardous debris, and about 81 tons of recyclable metals were removed.                                                                                                                                                                                                                                        |
| 2003 to 2004    | Removal of Soil Stockpiles                                                                | A field inventory of soil stockpiles at HPNS identified multiple stockpiles at IR-02 Southeast and IR-73. In total, about 3,000 cubic yards of soil, 150 cubic yards of gravel, and 22 cubic yards of other material were removed and disposed of off site.                                                                                                                                                                                                                                                                         |
| 2004            | Removal of TPH-Contaminated Soil from Various Locations                                   | Six areas at IR-05, IR-36 West, IR-39, and IR-73 were excavated to remove soil containing TPH at concentrations exceeding the screening criterion of 3,500 mg/kg. More than 13,000 cubic yards of soil was removed from these areas and disposed of off site.                                                                                                                                                                                                                                                                       |
| 2004 to Present | Basewide Groundwater Monitoring Program                                                   | Monitors groundwater on a quarterly basis at HPNS. Most locations included in the program exhibited chemical concentrations that pose potential risk to humans and wildlife.                                                                                                                                                                                                                                                                                                                                                        |
| 2005 to 2007    | Metal Debris Reef Removal Action                                                          | Approximately 11,200 cubic yards of soil, metal slag, and debris was removed from the Metal Debris Reef (in IR-02 Southeast). Low-level radioactive waste removed from the site included 131 devices and button sources and 31 cubic yards of metal debris.                                                                                                                                                                                                                                                                         |
| 2005 to 2007    | Removal of Soil at IR-02 Northwest and IR-02 Central Area                                 | Approximately 49,500 cubic yards of soil was excavated and tested for radioactive substances. Low-level radioactive waste removed from the site included 11,840 tons of soil, 2,342 devices and button sources, 420 tons of firebrick, 1,940 tons of metal debris, and 58 tons of miscellaneous debris (concrete, plastic, hoses, and rocks). After removing the radioactive waste, the soil was used to backfill the excavation.                                                                                                   |
| 2009 to 2012    | Groundwater Characterization and ZVI Treatability Study at Various VOC Groundwater Plumes | The study further characterized VOC groundwater plumes in Parcel E and evaluated the effectiveness of ZVI injection in reducing VOC concentrations at two plumes (IR-12 PCE plume and Building 406 TCE plume). The characterization refined the extent of the VOC groundwater plumes and identified elevated VOCs in soil gas at IR-04 and IR-36 (Building 406). The study determined that ZVI could effectively treat the VOC plumes but recommended additional monitoring to better assess post-injection groundwater conditions. |
| 2009 to Present | Basewide Radiological Removal Action                                                      | Activities in Parcel E are designed to identify and remove low-level radiological material with radioactivity levels exceeding the remediation goals at all radiologically impacted sites outside of IR-02 and IR-03, which includes the 500 series buildings, Building 707 triangle area, and storm drain and sewer lines. The fieldwork is scheduled for completion in 2015.                                                                                                                                                      |
| 2011 to Present | Characterization and Treatability Study at IR-03                                          | An initial study (from 2011 to 2012) further characterized the extent of NAPL at IR-03, and tested heating technologies (to enhance NAPL removal) on a bench-scale. A follow-on study was initiated in 2013 and further characterized the NAPL; a second phase of the study will be implemented in 2014 to test two technologies (in-situ stabilization/solidification and thermally enhanced NAPL extraction) in the field.                                                                                                        |

**Table 1. Previous Investigations, Treatability Studies, and Removal Actions** *(continued)*

| Date(s)      | Investigation/Study/Removal Action <sup>a</sup> | Investigation/Treatability Study/Removal Action Activities                                                                                                                                                                                            |
|--------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2012 to 2013 | Soil Characterization at Various Locations      | The study further characterized areas with soil contamination that significantly exceeded screening criteria (by at least five times). The characterization helped to delineate areas that may require excavation and offsite disposal in the future. |

Notes:

a = The documents listed are available in the Administrative Record and provide detailed information used to support remedy selection at Parcel E.

ACM = asbestos-containing material

ASTs = aboveground storage tanks

COPECs = chemicals of potential ecological concern

ERA = ecological risk assessment

FS = Feasibility Study

GPR = ground-penetrating radar

HHRA = human health risk assessment

HPNS = Hunters Point Naval Shipyard

HRA = Historical Radiological Assessment

IR = Installation Restoration

mg/kg = milligrams per kilogram

NAPL = nonaqueous-phase liquid

NRDL = Naval Radiological Defense Laboratory

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

PCE = tetrachloroethene

RCRA = Resource Conservation and Recovery Act

RI = Remedial Investigation

SVE = soil vapor extraction

TCE = trichloroethene

TPH = total petroleum hydrocarbons

USTs = underground storage tanks

VOCs = volatile organic compounds

ZVI = zero-valent iron

Figure 7 identifies the locations of several removal actions conducted at Parcel E, which have addressed radiological contamination in numerous areas pursuant to a **Basewide Time-Critical Removal Action Memorandum**<sup>(9)</sup>. The removal action to address the radiologically impacted sites in Parcel E (outside of IR-02 and IR-03) began in 2009 and is scheduled for completion in 2015. All interim reports will be summarized in a final removal action completion report (RACR), which will be reviewed and approved by the FFA signatories and the California Department of Public Health (CDPH). Although the removal action will not be completed by the time this ROD is signed, the removal action is intended to achieve cleanup goals identical to the remedial action objectives (RAOs) specified in this ROD. If the removal action does not achieve its cleanup goals, cleanup will continue in accordance with the remedial action selected in this ROD until the RAOs are achieved. The ongoing removal action does not address IR-02 and IR-03 because nonradioactive chemicals in soil and shoreline sediment within these areas require remedial action, which will be performed as part of the selected remedy.

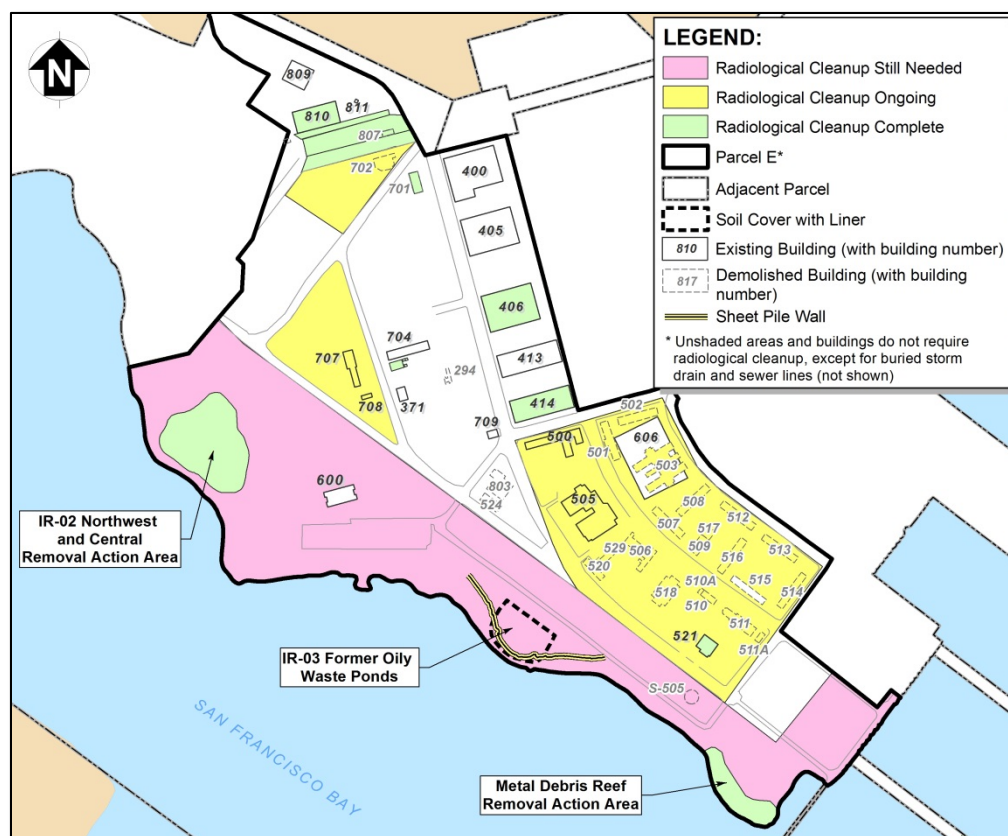


Figure 7. Removal Actions

Based on previous investigations and removal actions, the sources and extent of the remaining contamination in soil, shoreline sediment, and groundwater have been characterized adequately to select an appropriate remedy. [Section 2.3.1](#) summarizes the nature and extent of nonradioactive chemicals in soil and shoreline sediment, and [Section 2.3.2](#) summarizes the nature and extent of nonradioactive chemicals in groundwater. [Section 2.3.3](#) describes the nature and extent of NAPL at IR-03. [Section 2.3.4](#) describes the nature and extent of radionuclides in soil, shoreline sediment, and groundwater at Parcel E.

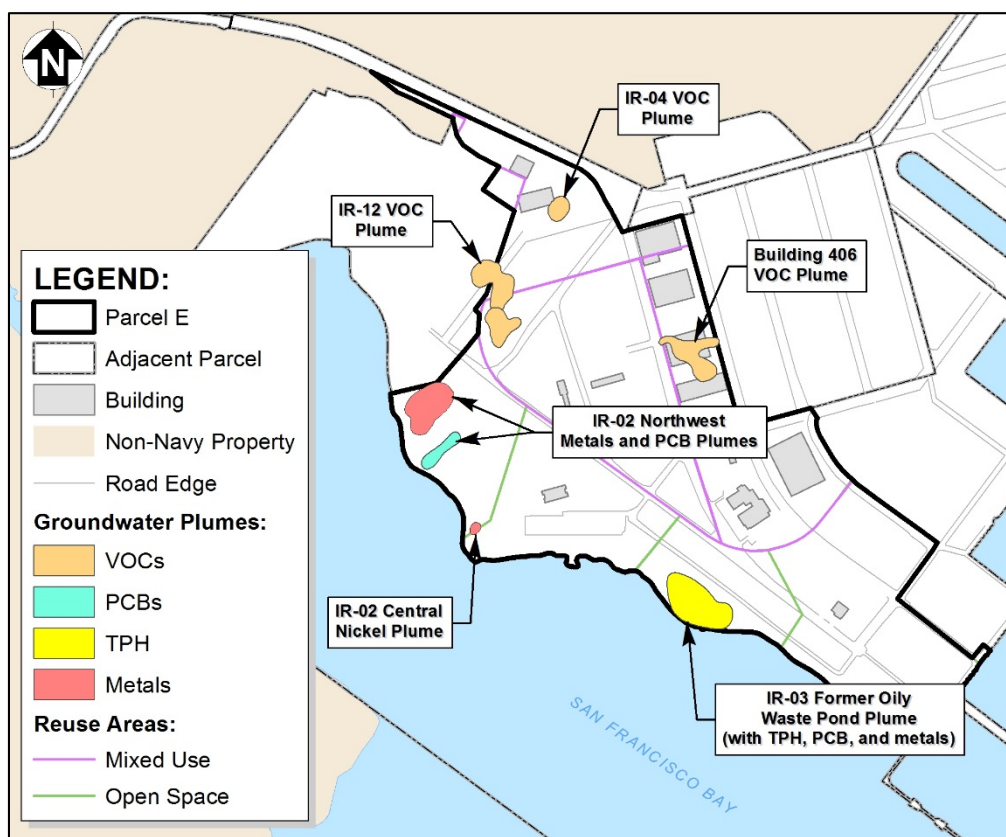
### 2.3.1. Nonradioactive Chemicals in Soil and Shoreline Sediment

Soil investigations at Parcel E identified metals, VOCs, SVOCs, PCBs, dioxins and furans, and TPH as the **chemicals in soil that exceeded screening criteria**<sup>(10)</sup> used in the RI and were present over large portions of Parcel E. The investigations of shoreline sediment indicated that concentrations of copper, lead, mercury, zinc, PCBs, and dichlorodiphenyltrichloroethane (DDT) exceeded screening criteria (used in the RI) in most locations along the Parcel E shoreline and are a **potential source of contamination to Parcel F**<sup>(11)</sup>. Contaminated sediments above msl will be addressed by the selected remedy for Parcel E. Contaminated sediments below msl will be addressed, as necessary, by the selected remedy for Parcel F, the Navy's property offshore of HPNS.

### 2.3.2. Nonradioactive Chemicals in Groundwater

Groundwater investigations at Parcel E have identified **groundwater plumes**<sup>(12)</sup> with concentrations of metals, VOCs, PCBs, and TPH that exceeded screening criteria used in the RI. Primary potential migration pathways for contaminated groundwater include migration and discharge of A-aquifer groundwater into San Francisco Bay and volatilization of A-aquifer groundwater (in areas within VOC plumes) into soil gas and then indoor air. The potential risk associated with these migration pathways is described in [Section 2.5](#). [Figure 8](#) shows the groundwater plumes at Parcel E that required further evaluation in the FS Report (as determined by the risk evaluations described further in [Section 2.5](#)). An additional groundwater plume, which contained benzene, was identified in IR-39. This plume, however, is attributed to past releases from the underground storage tanks at Building 709 (former Navy exchange gas station), thus it is being addressed under the Navy's TPH corrective action program.

Following identification of the VOC plumes ([Figure 8](#)) in the RI, the Navy performed additional studies (from 2009 to 2012) at these areas to better understand the extent of contamination and to evaluate potential cleanup technologies. The additional studies identified **VOCs in soil gas**<sup>(13)</sup> at concentrations that exceed risk-based screening levels. The VOCs reported in soil gas emanate from either contaminated soil or groundwater in the areas.



**Figure 8. Groundwater Plumes**

### 2.3.3. NAPLs at IR-03

Past investigations have identified **NAPL across large portions of the Former Oily Waste Ponds**<sup>(14)</sup> (referred to as IR-03) and adjacent portions of IR-02. Most of the NAPL is present at depths ranging from 11 to 18 feet below ground surface (bgs), with isolated locations where NAPL was found as shallow as 8 feet bgs and as deep as 25 feet bgs. The NAPL is highly viscous and contains a mixture of petroleum hydrocarbons and other organic chemicals (including PCBs and aryl phosphates in some locations). The high viscosity of NAPL limits its mobility; however, NAPL appears to be a continuing source to groundwater contamination, as evidenced by elevated chemical concentrations (most notably TPH and PCBs) in groundwater that may pose a risk to aquatic wildlife in the bay (discussed further in [Section 2.5](#)). In addition, groundwater monitoring wells located adjacent to the shoreline (bayside of the sheet-pile wall) contain measureable NAPL, indicating that NAPL could discharge to San Francisco Bay. [Section 2.8](#) discusses the remedial alternatives specific to NAPL at IR-03.

As noted in [Table 1](#), the Navy is conducting a study at IR-03, concurrent with this ROD, to further characterize the NAPL and test two technologies (in-situ stabilization/solidification and thermally-enhanced extraction) in the field. The first phase of this study was completed in 2013, and characterized the chemical composition and physical properties of the NAPL. The characterization findings, which identified some additional chemicals (aryl phosphates) that result in a denser NAPL when compared to other oily wastes, were used to develop an **approach for testing thermally-enhanced extraction**<sup>(15)</sup> in a manner that ensures the protection of human health and the environment. The second phase of the study will be completed in 2014 and will involve field testing of thermally-enhanced extraction and in-situ stabilization/solidification.

### 2.3.4. Radionuclides in Soil, Shoreline Sediment, and Groundwater

**Several radiological investigations**<sup>(16)</sup> have been conducted at radiologically impacted sites at Parcel E, and have included surface scans and collection of soil and groundwater samples for radiological analyses. The most extensive and recent of the radiological investigations, the Phase V investigation, involved the collection of more than 300 soil samples primarily within the location of current and former series 500 buildings and the Building 707 Triangle Area. Soil sample results identified two primary radionuclides of concern (ROCs) at these areas: cesium-137 (<sup>137</sup>Cs) and radium-226 (<sup>226</sup>Ra). For evaluation purposes in the radiological addendum to the FS Report, the activity level for each ROC was compared against the corresponding release criterion to provide a general assessment of the distribution of ROCs in surface soil at Parcel E. The assessment results, as identified in the radiological addendum to the FS Report, are as follows:

- The extent of <sup>137</sup>Cs in surface soil exceeding the release criterion (0.113 picocurie per gram [pCi/g]) was moderate.
- The extent of <sup>226</sup>Ra in surface soil exceeding the release criterion (1.0 pCi/g above the background activity level) was widespread.



As identified in the HRA, shoreline sediment (within the intertidal zone), subsurface soil, and structures at Parcel E are also considered radiologically impacted; however, data are inadequate to support a detailed evaluation of the nature and extent of radionuclides in shoreline sediment, subsurface soil, and structures. In the absence of such data, this ROD assumes that radiologically impacted sediment, subsurface soil, and structures, as identified in the HRA, will require remediation. As described in [Section 2.3](#), the radiologically impacted sites in Parcel E outside of IR-02 and IR-03 are being addressed through an ongoing removal action (initiated in 2009 and scheduled for completion in 2015). Although the radiological removal action will not be completed by the time this ROD is signed, the removal action is intended to achieve cleanup goals identical to the RAOs specified in this ROD. If the removal action does not achieve its cleanup goals, cleanup will continue in accordance with the remedial action selected in this ROD until the RAOs are achieved. The ongoing removal action does not address IR-02 and IR-03 because nonradioactive chemicals in soil and shoreline sediment within these areas will be addressed as part of the selected remedy. [Section 2.8](#) discusses the radiological remedial alternatives for IR-02 and IR-03.

The groundwater data set from previous [radiological groundwater investigations](#)<sup>(17)</sup>, performed from 2001 to 2002 and 2007 to 2009, consists of 159 samples collected from 37 A-aquifer wells and 4 samples collected from 1 B-aquifer well within Parcel E. The radionuclide groundwater data were evaluated by simple (non-statistical) threshold comparisons to fixed standards (drinking water criteria) and by statistical tests comparing the site data to fixed standards (one-sample statistical tests), if necessary. Through these comparisons, the radiological addendum concluded that groundwater does not appear to have been impacted by radionuclides at activity levels that warrant remedial action. However, nonradioactive chemicals in groundwater within IR-02 and IR-03 require remedial action, including monitoring, ICs, source removal, and containment. Future monitoring will include analysis for radionuclides in groundwater to demonstrate, consistent with the findings of previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health and the environment (see [Section 2.7](#) for further information).

## **2.4. CURRENT AND POTENTIAL FUTURE SITE USES**

Parcel E is a former industrial use area with most areas subject to restricted access because of ongoing remediation. Building 606, located in the southeast portion of Parcel E, is the only occupied building at Parcel E; it is currently leased to the San Francisco Police Department. As described in [Section 2.1](#), the future use of Parcel E is described in the CCSF's [2010 redevelopment plan for HPNS](#)<sup>(4)</sup>, which identifies two future land use districts located partially in Parcel E: the Shipyard South Multi-Use District and the Shipyard Shoreline Open Space District. The Shipyard South Multi-Use District may be used for recreational, industrial, and residential purposes. The Shipyard Shoreline Open Space District may be used for active and passive recreation, plazas and promenades, wetlands restoration, and ancillary commercial use.

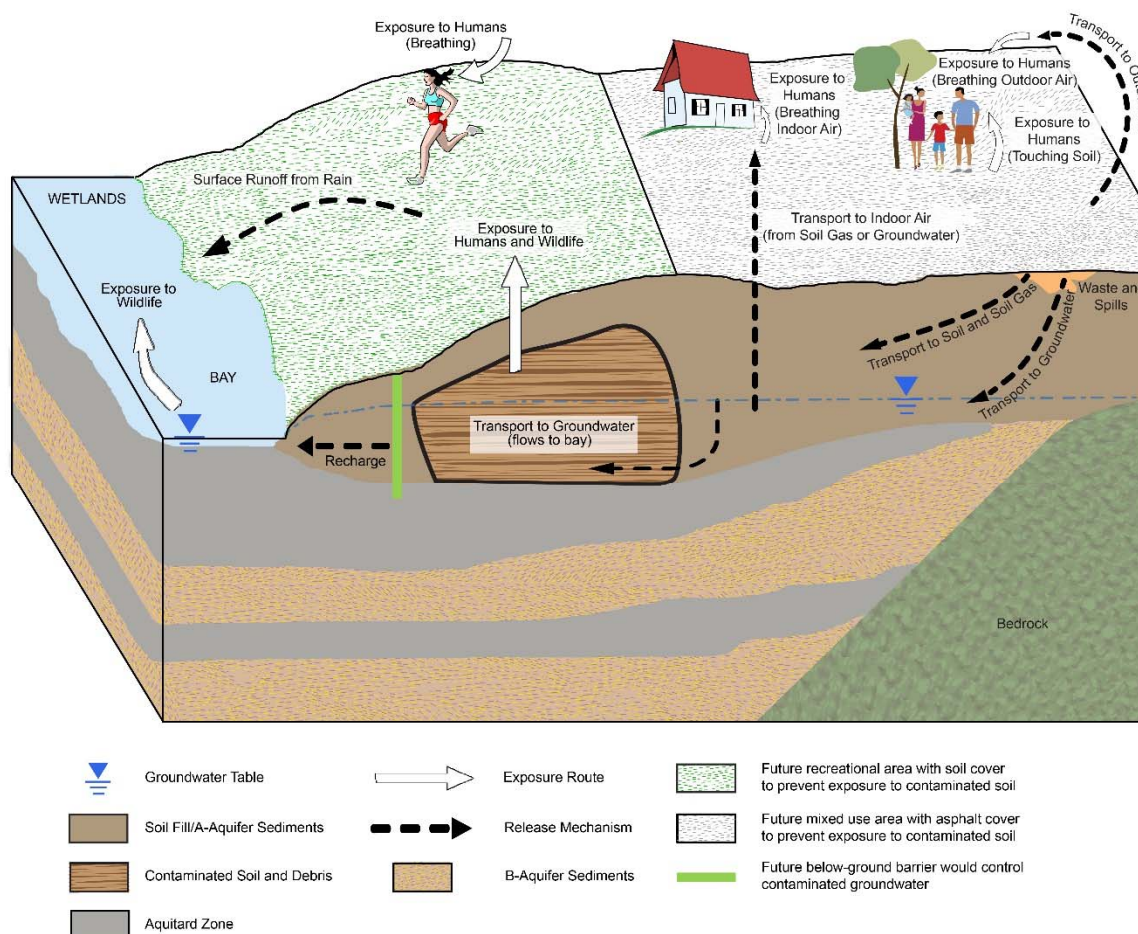
As discussed in [Section 2.1](#), the Navy subdivided the two land use districts into smaller reuse areas to facilitate the data presentation in the FS Report. The Navy-defined reuse areas in the portion of the Shipyard South Multi-Use District located in Parcel E are MU-1, MU-2, and MU-3. The Navy-defined reuse areas in the portion of the Shipyard Shoreline Open Space District located in Parcel E are EOS-1 through EOS-4, EOS-5A, EOS-5B, and EOS-5C. [Figure 5](#) presents the planned reuses and reuse areas within Parcel E. It should be noted that the data analysis and risk evaluations presented in the Revised RI Report were based on the 1997 “Hunters Point Shipyard Redevelopment Plan,” which included a different combination of future uses in Parcel E (including commercial and industrial uses). However, the Revised RI Report included an evaluation of residential exposures throughout Parcel E, which provides an adequate baseline for the risk evaluations.

Groundwater in the A-aquifer, as discussed in the Revised RI Report, is not suitable for use as [drinking water](#)<sup>(6)</sup>. Exposures to A-aquifer groundwater were evaluated based on transport of groundwater to San Francisco Bay. Groundwater in the B-aquifer was evaluated as a drinking water source, based on pertinent regulatory criteria, and was determined to have a potential for use as drinking water. However, as described in [Section 2.2](#), CCSF controls the future use of B-aquifer groundwater at HPNS, and the SFPUC does not provide for use of groundwater in this area of the city.

## 2.5. SUMMARY OF SITE RISKS

Contaminated media at Parcel E consist of soil, soil gas, shoreline sediment, and groundwater. The primary contaminant transport mechanisms are (1) leaching from soil to groundwater by infiltrating precipitation or as a result of fluctuating groundwater levels, (2) discharge from groundwater to surface water through direct discharge or via leaking utility lines, (3) volatilization from soil or groundwater to soil gas and then indoor air, and (4) transport of soil or shoreline sediment to surface water with overland flow of storm water.

[Figure 9](#) provides a general conceptual site model (CSM) for Parcel E. Based on the CSM, Parcel E was evaluated for potential risks to human health and the environment in the Revised RI Report, the FS Report, and the radiological addendum to the FS Report. [Section 2.5.1](#) presents the results of the human health risk assessment (HHRA). [Section 2.5.2](#) presents the results of the ecological risk assessments.



**Figure 9. Conceptual Site Model**

### 2.5.1. Human Health Risk Assessment

Based on a [CSM for human health<sup>\(18\)</sup>](#), a [quantitative HHRA<sup>\(19\)</sup>](#) was completed for soil, shoreline sediment, and groundwater at Parcel E. Potential [cancer risks and noncancer hazards<sup>\(20\)</sup>](#) were calculated based on reasonable maximum exposure (RME) assumptions recommended by EPA and DTSC. These assumptions are based on an RME rather than an average or medium range exposure assumption and provide a conservative and protective approach that estimates the highest health risks that are reasonably expected to occur at a site.

Cancer risk is the estimated probability that a person will develop cancer from exposure to site contaminants and is generally expressed as an upper-bound probability. For example, a 1 in 1,000,000 chance is a risk that for every 1,000,000 people, one additional cancer case may occur as a result of exposure to site contaminants. This risk estimate is termed excess cancer risk. The Navy adopted a conservative approach at Parcel E and evaluated action where potential excess cancer risk exceeded 1 in 1,000,000, which meets the most conservative end of the risk management range established by EPA.

Noncancer hazard is the risk of health effects other than cancer, and is expressed as a number called the hazard index (HI). An HI of 1 or less is considered an acceptable exposure level for noncancer health hazards. The Navy evaluated action at Parcel E areas with an HI greater than 1.

The HHRA specifies the [assumptions and uncertainties](#)<sup>(21)</sup> inherent in the risk assessment process attributed to a number of factors including the number of samples collected or their location, the literature-based exposure and toxicity values used to calculate risk, and risk characterization across multiple media and exposure pathways. The uncertainties can result in the overestimation or underestimation of the actual cancer risk or HI. In general, the risk assessment process is based on the use of conservative (health protective) assumptions that when combined are intended to overestimate the actual risk.

#### 2.5.1.1. Soil Risk Summary

Both [total excess and incremental excess risks](#)<sup>(22)</sup> were evaluated for exposure to soil. For the total risk evaluation, all detected chemicals, except for calcium, magnesium, potassium, and sodium (essential nutrients), were included as chemicals of potential concern (COPCs) regardless of concentration. The total excess risk evaluation provided an estimate of the risks posed by all chemicals at Parcel E, including those present at concentrations at or less than Hunters Point ambient levels (HPALs). The HPALs are an indicator for naturally occurring metals that are part of the soil and rock at the shipyard. For the incremental excess risk evaluation, the essential nutrients and metals with maximum detected concentrations less than HPALs were excluded as COPCs. The incremental excess risk evaluation provided an estimate of risks posed by all chemicals at Parcel E, except those that do not exceed HPALs.

Based on the [HHRA results for nonradioactive chemicals in soil](#)<sup>(23)</sup>, incremental excess cancer risks exceeded 1 in 1,000,000 and noncancer hazards were greater than 1 (see [Table 2](#)). In addition, incremental excess [cancer risks from exposure to radionuclides in soil](#)<sup>(24)</sup> exceeded 1 in 1,000,000 (see [Table 2](#)).

**Table 2. Incremental Excess Cancer Risks and Noncancer Hazards in Soil <sup>a</sup>**

| Parcel E Reuse Area | Exposure Scenario | Cancer Risk              |                | Noncancer Hazard Index |
|---------------------|-------------------|--------------------------|----------------|------------------------|
|                     |                   | Nonradioactive Chemicals | Radionuclides  |                        |
| EOS-1               | Recreational      | 1 in 10,000              | 7 in 1,000,000 | 10                     |
| EOS-2               | Recreational      | 9 in 1,000               | 3 in 10,000    | 1,700                  |
| EOS-3               | Recreational      | 1 in 1,000               | 2 in 100,000   | 3.2                    |
| EOS-4               | Recreational      | 3 in 10,000              | 7 in 1,000     | 9.6                    |
| EOS-5A              | Recreational      | 1 in 100,000             | --             | <1                     |
| EOS-5B              | Recreational      | 7 in 100,000             | --             | <1                     |
| EOS-5C              | Recreational      | --                       | --             | <1                     |
| MU-1                | Residential       | 6 in 1,000               | 7 in 1,000     | 130                    |
| MU-2                | Residential       | 3 in 1,000               | 9 in 10,000    | 54                     |

**Table 2. Incremental Excess Cancer Risks and Noncancer Hazards in Soil <sup>a</sup> (continued)**

| Parcel E<br>Reuse Area | Exposure<br>Scenario | Cancer Risk                 |               | Noncancer<br>Hazard Index |
|------------------------|----------------------|-----------------------------|---------------|---------------------------|
|                        |                      | Nonradioactive<br>Chemicals | Radionuclides |                           |
| MU-3                   | Residential          | 1 in 1,000                  | 8 in 10,000   | 65                        |

Notes: Reuse areas are shown on [Figure 5](#) and align with anticipated future use.

a = Listed risk value is maximum incremental risk in each area; risk is based on conditions before cleanup (including prior to interim removal actions, such as those related to radionuclides).

EOS = Parcel E open space (reuse area) MU = multi-use (reuse area) -- = not applicable (i.e., no chemicals of concern in the reuse area)

### 2.5.1.2. Shoreline Sediment Risk Summary

Total excess risks were evaluated for [direct exposure to shoreline sediment](#)<sup>(25)</sup>, as well as ingestion of shellfish along the shoreline. For the direct exposure pathway, PCBs were the only chemical with a risk greater than 1 in 1,000,000 (based on RME assumptions). Noncancer hazards for the direct exposure pathway were less than 1. For the shellfish ingestion pathway, the primary risk drivers associated with Parcel E shoreline sediments were arsenic, total PCBs, and dioxins, where cancer risks for these chemicals exceeded 1 in 1,000,000 (based on RME assumptions). Noncancer hazards for the shellfish ingestion pathway were greater than 1, and were attributed to total PCBs.

### 2.5.1.3. Groundwater Risk Summary

Both total and incremental excess risks were evaluated for exposure to groundwater. Based on the [HHRA results for nonradioactive chemicals in groundwater](#)<sup>(26)</sup>, incremental excess cancer risks exceeded 1 in 100,000 and noncancer hazards were greater than 1 (see [Table 3](#)).

**Table 3. Incremental Excess Cancer Risks and Noncancer Hazards, Groundwater Before Cleanup<sup>a</sup>**

| Reuse Area                                                       | Exposure Scenario | Cancer Risk  | Hazard Index |
|------------------------------------------------------------------|-------------------|--------------|--------------|
| Breathing Indoor Air from A-Aquifer Groundwater                  |                   |              |              |
| MU-1                                                             | Residential       | 2 in 1,000   | 11           |
| MU-2                                                             | Residential       | 1 in 1,000   | 4.6          |
| MU-3                                                             | Residential       | 8 in 100,000 | 2.9          |
| Drinking of or Showering with B-Aquifer Groundwater <sup>b</sup> |                   |              |              |
| MU-1                                                             | Residential       | --           | --           |
| MU-2                                                             | Residential       | 4 in 10,000  | 2.5          |
| MU-3                                                             | Residential       | --           | --           |

Notes:

a = Listed risk value is maximum incremental risk in Parcel E; risk is based on conditions before cleanup.

b = B-aquifer groundwater has a moderate potential to be used as a future drinking water source but is subject to local regulatory controls (as described in [Section 2.2](#)).

EOS = Parcel E open space (reuse area) MU = multi-use (reuse area) -- = not applicable (i.e., no chemicals of concern in the reuse area)

### 2.5.2. Ecological Risk Assessment

The Navy performed a **baseline ecological risk assessment**<sup>(27)</sup> (BERA) for soil and a **screening-level ecological risk assessment**<sup>(28)</sup> (SLERA) for shoreline sediment to evaluate risks to wildlife (such as small mammals, birds, and marine life) from exposure to soil and sediment. In addition, the Navy performed a SLERA to evaluate **risks to aquatic wildlife**<sup>(29)</sup> from exposure to potentially contaminated groundwater at Parcel E.

#### 2.5.2.1. BERA for Soil

The BERA compared soil data against toxicity benchmarks for selected ecological receptors. Results of the risk evaluation indicated carnivorous birds (such as the American kestrel) and small omnivorous mammals (such as the house mouse) may be at risk from ingested doses of copper, lead, and PCBs at Parcel E. However, the magnitude of the hazard quotient (HQ) (all less than 2.7) and the low quality of the habitat at Parcel E suggests that risk is neither immediate nor severe.

#### 2.5.2.2. SLERA for Shoreline Sediment

The SLERA for shoreline sediment evaluated whether or not chemicals detected along the shoreline pose an ecological risk to those receptors exposed to the narrow intertidal zone. All chemicals detected in shoreline sediment samples were screened to identify chemicals of potential ecological concern (COPECs). A toxicity-based approach was used to identify site-related chemicals that may pose risks to sensitive ecological receptors, including benthic invertebrates, birds, and mammals. Ingested doses were estimated for three birds (willet, surf scoter, and red tailed-hawk) and one mammal (house mouse). The SLERA identified the following COECs in shoreline sediment:

- Benthic invertebrates: copper, lead, mercury, zinc, PCBs, and DDT
- Birds (willet, surf scoter, and red tailed-hawk): PCBs
- Mammals (house mouse): cadmium, copper, molybdenum, zinc, and PCBs

#### 2.5.2.3. Risk Evaluation of Groundwater

The SLERA evaluated potential risks to aquatic wildlife from exposure to contaminated groundwater at Parcel E. Chemical concentrations in groundwater were screened against the assigned aquatic evaluation criteria, mainly comprising saltwater aquatic criteria, to identify COPECs for surface water quality. Site-specific data for select COPECs were then evaluated against **trigger levels**<sup>(30)</sup><sup>9</sup>, consistent with the methods used in recent FS reports at other HPNS parcels, to further confirm if the COPECs needed to be addressed in remedial alternatives. Based on concentrations exceeding trigger levels (as adjusted based on ambient

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<sup>9</sup> Trigger levels were developed (in the FS Report for Parcel E) for specific groundwater plumes by applying attenuation factors to pertinent surface water quality criteria (as identified in pertinent surface water ARARs and, for select metals, adjusted for ambient levels). The attenuation factors vary based on several parameters (most notably, width of the contaminant plume and distance to the bay) and provide a conservative estimate of the advection and dispersion that reduces chemical concentrations as groundwater moves from an inland location to San Francisco Bay. Further information on the development of trigger levels is provided in the hyperlinked reference document ([Attachment 2](#)).



levels), the following chemicals (or groups of chemicals) pose a potential risk to aquatic wildlife exposed to contaminated groundwater at Parcel E:

- Metals: arsenic, copper, lead, nickel, and zinc
- PCBs and pesticides: Aroclor-1254, Aroclor-1260, 4,4'-dichlorodiphenyldichloroethene (DDE), and alpha-chlordane
- Total TPH: sum of detected concentrations of all TPH ranges (gasoline-range, diesel-range, and motor-oil range)

Figure 8 identifies the groundwater plumes where these chemicals are present at concentrations exceeding the corresponding trigger levels (as adjusted based on ambient levels). Two additional groundwater plumes, which contained metals, were identified at IR-05 and IR-12; however, groundwater concentrations at these plumes did not exceed the corresponding trigger levels, thus the plumes did not require further evaluation in the FS Report.

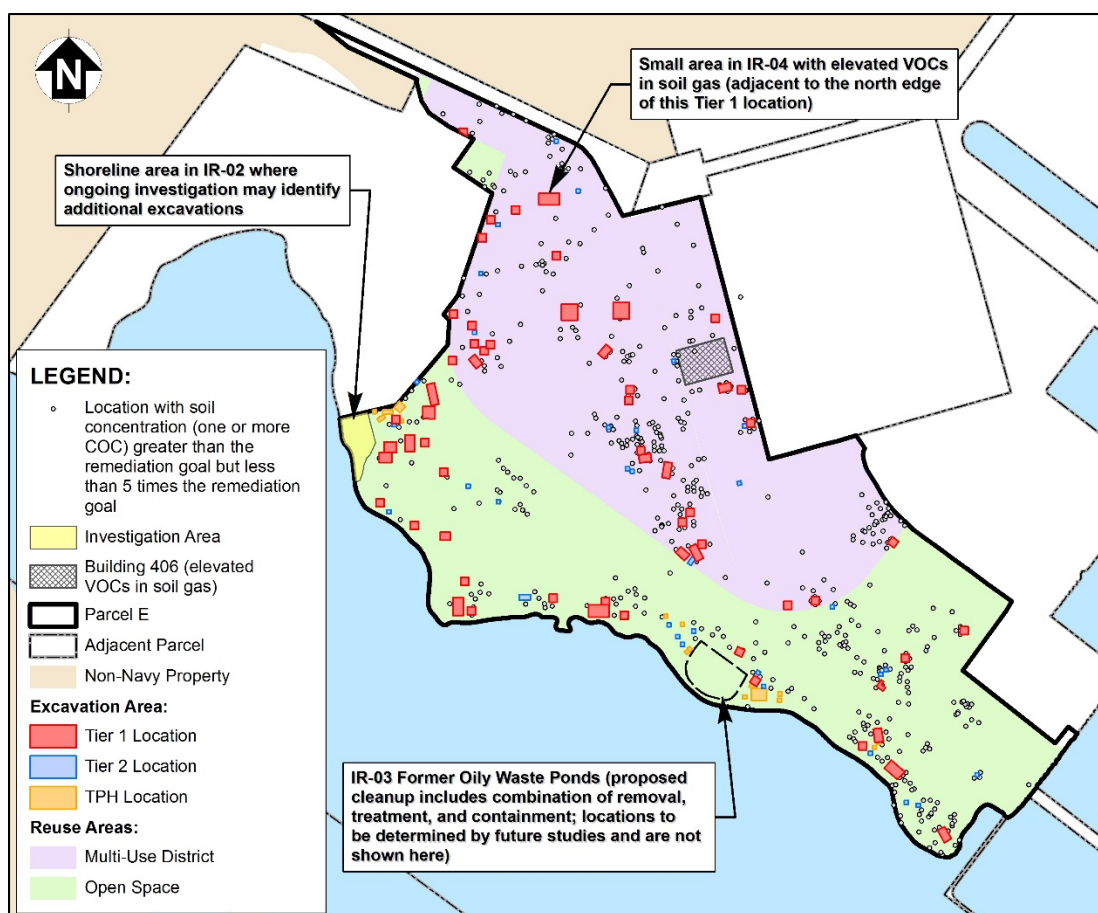
### 2.5.3. Basis for Response Action

The response actions selected in this ROD are necessary to protect the public health, welfare, or the environment from actual or potential releases of hazardous substances into the environment. The Navy, in partnership with EPA, DTSC, and the Water Board, considered all pertinent factors in accordance with CERCLA and NCP remedy selection criteria and determined that remedial action is necessary to clean up soil, shoreline sediment, groundwater, and radiologically impacted media (including soil, shoreline sediment, and structures) at Parcel E. In addition, remedial action is necessary to control the NAPL contaminant source at IR-03. This determination was made because:

- Based on the HHRA results for **nonradioactive chemicals in soil**<sup>(31)</sup>, shoreline sediment, and **groundwater**<sup>(32)</sup>, incremental excess cancer risks exceed 1 in 1,000,000 and noncancer hazards were greater than 1 (see [Tables 2 and 3](#)).
- Incremental excess cancer risks from exposure to radionuclides in soil exceed 1 in 1,000,000 (see [Table 2](#)).
- Based on the **SLERA results**<sup>(33)</sup>, chemical concentrations in shoreline sediment and groundwater in Parcel E pose a potential threat to wildlife.

The HHRA identified numerous nonradioactive COCs in soil present at concentrations that posed an unacceptable excess cancer risk or noncancer hazard (based on an evaluation of incremental risk). The elevated concentrations of several COCs (most notably arsenic, polycyclic aromatic hydrocarbons, and PCBs) were found to be dispersed over the different reuse areas at Parcel E. The widespread extent of these COCs prompted the Navy to consider a combination of removal and containment options in developing potential response actions. Specifically, the Navy identified an approach that proposed removal of the soil areas that posed the most significant risk to humans, and proposed containment for the remaining soil areas that posed a lower risk to humans.

In identifying potential soil areas for removal, the Navy focused the list of COCs to those nonradioactive chemicals present at concentrations that exceeded the **remediation goals**<sup>(34)</sup>, which generally correspond to an excess cancer risk of 1 in 1,000,000 or a noncancer HI of 1 (based on an evaluation of incremental risk), by a factor of at least 5 (these areas are referred to as Tier 1 and Tier 2 locations). Tier 1 locations contain COCs at concentrations greater than 10 times the remediation goals. Tier 2 locations contain COCs at concentrations greater than 5 times the remediation goals. Tier 1 and Tier 2 locations contain elevated concentrations of nonradioactive COCs that pose the most significant risk to humans. **Figure 10** on page 2-24 identifies the Tier 1 and Tier 2 locations, as well as TPH locations that contain TPH (commingled with CERCLA-regulated chemicals) at concentrations exceeding the petroleum source criterion (3,500 mg/kg). **Figure 10** also identifies an area, adjacent to the shoreline in the northwest portion of Parcel E, where the Navy is conducting a soil investigation that may identify additional Tier 1, Tier 2, and TPH locations. In addition, **Figure 10** highlights Building 406 and a portion of IR-04, which contain elevated concentrations of VOCs in soil gas that pose a potential risk to humans.



**Figure 10. Tier 1, Tier 2, and TPH Locations in Soil**



Table 4 identifies the COCs at the Tier 1 and Tier 2 locations, along with the soil remediation goals and soil action levels for each COC (i.e., corresponding to five times the remediation goal).

**Table 4. Chemicals of Concern at Tier 1 and Tier 2 Locations**

| Reuse Area                          | COCs                       | Soil Remediation Goal <sup>a</sup><br>(mg/kg) | Soil Action Level <sup>b</sup><br>(mg/kg) |
|-------------------------------------|----------------------------|-----------------------------------------------|-------------------------------------------|
| Open Space<br>(EOS-1 through EOS-5) | Aroclor-1254               | 0.74                                          | 3.7                                       |
|                                     | Aroclor-1260               | 0.74                                          | 3.7                                       |
|                                     | Arsenic                    | 11.1                                          | 55.5                                      |
|                                     | Benzo(a)anthracene         | 1.3                                           | 6.5                                       |
|                                     | Benzo(a)pyrene             | 0.33                                          | 1.7                                       |
|                                     | Benzo(b)fluoranthene       | 1.3                                           | 6.5                                       |
|                                     | Benzo(k)fluoranthene       | 1.3                                           | 6.5                                       |
|                                     | Chrysene                   | 13                                            | 65                                        |
|                                     | Copper <sup>c</sup>        | 470 <sup>c</sup>                              | 2,350 <sup>d</sup>                        |
|                                     | Dibenz(a,h)anthracene      | 0.33                                          | 1.7                                       |
|                                     | Dieldrin                   | 0.12                                          | 0.59                                      |
|                                     | Heptachlor epoxide         | 0.21                                          | 1.1                                       |
|                                     | Indeno(1,2,3-cd)pyrene     | 1.3                                           | 6.5                                       |
|                                     | Lead                       | 155                                           | 775                                       |
|                                     | Manganese                  | 2,430                                         | 12,200                                    |
|                                     | Zinc <sup>c</sup>          | 719 <sup>c</sup>                              | 3,600 <sup>d</sup>                        |
| Mixed Used<br>(MU-1 through MU-3)   | 3,3-Dichlorobenzidine      | 0.008                                         | 0.04                                      |
|                                     | Alpha-BHC                  | 0.0019                                        | 0.010                                     |
|                                     | Antimony                   | 10                                            | 50                                        |
|                                     | Aroclor-1254               | 0.093                                         | 0.47                                      |
|                                     | Aroclor-1260               | 0.21                                          | 1.1                                       |
|                                     | Arsenic                    | 11.1                                          | 55.5                                      |
|                                     | Benzo(a)anthracene         | 0.37                                          | 1.9                                       |
|                                     | Benzo(a)pyrene             | 0.33                                          | 1.7                                       |
|                                     | Benzo(b)fluoranthene       | 0.34                                          | 1.7                                       |
|                                     | Benzo(k)fluoranthene       | 0.34                                          | 1.7                                       |
|                                     | Bis(2-ethylhexyl)phthalate | 1.1                                           | 5.5                                       |
|                                     | Cadmium                    | 3.5                                           | 18                                        |
|                                     | Copper                     | 160                                           | 800                                       |
|                                     | Dibenz(a,h)anthracene      | 0.33                                          | 1.7                                       |
|                                     | Heptachlor epoxide         | 0.00054                                       | 0.0027                                    |

**Table 4. Chemicals of Concern at Tier 1 and Tier 2 Locations** *(continued)*

| Reuse Area                                          | COCs                   | Soil Remediation Goal <sup>a</sup><br>(mg/kg) | Soil Action Level <sup>b</sup><br>(mg/kg) |
|-----------------------------------------------------|------------------------|-----------------------------------------------|-------------------------------------------|
| Mixed Used<br>(MU-1 through<br>MU-3) <i>(cont.)</i> | Indeno(1,2,3-cd)pyrene | 0.35                                          | 1.8                                       |
|                                                     | Lead                   | 155                                           | 775                                       |
|                                                     | Mercury                | 2.28                                          | 11.4                                      |
|                                                     | Naphthalene            | 1.7                                           | 8.5                                       |
|                                                     | Vanadium               | 117.2                                         | 586                                       |
|                                                     | Zinc                   | 370                                           | 1,850                                     |

## Notes:

a = Remediation goals for recreational exposure scenario (associated with future open space areas) and residential exposure scenario (associated with future mixed use areas) are detailed in [Table 5](#). Although not listed in this table, the total TPH remediation goal (3,500 mg/kg) is used to identify TPH locations that are a potential source to groundwater contamination.

b = The soil action level for each COC is equal to five times the corresponding remediation goal. Tier 1 and Tier 2 locations contain COCs at concentrations greater than the soil action levels.

c = Remediation goals for copper and zinc (in open space reuse areas EOS-1 through EOS-5) are based on [PSCs<sup>\(35\)</sup>](#) for terrestrial wildlife. Although copper and zinc are not COCs for the recreational exposure scenario, ecological benchmarks for these chemicals are being considered during response actions to address risk from the COCs identified in the human health risk assessment.

d = Soil action levels for copper and zinc are based on PSCs for terrestrial wildlife. Soil action levels for these metals are 5 times the PSC. Excavation of soil with concentrations exceeding these soil actions levels will reduce potential sources to groundwater contamination because copper and zinc are present in groundwater in select areas at concentrations that pose a risk to aquatic life in the bay.

bgs = below ground surface

BHC = benzene hexachloride

COC = chemical of concern

mg/kg = milligrams per kilogram

PSCs = protective soil concentrations

TPH = total petroleum hydrocarbons

In developing the response actions for radiologically impacted media, the Navy considered the historical operations and the available data on the distribution of radioactivity. At most radiologically impacted sites at Parcel E, radioactive contamination is present in shallow soil and is the result of historical operations at buildings or open storage areas. At these types of sites, removal by excavation is considered a practical and cost-effective means of preventing unacceptable exposure to humans. However, the operational history at IR-02 and IR-03 involved historical filling with soil and construction debris and intermittent disposal of various shipyard wastes, including radiological devices, and required an evaluation of a combination of removal and containment. The Navy focused the removal of ROCs to the surface of IR-02 and IR-03 because these areas posed the most significant risk to future recreational users. Following cleanup of ROCs within 1 foot of the existing ground surface, a cover (comprising clean imported soil and geosynthetic material) and ICs would effectively prevent unacceptable exposures to remaining concentrations of ROCs.

The risk evaluations identified several groundwater plumes containing nonradioactive chemicals that pose a potential risk to either humans or aquatic wildlife in San Francisco Bay. Groundwater plumes containing VOCs pose a potential risk to humans and are located in the inland portions of Parcel E (see [Figure 8](#)). In evaluating potential response actions, the Navy determined that remedial action, in the form of active treatment and monitoring, is needed to address this potential risk to humans. Groundwater plumes containing metals, PCBs, and TPH pose a potential risk to aquatic wildlife and are located near the shoreline (see [Figure 8](#)). In evaluating potential response actions, the Navy determined that remedial action, in the form of source removal, containment, and monitoring, is needed to address this potential risk to aquatic

wildlife. Remedial action at the groundwater plumes will be further evaluated in the remedial design (RD) using results from the ongoing groundwater monitoring program.

## 2.6. PRINCIPAL THREAT WASTE

According to EPA's "Guide to Principal Threat and Low Level Threat Wastes," principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. The **potential principal threat wastes at Parcel E**<sup>(36)</sup> consist of trichloroethene (TCE) at Building 406 and NAPL at IR-03. Source materials at these locations have migrated to A-aquifer groundwater at concentrations that pose a potential risk to humans (from TCE at Building 406) or aquatic wildlife in San Francisco Bay (from NAPL at IR-03). To address this potentially significant risk, removal or treatment of these source materials was evaluated as a component of the remedial alternatives for these areas. However, as described in [Section 2.3.3](#), the high viscosity of NAPL at IR-03 limits its mobility, which suggests that containment may be used at IR-03, in combination with removal and treatment, to address the potential risk associated with the NAPL source. [Section 2.8](#) discusses the remedial alternatives specific to NAPL at IR-03.

## 2.7. REMEDIAL ACTION OBJECTIVES

**RAOs**<sup>(37)</sup> are established based on attainment of regulatory requirements, standards, and guidance; contaminated media; COCs and COECs; potential receptors and exposure scenarios; and human health and ecological risks. Ultimately, the success of a remedial action is measured by its ability to meet the RAOs. Planned future land use is an important component in developing RAOs, and the RAOs for Parcel E are based on the CCSF's planned use for each reuse area, which is considered the reasonable anticipated end use of the property.

The RAOs for Parcel E were developed in conjunction with the regulatory agencies and are listed below by medium of concern.

### **Soil, Soil Gas, and Shoreline Sediment RAOs**

- Prevent exposure of humans to inorganic and organic chemicals in soil at concentrations exceeding the remediation goals (see [Table 5](#)) for the following exposure pathways:
  - Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by residents in areas zoned for mixed-use reuse
  - Ingestion of homegrown produce in native soil in areas zoned for mixed-use reuse
  - Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 2 feet bgs by recreational users in areas zoned for open space reuse
  - Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by construction workers in all areas

**Table 5. Remediation Goals for Nonradioactive Chemicals in Soil**

| Chemical of Concern               | Remediation Goal for Residential Exposure Scenario (mg/kg) | Remediation Goal for Recreational Exposure Scenario (mg/kg) | Remediation Goal for Construction Worker Exposure Scenario (mg/kg) |
|-----------------------------------|------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------|
| 1,2,4-Trichlorobenzene            | --                                                         | --                                                          | 230                                                                |
| 1,2,4-Trimethylbenzene            | --                                                         | --                                                          | 170                                                                |
| 1,3,5-Trimethylbenzene            | --                                                         | --                                                          | 69                                                                 |
| 3,3'-Dichlorobenzidine            | 1.6                                                        | --                                                          | --                                                                 |
| 4-Nitrophenol                     | 0.29                                                       | --                                                          | --                                                                 |
| 4,4'-DDD                          | 2.1                                                        | --                                                          | --                                                                 |
| 4,4'-DDE                          | 1.6                                                        | --                                                          | --                                                                 |
| Aldrin                            | 0.024                                                      | --                                                          | 0.54                                                               |
| alpha-BHC                         | 0.0019                                                     | --                                                          | --                                                                 |
| Antimony                          | 10                                                         | --                                                          | 120                                                                |
| Aroclor-1248                      | --                                                         | --                                                          | 2.1                                                                |
| Aroclor-1254                      | 0.093                                                      | 0.74                                                        | 2.1                                                                |
| Aroclor-1260                      | 0.21                                                       | 0.74                                                        | 2.1                                                                |
| Arsenic                           | 11.1                                                       | 11.1                                                        | 11.1                                                               |
| Benzene                           | 0.18                                                       | --                                                          | 9.4                                                                |
| Benzo(a)anthracene                | 0.37                                                       | 1.3                                                         | 6.4                                                                |
| Benzo(a)pyrene                    | 0.33                                                       | 0.33                                                        | 0.65                                                               |
| Benzo(b)fluoranthene              | 0.34                                                       | 1.3                                                         | 6.5                                                                |
| Benzo(k)fluoranthene              | 0.34                                                       | 1.3                                                         | 6.5                                                                |
| Bis(2-ethylhexyl)phthalate        | 1.1                                                        | --                                                          | --                                                                 |
| Cadmium                           | 3.5                                                        | --                                                          | --                                                                 |
| Carbazole                         | 2.2                                                        | --                                                          | --                                                                 |
| Chrysene                          | --                                                         | 13                                                          | --                                                                 |
| Copper                            | 160                                                        | 470 <sup>a</sup>                                            | 11,000                                                             |
| Dibenz(a,h)anthracene             | 0.33                                                       | 0.33                                                        | 1.1                                                                |
| Dieldrin                          | 0.0033                                                     | 0.12                                                        | --                                                                 |
| Dioxins/furans (TEQ) <sup>b</sup> | --                                                         | --                                                          | 0.000023                                                           |
| gamma-BHC                         | 0.0026                                                     | --                                                          | --                                                                 |
| Heptachlor epoxide                | 0.0017                                                     | 0.21                                                        | --                                                                 |
| Indeno(1,2,3-cd)pyrene            | 0.35                                                       | 1.3                                                         | 6.5                                                                |
| Iron                              | 58,000                                                     | --                                                          | 93,000                                                             |
| Lead                              | 155                                                        | 155                                                         | 800                                                                |

**Table 5. Remediation Goals for Nonradioactive Chemicals in Soil** *(continued)*

| Chemical of Concern        | Remediation Goal for Residential Exposure Scenario (mg/kg) | Remediation Goal for Recreational Exposure Scenario (mg/kg) | Remediation Goal for Construction Worker Exposure Scenario (mg/kg) |
|----------------------------|------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------|
| Manganese                  | 1,431                                                      | 2,430                                                       | 6,900                                                              |
| Mercury                    | 2.28                                                       | 210                                                         | 93                                                                 |
| n-Nitroso-di-n-propylamine | 0.33                                                       | 0.33                                                        | 1.3                                                                |
| n-Nitrosodiphenylamine     | 0.68                                                       | --                                                          | --                                                                 |
| Naphthalene                | 1.7                                                        | --                                                          | 75                                                                 |
| Nickel                     | --                                                         | --                                                          | 5,800                                                              |
| Pentachlorophenol          | 2.60                                                       | --                                                          | --                                                                 |
| Thallium                   | 5.0                                                        | --                                                          | --                                                                 |
| Vanadium                   | 117                                                        | --                                                          | 310                                                                |
| Trichloroethene            | 2.9                                                        | --                                                          | --                                                                 |
| Zinc                       | 370                                                        | 719 <sup>a</sup>                                            | --                                                                 |
| Xylene                     | 270                                                        | --                                                          | --                                                                 |
| Total TPH <sup>c</sup>     | 3,500                                                      | 3,500                                                       | 3,500                                                              |

Notes: The basis (risk-based or ambient level) for the remediation goals is presented in Section 3 of the Feasibility Study Report.

a = Remediation goals for copper and zinc (in open space reuse areas EOS-1 through EOS-5) are based on **protective soil concentrations<sub>(35)</sub>** for terrestrial wildlife. Although copper and zinc are not COCs for the recreational exposure scenario, ecological benchmarks for these chemicals are being considered during response actions to address risk from the COCs identified in the human health risk assessment.

b = Remediation goal for dioxins and furans is expressed as a TEQ, which is calculated by multiplying the concentration of each dioxin and furan congener by a toxicity equivalency factor established by the 2005 World Health Organization and based on each congener's toxicity relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin.

c = The total TPH remediation goal is based on the petroleum source criterion for HPNS

BHC = benzene hexachloride

COC = chemical of concern

DDD = dichlorodiphenyldichloroethane

DDE = dichlorodiphenyldichloroethene

mg/kg = milligrams per kilogram

TEQ = toxic equivalent quotient

TPH = total petroleum hydrocarbons

-- = not applicable (i.e., not a chemical of concern under the exposure scenario)

- Prevent exposure of humans to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. **Table 7 of the final soil gas memorandum<sup>(38)</sup>** lists risk-based action levels for various volatile chemicals, including SVOCs and pesticides, that may pose an unacceptable risk via indoor inhalation of vapors. These soil gas action levels will be used for an initial risk-based screening of data collected during a future soil gas survey (such as the survey to be performed at Building 406 and VOC groundwater plumes following active treatment). After the initial risk-based screening, areas with unacceptable risk will be further evaluated using location-specific data (i.e., physical characteristics of the soil) to assess potential exposures consistent with the most current State of California and EPA vapor intrusion guidance. In addition, risks and hazards at these areas will be further characterized using the accepted methodology for risk assessments at HPNS. **Section 2.9.2.1** provides additional information on the future soil gas survey and potential actions that may be prompted based on the results of the risk and hazard evaluation.
- Prevent exposure of humans to COCs in shoreline sediment at concentrations exceeding the remediation goals in **Table 6**.
- Prevent exposure of benthic invertebrates, birds, and mammals to COECs in shoreline sediment at concentrations exceeding the remediation goals in **Table 6**.

**Table 6. Remediation Goals for COECs and COCs in Shoreline Sediment**

| COEC/COC              | Remediation Goal (mg/kg) |
|-----------------------|--------------------------|
| Cadmium               | 3.14                     |
| Copper                | 124                      |
| Lead                  | 218                      |
| Mercury               | 2.28                     |
| Molybdenum            | 2.68                     |
| Zinc                  | 158                      |
| Total DDT             | 0.0461                   |
| Total Aroclors (PCBs) | 0.2                      |

Notes:

COC = chemical of concern

COEC = chemical of ecological concern

DDT = dichlorodiphenyltrichloroethane

mg/kg = milligram per kilogram

PCBs = polychlorinated biphenyls

The RAOs for soil and shoreline sediment would be satisfied through actions involving removal, containment, monitoring, and ICs. The RAO for soil gas would be satisfied through actions involving active treatment (at Building 406 and other VOC groundwater plumes at Parcel E), monitoring, and ICs. Active treatment of soil gas would be performed at Building 406 until soil gas action levels are achieved or until systematic asymptotic conditions are reached without reasonable indication of further reduction based on system monitoring results. Active treatment of VOC groundwater plumes would also be performed to address unacceptable risk via indoor inhalation of vapors, and would be supplemented with monitored

natural attenuation (MNA) to ensure that natural processes are degrading the remaining VOCs. [Section 2.9.2](#) provides further information on the actions required to satisfy the RAOs for soil, soil gas, and shoreline sediment.

### **Groundwater RAOs**

- Prevent or minimize exposure of construction worker to VOCs in A-aquifer groundwater by dermal exposure and inhalation of vapors with chemicals exceeding remediation goals ([Table 7](#)).
- Prevent or minimize exposure of humans to COCs in the B-aquifer at concentrations exceeding remediation goals ([Table 7](#)) via the domestic use pathway.
- Prevent or minimize migration of arsenic, copper, lead, nickel, zinc, Aroclor-1254, Aroclor-1260, alpha-chlordane, and 4,4'-DDE to prevent discharge (into San Francisco Bay) that would result in concentrations exceeding corresponding [surface water quality criteria for aquatic wildlife](#)<sup>(39)</sup><sup>10</sup>.
- Prevent or minimize migration of A-aquifer groundwater containing total TPH concentrations greater than 1,400 micrograms per liter (µg/L) (where commingled with CERCLA-regulated substances) into San Francisco Bay.

**Table 7. Remediation Goals for Groundwater**

| Exposure Scenario                                     | Chemical of Concern        | Plume/Exposure Area                                                                                        | Remediation Goal (µg/L) |
|-------------------------------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------|-------------------------|
| Construction Worker Exposure to A-Aquifer Groundwater | 1,2-Dichloroethene (total) | ▪ Building 406 VOC Plume                                                                                   | 270 <sup>a</sup>        |
|                                                       | 1,4-Dichlorobenzene        | ▪ IR-03 Plume<br>▪ IR-04/IR-12 VOC Plume                                                                   | 52 <sup>a</sup>         |
|                                                       | Arsenic                    | ▪ IR-02 Central Nickel Plume<br>▪ IR-02 Northwest Metals Plume<br>▪ IR-03 Plume<br>▪ IR-04/IR-12 VOC Plume | 39                      |
|                                                       | Benzo(a)anthracene         | ▪ IR-03 Plume                                                                                              | 0.65                    |
|                                                       | Benzo(a)pyrene             | ▪ IR-03 Plume                                                                                              | 0.05                    |
|                                                       | Benzo(b)fluoranthene       | ▪ IR-03 Plume                                                                                              | 0.45                    |
|                                                       | Chrysene                   | ▪ IR-03 Plume<br>▪ IR-04/IR-12 VOC Plume                                                                   | 6.7                     |
|                                                       | Indeno(1,2,3-cd)pyrene     | ▪ IR-03 Plume                                                                                              | 0.31                    |
|                                                       | Naphthalene                | ▪ IR-03 Plume<br>▪ IR-04/IR-12 VOC Plume                                                                   | 16 <sup>a</sup>         |
|                                                       | Pentachlorophenol          | ▪ IR-04/IR-12 VOC Plume                                                                                    | 50                      |
|                                                       | Tetrachloroethene          | ▪ IR-04/IR-12 VOC Plume                                                                                    | 18 <sup>b</sup>         |
|                                                       | Trichloroethene            | ▪ Building 406 VOC Plume                                                                                   | 290 <sup>a</sup>        |
|                                                       | Vinyl chloride             | ▪ Building 406 VOC Plume                                                                                   | 5.4 <sup>a</sup>        |

<sup>10</sup> This evaluation should not be interpreted to state or imply that surface water ARARs such as the California Toxics Rule are ARARs for in-situ groundwater. Surface water ARARs apply to surface waters.

**Table 7. Remediation Goals for Groundwater (continued)**

| Exposure Scenario                                  | Chemical of Concern                                                | Plume/Exposure Area                                                                                                                 | Remediation Goal (µg/L) |
|----------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Domestic Use Exposure to B-Aquifer Groundwater     | 1,1- Dichloroethene                                                | <ul style="list-style-type: none"> <li>IR-03 Plume</li> <li>Building 406 VOC Plume</li> </ul>                                       | 6 <sup>b</sup>          |
|                                                    | <i>cis</i> -1,2- Dichloroethene                                    | <ul style="list-style-type: none"> <li>IR-03 Plume</li> <li>Building 406 VOC Plume</li> </ul>                                       | 6 <sup>b</sup>          |
|                                                    | <i>trans</i> -1,2- Dichloroethene                                  | <ul style="list-style-type: none"> <li>IR-03 Plume</li> <li>Building 406 VOC Plume</li> </ul>                                       | 10 <sup>b</sup>         |
|                                                    | 1,4-Dichlorobenzene                                                | <ul style="list-style-type: none"> <li>IR-03 Plume</li> <li>Building 406 VOC Plume</li> </ul>                                       | 5                       |
|                                                    | Arsenic                                                            | <ul style="list-style-type: none"> <li>IR-02 Northwest Metals Plume</li> <li>IR-03 Plume</li> <li>Building 406 VOC Plume</li> </ul> | 27.3                    |
|                                                    | Manganese                                                          | <ul style="list-style-type: none"> <li>IR-02 Northwest Metals Plume</li> <li>IR-03 Plume</li> <li>Building 406 VOC Plume</li> </ul> | 8,140                   |
|                                                    | Tetrachloroethene                                                  | <ul style="list-style-type: none"> <li>IR-03 Plume</li> <li>Building 406 VOC Plume</li> </ul>                                       | 5                       |
|                                                    | Thallium                                                           | <ul style="list-style-type: none"> <li>Building 406 VOC Plume</li> </ul>                                                            | 12.97                   |
|                                                    | Trichloroethene                                                    | <ul style="list-style-type: none"> <li>IR-03 Plume</li> <li>Building 406 VOC Plume</li> </ul>                                       | 5                       |
|                                                    | Vinyl chloride                                                     | <ul style="list-style-type: none"> <li>IR-03 Plume</li> <li>Building 406 VOC Plume</li> </ul>                                       | 0.5                     |
| Aquatic Wildlife Exposure to A-Aquifer Groundwater | Total TPH (goals vary based on distance from the bay) <sup>c</sup> | <ul style="list-style-type: none"> <li>IR-03 Plume</li> </ul>                                                                       | 1,400 to 20,000         |

Notes: The basis (risk-based, regulatory limit, or ambient level) for the remediation goals is presented in Section 3 of the FS Report (unless otherwise noted).

a = The remediation goals for select chemicals were revised (i.e., reduced slightly relative to the risk-based criteria in the FS Report) to ensure consistency with the ROD for HPNS Parcel C.

b = Remediation goals for select VOCs were added to this ROD because of their relationship to other VOCs (e.g., 1,1-dichloroethene and 1,2-dichloroethene are degradation products of trichloroethene) that were identified as chemicals of concern in the FS Report. The remediation goal for tetrachloroethene in A-aquifer groundwater is based on the risk-based criteria presented in the ROD for HPNS Parcel C. The remediation goals for 1,1-dichloroethene and 1,2-dichloroethene in B-aquifer groundwater are based on the State of California maximum contaminant limits.

c = The distance-based TPH criteria are as follows:

| Distance from shoreline (feet) | Total TPH (µg/L) | Distance from shoreline (feet) | Total TPH (µg/L) |
|--------------------------------|------------------|--------------------------------|------------------|
| 0–<25                          | 1,400            | 125–<150                       | 6,949            |
| 25–<50                         | 1,467            | 150–<175                       | 9,539            |
| 50–<75                         | 2,092            | 175–<200                       | 12,604           |
| 75–<100                        | 3,216            | 200–<225                       | 16,145           |
| 100–<125                       | 4,839            | ≥225                           | 20,000           |

HPNS = Hunters Point Naval Shipyard

IR = Installation Restoration

ROD = record of decision

TPH = total petroleum hydrocarbons

VOC = volatile organic compound

µg/L = micrograms per liter



The RAOs for groundwater would be satisfied through actions involving treatment, containment, monitoring, and ICs. As described previously, active treatment and MNA of VOC groundwater plumes would be performed to address unacceptable risk via indoor inhalation of vapors. Actions and decisions to address the indoor inhalation of vapors will be based on soil gas data and the soil gas action levels. [Section 2.9.2](#) provides further information on the actions required to satisfy the RAOs for groundwater.

**RAOs for NAPL at IR-03 (Former Oily Waste Ponds)**

- Prevent or minimize migration of NAPL to prevent discharge that would result in COEC concentrations greater than the [surface water quality criteria for aquatic wildlife<sup>\(39\)</sup>](#).
- Prevent or minimize migration of NAPL to prevent discharge that would result in total TPH groundwater concentrations greater than 1,400 µg/L into San Francisco Bay.

The COCs and COECs in soil, soil gas, shoreline sediment, and groundwater at IR-03 would be subject to the pertinent RAOs, as previously described. The RAOs for NAPL at IR-03 would be satisfied through actions involving removal, treatment, containment, monitoring, and ICs. In addition, active treatment of remaining contaminants in groundwater (following removal or treatment of NAPL) would also be performed to ensure compliance with the pertinent groundwater RAOs (regarding discharge of contaminants into San Francisco Bay). The active treatment would be supplemented with MNA to ensure that natural processes are degrading the remaining VOCs and TPH. [Section 2.9.2](#) provides further information on the actions required to satisfy the RAOs for NAPL at IR-03.

**Radiological RAO for Radiologically Impacted Media (soil, shoreline sediment, and structures)**

- Prevent exposure to ROCs at activity levels that exceed remediation goals (see [Table 8](#)) for all potentially complete exposure pathways (which include external exposure, ingestion, and inhalation of soil based on the [CSM for human health<sup>\(18\)</sup>](#)).

**Table 8. Remediation Goals for Radionuclides**

| Radionuclide  | Soil and Sediment <sup>a</sup> (pCi/g) <sup>a</sup> |                    | Surfaces                                    |                                       |
|---------------|-----------------------------------------------------|--------------------|---------------------------------------------|---------------------------------------|
|               | Industrial Worker                                   | Residential        | Equipment, Waste (dpm/100 cm <sup>2</sup> ) | Structures (dpm/100 cm <sup>2</sup> ) |
| Americium-241 | 5.67                                                | 1.36               | 100                                         | 100                                   |
| Cesium-137    | 0.113                                               | 0.113              | 5,000                                       | 5,000                                 |
| Cobalt-60     | 0.252 <sup>b</sup>                                  | 0.252 <sup>b</sup> | 5,000                                       | 5,000                                 |
| Plutonium-239 | 14.0                                                | 2.59               | 100                                         | 100                                   |
| Radium-226    | 1.0 <sup>c</sup>                                    | 1.0 <sup>c</sup>   | 100                                         | 100                                   |

**Table 8. Remediation Goals for Radionuclides** *(continued)*

| Radionuclide | Soil and Sediment <sup>a</sup> (pCi/g) <sup>a</sup> |             | Surfaces                                    |                                       |
|--------------|-----------------------------------------------------|-------------|---------------------------------------------|---------------------------------------|
|              | Industrial Worker                                   | Residential | Equipment, Waste (dpm/100 cm <sup>2</sup> ) | Structures (dpm/100 cm <sup>2</sup> ) |
| Strontium-90 | 10.8                                                | 0.331       | 1,000                                       | 1,000                                 |
| Uranium-235  | 0.398                                               | 0.195       | 5,000                                       | 488                                   |

Notes: The basis (risk-based) for the RGs is presented in Section 3 of the radiological addendum to the FS Report.

a = RGs for two future use scenarios; however, the residential RGs will apply in all Parcel E areas. These more conservative RGs will enhance the protectiveness of the remedial action for Parcel E, particularly as it relates to future property transfer and the potential need to apply institutional controls for radionuclides.

b = RG for Cobalt-60 was revised to support efficient laboratory gamma spectroscopy analysis of soil samples. This revised RG maintains morbidity risks within the U.S. Environmental Protection Agency-defined acceptable range and permits an exposure level that does not increase the risk of cancer from a potential exposure to Cobalt-60.

c = Objective is 1 pCi/g above background per agreement with U.S. Environmental Protection Agency (established in "Final Basewide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California," dated April 21, 2006). The Radium-226 background level for surface soil is 0.633 pCi/g. The Radium-226 background level for storm drain and sewer lines is 0.485 pCi/g.

dpm/100 cm<sup>2</sup> = disintegrations per minute per 100 square centimeters

pCi/g = picocurie per gram

RG = remediation goal

The RAO for radiologically impacted media outside of IR-02 and IR-03 would be satisfied through actions involving removal. The RAO for radiologically impacted media within IR-02 and IR-03 would be satisfied through actions involving a combination of removal, containment, monitoring/maintenance, and ICs. The RAO for radiologically impacted media does not pertain to groundwater because, as described in [Section 2.3.4](#), previous investigations have not identified radionuclides in groundwater at activity levels that warrant remedial action. However, the selected remedy at IR-02 and IR-03 includes future monitoring to demonstrate, consistent with the findings of previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health and the environment. The determination of statistical significance will be made in accordance with the substantive provisions of Title 22 California Code of Regulations § 66264.98(i). The duration of the groundwater monitoring for radionuclides will be determined in accordance with Title 22 California Code of Regulations § 66264.90(c). [Section 2.9.2](#) provides further information on the actions required to satisfy the RAOs for radiologically impacted media.

[Table 5](#) lists the remediation goals for COCs and COECs in soil. [Table 6](#) lists the remediation goals for COCs and COECs in shoreline sediment. [Table 7](#) lists the remediation goals for COCs in groundwater. [Table 8](#) the remediation goals for ROCs in radiologically impacted media. Remediation goals were not developed for COECs in groundwater because, except for total TPH, the water quality criteria referenced in the groundwater and NAPL RAOs are based on standards for aquatic wildlife in San Francisco Bay, apply to surface water at the interface of A-aquifer groundwater, and do not apply to in-situ A-aquifer groundwater at Parcel E. Plume-specific [trigger levels](#)<sub>(30)</sub><sup>11</sup> will be used as groundwater monitoring criteria

<sup>11</sup> Trigger levels were developed (in the FS Report for Parcel E) for specific groundwater plumes by applying attenuation factors to pertinent surface water quality criteria (as identified in pertinent surface water ARARs and, for select metals, adjusted for ambient levels). The attenuation factors vary based on several parameters (most notably, width of the contaminant plume and distance to the bay) and provide a conservative estimate of the advection and dispersion that reduces chemical concentrations as groundwater moves from an inland location to San Francisco Bay. Further information on the development of trigger levels is provided in the hyperlinked reference document ([Attachment 2](#)).

to evaluate the potential risk to aquatic wildlife in San Francisco Bay, but the RD may develop alternative monitoring criteria (using refined fate and transport modeling) to more rigorously assess the groundwater-to-surface water transport mechanism.

## 2.8. DESCRIPTION AND EVALUATION OF REMEDIAL ALTERNATIVES

The Navy screened a range of [general response actions and remedial technologies](#)<sup>(40)</sup> and used the retained technologies to develop alternatives in the FS to address contamination at Parcel E. In developing the remedial alternatives, the Navy evaluated site conditions and used experience and engineering judgment to formulate process options into the most plausible site-specific response actions. Remedial alternatives were developed and evaluated for the following contaminated media and source areas:

- Soil and shoreline sediment contaminated with nonradioactive chemicals
- Groundwater contaminated with nonradioactive chemicals
- NAPL contaminant source at IR-03
- Radiologically-impacted media (including soil, shoreline sediment, and structures)

Section 2.8.1 describes the remedial alternatives, and [Section 2.8.2](#) presents the results of the Navy's comparative analysis (performed in accordance with the NCP).

### 2.8.1. Description of Remedial Alternatives

[Table 9](#) presents the major components, details, and cost of each remedial alternative identified for soil and shoreline sediment, groundwater, NAPL at IR-03, and radiologically impacted media. The costs shown in [Table 9](#) are from the Final FS Report for the combined Parcels E and UC-3. No adjustments were made to this original cost analysis because Parcel UC-3 represents a negligible portion of the combined parcels (less than 1 percent for the soil alternatives and between 4 and 6 percent for the groundwater alternatives). Thus, the original cost estimate is valid for Parcel E.

**Table 9. Remedial Alternatives for Parcel E**

| Remedial Alternative                                                          | Approximate Cost <sup>12</sup>                                                                                                                   | Components of Remedial Alternative                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Soil and Shoreline Sediment Contaminated with Nonradioactive Chemicals</i> |                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| S-1                                                                           | \$0M                                                                                                                                             | No Action: No actions or costs; this alternative is required by CERCLA as a baseline for comparison with the other alternatives.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| S-2                                                                           | <b>Capital Cost: \$24.6M<sub>(41)</sub></b><br>Total O&M Cost: \$8.4M<br>Present-Worth Cost: \$35.2M (2.7% discount rate)<br>Timeframe: 32 years | Covers: Construct physical barriers to prevent exposure to remaining contaminants in soil and shoreline sediment at Parcel E.<br>Shoreline Protection: Construct shoreline protection features to prevent contaminated shoreline sediment and onshore soil from entering San Francisco Bay and to integrate with the proposed surface covers.<br>Long-Term Monitoring and Maintenance: Regularly inspect, maintain, and repair the existing covers and shoreline protection.<br>ICs: Impose ICs to limit the use of land or restrict activities that take place within an area. |
| S-3                                                                           | <b>Capital Cost: \$36.1M<sub>(42)</sub></b><br>Total O&M Cost: \$8.3M<br>Present-Worth Cost: \$48.7M (2.7% discount rate)<br>Timeframe: 32 years | <i>All of the same elements as Alternative S-2, but would also include:</i><br>Excavation and Offsite Disposal of Tier 1 Locations: Remove Tier 1 locations that contain chemicals in soil at concentrations greater than 10 times the remediation goals and locations that contain TPH at concentrations greater than the remediation goals; covers and ICs to address remaining low-risk contaminated soil.                                                                                                                                                                   |
| S-4                                                                           | <b>Capital Cost: \$37.3M<sub>(43)</sub></b><br>Total O&M Cost: \$8.3M<br>Present-Worth Cost: \$50.2M (2.7% discount rate)<br>Timeframe: 32 years | <i>All of the same elements as Alternative S-3, but would also include:</i><br>Excavation and Offsite Disposal of Tier 2 Locations: Remove Tier 2 locations that contain chemicals in soil at concentrations greater than 5 times the remediation goals; covers and ICs to address remaining low-risk contaminated soil.<br>SVE: Perform SVE to address VOC soil contamination associated with Building 406 TCE plume.                                                                                                                                                          |
| <i>Groundwater Contaminated with Nonradioactive Chemicals</i>                 |                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| GW-1                                                                          | \$0M                                                                                                                                             | No Action: No actions or costs; this alternative is required by CERCLA as a baseline for comparison with the other alternatives.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| GW-2                                                                          | <b>Capital Cost: \$0.28M<sub>(44)</sub></b><br>Total O&M Cost: \$2.9M<br>Present-Worth Cost: \$2.6M (2.7% discount rate)<br>Timeframe: 32 years  | Groundwater Monitoring: Implement long-term monitoring of groundwater to assess whether chemicals are migrating and to monitor changes in ambient conditions.<br>ICs: Impose ICs to limit the use of land or restrict activities that take place within an area.                                                                                                                                                                                                                                                                                                                |

<sup>12</sup> The approximate costs are consistent with the estimates provided in the Final FS Report for Parcel E and include small amounts attributed to implementation of the soil and groundwater alternatives at Parcel UC-3 (which was part of Parcel E at the time the FS Report was published). The approximate costs were not adjusted in this ROD to maintain consistency with the FS Report and because the proportion of these cost attributed to the soil and groundwater alternatives at Parcel UC-3 is very small (around 1 percent for the soil alternatives and between 4 and 6 percent for the groundwater alternatives).

**Table 9. Remedial Alternatives for Parcel E (continued)**

| Remedial Alternative                                                      | Approximate Cost <sup>12</sup>                                                                                                                  | Components of Remedial Alternative                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Groundwater Contaminated with Nonradioactive Chemicals (continued)</i> |                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| GW-3                                                                      | <b>Capital Cost: \$1.2M<sub>(45)</sub></b><br>Total O&M Cost: \$3.8M<br>Present-Worth Cost: \$4.5M (2.7% discount rate)<br>Timeframe: 32 years  | <i>All of the same elements as Alternative GW-2, but would also include:</i><br>Groundwater Containment: Build below-ground barrier to limit groundwater flow from nearshore contaminant plumes (with PCBs and metals) into San Francisco Bay.<br>In-Situ Groundwater Treatment: Inject an organic compound (biological nutrients) at the source of groundwater contamination to stimulate biological activity to create conditions where VOCs are destroyed in groundwater. If determined necessary in the remedial design, a more aggressive form of in-situ treatment may be performed at the Building 406 TCE plume. This option would consist of injecting zero-valent iron (potentially mixed with biological nutrients) at the source of groundwater contamination to create conditions where VOCs are destroyed in groundwater.<br>Monitored Natural Attenuation: Implement long-term monitoring and studies of groundwater to assess whether chemicals are migrating and to evaluate the effects of treatment. |
| GW-4                                                                      | <b>Capital Cost: \$2.0M<sub>(46)</sub></b><br>Total O&M Cost: \$4.2M<br>Present-Worth Cost: \$5.9M (2.7% discount rate)<br>Timeframe: 32 years  | <i>All of the same elements as Alternative GW-3, but would include a different treatment technology for the Building 406 TCE plume:</i><br>Air Sparging: Perform a more aggressive form of in-situ treatment at the Building 406 TCE plume, consisting of injecting air under high pressure at the source of groundwater contamination to create conditions where VOCs are stripped from groundwater, captured by SVE wells, and treated above the ground prior to discharge to the atmosphere.<br>SVE: Perform SVE to address VOC soil contamination associated with Building 406 TCE plume.                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <i>NAPL Contaminant Source at Former Oily Waste Ponds (IR-03)</i>         |                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| O-1                                                                       | \$0M                                                                                                                                            | No Action: No actions or costs; this alternative is required by CERCLA as a baseline for comparison with the other alternatives.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| O-2                                                                       | <b>Capital Cost: \$1.1M<sub>(47)</sub></b><br>Total O&M Cost: \$0.43M<br>Present-Worth Cost: \$1.7M (2.7% discount rate)<br>Timeframe: 31 years | Source Containment: Construct surface cover to prevent exposure to remaining contaminants and limit groundwater infiltration, and build below-ground barrier to limit groundwater flow from the contaminant plume into the bay.<br>Groundwater Monitoring: Implement long-term monitoring of groundwater to assess whether chemicals are migrating and to monitor changes in ambient conditions.<br>ICs: Impose ICs to limit the use of land or restrict activities that take place within an area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

**Table 9. Remedial Alternatives for Parcel E (continued)**

| Remedial Alternative                                                          | Approximate Cost <sup>12</sup>                                                                                                                       | Components of Remedial Alternative                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>NAPL Contaminant Source at Former Oily Waste Ponds (IR-03) (continued)</i> |                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| O-3                                                                           | <b>Capital Cost: \$11.2M<sub>(48)</sub></b><br>Total O&M Cost: \$0.59M<br>Present-Worth Cost: \$13.1M<br>(2.7% discount rate)<br>Timeframe: 34 years | <i>All of the same elements as Alternative O-2, but would also include:</i><br>Source Removal or Treatment: Perform a combination of several technologies to remove or treat the NAPL contaminant source (future studies would help identify the specific combination of technologies, which may include excavation and offsite disposal, in-situ stabilization/solidification, and thermally-enhanced extraction).<br>Monitored Natural Attenuation: Implement long-term monitoring and studies of groundwater to assess whether chemicals are migrating and to evaluate the effects of treatment.                                                                                                                                                 |
| O-4                                                                           | <b>Capital Cost: \$12.5M<sub>(49)</sub></b><br>Total O&M Cost: \$0.90M<br>Present-Worth Cost: \$14.7M<br>(2.7% discount rate)<br>Timeframe: 35 years | <i>All of the same elements as Alternative O-3, but would also include:</i><br>In-Situ Groundwater Treatment: Inject an organic compound at the source of groundwater contamination to stimulate biological activity to create conditions where contaminants are destroyed in groundwater. If thermally-enhanced extraction is used over a large area (to be determined in the remedial design), then a more aggressive form of in-situ treatment involving heating the groundwater might be implemented. This option would involve heating the groundwater to boiling temperature to create conditions where contaminants are stripped from groundwater, captured by SVE wells, and treated above the ground prior to discharge to the atmosphere. |
| O-5                                                                           | <b>Capital Cost: \$18.7M<sub>(50)</sub></b><br>Total O&M Cost: \$0.90M<br>Present-Worth Cost: \$22.0M<br>(2.7% discount rate)<br>Timeframe: 35 years | <i>All of the same elements as Alternative O-4, but would also include:</i><br>Excavation and Offsite Disposal of Shallow Contamination: Excavate the NAPL contaminant source above the groundwater table and dispose of the material at an offsite landfill; the NAPL contaminant source below the groundwater table would be addressed with a combination of several technologies (as identified for Alternative O-3).                                                                                                                                                                                                                                                                                                                            |
| O-6                                                                           | <b>Capital Cost: \$17.9M<sub>(51)</sub></b><br>Total O&M Cost: \$0.43M<br>Present-Worth Cost: \$21.8M<br>(2.7% discount rate)<br>Timeframe: 31years  | Excavation and Offsite Disposal of Shallow and Deep Contamination: Excavate the NAPL contaminant source above and below the groundwater table and dispose of the material at an offsite landfill; monitored natural attenuation would be performed and ICs would be imposed (as identified for Alternative O-3) until groundwater concentrations meet remediation goals.                                                                                                                                                                                                                                                                                                                                                                            |

**Table 9. Remedial Alternatives for Parcel E (continued)**

| Remedial Alternative                 | Approximate Cost <sup>12</sup>                                                                                                                                 | Components of Remedial Alternative                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Radiologically Impacted Media</i> |                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| R-1                                  | \$0M                                                                                                                                                           | No Action: No actions or costs; this alternative is required by CERCLA as a baseline for comparison with the other alternatives.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| R-2                                  | <b>Capital Cost: \$29.5M<sub>(52)</sub></b><br>Total O&M Cost: \$0M <sup>a</sup><br>Present-Worth Cost: \$34.9M<br>(2.7% discount rate)<br>Timeframe: 32 years | Scoping or Characterization Surveys: Perform scoping or characterization surveys to identify potential radioactive contamination requiring remediation.<br>Soil, Sediment, or Debris Removal: Remove soil, sediment, or debris with radioactive contamination exceeding remediation goals and dispose of the waste at an offsite landfill, with soil excavation depth at IR-02 and IR-03 (where covers and ICs are proposed to address radioactive contamination) generally limited to the upper 1 foot.<br>Structure Decontamination and Demolition: Remove building materials with radioactive contamination exceeding remediation goals and dispose of the debris at an offsite landfill, with specific decontamination or demolition approach varying depending on the extent of contamination and building type and size.<br>Final Status Surveys: Perform final surveys to demonstrate that remediation goals have been met.<br>Soil Cover, Shoreline Protection, and ICs (at IR-02 and IR-03): Following removal of radioactive contamination near the existing surface, construct a 2-foot-thick soil cover (with underlying demarcation layer) to prevent exposure to remaining contaminants and impose ICs to limit the use of land or restrict activities that take place within an area. |
| R-3                                  | <b>Capital Cost: \$30.5M<sub>(53)</sub></b><br>Total O&M Cost: \$0M <sup>a</sup><br>Present-Worth Cost: \$36.1M<br>(2.7% discount rate)<br>Timeframe: 32 years | All of the same elements as Alternative R-2, with the addition of a thicker (3-foot) soil cover at IR-02 and IR-03 to provide additional shielding from residual radioactivity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## Notes:

a = The O&M activities associated with the radiological remedial alternatives are attributed to the soil cover, shoreline protection, and ICs at IR-02 and IR-03, and include inspection, landscaping maintenance, 5-year reviews, and IC implementation. However, these O&M activities are also required to implement the selected remedy for soil. Therefore, consistent with information presented in the Radiological Addendum to the FS Report, the costs associated with these O&M activities were evaluated in the FS Report as part of the analysis of the soil remedial alternatives.

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

ICs = institutional controls

IR = Installation Restoration

NAPL = nonaqueous-phase liquid

O&M = operation and maintenance

SVE = soil vapor extraction

TCE = trichloroethene

TPH = total petroleum hydrocarbons

VOC = volatile organic compound

## 2.8.2. Comparative Analysis of Alternatives

A comparative analysis of alternatives with respect to the **nine evaluation criteria**<sup>(54)</sup> is provided below. **Tables 10 through 13** provide a relative ranking of the alternatives for soil and shoreline sediment, groundwater, NAPL at IR-03, and radiologically impacted media, respectively. The results of the comparative analysis are briefly summarized on page 2-44.

**Table 10. Relative Ranking of Remedial Alternatives for Soil and Shoreline Sediment**

| CERCLA Criteria                                              | S-1<br>No Action | S-2<br>Covers, ICs, and<br>Shoreline<br>Protection | S-3<br>Excavation and Offsite<br>Disposal of Tier 1<br>Locations, followed by<br>Covers, ICs, and<br>Shoreline Protection | S-4<br>Excavation and Offsite<br>Disposal of Tier 1 and Tier<br>2 Locations, followed by<br>Covers, SVE, ICs, and<br>Shoreline Protection |
|--------------------------------------------------------------|------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Threshold Criteria</b>                                    |                  |                                                    |                                                                                                                           |                                                                                                                                           |
| Overall Protection of Human Health and the Environment       | No               | Yes                                                | Yes                                                                                                                       | Yes                                                                                                                                       |
| Compliance with ARARs                                        | N/A              | Yes                                                | Yes                                                                                                                       | Yes                                                                                                                                       |
| <b>Balancing Criteria</b>                                    |                  |                                                    |                                                                                                                           |                                                                                                                                           |
| Long-Term Effectiveness and Permanence                       |                  |                                                    |                                                                                                                           |                                                                                                                                           |
| Reduction in Toxicity, Mobility, or Volume Through Treatment |                  |                                                    |                                                                                                                           |                                                                                                                                           |
| Short-Term Effectiveness                                     |                  |                                                    |                                                                                                                           |                                                                                                                                           |
| Implementability                                             |                  |                                                    |                                                                                                                           |                                                                                                                                           |
| Present-Worth Cost (\$M)                                     | 0                | 35.2                                               | 48.7                                                                                                                      | 50.2                                                                                                                                      |
| <b>Modifying Criteria</b>                                    |                  |                                                    |                                                                                                                           |                                                                                                                                           |
| State Acceptance                                             |                  |                                                    |                                                                                                                           |                                                                                                                                           |
| Community Acceptance                                         |                  |                                                    |                                                                                                                           |                                                                                                                                           |

Notes: Fill symbol by quarters from open (not acceptable) to full (excellent).

ARARs = applicable or relevant and appropriate requirements

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

ICs = institutional controls

SVE = soil vapor extraction



**Table 11. Relative Ranking of Remedial Alternatives for Groundwater**

| CERCLA Criteria                                                    | GW-1<br>No<br>Action | GW-2<br>ICs and Long-Term<br>Groundwater<br>Monitoring | GW-3<br>Groundwater<br>Containment, In-Situ<br>Treatment, MNA, and ICs | GW-4<br>Groundwater Containment,<br>In-Situ Treatment, Air<br>Sparging, MNA, and ICs |
|--------------------------------------------------------------------|----------------------|--------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Threshold Criteria</b>                                          |                      |                                                        |                                                                        |                                                                                      |
| Overall Protection of<br>Human Health and the<br>Environment       | No                   | No                                                     | Yes                                                                    | Yes                                                                                  |
| Compliance with ARARs                                              | N/A                  | No                                                     | Yes                                                                    | Yes                                                                                  |
| <b>Balancing Criteria</b>                                          |                      |                                                        |                                                                        |                                                                                      |
| Long-Term<br>Effectiveness and<br>Permanence                       |                      |                                                        |                                                                        |                                                                                      |
| Reduction in Toxicity,<br>Mobility, or Volume<br>Through Treatment |                      |                                                        |                                                                        |                                                                                      |
| Short-Term<br>Effectiveness                                        |                      |                                                        |                                                                        |                                                                                      |
| Implementability                                                   |                      |                                                        |                                                                        |                                                                                      |
| Present-Worth Cost<br>(\$M)                                        | 0                    | 2.6                                                    | 4.5                                                                    | 5.9                                                                                  |
| <b>Modifying Criteria</b>                                          |                      |                                                        |                                                                        |                                                                                      |
| State Acceptance                                                   |                      |                                                        |                                                                        |                                                                                      |
| Community Acceptance                                               |                      |                                                        |                                                                        |                                                                                      |

Notes: Fill symbol by quarters from open (not acceptable) to full (excellent).

ARARs = applicable or relevant and appropriate requirements

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

ICs = institutional controls

MNA = monitored natural attenuation

**Table 12. Relative Ranking of Remedial Alternatives for NAPL at IR-03**

| CERCLA Criteria                                              | O-1<br>No Action | O-2<br>Source<br>Containment,<br>Long-Term<br>Monitoring,<br>and ICs | O-3<br>Source<br>Removal or<br>Treatment,<br>Containment,<br>MNA, and<br>ICs | O-4<br>Source<br>Removal or<br>Treatment,<br>In-Situ<br>Groundwater<br>Treatment,<br>Containment,<br>MNA, and ICs | O-5<br>Source<br>Removal by<br>Excavation and<br>Extraction/<br>Treatment,<br>In-Situ<br>Groundwater<br>Treatment,<br>MNA, and ICs | O-6<br>Source<br>Removal<br>by<br>Excavation,<br>MNA, and<br>ICs |
|--------------------------------------------------------------|------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| <b>Threshold Criteria</b>                                    |                  |                                                                      |                                                                              |                                                                                                                   |                                                                                                                                    |                                                                  |
| Overall Protection of Human Health and the Environment       | No               | Yes                                                                  | Yes                                                                          | Yes                                                                                                               | Yes                                                                                                                                | Yes                                                              |
| Compliance with ARARs                                        | N/A              | Yes                                                                  | Yes                                                                          | Yes                                                                                                               | Yes                                                                                                                                | Yes                                                              |
| <b>Balancing Criteria</b>                                    |                  |                                                                      |                                                                              |                                                                                                                   |                                                                                                                                    |                                                                  |
| Long-Term Effectiveness and Permanence                       |                  |                                                                      |                                                                              |                                                                                                                   |                                                                                                                                    |                                                                  |
| Reduction in Toxicity, Mobility, or Volume Through Treatment |                  |                                                                      |                                                                              |                                                                                                                   |                                                                                                                                    |                                                                  |
| Short-Term Effectiveness                                     |                  |                                                                      |                                                                              |                                                                                                                   |                                                                                                                                    |                                                                  |
| Implementability                                             |                  |                                                                      |                                                                              |                                                                                                                   |                                                                                                                                    |                                                                  |
| Present-Worth Cost (\$M)                                     | 0                | 1.7                                                                  | 13.1                                                                         | 14.7                                                                                                              | 22.0                                                                                                                               | 21.8                                                             |
| <b>Modifying Criteria</b>                                    |                  |                                                                      |                                                                              |                                                                                                                   |                                                                                                                                    |                                                                  |
| State Acceptance                                             |                  |                                                                      |                                                                              |                                                                                                                   |                                                                                                                                    |                                                                  |
| Community Acceptance                                         |                  |                                                                      |                                                                              |                                                                                                                   |                                                                                                                                    |                                                                  |

Notes: Fill symbol by quarters from open (not acceptable) to full (excellent).

ARARs = applicable or relevant and appropriate requirements

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

NAPL = nonaqueous-phase liquid

ICs = institutional controls

MNA = monitored natural attenuation

**Table 13. Relative Ranking of Remedial Alternatives for Radiologically Impacted Media**

| CERCLA Criteria                                              | R-1<br>No Action | R-2<br>Survey, Removal, and Disposal<br>(with 2-foot-thick soil cover and<br>ICs at IR-02 and IR-03) | R-3<br>Survey, Removal, and Disposal<br>(with 3-foot-thick soil cover and<br>ICs at IR-02 and IR-03) |
|--------------------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <b>Threshold Criteria</b>                                    |                  |                                                                                                      |                                                                                                      |
| Overall Protection of Human Health and the Environment       | No               | Yes                                                                                                  | Yes                                                                                                  |
| Compliance with ARARs                                        | N/A              | Yes                                                                                                  | Yes                                                                                                  |
| <b>Balancing Criteria</b>                                    |                  |                                                                                                      |                                                                                                      |
| Long-Term Effectiveness and Permanence                       |                  |                                                                                                      |                                                                                                      |
| Reduction in Toxicity, Mobility, or Volume Through Treatment |                  |                                                                                                      |                                                                                                      |
| Short-Term Effectiveness                                     |                  |                                                                                                      |                                                                                                      |
| Implementability                                             |                  |                                                                                                      |                                                                                                      |
| Present-Worth Cost (\$M)                                     | 0                | 34.9                                                                                                 | 36.1                                                                                                 |
| <b>Modifying Criteria</b>                                    |                  |                                                                                                      |                                                                                                      |
| State Acceptance                                             |                  |                                                                                                      |                                                                                                      |
| Community Acceptance                                         |                  |                                                                                                      |                                                                                                      |

Notes:

Fill symbol by quarters from open (not acceptable) to full (excellent).

ARARs = applicable or relevant and appropriate requirements

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

ICs = institutional controls

IR = Installation Restoration

***Threshold Criteria***

All alternatives, except for the no action alternatives (S-1, GW-1, O-1, and R-1) and Alternative GW-2, provide adequate protection of human health and the environment and comply with state and federal ARARs. Therefore, Alternatives S-2 through S-4, GW-3 and GW-4, O-2 through O-6, and R-2 and R-3 satisfy the two threshold criteria specified in the NCP and are eligible for selection as the final remedial action. The “no action” alternatives (S-1, GW-1, O-1, and R-1) and Alternative GW-2 would not provide adequate protection of human health and the environment and are not eligible for selection as the final remedial action.

***Primary Balancing Criteria***

Long-Term Effectiveness and Permanence. All alternatives, except for the no action alternatives (S-1, GW-1, O-1, and R-1) and Alternative GW-2, would be effective in the long-term. Of the soil alternatives, Alternative S-4 would be most effective in the long-term because the largest volume of soil contamination would be removed. Of the groundwater alternatives, Alternative GW-3 would be most effective in the long-term because it would use reliable and effective treatment technologies, as demonstrated by cleanup of groundwater at other HPNS parcels. Alternative GW-4 was rated slightly lower than Alternative GW-3 because the air sparging (proposed for the Building 406 TCE Plume) may be limited by the presence of heterogeneous soil, which poses challenges in adequately capturing VOC emissions from the unsaturated zone. For contamination at IR-03 (the Former Oily Waste Ponds), Alternative O-6 would be most effective in the long-term because the largest volume of the NAPL contaminant source would be removed. For radiologically impacted media at Parcel E, Alternatives R-2 and R-3 would be equally effective in the long-term because residual radiological contamination would be removed and, for IR-02 and IR-03, the final soil cover would protect people and wildlife from being exposed to remaining contamination. The permanent features of each alternative (such as covers) would be maintained as long as contamination that could pose an unacceptable risk remains at the site.

Reduction in Toxicity, Mobility, or Volume through Treatment. The alternatives include varying levels of treatment to address contamination in soil and groundwater, as well as contamination at IR-03 (the Former Oily Waste Ponds). Alternatives S-4, GW-3, O-4, and O-5 provide the highest performance in the way they reduce the toxicity, mobility, and volume of contaminants through treatment. Alternative GW-4 was rated slightly lower than Alternative GW-3 because the air sparging (proposed for the Building 406 TCE Plume) may be limited by the presence of heterogeneous soil, which poses challenges in effectively removing and treating VOCs from groundwater. The alternatives for radiologically impacted media focus on removing and containing contaminants at Parcel E and do not involve a significant amount of treatment. Therefore, Alternatives R-2 and R-3 would perform equally in the minimal way they reduce the toxicity, mobility, and volume of radiological contaminants through treatment.

Short-Term Effectiveness, Implementability, and Cost. Alternatives involving more active cleanup (such as excavation) generally pose more short-term risks (to humans and the environment), are more difficult to carry out, and are more expensive. This finding is illustrated by the different ratings for Alternatives S-2 and S-4

(see [Table 10](#)). In addition, the Navy's evaluation identified major differences between Alternative O-6 and Alternatives O-2, O-3, and O-4 relative to short-term effectiveness, implementability, and cost. In comparison with Alternatives O-2, O-3, and O-4, Alternative O-6 presents more short-term risks (for example, increased risk of accidents for site workers), would be more difficult to carry out, and would cost more. The ratings for Alternative O-6 were based on several factors, the most significant being the deep excavation (potentially up to 35 feet) required to completely remove the NAPL contaminant source. Alternatives O-2, O-3, and O-4 present fewer short-term risks, would be easier to carry out, and would cost significantly less in comparison with Alternative O-6. Alternative O-2 would be the easiest and least expensive because it involves only containment, while Alternatives O-3 and O-4 balance ease of implementation and cost because they would involve removing or treating the NAPL contaminant source without major excavations. For the alternatives addressing radiologically impacted media, Alternative R-2 would be easier to carry out when compared with Alternative R-3 because the soil cover (over about 45 acres comprising IR-02 and IR-03) would be 2 feet thick instead of 3 feet thick.

### ***Modifying Criteria***

State Acceptance. State involvement has been solicited throughout the CERCLA process. The State of California concurs with the Navy's selected remedial alternatives (Alternatives S-4, GW-3, O-4, and R-2).

Community Acceptance. Community acceptance is evaluated based on comments received from the public during the public comment period for the Proposed Plan. The Proposed Plan, which identified Alternatives S-4, GW-3, O-4, and R-2 as the preferred remedial alternatives, was presented to the community and discussed during a public meeting on February 28, 2013. Comments were also gathered during the public comment period from February 13 through April 1, 2013. In general, public comments expressed support for the Navy's selected remedial alternatives. [Attachment 3](#), the responsiveness summary, of this ROD addresses the public's comments and specific concerns about the selected remedial alternatives for NAPL at IR-03 (Alternative O-4) and radiologically impacted media at Parcel E (Alternative R-2). [Section 2.10](#) provides additional information on the Navy's community participation efforts for Parcel E.

## **2.9. SELECTED REMEDY**

### **2.9.1. Rationale for Selected Remedies**

The selected remedies for Parcel E are:

- **Soil and Shoreline Sediment – Alternative S-4:** Excavation and Offsite Disposal of Tier 1 and Tier 2 Locations, followed by Covers, SVE, Institutional Controls, and Shoreline Protection
- **Groundwater – Alternative GW-3:** Groundwater Containment, In-Situ Treatment, MNA, and Institutional Controls

- **NAPL at IR-03 – Alternative O-4:** Source Removal or Treatment, In-Situ Groundwater Treatment, Containment, MNA, and Institutional Controls
- **Radiologically Impacted Media – Alternative R-2:** Survey, Removal, and Disposal (with 2-foot-thick soil cover and ICs at IR-02 and IR-03)

The remedies were selected based on an evaluation of the remedial alternatives, as described in [Section 2.8](#), relative to the nine evaluation criteria. The selected remedies comply with the two threshold criteria and provide the best balance of tradeoffs with respect to the five balancing criteria. The Navy's evaluation of the two modifying criteria did not warrant changes to the preferred alternatives published in the Proposed Plan. The State of California, through DTSC and the Water Board, and segments of the community support Alternatives S-4, GW-3, O-4, and R-2. As detailed in [Attachment 3](#), the information presented by members of the community that do not support the preferred alternatives does not justify modification of them, or selection of a different alternative, based upon the community acceptance criteria.

The selected remedies will effectively reduce site risks by removing or treating significant amounts of contaminants and safely containing the remaining material. The cover and groundwater controls will prevent contact with hazardous materials remaining on site (following removal and treatment) at levels that might pose an unacceptable risk. The cover and shoreline protection will be designed to address potential erosion and earthquakes, in accordance with the substantive provisions of pertinent ARARs. In addition, the selected remedies will be subject to statutory reviews every 5 years, pursuant to CERCLA, to ensure that they remain protective of human health and the environment. The selected remedies allow the property to be used in the future in a manner consistent with CCSF's 2010 redevelopment plan and include monitoring and maintenance that would be performed as long as necessary to protect human health and the environment.

### 2.9.2. Description of Selected Remedy

The selected remedies for Parcel E will address soil, shoreline sediment, groundwater, NAPL, and residual radiological contamination. The four selected remedies are described below and will be **further developed in the RD**<sup>(55)</sup>.

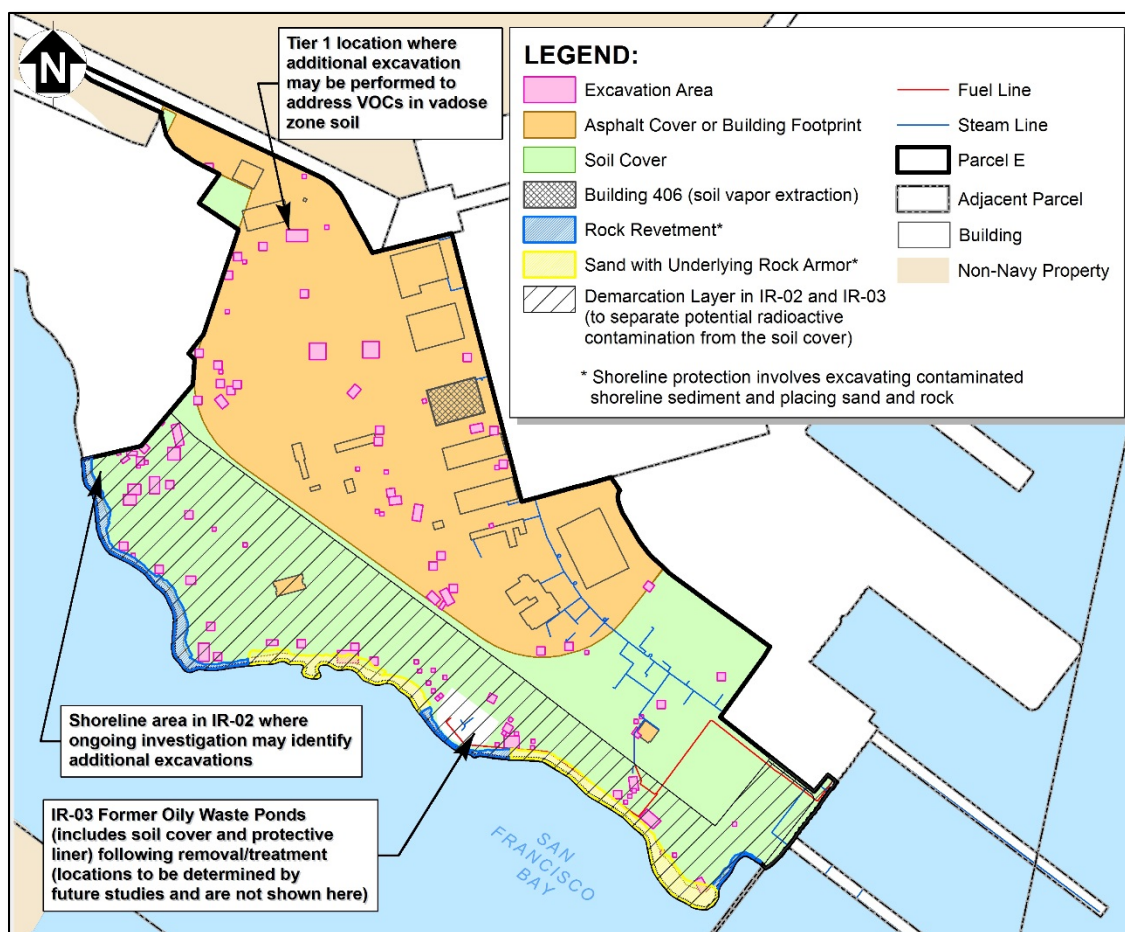
#### 2.9.2.1. Removal, Treatment, and Containment of Soil and Shoreline Sediment (Alternative S-4)

Alternative S-4 includes excavation of Tier 1 and Tier 2 locations where remediation goals are exceeded (by more than five times) with offsite disposal at a permitted disposal facility. Alternative S-4 also includes excavation of TPH locations (that are commingled with CERCLA-regulated substances) where the remediation goal is exceeded, with offsite disposal at a permitted disposal facility. This alternative also provides for covers, ICs, and shoreline protection. In total, 109 areas in Parcels E are planned for excavation ([Figure 11](#)), with a total of approximately 42,000 cubic yards (about 3,250 truckloads) of soil estimated to be removed and disposed of at an approved offsite landfill. As described in [Section 2.5.3](#), the Navy is conducting a soil investigation adjacent to the shoreline in the northwest portion of Parcel E ([Figure 11](#)) that may identify additional Tier 1, Tier 2, and TPH locations requiring excavation and offsite disposal. The planned excavation areas generally range from 2 to 10 feet deep, but include isolated TPH locations adjacent to the Former Oily Waste Ponds that are up to 16 feet deep. The RD will further evaluate soil concentrations at

Tier 1, Tier 2, and TPH locations (using additional data collected during investigations performed in 2012 and 2013) and may refine the extent of the proposed excavations (based on the soil action levels that correspond to five times the remediation goals). The RD will also specify the collection of soil confirmation samples to ensure that the Tier 1, Tier 2, and TPH locations are adequately removed, so remaining chemical concentrations at these locations do not exceed the soil action levels (corresponding to five times the remediation goals; see [Table 4](#)) or the petroleum source criterion (3,500 mg/kg of total TPH). The areas of Parcel E with buried steam and fuel lines will be cleaned and closed.

At Building 406 in Parcel E, where volatile chemicals are present in soil and soil gas, an SVE system will be installed and operated to extract contaminated soil gas (using a vacuum technology) and treat the removed vapors (using adsorbent material like a charcoal filter). SVE would be performed at Building 406 until soil gas action levels are achieved or until systematic asymptotic conditions are reached without reasonable indication of further reduction based on system monitoring results. Following active treatment, soil gas monitoring will be performed at Building 406, and VOC groundwater plumes requiring treatment (as described in [Section 2.9.2.2](#)), to evaluate chemical concentrations in soil gas relative to risk-based action levels (as described in [Section 2.7](#)). As noted in [Section 2.3.2](#), a recent study (performed from 2009 to 2012) identified elevated concentrations of VOCs in soil and soil gas at IR-04 (near Building 810). The elevated VOC concentrations in soil and soil gas appear to be limited to a small area that is directly adjacent to a Tier 1 location where excavation and offsite disposal is required for metals and PCBs (see [Figure 11](#)). The RD will further evaluate VOCs in soil and soil gas in this area and may propose expanding the excavation at this Tier 1 location to address VOCs in vadose zone soil (up to 10 feet bgs), if deemed necessary to satisfy the soil gas RAO. Additionally, a soil gas survey will be conducted, following a planning process performed in consultation with the regulatory agencies, in Parcel E to:

- investigate soil gas in areas planned for mixed use where concerns continue about residual VOCs in soil (at concentrations that may pose an unacceptable risk via vapor intrusion);
- identify COCs for which risk-based numeric action levels for VOCs in soil gas would be established (based on a cumulative excess cancer risk of 1 in a million); and
- evaluate and map the extent to which areas with potential unacceptable risk via vapor intrusion require control (as described in [Section 2.9.2.5](#), areas with unacceptable vapor intrusion risk will be subject to institutional controls, and the potential risk will be reduced by engineering controls or other design alternatives that meet the specifications set forth in the ROD, RD reports, and LUC RD report).



**Figure 11. Soil Remediation Areas**

As described above, the selected remedy includes cleanup for TPH that are commingled with CERCLA-regulated substances. For areas where TPH in soil are not commingled with CERCLA-regulated substances or TPH remains after CERCLA cleanup is complete, the TPH cleanup would be conducted under the Navy's TPH Corrective Action Program for Parcel E and would not be addressed by the Navy's CERCLA program.

Durable covers would be applied across all of Parcel E as physical barriers to cut off potential exposure to residual contamination that remains in soil after excavation. Durable covers at Parcel E would consist of asphalt and concrete surfaces in the northern half of Parcel E (the Shipyard South Multi-Use District) and a 2-foot thick soil cover in the southern half and in small areas on the western edge of Parcel E (the Shipyard Shoreline Open Space District). The durable covers, which will be designed in the RD, will satisfy performance standards consistent with the pertinent state and federal ARARs (see [Attachment 4](#)), including those related to surface water drainage, erosion control, and slope stability. In addition, the cover design will also require the evaluation of subsurface methane, which was previously reported in isolated areas within IR-03 and IR-12, to determine if control measures (such as passive vents) are required to protect human health in accordance with Title 27 California Code of Regulations § 20921(a).

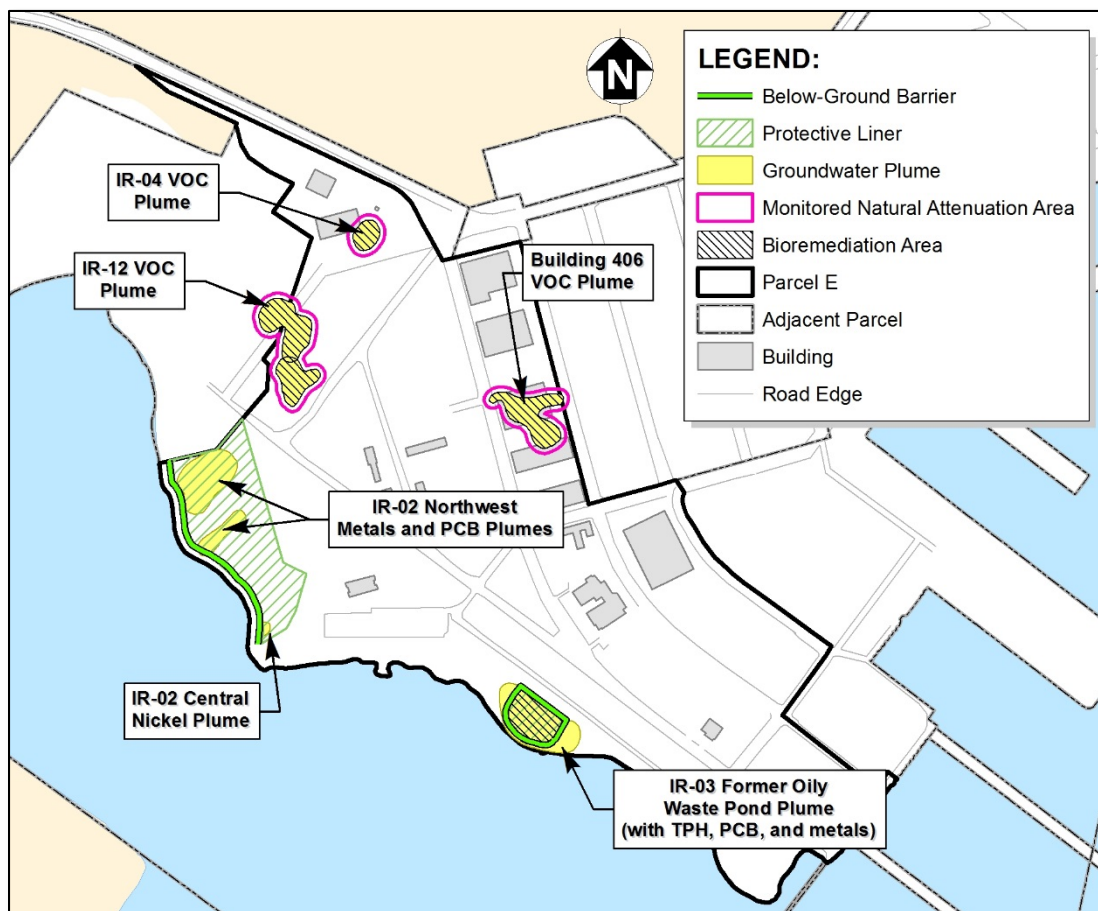


Two areas in Parcel E—IR-03 (the Former Oily Waste Ponds) and the northwest portion of IR-02—require additional actions to properly contain contaminants that remain in soil after excavation. A protective liner (consisting of high-density polyethylene) would be installed under the soil cover in these two areas to minimize water seeping into contaminated soil. The protective liners would work with the below-ground barriers (under Alternatives GW-3 and O-4) to minimize migration of contaminants to San Francisco Bay, as described in [Section 2.9.2.2](#).

In addition, contaminated sediment along the Parcel E shoreline would be excavated to a depth of at least 2.5 feet (which aligns with the [exposure depth for aquatic wildlife<sup>\(56\)</sup>](#) that may inhabit the shoreline) and disposed of at an approved offsite landfill. The shoreline excavations would be backfilled with natural materials (such as sand) and large rocks to prevent exposure to remaining contaminants in shoreline sediment (and to integrate with the durable covers at onshore areas). The shoreline adjacent to IR-03 and the northwest portion of IR-02 is steep and requires stronger protection. A rock revetment structure (about 2,400 feet long), consisting of large rocks placed on the shoreline slope, is proposed to prevent exposure to contaminated soil and shoreline sediment by controlling erosion and protecting the edge of the covered upland area. The remaining shoreline in Parcel E (about 2,400 feet long) has more gradual slopes and would be protected with natural materials (such as sand) over a protective rock layer to prevent exposure to contaminated soil and shoreline sediment. The covers and the shoreline protection features would be inspected and maintained regularly to ensure they remain intact. The Navy would also implement ICs after these activities for continued protection of public health and the environment and to ensure the integrity of the containment remedies (for example, soil covers).

### **2.9.2.2. Treatment and Containment of Groundwater (Alternative GW-3)**

Alternative GW-3 would achieve RAOs by actively treating VOC groundwater plumes at Parcel E using injected biological nutrients to accelerate the breakdown of VOCs to less toxic compounds. [Figure 12](#) on page 2-50 identifies the groundwater plumes to be treated. The Building 406 plume may require more aggressive treatment using injected zero-valent iron (potentially mixed with biological nutrients), if determined necessary in the RD to satisfy the soil gas RAO (as described in [Section 2.7](#)). The injection process will be developed in the RD and will be implemented in a manner that allows for regular optimization so that the RAOs are met in a timely, cost-effective manner while minimizing negative environmental effects (e.g., energy consumption, greenhouse gas emissions, and accident risk). The optimization process will be informed by performance monitoring data for various factors that are critical to successful in-situ treatment (e.g., changes in VOC concentrations within the groundwater plume, and geochemical conditions that are conducive to natural degradation of VOCs). Potential optimization measures may include modifying the amount or type of treatment material, or modifying the injection method to improve the distribution of the treatment chemicals. Active treatment will be performed until the technology is no longer the most cost-effective or environmentally sustainable option, at which point a recommendation will be made to transition to MNA. The recommended transition to MNA, which would be subject to approval by the FFA signatories, will need to demonstrate that natural processes are adequately degrading the remaining VOCs (to allow RAOs to be achieved in a timely manner), and that continued active treatment would be less cost-effective and environmentally sustainable (in comparison to MNA).



**Figure 12. Groundwater Remediation Areas**

As part of the performance monitoring, groundwater quality (as well as flow direction) will be monitored at the VOC groundwater plumes to evaluate the breakdown of VOCs to less toxic compounds, and soil gas will be monitored to evaluate concentrations relative to risk-based action levels (as described in [Section 2.7](#)). Groundwater monitoring will continue until chemical concentrations meet remediation goals, and soil gas monitoring will continue until chemical concentrations are less than risk-based action levels. ICs will be implemented to restrict access to and use of contaminated groundwater (both VOC groundwater plumes and other groundwater plumes near San Francisco Bay).

For groundwater plumes near San Francisco Bay containing metals and PCBs (at IR-02), a below-ground barrier will be constructed to control discharge of contaminated groundwater into the bay. The below-ground barrier would work with the protective liners (under Alternative S-4) to minimize migration of contaminants to San Francisco Bay. The below-ground barrier would decrease the groundwater flow gradient and consequently increase the residence time (for groundwater behind the barrier) during which chemical concentrations would be reduced through physical, chemical, and biological processes. The presence of the barrier would lead to hydraulic head buildup behind it, which would dissipate by lateral movement of groundwater around the barrier. In addition, the hydraulic head buildup behind the barrier

would be lower during high tides, when bay waters move inland through the tidal mixing zone. Groundwater quality (as well as flow direction) will be monitored at the plumes behind the below-ground barrier to ensure that contamination is not discharged into San Francisco Bay at concentrations greater than the corresponding [surface water quality criteria for aquatic wildlife](#)<sup>(39)</sup> (to comply with the groundwater RAO specified in Section 2.7). Plume-specific [trigger levels](#)<sup>(30)</sup><sup>13</sup> will be used as groundwater monitoring criteria to evaluate the potential risk to aquatic wildlife in San Francisco Bay, but the RD may develop alternative monitoring criteria (using refined fate and transport modeling) to more rigorously assess the groundwater-to-surface water transport mechanism.

### 2.9.2.3. Removal, Treatment, and Containment of NAPL at IR-03 (Alternative O-4)

Alternative O-4 would achieve RAOs by using a combination of technologies (such as excavation and offsite disposal, in-situ stabilization/solidification, or thermally-enhanced extraction) to remove or treat the NAPL contaminant source. The Navy will perform additional studies to select the best combination of technologies to cost-effectively remove or treat the NAPL contaminant source at IR-03; as described in [Section 2.3.3](#), the Navy is conducting a study at IR-03, concurrent with this ROD, to further characterize the the NAPL and test two technologies (in-situ stabilization/solidification and thermally-enhanced extraction) in the field. The FS Report assumed for cost-estimating purposes that the NAPL source removal and treatment activities would be limited to the area within the IR-03 site boundary (corresponding to the IR-03 area on [Figure 12](#) encircled by the green line), where the distribution of NAPL is the most extensive. NAPL associated with the Former Oily Waste Ponds is present outside the IR-03 boundary, and the cost estimates for Alternative S-4 assume these areas will be addressed by excavation and offsite disposal. The RD will evaluate the data from recent studies and determine the extent to which removal and treatment technologies can cost-effectively satisfy the NAPL RAOs (as described in [Section 2.7](#)). Based on this determination to be provided in the RD, the NAPL removal and treatment area may be increased or decreased, with the remaining NAPL contamination being addressed by containment, monitoring, and ICs.

As described for Alternative S-4, a 2-foot-thick soil cover with protective liner would be constructed to prevent exposure to remaining contaminants and limit groundwater infiltration. Also, as described for Alternative GW-3, a below-ground barrier would be constructed to control discharge of NAPL and contaminated groundwater into San Francisco Bay. Following removal or treatment of the NAPL, biological nutrients would be injected to create conditions where remaining contaminants in groundwater are broken down to less toxic compounds. As described for Alternative GW-3, the injection process will be developed in the RD, and will be implemented in a manner that allows for regular optimization so that the RAOs are met in a timely, cost effective manner while minimizing negative environmental effects (e.g., energy consumption, greenhouse gas emissions, and accident risk). The optimization process will be informed by performance monitoring data for various factors that are critical to successful in-situ treatment

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<sup>13</sup> Trigger levels were developed (in the FS Report for Parcel E) for specific groundwater plumes by applying attenuation factors to pertinent surface water quality criteria (as identified in pertinent surface water ARARs and, for select metals, adjusted for ambient levels). The attenuation factors vary based on several parameters (most notably, width of the contaminant plume and distance to the bay) and provide a conservative estimate of the advection and dispersion that reduces chemical concentrations as groundwater moves from an inland location to San Francisco Bay. Further information on the development of trigger levels is provided in the hyperlinked reference document (Attachment 2).

(e.g., changes in contaminant concentrations within the groundwater plume, and geochemical conditions that are conducive to natural degradation of the remaining contaminants). Potential optimization measures may include modifying the amount or type of treatment material, or modifying the injection method to improve the distribution of the treatment chemicals. Active treatment will be performed until the technology is no longer the most cost-effective or environmentally sustainable option, at which point a recommendation will be made to transition to MNA. The recommended transition to MNA, which would be subject to approval by the FFA signatories, will need to demonstrate that natural processes are adequately degrading the remaining contaminants (to allow RAOs to be achieved in a timely manner), and that continued active treatment would be less cost effective and environmentally sustainable (in comparison to MNA).

Similar to Alternative GW-3, groundwater quality (as well as flow direction) will be monitored to ensure that contamination is not discharged into San Francisco Bay at concentrations greater than the corresponding [surface water quality criteria for aquatic wildlife<sup>\(39\)</sup>](#) (these criteria also include, consistent with the NAPL RAO in Section 2.7, a discharge limit for total TPH of 1,400 µg/L). Plume-specific [trigger levels<sup>\(30\)</sup>](#)<sup>14</sup> will be used as groundwater monitoring criteria to evaluate the potential risk to aquatic wildlife in San Francisco Bay, but the RD may develop alternative monitoring criteria (using refined fate and transport modeling) to more rigorously assess the groundwater-to-surface water transport mechanism. In addition, ICs would be implemented to restrict access to and use of contaminated groundwater.

#### **2.9.2.4. Removal and Containment of Radiologically Impacted Media (Alternative R-2)**

Alternative R-2 would achieve RAOs by performing the following actions: (1) scanning radiologically impacted areas at Parcel E that may include structures (requiring aboveground scans), former building sites (requiring surface scans), and buried storm drain and sewer lines (requiring subsurface scans); (2) decontaminating (and demolishing if necessary) buildings at Parcel E (demolition of small buildings may be performed if deemed the most cost-effective means of achieving the RAOs); (3) screening, separating, and disposing of radiologically contaminated debris and soil at an approved landfill; and (4) performing final surveys to demonstrate remediation goals have been met. The final radiological cleanup has been initiated (under a time-critical removal action) in all of Parcel E areas except IR-02 and IR-03 (see [Figure 7](#)). The Navy has also removed storm drain and sewer lines throughout most of Parcel E as part of the same radiological removal action. As described in [Section 2.3](#), the radiological removal action is scheduled for completion in 2015 and the results will be summarized in a final RACR, which will be reviewed and approved by the FFA signatories and CDPH. Although the radiological removal action will not be completed by the time this ROD is signed, the removal action is intended to achieve cleanup goals identical to the RAOs specified in this ROD. If the removal action does not achieve its cleanup goals, cleanup will continue in accordance with the remedial action selected in this ROD until the RAOs are achieved.

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<sup>14</sup> Trigger levels were developed (in the FS Report for Parcel E) for specific groundwater plumes by applying attenuation factors to pertinent surface water quality criteria (as identified in pertinent surface water ARARs and, for select metals, adjusted for ambient levels). The attenuation factors vary based on several parameters (most notably, width of the contaminant plume and distance to the bay) and provide a conservative estimate of the advection and dispersion that reduces chemical concentrations as groundwater moves from an inland location to San Francisco Bay. Further information on the development of trigger levels is provided in the hyperlinked reference document (Attachment 2).

The ongoing removal action does not address IR-02 and IR-03 because nonradioactive chemicals in soil and shoreline sediment within these areas require remedial action, which would be performed concurrent with future radiological remediation. Alternative R-2 would achieve RAOs and address the radiologically impacted media in IR-02 and IR-03 by performing the following actions: (1) scanning the entire area for radioactivity to a depth of at least 1 foot; (2) removing residual radiological contamination to a depth of 1 foot (the maximum effective depth of the surface survey) and disposing of it at an approved landfill; (3) constructing a 2-foot-thick soil cover (as provided by the selected remedy for soil, Alternative S-4) to prevent exposure to remaining contaminants and installing a demarcation layer to mark the boundary between the existing surface and the soil cover (see [Figure 11](#)); (4) conducting regular inspections and maintenance (as provided by the selected remedy for soil, Alternative S-4) of the soil cover and adjoining shoreline protection features to ensure their integrity; and (5) implementing ICs to limit the use of land or restrict activities that take place within the area. Deeper soil excavation would be performed at IR-02 and IR-03, if necessary, to ensure that the residual radiological risk (i.e., the incremental excess cancer risks from exposure to radionuclides in soil) at the final ground surface (following installation of a demarcation layer and soil cover) is acceptable. The residual radiological risk at the final ground surface (based on residential exposure) would be within the risk management range specified in the NCP ( $10^{-6}$  to  $10^{-4}$ ). In preparing the RD, the Navy would work closely with the regulatory agencies to develop specific protocols for determining when deeper soil excavation is needed to ensure that the residual radiological risk at the final ground surface is acceptable. In addition, the Navy would perform radiological risk modeling, in conjunction with the final radiological surveys, to verify that the residual radiological risk is acceptable. Buried storm drain and sewer lines in IR-02 and IR-03 would remain in place because the soil cover and ICs would prevent exposure to residual radiological contamination in these lines. Also, future groundwater monitoring would be performed in IR-02 and IR-03 to demonstrate, consistent with the findings of previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health and the environment. The determination of statistical significance will be made in accordance with the substantive provisions of Title 22 California Code of Regulations § 66264.98(i). The duration of the groundwater monitoring for radionuclides will be determined in accordance with Title 22 California Code of Regulations § 66264.90(c).

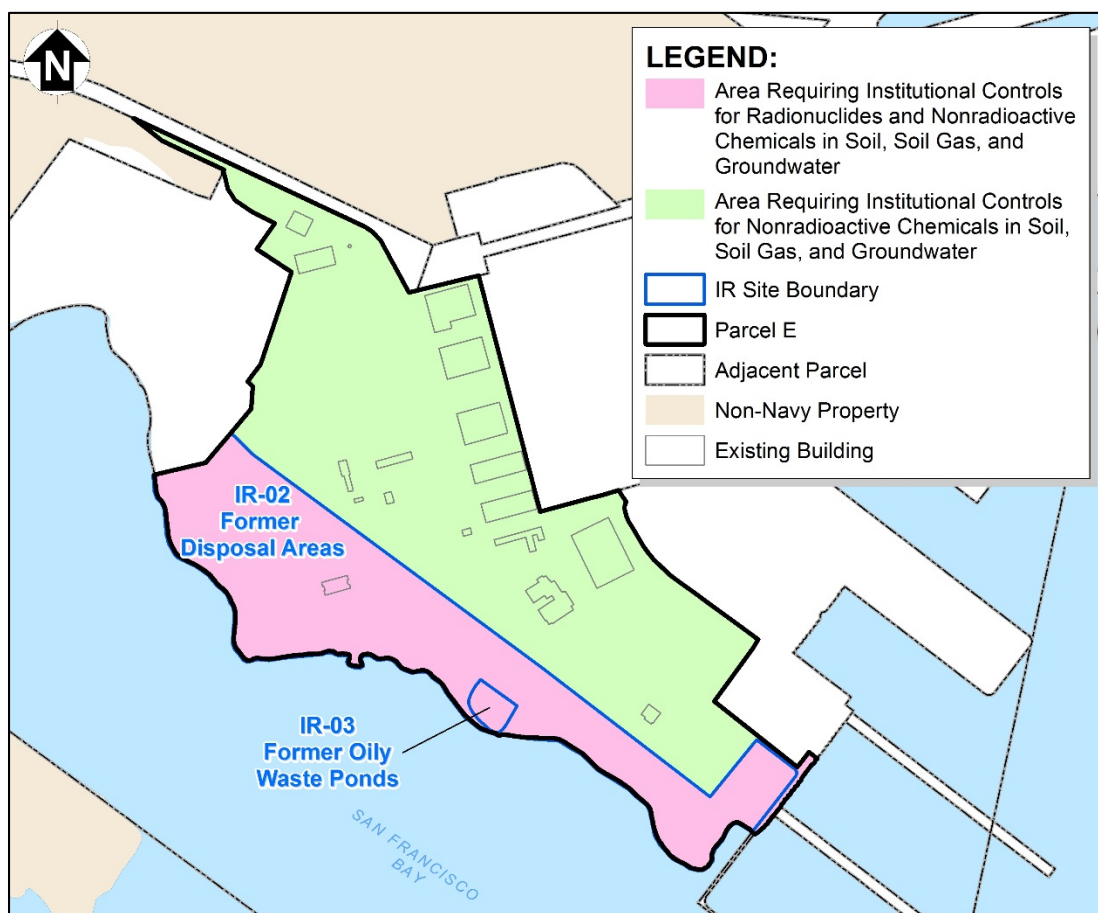
#### **2.9.2.5. Monitoring, Maintenance, and Institutional Controls**

Each of the selected remedies includes the monitoring and maintenance activities that would be performed as long as necessary to protect human health and the environment and to comply with the substantive provisions of pertinent state and federal ARARs (see [Attachment 4](#)). In addition, the selected remedy will be subject to statutory reviews every 5 years pursuant to CERCLA to ensure that it remains protective of human health and the environment.

The Navy would also implement ICs, which are legal and administrative mechanisms for the continued protection of human health and the environment. In Parcel E, the objectives of the ICs are to implement land use and activity restrictions that are used to limit the exposure of future landowner(s) or user(s) of the property to hazardous substances present on the property and in groundwater, and to ensure the integrity of the remedial action, including any current or future remedial or monitoring systems such as monitoring wells and



subsurface groundwater control barriers. Institutional controls are required on a property where the selected remedial action results in contamination remaining at the property above levels that allow for unlimited use and unrestricted exposure. The ICs for Parcel E would restrict the development, land use, and activities on Parcel E property as described in this ROD. These ICs would be maintained until the concentrations of hazardous substances in soil and groundwater are at such levels to allow for unrestricted use and exposure. Implementation of ICs at Parcel E includes requirements for monitoring and inspections and reporting to ensure compliance with land use or activity restrictions. Figure 13 presents the area requiring institutional controls (ARIC) for nonradioactive chemicals, which comprises all of Parcel E. Figure 12 also identifies the ARIC for radionuclides (pink shading on Figure 13; also referred to as the radiological ARIC), which consists of all of IR-02 and IR-03. Outside of the radiological ARIC, potential radioactive contamination exceeding the remediation goals would be removed, thus these areas would not require ICs regarding exposure to radioactivity.



**Figure 13. Area Requiring Institutional Controls**

The Navy has determined that it will rely on proprietary controls in the form of environmental restrictive covenants as provided in the “Memorandum of Agreement between the United States Department of the Navy and the California Department of Toxic Substances Control” (hereinafter referred to as the “Navy/DTSC MOA”).

More specifically, land use and activity restrictions will be incorporated into two separate legal instruments as provided in the Navy/DTSC MOA:

1. Restrictive covenants included in one or more Quitclaim Deeds from the Navy to the property recipient.
2. Restrictive covenants included in one or more “Covenant to Restrict Use of Property” entered into by the Navy and DTSC as provided in the Navy/DTSC MOA and consistent with the substantive provisions of Title 22 California Code of Regulations § 67391.1.

The “Covenant(s) to Restrict Use of Property” will incorporate the land use and activity restrictions into environmental restrictive covenants that run with the land and that are enforceable by DTSC against future transferees. The Quitclaim Deed(s) will include the identical land use and activity restrictions in environmental restrictive covenants that run with the land and that will be enforceable by the Navy against future transferees.

The land use and activity restrictions in the “Covenant(s) to Restrict Use of Property” and Quitclaim Deed(s) shall be further defined in the land use control remedial design (LUC RD) report that would be prepared by the Navy and reviewed and approved by the other FFA signatories. The LUC RD report shall be referenced in the applicable Covenant to Restrict Use of Property and Deed. CCSF may prepare a risk management plan (RMP) to be approved by the FFA signatories that may set forth certain requirements and protocols used to conduct restricted activities that shall be overseen by the FFA signatories (and CDPH for restricted activities conducted within the radiological ARIC).

In addition to being set forth in the “Covenant(s) to Restrict Use of Property” and Quitclaim Deed(s) as described above, restrictions applied to specified portions of the property will be described in findings of suitability to transfer.

### ***Access***

The Deed and Covenant shall provide that the Navy and other FFA signatories, where applicable, and for CDPH in the radiological ARIC, and their authorized agents, employees, contractors, and subcontractors shall have the right to enter upon HPNS Parcel E to conduct investigations, tests, or surveys; inspect field activities; or construct, operate, and maintain any response or remedial action as required or necessary under the cleanup program, including but not limited to monitoring wells, pumping wells, treatment facilities, and cap and containment systems.

### ***Implementation***

The Navy shall address and describe implementation and maintenance actions for ICs, including periodic inspections and reporting requirements, in the preliminary and final RD reports to be developed and submitted to the other FFA signatories for review pursuant to the FFA (see “Navy Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions” attached to January 16, 2004 Department of Defense memorandum titled “Comprehensive Environmental Response,

Compensation and Liability Act [CERCLA] Record of Decision [ROD] and Post-ROD Policy”). The preliminary and final RD reports are primary documents as provided in Section 7.3 of the FFA.

The Navy is responsible for implementing, maintaining, reporting on, and enforcing ICs. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for integrity of the remedy.

### ***Land Use and Activity Restrictions***

The following paragraphs describe the IC objectives to be achieved through land use and activity restrictions to ensure that any necessary measures to protect human health and the environment and the integrity of the remedy have been undertaken.

#### **General Activity Restrictions**

The following restricted activities throughout HPNS Parcel E must be conducted in accordance with the “Covenant(s) to Restrict Use of Property,” Quitclaim Deed(s), the Operation and Maintenance Plan(s), LUC RD report and, if deemed necessary, the RMP and any other work plan or document approved in accordance with these referenced documents:

- a. “Land disturbing activity,” which includes but is not limited to (1) excavation of soil and sediment; (2) construction of roads, utilities, facilities, structures, and appurtenances of any kind; (3) demolition or removal of “hardscape” (for example, concrete roadways, parking lots, foundations, and sidewalks); (4) any activity that involves movement of soil to the surface from below the surface of the land; and (5) any other activity that causes or facilitates the movement of groundwater known to be contaminated with radionuclides or nonradioactive chemicals. Land-disturbing activities are not intended to include placement of additional clean, imported fill on top of the soil cover that the Navy will construct at HPNS Parcel E.
- b. Alteration, disturbance, or removal of any component of a response or cleanup action (including but not limited to pump-and-treat facilities, revetment walls and shoreline protection, and soil cap/containment systems); groundwater extraction, injection, and monitoring wells and associated piping and equipment; or associated utilities.
- c. Extraction of groundwater and installation of new groundwater wells.
- d. Removal of or damage to security features (e.g., locks on monitoring wells, survey monuments, fencing, signs, or monitoring equipment and associated pipelines and appurtenances).

In addition, the following activities are prohibited throughout HPNS Parcel E:

- a. Growing vegetables, fruits, and any edible items in native soil for human consumption. Plants for human consumption may be grown if they are planted in raised beds (above the CERCLA-approved cover) containing non-native soil. Trees producing edible fruit (including trees producing edible nuts) may also be planted provided they are grown in containers with a bottom that prevents the roots from penetrating the native soil.
- b. Use of groundwater.



*Activity Restrictions Relating to Soil and Associated VOC Vapors at Specific Locations within Parcel E*

Any proposed construction and occupancy of enclosed structures within the ARIC for VOC vapors must be approved by the FFA signatories in accordance with the “Covenant to Restrict Use of the Property,” Quitclaim Deed, and LUC RD to ensure that the risks of potential exposures to VOC vapors are reduced to acceptable levels that are adequately protective of human health. The ARIC for VOC vapors currently includes the entire ARIC for nonradioactive chemicals (both the green and pink shaded areas) shown on [Figure 13](#).

The reduction in potential risk can be achieved through engineering controls or other design alternatives that meet the specifications set forth in the ROD, RD reports, and LUC RD report. When construction of enclosed structures or reuse of an existing building is proposed in an ARIC for VOC vapors, the FFA signatories must approve the design of the vapor control system built into foundations. In addition, enclosed structures within the ARIC for VOC vapors at Parcel E shall not be occupied until the Owner has requested and obtained FFA signatory approval (through approval of a RACR or similar document) that any necessary engineering controls or design alternatives have been properly constructed and are operating successfully.

The FFA signatories may modify the ARIC as soil contamination areas and groundwater contaminant plumes that are producing unacceptable vapor inhalation risks are reduced over time or in response to further soil, vapor, and groundwater sampling and analysis for VOCs that establishes that areas now included in the ARIC do not pose unacceptable potential exposure risk to VOC vapors.

*Additional Land Use Restrictions for IR-02 and IR-03 and Other Areas Designated for Open Space Reuse*

In addition to the specific activities prohibited below, IR-02 and IR-03 would be restricted to open space and recreational uses, unless written approval for other uses is granted by the FFA signatories and CDPH. In addition, the following land uses would be specifically prohibited unless written approval for such uses is granted by the FFA signatories and the CDPH in accordance with the “Covenant(s) to Restrict Use of the Property,” Quitclaim Deed(s), and LUC RD report:

- a. A residence, including any mobile home or factory built housing, constructed or installed for use as residential human habitation.
- b. A hospital for humans.
- c. A school for persons under 21 years of age.
- d. A daycare facility for children.

The restricted land uses identified above shall also apply to property areas in the Shipyard Shoreline Open Space District, as identified in the CCSF’s 2010 redevelopment plan for HPNS, unless written approval for such uses is granted by the FFA signatories in accordance with the “Covenant(s) to Restrict Use of the Property,” Quitclaim Deed(s), and LUC RD report. Parcel E property areas within the Shipyard Shoreline Open Space District are identified as Redevelopment Blocks EOS-1, EOS-2, EOS-3, EOS-4, EOS-5A, EOS-5B, and EOS-5C ([Figure 5](#)).

*Additional Activity Restrictions Related to Radionuclides at Parcel E*

Exposure to radionuclides in the radiological ARIC, comprising IR-02 and IR-03 (see [Figure 13](#)), would be prevented by three separate components: (1) an engineered cover, consisting of clean imported fill and (in some areas) a low hydraulic conductivity layer, to provide adequate shielding against residual radioactivity; (2) permeable geosynthetic fabric to serve as a demarcation layer between soil cover and underlying soil with residual radioactivity; and (3) ICs to implement land use and activity restrictions necessary to limit the exposure to radiological hazardous substances and to ensure the integrity of the remedial action.

In addition to the land use and activity restrictions specified above, the following activity restriction would apply in the radiological ARIC.

- a. Land-disturbing activities within the radiological ARIC, as defined above and including installation of water lines, storm drains, or sanitary sewers below the demarcation layer, are strictly prohibited unless approved in writing by the FFA signatories and the CDPH. Any proposed land-disturbing activity within the ARIC for radionuclides shall be described in a work plan that will include but not be limited to a radiological work plan, the identification of a radiological safety specialist, a soil management plan, soil sampling and analysis requirements, and a plan for offsite disposal of any excavated radionuclides by the transferee in accordance with federal and state law. This work plan must also specify appropriate procedures for the proper identification and handling of material potentially presenting an explosive hazard<sup>15</sup>. This work plan must be submitted to and approved in writing by the FFA signatories and CDPH in accordance with procedures (including dispute resolution procedures) and timeframes that will be set forth in the Parcel E Operations and Maintenance Plan (OMP) and LUC RD Report.
- b. Following implementation of an approved land-disturbing activity within the radiological ARIC, the integrity of the cover/cap must be restored upon completion of excavation as provided in the OMP, LUC RD report, or similar document. A completion report describing the details of the implementation of the work plan, sampling and analysis (if required), offsite disposal (if required), and the restoration of the integrity of the cover/cap must be submitted to and approved in writing by the FFA signatories and CDPH in accordance with procedures (including dispute resolution procedures) and timeframes that will be set forth in the OMP and LUC RD Report.
- c. For land-disturbing activities, as defined above and including installation of water lines, storm drains, or sanitary sewers above the demarcation layer, the LUC RD report, the OMP, or, if deemed necessary, the RMP or a project-specific work plan will list the procedures for ensuring that the cover is not disturbed or breached. The specific design of the cover shall be agreed to in the RD. Installation of water lines, storm drains, or sanitary sewers in any additional clean, imported fill placed on top of the soil cover that the Navy has constructed at the Property is not intended to be restricted if the property owner demarcates the interface between the preexisting cover and any new imported soil.

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<sup>15</sup> Previous radiological removal actions in IR-02 encountered material potentially presenting an explosive hazard that required inspection by qualified unexploded ordnance technicians and handling/disposal in accordance with Department of Defense guidelines. This prior finding necessitates similar protocols for future land-disturbing activities within the radiological ARIC (which includes all of IR-02 and IR-03).

At the time of transfer, the areas that require this restriction will be surveyed to define the legal metes and bounds for inclusion in the property transfer documents. No variance or exemption from this restriction shall be allowed unless written approval is provided by the FFA signatories and CDPH. The OMP or LUC RD report shall address any necessary additional soil and radiological management requirements; for example, inspections, monitoring, and reporting requirements for portions of Parcel E in the radiological ARIC.

### **2.9.3. Expected Outcomes of the Selected Remedy**

Once the selected remedies have been implemented, risks to human health and the environment under the planned future uses will be acceptable and the RAOs will be achieved. Removal and offsite disposal of soil, shoreline sediment, NAPL, and radiologically impacted media in selected areas will reduce site risks, and the cover will prevent contact with remaining contamination that might pose an unacceptable risk. Treatment of soil gas, groundwater, and NAPL in selected areas will reduce concentrations of nonradioactive chemicals and reduce their migration potential. The groundwater remedy is expected to achieve the remediation goals presented in [Table 7](#) via active treatment and MNA of VOCs in groundwater to restore the aquifer quality by reducing or immobilizing the mass of COCs in groundwater to levels that do not pose a threat to human health through the inhalation exposure pathway. As described in [Section 2.9.2.2](#), active treatment will be performed until the technology is no longer the most cost-effective or environmentally sustainable option, at which point MNA will be relied upon to degrade the remaining VOCs (following approval by the FFA signatories). Although active treatment of groundwater (with MNA) is expected to reduce VOC and SVOC vapors released from groundwater, ICs for vapor intrusion may be needed at some locations at Parcel E (as discussed in [Section 2.9.2.5](#)). Furthermore, the Navy intends to permanently prohibit use of groundwater at Parcel E through implementation of ICs.

The remedy for radiologically impacted media includes surveys, decontamination, excavation, and offsite disposal. Removal of contaminants from radiologically impacted buildings and former building sites with documented radiological impacts and removal of potential radiologically impacted sanitary and storm sewers and soil are expected to result in a reduction of the potential risks to levels less than the remediation goals presented in [Table 8](#) associated with exposure to ROCs.

The selected remedies will take a relatively short period of time to implement and will use readily available technologies and labor. Following implementation, long-term monitoring, MNA, and maintenance will ensure the continued protection of human health and the environment. In addition, ICs will restrict potential exposure to contaminated soil, shoreline sediment, and groundwater and the restrictions will be consistent with the planned future use of Parcel E.

### **2.9.4. Statutory Determinations**

In accordance with the NCP, the selected remedies meet the following statutory determinations.

- **Protection of Human Health and the Environment** – The selected remedies will adequately protect human health and the environment by preventing exposure to COCs and COECs through (1) removal and offsite disposal of soil, shoreline sediment, NAPL, and radiologically impacted media to significantly reduce risks in selected areas; (2) treatment of soil gas, groundwater, and NAPL to reduce the potential for contaminant migration in selected areas; and (3) installation and monitoring of soil and groundwater containment systems (including durable covers and below-ground barriers) and the implementation of ICs.
- **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** – CERCLA § 121(d)(1) states that remedial actions on CERCLA sites must attain (or the decision document must justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate. The selected remedies for Parcel E will comply with the substantive provisions of the federal and state requirements identified as ARARs. The chemical-, location-, and action-specific ARARs for the selected remedy are summarized in [Attachment 4](#).
- **Cost-Effectiveness** – As specified in the NCP, the cost-effectiveness of a remedy is determined in two steps. First, the overall effectiveness of a remedial alternative is determined by evaluating the following three of the five balancing criteria: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility, or volume through treatment; and (3) short-term effectiveness. The overall effectiveness is then compared to cost to determine whether a remedy is cost-effective. The selected remedies have a high overall effectiveness because, relative to the other remedial alternatives, they offer a high degree of long-term effectiveness in a manner that maximizes the use of treatment (to reduce the toxicity, mobility, or volume of contaminants) and minimizes short-term risks. The selected remedies will provide high overall effectiveness proportional to their costs. For example, Alternatives S-4 and GW-3 offer improved overall effectiveness for a modest incremental cost increase (relative to other alternatives). Therefore, the selected remedies are considered cost-effective. In contrast, Alternative O-6 is not considered cost-effective because its lower overall effectiveness (relative to Alternative O-4) is accompanied by a significant incremental cost increase (nearly 50 percent relative to Alternative O-4).
- **Use of Permanent Solution and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable** – The Navy has determined that the selected remedies represent the maximum extent to which permanent solutions and treatment are practicable at this site. The selected remedies include treatment components to reduce toxicity, mobility, or volume of VOCs in soil gas and groundwater at various locations, as well as NAPL at IR-03. For the soil remedy, the Navy concluded that, because soil contamination is widely dispersed across the parcel, a containment remedy combined with excavation of more highly contaminated soil represents the maximum extent to which permanent solutions can be used in a cost-effective manner. For the NAPL at IR-03, the Navy concluded that the selected remedy (Alternative O-4) provides the best balance of tradeoffs relative to the five balancing criteria: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; (5) and cost. Alternative O-4 provides a high degree of long-term effectiveness, although not as high as Alternative O-6, because the NAPL contaminant source would be removed and treated, and the final soil cover, protective liner, and below-ground barrier (for groundwater) would protect people and wildlife from being exposed to remaining contamination. Alternative O-4 provides the highest degree of short-term effectiveness and implementability because it uses proven and accepted technologies

that can be implemented more quickly and readily than the other alternatives, most notably Alternative O-6, thereby reducing the short-term risks to site workers and the surrounding community. Alternative O-4 would cost significantly less than Alternative O-6. The selected remedies are expected to be permanent and effective in light of the anticipated land use.

- **Preference for Treatment as a Principal Element** – The selected remedy for soil and shoreline sediment does not satisfy the statutory preference for treatment<sup>16</sup> as a principal element because no cost-effective means of treating the large quantity of low-level soil contamination is available and the quantities of soil to be excavated cannot be treated in a cost-effective manner. With the exception of soil gas treatment (via SVE), the soil and shoreline sediment remedy would not reduce the toxicity, mobility, or volume of contaminants through treatment, but would provide for offsite disposal of more highly contaminated soil at a facility, which would minimize the potential for those hazardous substances to migrate or otherwise pose a threat. The selected remedy for groundwater and NAPL at IR-03 satisfies the statutory preference for treatment as a principal element of the remedy; that is, it would reduce the toxicity, mobility, or volume of contaminants through treatment as a principal element. The selected remedy for radiologically impacted media does not include treatment as a principal element because no technology is available to reduce the toxicity or volume of radionuclides in contaminated soil or building materials.
- **Five-Year Review Requirements** – Statutory five-year reviews pursuant to CERCLA § 121 and the NCP will be conducted because the selected remedies may leave contamination in place at Parcel E above levels that allow for unrestricted use and unlimited exposure. Five-year reviews for Parcel E will follow the ongoing schedule of five-year reviews established for other remedies in place at HPNS (the next five-year review for HPNS will be completed in 2018).

### 2.9.5. Documentation of Significant Changes

No significant changes were made to the ROD from the information presented in the Proposed Plan.

## 2.10. COMMUNITY PARTICIPATION

Community participation at HPNS includes public meetings, public information repositories, an IR Program website, newsletters and fact sheets, public notices, and site tours. The Community Involvement Plan for HPNS provides detailed information on community participation for the IR Program and documents interests, issues, and concerns raised by the community regarding ongoing investigation and cleanup activities at HPNS. The Navy held a community meeting on February 2, 2010, to solicit community input on updating the Community Involvement Plan for HPNS. The Navy used this input in preparing an update to the **Community Involvement Plan**<sup>(57)</sup>, which was finalized in May 2011. The Navy is currently working on another update to the community involvement plan, which is scheduled for completion in summer 2013.

Starting in January 2010, the Navy began conducting bimonthly Community Technical Meetings to discuss the technical aspects of the CERCLA milestone documents with community members (and with

<sup>16</sup> As defined in the NCP (Title 40 Code of Federal Regulations § 300.5), “treatment technology” means any unit operation or series of unit operations that alters the composition of a hazardous substance or pollutant or contaminant through chemical, biological, or physical means so as to reduce toxicity, mobility, or volume of the contaminated materials being treated. Treatment technologies are an alternative to land disposal of hazardous wastes without treatment.

participation from the BCT). Documents and relevant information relied upon in the remedy selection process are made available for public review in the public information repositories (listed at the end of this section) or on the [IR Program website](#)<sup>(58)</sup>.

Community participation is also solicited through public mailings, including newsletters, fact sheets, public notices, and proposed plans, which are designed to broadly disseminate information throughout the local community. Public mailings for HPNS are sent to more than 2,000 groups and individuals that have added their names to the community mailing list, including residents in the local Hunters Point-Bayview community; city, state, and federal officials; regulatory agencies; and other interested groups and individuals. Previous updates and fact sheets have included general program information such as the status of environmental investigations and cleanup activities at each HPNS parcel. In addition, the Navy has held periodic site tours of HPNS to better explain the status of cleanup activities to interested community members.

For Parcel E, a significant effort was made to inform the public of the remedy proposed in the Proposed Plan and selected in this ROD. Prior to making the Proposed Plan available for public review, public notices of the meeting and availability of documents was placed in the *San Francisco Chronicle* on February 10, 2013; the *San Francisco Bayview* on February 1, 2013; and *Sun-Reporter* on February 7, 2013. The Proposed Plan, along with [the associated fact sheet](#)<sup>(59)</sup>, was distributed to recipients on the community mailing list beginning on February 12, 2013.

In accordance with CERCLA § 113 and § 117, the Navy provided a public comment period from February 13, 2013, to April 1, 2013, for the proposed remedial action described in the Proposed Plan for Parcel E. A public meeting to present the Proposed Plan was held from 6:00 to 9:00 p.m. on February 28, 2013. At the public meeting, the Navy gave presentations on the conditions at Parcel E and representatives from the Navy and regulatory agencies were available to answer questions. A [transcript of the public meeting](#)<sup>(60)</sup> prepared by a court reporter is part of the Administrative Record for this ROD and is available on the CD for this ROD. Responses to spoken comments received during the public meeting and written comments received during the public comment period are included in the Responsiveness Summary in [Section 3](#).

Key supporting documents that pertain to Parcel E and a complete index of all Navy HPNS documents are available at the following information repositories:

San Francisco Main Library  
100 Larkin Street  
Government Information Center, 5th Floor  
San Francisco, California 94102  
Phone: (415) 557-4500

HPNS Office Trailer  
690 Hudson Street  
San Francisco, California 94124

For access to the Administrative Record contact:

Naval Facilities Engineering Command Southwest  
Attention: Diane Silva, Command Records Manager  
2965 Mole Road, Building 3519  
San Diego, CA 92136  
Phone: (619) 556-1280

For additional information on the IR Program contact:

Mr. Keith Forman  
HPNS BRAC Environmental Coordinator  
BRAC Program Management Office West  
1455 Frazee Road, Suite 900  
San Diego, California 92108-4310  
Phone: (619) 532-0913  
e-mail: [keith.s.forman@navy.mil](mailto:keith.s.forman@navy.mil)

## Section 3. Responsiveness Summary

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The responsiveness summary is the third component of a ROD; its purpose is to summarize information about the views of the public and regulatory agencies on both the remedial alternatives and general concerns about Parcel E submitted during the public comment period. It documents in the record how public comments were integrated into the decision-making process. The participants in the public meeting, held on February 28, 2013, included community members and representatives of the Navy, EPA, DTSC, and the Water Board. Questions and concerns received during the meeting were addressed at the meeting and are documented in the meeting transcript. Responses to comments provided at the meeting and received during the public comment period by the Navy, EPA, DTSC, or the Water Board are included in the responsiveness summary ([Attachment 3](#)). In addition, responses to comments received on the draft version of this ROD are provided in [Attachment 5](#).



## **Attachment 1. Administrative Record Index**

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*(The Administrative Record Index provided on CD only)*

# HUNTERS POINT

## DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

### ADMINISTRATIVE RECORD INDEX FOR SITE 3 AND PARCELS E AND UC-3

UIC No. \_ Rec. No.

| Record Type<br>Approx. # Pages    | Record Date | Author Affiliation        | Title                                                                                                                                                       | Imaged? | Sites                                                                                                                                                                              |
|-----------------------------------|-------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AR_N00217_002880<br>REPORT<br>235 | 03-19-1987  | EMCON ASSOCIATES          | CONFIRMATION STUDY, VERIFICATION STEP - VOLUME I OF IV (SEE RECORD # 2881 THROUGH RECORD #2883 - VOLUMES II THROUGH IV, AND # 38 - WDIV TRANSMITTAL LETTER) | YES     | BLDG 0000521<br>PARCEL B<br>PARCEL E-2<br>SITE 00001<br>SITE 00003<br>SITE 00005<br>SITE 00006<br>SITE 00007<br>SITE 00008<br>SITE 00009<br>SITE 00010<br>SITE 00011<br>SITE 00012 |
| AR_N00217_002886<br>REPORT<br>6   | 03-01-1988  | HARDING LAWSON ASSOCIATES | PROPOSED RECONNAISSANCE ACTIVITIES                                                                                                                          | YES     | PARCEL A<br>PARCEL B<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00006<br>SITE 00007                                                                                         |

UIC No. \_ Rec. No.

| Record Type<br>Approx. # Pages           | Record Date | Author Affiliation                 | Title                                                                                                                                                                                    | Imaged? | Sites                                                                                                                                                            |
|------------------------------------------|-------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AR_N00217_000229<br>CORRESPONDENCE<br>20 | 03-08-1988  | NAVFAC - WESTERN DIVISION          | RESPONSES TO COMMENTS ON THE DRAFT SCOPING DOCUMENT                                                                                                                                      | YES     | PARCEL A<br>PARCEL B<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00004<br>SITE 00005<br>SITE 00006<br>SITE 00007<br>SITE 00008<br>SITE 00009<br>SITE 00011 |
| AR_N00217_000278<br>CORRESPONDENCE<br>2  | 04-06-1988  | CRWQCB - OAKLAND, CA               | REQUEST FOR SOLID WASTE ASSESSMENT TEST REPORT FOR THE INDUSTRIAL LANDFILL, BURNING DISPOSAL SITE, BAY FILL SITE, AND DISPOSAL TRENCH LOCATED NEAR THE CORNER OF 6TH AVENUE AND J STREET | YES     | PARCEL B<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00007                                                                                                 |
| AR_N00217_000470<br>CORRESPONDENCE<br>2  | 08-12-1988  | NAVFAC - WESTERN DIVISION          | APPLICABLE AND RELEVANT OR APPROPRIATE REQUIREMENTS OF SOLID WASTE AIR QUALITY ASSESSMENT TEST                                                                                           | YES     | PARCEL B<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00007                                                                                                 |
| AR_N00217_001654<br>REPORT<br>768        | 12-03-1990  | PRC ENVIRONMENTAL MANAGEMENT, INC. | POST CONSTRUCTION REPORT ON THE CLEAN-UP OF ASBESTOS-CONTAINING MATERIALS AT THE WATER SOFTENING TREATMENT AREA AND VARIOUS REMOTE SITES (SEE RECORD # 1699 - WDIV TRANSMITTAL LETTER)   | YES     | BLDG 0000521<br>PARCEL E                                                                                                                                         |
| AR_N00217_001806<br>CORRESPONDENCE<br>2  | 01-08-1991  | NAVFAC - WESTERN DIVISION          | RESPONSES TO LETTER DATED 12 DECEMBER 1990 REGARDING OIL PONDS                                                                                                                           | YES     | SITE 00003                                                                                                                                                       |
| AR_N00217_002722<br>CORRESPONDENCE<br>2  | 08-06-1992  | CRWQCB - OAKLAND, CA               | REVIEW AND COMMENTS ON DRAFT TREATABILITY STUDY WORK PLAN                                                                                                                                | YES     | OU 0000001<br>SITE 00003                                                                                                                                         |

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| Record Type<br>Approx. # Pages           | Record Date | Author Affiliation           | Title                                                                                                                                                           | Imaged? | Sites                                                                                                                            |
|------------------------------------------|-------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------|
| AR_N00217_002566<br>CORRESPONDENCE<br>17 | 10-16-1992  | NAVFAC - WESTERN DIVISION    | TRANSMITTAL OF PROPOSED SCHEDULES AND ASSUMPTIONS; INTERIM ACTION SCHEDULES FOR GROUP V SITES (W/ ENCLOSURES)                                                   | YES     | OU 0000002<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                           |
| AR_N00217_002582<br>CORRESPONDENCE<br>21 | 12-04-1992  | NAVFAC - WESTERN DIVISION    | TRANSMITTAL OF RESPONSE TO COMMENTS ON PARCEL SCHEDULING ASSUMPTIONS AND PARCEL SCHEDULES, REVISED SCHEDULING ASSUMPTIONS, AND REVISED SCHEDULES (W/ ENCLOSURE) | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                                         |
| AR_N00217_002720<br>CORRESPONDENCE<br>1  | 07-13-1993  | U.S. EPA - SAN FRANCISCO, CA | QUESTIONS ABOUT NAVY'S MEMORANDUM OF 10 JUNE 1993 REGARDING THE CONTAINMENT FEASIBILITY STUDIES                                                                 | YES     | PARCEL E                                                                                                                         |
| AR_N00217_003266<br>CORRESPONDENCE<br>5  | 07-13-1993  | NAVFAC - EFA WEST            | TRANSMITTAL OF MAY 1993 AND JUNE 1993 MONTHLY PROGRESS REPORTS (W/ENCLOSURE)                                                                                    | YES     | BLDG 0000816<br>OU 0000002<br>OU 0000003<br>OU 0000004<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00003 |
| AR_N00217_002721<br>CORRESPONDENCE<br>4  | 08-05-1993  | DTSC - BERKELEY, CA          | REVIEW AND COMMENTS ON DRAFT TREATABILITY STUDY WORK PLAN                                                                                                       | YES     | SITE 00003                                                                                                                       |
| AR_N00217_002731<br>CORRESPONDENCE<br>2  | 08-05-1993  | CRWQCB - OAKLAND, CA         | COMMENTS ON DRAFT TREATABILITY STUDY WORK PLAN FOR TREATING SUBSURFACE PETROLEUM PRODUCTS                                                                       | YES     | SITE 00003                                                                                                                       |
| AR_N00217_002730<br>CORRESPONDENCE<br>2  | 08-16-1993  | DTSC - BERKELEY, CA          | REVIEW AND COMMENTS ON DRAFT TREATABILITY STUDY WORK PLAN FOR TREATING SUBSURFACE PETROLEUM PRODUCTS                                                            | YES     | SITE 00003                                                                                                                       |

UIC No. \_ Rec. No.

| Record Type<br>Approx. # Pages           | Record Date | Author Affiliation                 | Title                                                                                                                                                                                                                                             | Imaged? | Sites                                        |
|------------------------------------------|-------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------|
| AR_N00217_002872<br>CORRESPONDENCE<br>16 | 09-01-1993  | U.S. EPA - SAN FRANCISCO, CA       | COMMENTS ON THE DRAFT TREATABILITY STUDY WORK PLAN, AND DRAFT TREATABILITY STUDY WORK PLAN FOR TREATING SUBSURFACE PETROLEUM PRODUCTS BY BIODEGRADATION (W/ ENCLOSURES)                                                                           | YES     | OU 0000001<br>SITE 00003                     |
| AR_N00217_002930<br>CORRESPONDENCE<br>26 | 10-21-1993  | NAVFAC - WESTERN DIVISION          | RESPONSES TO COMMENTS ON DRAFT TREATABILITY STUDY WORK PLAN FOR TREATING SUBSURFACE PETROLEUM PRODUCTS BY BIODEGRADATION (SEE RECORD # 2931 - WDIV TRANSMITTAL LETTER)                                                                            | YES     | SITE 00003                                   |
| AR_N00217_002931<br>CORRESPONDENCE<br>3  | 11-18-1993  | NAVFAC - WESTERN DIVISION          | TRANSMITTAL OF 1) RESPONSE TO COMMENTS ON DRAFT TREATABILITY STUDY WORK PLAN AND 2) DRAFT FINAL TREATABILITY STUDY WORK PLAN FOR TREATING SUBSURFACE PETROLEUM PRODUCTS BY BIODEGRADATION (ENCLOSURE 1) IS RECORD # 2930 AND 2) IS RECORD # 2929) | YES     | SITE 00003                                   |
| AR_N00217_000127<br>REPORT<br>74         | 11-30-1993  | PRC ENVIRONMENTAL MANAGEMENT, INC. | REMEDIATION INVESTIGATION/FEASIBILITY STUDY FIELD WORK AND ANALYSIS                                                                                                                                                                               | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E |
| AR_N00217_002939<br>CORRESPONDENCE<br>4  | 01-04-1994  | U.S. EPA - SAN FRANCISCO, CA       | COMMENTS ON SITE INSPECTION DATA PRESENTATION VOLUMES II AND III                                                                                                                                                                                  | YES     | PARCEL E                                     |
| AR_N00217_002969<br>CORRESPONDENCE<br>3  | 01-04-1994  | U.S. EPA - SAN FRANCISCO, CA       | COMMENTS ON THE DRAFT SITE INSPECTION DATA PRESENTATION ON 02 NOVEMBER 1993 (VOLUMES II AND III) [SEE RECORD # 2484 - DRAFT SI WORK PLAN, VOLUMES I-III OF III]                                                                                   | YES     | PARCEL E                                     |
| AR_N00217_002942<br>CORRESPONDENCE<br>2  | 01-31-1994  | U.S. EPA - SAN FRANCISCO, CA       | REVIEW AND COMMENTS ON SITE INSPECTION DATA PRESENTATIONS, VOLUME I                                                                                                                                                                               | YES     | PARCEL D<br>PARCEL E                         |
| AR_N00217_002975<br>CORRESPONDENCE<br>3  | 04-15-1994  | NAVFAC - WESTERN DIVISION          | TRANSMITTAL OF SITE ASSESSMENT REPORT, POTENTIALLY CONTAMINATED SITES (ENCLOSURE IS RECORD # 3027)                                                                                                                                                | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E |

UIC No. \_ Rec. No.

| Record Type<br>Approx. # Pages           | Record Date | Author Affiliation                    | Title                                                                                                            | Imaged? | Sites                                            |
|------------------------------------------|-------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------|---------|--------------------------------------------------|
| AR_N00217_003027<br>REPORT<br>282        | 04-15-1994  | PRC ENVIRONMENTAL<br>MANAGEMENT, INC. | FINAL SITE ASSESSMENT REPORT, POTENTIALLY<br>CONTAMINATED SITES (SEE RECORD # 2975 - WDIV<br>TRANSMITTAL LETTER) | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E     |
| AR_N00217_003019<br>CORRESPONDENCE<br>3  | 04-19-1994  | U.S. EPA - SAN FRANCISCO, CA          | REVIEW AND COMMENTS ON DRAFT FINAL<br>TREATABILITY STUDY WORK PLAN (OIL RECLAMATION<br>PONDS)                    | YES     | PARCEL E<br>SITE 00003                           |
| AR_N00217_003180<br>CORRESPONDENCE<br>2  | 04-19-1994  | U.S. EPA - SAN FRANCISCO, CA          | CLARIFICATION OF RADIATION ISSUES                                                                                | YES     | PARCEL B<br>PARCEL E<br>SITE 00001<br>SITE 00002 |
| AR_N00217_002991<br>CORRESPONDENCE<br>18 | 05-11-1994  | U.S. EPA - SAN FRANCISCO, CA          | REVIEW AND COMMENTS ON DRAFT SITE INSPECTION<br>REPORT                                                           | YES     | PARCEL E                                         |
| AR_N00217_003000<br>CORRESPONDENCE<br>17 | 06-03-1994  | ARC ECOLOGY                           | REVIEW AND COMMENTS ON SITE INVESTIGATION<br>REPORTS                                                             | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                 |
| AR_N00217_003028<br>CORRESPONDENCE<br>9  | 06-14-1994  | HARDING LAWSON ASSOCIATES             | RESPONSES TO COMMENTS ON THE DRAFT FINAL<br>TREATABILITY STUDY WORK PLAN                                         | YES     | OU 0000001<br>SITE 00003                         |
| AR_N00217_003029<br>CORRESPONDENCE<br>3  | 06-24-1994  | U.S. EPA - SAN FRANCISCO, CA          | REVIEW AND COMMENTS ON THE FINAL SITE<br>ASSESSMENT REPORT, POTENTIALLY CONTAMINATED<br>SITES                    | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E     |
| AR_N00217_003030<br>CORRESPONDENCE<br>2  | 07-05-1994  | DTSC - BERKELEY, CA                   | REVIEW AND COMMENTS ON THE FINAL SITE<br>ASSESSMENT REPORT, POTENTIALLY CONTAMINATED<br>SITES                    | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E     |
| AR_N00217_003017<br>CORRESPONDENCE<br>3  | 07-15-1994  | NAVFAC - WESTERN DIVISION             | TRANSMITTAL OF THE DRAFT FINAL SITE INSPECTION<br>REPORT (ENCLOSURE IS RECORD # 3018)                            | YES     | PARCEL E                                         |

UIC No. \_ Rec. No.

| Record Type<br>Approx. # Pages          | Record Date | Author Affiliation           | Title                                                                                                                                                  | Imaged? | Sites                                        |
|-----------------------------------------|-------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------|
| AR_N00217_003039<br>CORRESPONDENCE<br>2 | 08-19-1994  | NAVFAC - WESTERN DIVISION    | RESPONSES TO COMMENTS ON THE DRAFT SITE INSPECTION REPORT AND DRAFT FINAL SITE INSPECTION REPORT                                                       | YES     | PARCEL C<br>PARCEL D<br>PARCEL E             |
| AR_N00217_003053<br>CORRESPONDENCE<br>9 | 08-30-1994  | U.S. EPA - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON DRAFT FINAL SITE INSPECTION REPORT                                                                                              | YES     | PARCEL E                                     |
| AR_N00217_003924<br>REPORT<br>45        | 09-08-1994  | SANFORD COHEN AND ASSOCIATES | EPA - NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY CONDUCTED A PRELIMINARY STUDY AT THE RADIOLOGICAL AND CHEMICAL TECHNICAL SUPPORT CENTER      | YES     | PARCEL E                                     |
| AR_N00217_003059<br>CORRESPONDENCE<br>8 | 11-21-1994  | NAVFAC - EFA WEST            | RESPONSES TO COMMENTS ON FINAL SITE ASSESSMENT REPORT, POTENTIALLY COMTAMINATED SITES                                                                  | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E |
| AR_N00217_003079<br>CORRESPONDENCE<br>3 | 04-06-1995  | NAVFAC - EFA WEST            | TRANSMITTAL OF THE DRAFT RESULTS OF SUBSURFACE RADIATION INVESTIGATION (ENCLOUSRE IS RECORD # 3080 AND 3081)                                           | YES     | PARCEL B<br>PARCEL E                         |
| AR_N00217_003088<br>CORRESPONDENCE<br>4 | 04-28-1995  | ARC ECOLOGY                  | COMMENTS ON THE RESULTS OF SUBSURFACE RADIATION INVESTIGATION                                                                                          | YES     | PARCEL B<br>PARCEL E                         |
| AR_N00217_003124<br>CORRESPONDENCE<br>2 | 05-30-1995  | U.S. EPA - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON RESULTS OF SUBSURFACE RADIATION INVESTIGATION, VOLUMES I AND II OF II                                                           | YES     | PARCEL B<br>PARCEL E                         |
| AR_N00217_003125<br>CORRESPONDENCE<br>7 | 06-19-1995  | DTSC - BERKELEY, CA          | REVIEW AND COMMENTS ON SUBSURFACE RADIATION INVESTIGATION                                                                                              | YES     | PARCEL B<br>PARCEL E                         |
| AR_N00217_003108<br>CORRESPONDENCE<br>3 | 07-10-1995  | NAVFAC - EFA WEST            | TRANSMITTAL OF THE DRAFT FINAL, TREATABILITY STUDY WORK PLAN FOR TREATING SUBSURFACE PETROLEUM PRODUCTS BY BIODEGRADATION (ENCLOSURE IS RECORD # 3109) | YES     | SITE 00003                                   |

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| AR_N00217_003132<br>CORRESPONDENCE<br>3  | 08-07-1995  | NAVFAC - EFA WEST                                      | TRANSMITTAL OF THE DRAFT ADDENDUM TO THE FACILITY GROUNDWATER MONITORING PLAN                                                                           | YES     | PARCEL B<br>PARCEL D<br>PARCEL E                                                                                   |
| AR_N00217_003122<br>CORRESPONDENCE<br>4  | 08-31-1995  | DTSC - BERKELEY, CA                                    | COMMENTS ON DRAFT FINAL TREATABILITY STUDY FOR TREATING SUBSURFACE PETROLEUM PRODUCTS BY BIODEGRADATION                                                 | YES     | SITE 00003                                                                                                         |
| AR_N00217_003137<br>CORRESPONDENCE<br>6  | 10-02-1995  | U.S. EPA - SAN FRANCISCO, CA                           | REVIEW AND COMMENTS ON DRAFT FINAL TREATABILITY STUDY WORK PLAN FOR TREATING SUBSURFACE PETROLEUM PRODUCTS BY BIOREMEDIATION                            | YES     | SITE 00003                                                                                                         |
| AR_N00217_003138<br>CORRESPONDENCE<br>2  | 10-05-1995  | NAVAL SEA SYSTEMS COMMAND<br>DETACHMENT - YORKTOWN, VA | RESPONSES TO RESPONSE TO COMMENTS ON THE RESULTS OF THE DRAFT SUBSURFACE RADIATION INVESTIGATION                                                        | YES     | PARCEL B<br>PARCEL E                                                                                               |
| AR_N00217_003140<br>CORRESPONDENCE<br>4  | 10-12-1995  | DTSC - BERKELEY, CA                                    | COMMENTS ON RADIATION INVESTIGATION OF THE INTERTIDAL AREAS SURROUNDING THE INDUSTRIAL LANDFILL AND BAY LANDFILL AREA, DRAFT SAMPLING AND ANALYSIS PLAN | YES     | PARCEL E<br>SITE 00001<br>SITE 00002                                                                               |
| AR_N00217_003157<br>REPORT<br>34         | 12-22-1995  | PRC ENVIRONMENTAL<br>MANAGEMENT, INC.                  | FORMERLY USED DEFENSE SITES FIELD SAMPLING PLAN (SEE RECORD # 3158 - EFAW TRANSMITTAL LETTER)                                                           | YES     | BLDG 0000815<br>BLDG 0000820<br>BLDG 0000830<br>BLDG 0000831<br>PARCEL E<br>SITE IR-74<br>SITE SI-74<br>SITE SI-75 |
| AR_N00217_003159<br>CORRESPONDENCE<br>13 | 01-11-1996  | NAVFAC - EFA WEST                                      | RESPONSES TO COMMENTS ON THE DRAFT FINAL TREATABILITY STUDY WORK PLAN FOR TREATING SUBSURFACE PETROLEUM PRODUCTS BY BIODEGRADATION                      | YES     | SITE 00003                                                                                                         |
| AR_N00217_003160<br>CORRESPONDENCE<br>15 | 01-11-1996  | NAVFAC - EFA WEST                                      | RESPONSES TO COMMENTS ON THE DRAFT RESULTS OF THE SUBSURFACE RADIATION INVESTIGATION                                                                    | YES     | PARCEL B<br>PARCEL E                                                                                               |



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| AR_N00217_003197<br>CORRESPONDENCE<br>1  | 01-23-1996  | U.S. EPA - SAN FRANCISCO, CA       | RESPONSES TO COMMENTS ON THE SUBSURFACE RADIATION INVESTIGATION, VOLUMES I AND II OF II       | YES     | PARCEL B<br>PARCEL E                                                                                                       |
| AR_N00217_003200<br>CORRESPONDENCE<br>24 | 02-08-1996  | DTSC - BERKELEY, CA                | RESPONSES TO RESPONSE TO COMMENTS ON THE RESULTS OF SUBSURFACE RADIATION INVESTIGATION        | YES     | PARCEL B<br>PARCEL E                                                                                                       |
| AR_N00217_003252<br>REPORT<br>10         | 03-26-1996  | NAVFAC - EFA WEST                  | TRANSMITTAL OF FEBRUARY 1996 MONTHLY PROGRESS REPORT (W/ ENCLOSURE)                           | YES     | PARCEL B<br>PARCEL C<br>PARCEL E<br>SITE 00002<br>SITE 00006<br>SITE 00009                                                 |
| AR_N00217_001415<br>CORRESPONDENCE<br>2  | 03-27-1996  | PRC ENVIRONMENTAL MANAGEMENT, INC. | NET LABORATORY HISTORY AND ISSUES                                                             | YES     | OU 0000001<br>OU 0000003<br>OU 0000004<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00004<br>SITE 00005<br>SITE 00007 |
| AR_N00217_003234<br>REPORT<br>383        | 04-05-1996  | PRC ENVIRONMENTAL MANAGEMENT, INC. | FINAL FACILITY-WIDE GROUNDWATER MONITORING PLAN (SEE RECORD # 3260 - EFAW TRANSMITTAL LETTER) | YES     | BASEWIDE<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                                   |

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| AR_N00217_003257<br>CORRESPONDENCE<br>12 | 04-18-1996  | NAVFAC - EFA WEST                     | TRANSMITTAL OF MARCH 1996 MONTHLY PROGRESS<br>REPORT (W/ ENCLOSURE)       | YES     | BLDG 0000364<br>OU 0000001<br>OU 0000002<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00006<br>SITE 00007<br>SITE 00009<br>SITE 00018<br>SITE 00021 |
| AR_N00217_003261<br>CORRESPONDENCE<br>7  | 04-30-1996  | DTSC - BERKELEY, CA                   | APPLICABLE OR RELEVANT AND APPROPRIATE<br>REQUIREMENTS FOR REMOVAL ACTION | YES     | PARCEL E<br>SITE 00001<br>SITE 00021                                                                                                                                                                                 |
| AR_N00217_003262<br>REPORT<br>26         | 04-30-1996  | PRC ENVIRONMENTAL<br>MANAGEMENT, INC. | REVISED TECHNICAL MEMORANDUM, REMEDIATION<br>ALTERNATIVE ANALYSIS         | YES     | PARCEL E<br>SITE 00001<br>SITE 00003<br>SITE 00021                                                                                                                                                                   |

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| AR_N00217_003267<br>CORRESPONDENCE<br>13 | 05-17-1996  | NAVFAC - EFA WEST                  | TRANSMITTAL OF APRIL 1996 MONTHLY PROGRESS REPORT (W/ ENCLOSURE)                                                                                                                 | YES     | OU 0000001<br>OU 0000002<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00006<br>SITE 00007<br>SITE 00009<br>SITE 00018<br>SITE 00021 |
| AR_N00217_003280<br>CORRESPONDENCE<br>9  | 05-23-1996  | U.S. EPA - SAN FRANCISCO, CA       | COMMENTS ON THE DRAFT ENGINEERING EVALUATION/COST ANALYSIS, REMOVAL ACTIONS FOR THE WASTE OIL RECLAMATION PONDS (SEE RECORD # 3258 - DRAFT ENGINEERING EVALUATION/COST ANALYSIS) | YES     | SITE 00003                                                                                                                                                                               |
| AR_N00217_003320<br>CORRESPONDENCE<br>5  | 05-23-1996  | DTSC - BERKELEY, CA                | REVIEW AND COMMENTS ON THE ENGINEERING EVALUATION/COST ANALYSIS REMOVAL ACTION                                                                                                   | YES     | SITE 00003                                                                                                                                                                               |
| AR_N00217_003294<br>REPORT<br>54         | 05-31-1996  | PRC ENVIRONMENTAL MANAGEMENT, INC. | TECHNICAL MEMORANDUM, REVIEW OF POLYCHLORINATED BIPHENYL OCCURRENCES IN SOIL AND GROUNDWATER (SEE RECORD # 3293 - EFAW TRANSMITTAL LETTER)                                       | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                                                             |
| AR_N00217_003281<br>CORRESPONDENCE<br>3  | 06-01-1996  | NAVFAC - EFA WEST                  | REQUEST FOR VARIANCE IN BORING LOCATIONS FOR THE FORMERLY USED DEFENSE SITES FIELD SAMPLING (W/ ENCLOSURE)                                                                       | YES     | BLDG 0000815<br>BLDG 0000820<br>PARCEL E                                                                                                                                                 |
| AR_N00217_003449<br>CORRESPONDENCE<br>2  | 06-10-1996  | NAVFAC - EFA WEST                  | TRANSMITTAL OF THE FINAL DRAFT RESULTS OF SUBSURFACE RADIATION INVESTIGATION REPORT                                                                                              | YES     | PARCEL B<br>PARCEL E                                                                                                                                                                     |

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| AR_N00217_003293<br>CORRESPONDENCE<br>3 | 06-26-1996  | NAVFAC - EFA WEST            | TRANSMITTAL OF TECHNICAL MEMORANDUM, REVIEW OF POLYCHLORINATED BIPHENYL OCCURRENCES IN SOIL AND GROUNDWATER (ENCLOSURE IS RECORD # 3294)                                                                                                                       | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                     |
| AR_N00217_003330<br>CORRESPONDENCE<br>3 | 07-12-1996  | NAVFAC - EFA WEST            | TRANSMITTAL OF DRAFT FINAL ENGINEERING EVALUATION/COST ANALYSIS REMOVAL ACTIONS FOR THE WASTE OIL RECLAMATION PONDS (ENCLOSURE IS RECORD # 3331)                                                                                                               | YES     | SITE 00003                                                       |
| AR_N00217_003332<br>CORRESPONDENCE<br>2 | 07-15-1996  | NAVFAC - EFA WEST            | TRANSMITTAL OF DRAFT FINAL SUBSURFACE RADIATION INVESTIGATION, VOLUME I (ENCLOSURE IS RECORD # 3333)                                                                                                                                                           | YES     | PARCEL B<br>PARCEL E                                             |
| AR_N00217_003335<br>CORRESPONDENCE<br>3 | 07-19-1996  | NAVFAC - EFA WEST            | TRANSMITTAL OF 1) DRAFT ACTION MEMORANDUM FOR THE INDUSTRIAL LANDFILL GROUNDWATER PLUME REMOVAL ACTION, 2) STORM DRAIN SYSTEM REMOVAL ACTION AND 3) WASTE OIL RECLAMATION PONDS REMOVAL ACTION (ENCLOSURES ARE 1) RECORD # 3336, 2) RECORD # 3337, AND # 3338) | YES     | PARCEL B<br>SITE 00001<br>SITE 00003<br>SITE 00021<br>SITE 00050 |
| AR_N00217_003394<br>CORRESPONDENCE<br>1 | 09-09-1996  | U.S. EPA - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM FOR THE RADIATION INVESTIGATION OF TIDAL AREA SURROUNDING THE BAY AREA LANDFILL                                                                                                                          | YES     | PARCEL E<br>SITE 00002                                           |
| AR_N00217_003395<br>CORRESPONDENCE<br>2 | 09-09-1996  | U.S. EPA - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT FINAL REPORT FOR RESULTS OF SUBSURFACE RADIATION INVESTIGATION                                                                                                                                                                | YES     | PARCEL B<br>PARCEL E                                             |
| AR_N00217_003388<br>CORRESPONDENCE<br>2 | 10-16-1996  | NAVFAC - EFA WEST            | TRANSMITTAL OF THE FINAL ACTION MEMORANDUM AND FINAL ENGINEERING EVALUATION/COST ANALYSIS, REMOVAL ACTIONS, WASTE OIL RECLAMATION PONDS (ENCLOSURE IS RECORD # 3389)                                                                                           | YES     | PARCEL E<br>SITE 00003                                           |
| AR_N00217_003389<br>REPORT<br>298       | 10-18-1996  | LEVINE-FRICKE, INC.          | FINAL ACTION MEMORANDUM AND FINAL ENGINEERING EVALUATION/COST ANALYSIS, REMOVAL ACTIONS, WASTE OIL RECLAMATION PONDS (INCLUDES EFAW TRANSMITTAL LETTER) [SEE RECORD # 3390 - REPLACEMENT SIGNATURE PAGE 18]                                                    | YES     | PARCEL E<br>SITE 00003                                           |

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| AR_N00217_003390<br>CORRESPONDENCE<br>3  | 10-25-1996  | NAVFAC - EFA WEST   | TRANSMITTAL OF THE REPLACEMENT SIGNATURE PAGE FOR FINAL ACTION MEMORANDUM AND FINAL ENGINEERING EVALUATION/COST ANALYSIS, REMOVAL ACTIONS, WASTE OIL RECLAMATION PONDS - 18 OCTOBER 1996 (W/ ENCLOSURE) | YES     | PARCEL E<br>SITE 00003 |
| AR_N00217_003401<br>CORRESPONDENCE<br>17 | 11-12-1996  | NAVFAC - EFA WEST   | RESPONSES TO COMMENTS ON THE RADIATION INVESTIGATION OF THE TIDAL AREA DRAFT TECHNICAL MEMORANDUM                                                                                                       | YES     | PARCEL E<br>SITE 00002 |
| AR_N00217_003450<br>CORRESPONDENCE<br>8  | 12-12-1996  | NAVFAC - EFA WEST   | COMMENTS ON VARIOUS DRAFT PLANS, REMOVAL ACTIONS, WASTE OIL RECLAMATION PONDS                                                                                                                           | YES     | SITE 00003             |
| AR_N00217_003452<br>CORRESPONDENCE<br>3  | 12-17-1996  | NAVFAC - EFA WEST   | REPOSE TO COMMENTS ON THE RESULTS OF THE DRAFT FINAL REPORT, RESULTS OF SUBSURFACE RADIATION INVESTIGATION                                                                                              | YES     | PARCEL B<br>PARCEL E   |
| AR_N00217_000484<br>REPORT<br>274        | 12-20-1996  | IT CORPORATION      | WORK PLAN, CONTRACTOR QUALITY CONTROL PLAN, ENVIRONMENTAL PROTECTION PLAN, SAMPLING AND ANALYSIS PLAN, SITE HEALTH AND SAFETY PLAN - WASTE OIL RECLAMATION PONDS                                        | YES     | SITE 00003             |
| AR_N00217_003481<br>CORRESPONDENCE<br>3  | 05-29-1997  | NAVFAC - EFA WEST   | TRANSMITTAL OF THE DRAFT REMEDIAL INVESTIGATION REPORT (ENCLOSURE IS RECORDS # 3482 THROUGH # 3508 - DRAFT REMEDIAL INVESTIGATION REPORT, VOLUMES I THROUGH XXVII OF XXVII)                             | YES     | PARCEL E               |
| AR_N00217_003514<br>CORRESPONDENCE<br>5  | 06-24-1997  | NAVFAC - EFA WEST   | TRANSMITTAL OF PUBLIC SUMMARY FOR REMEDIAL INVESTIGATION, DRAFT REPORT (W/ ENCLOSURES)                                                                                                                  | YES     | PARCEL E               |
| AR_N00217_003517<br>CORRESPONDENCE<br>4  | 07-01-1997  | NAVFAC - EFA WEST   | TRANSMITTAL OF PUBLIC SUMMARY REMEDIAL INVESTIGATION DRAFT REPORT (W/ ENCLOSURES)                                                                                                                       | YES     | PARCEL E               |
| AR_N00217_003525<br>CORRESPONDENCE<br>18 | 08-15-1997  | DTSC - BERKELEY, CA | REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT (INCLUDES HERD MEMO DATED 4 AND 7 AUGUST 1997 AND CRWQCB COMMENTS DATE 8 JULY 1997)                                                      | YES     | PARCEL E               |

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| AR_N00217_003526<br>CORRESPONDENCE<br>64 | <b>08-15-1997</b>  | U.S. EPA - SAN FRANCISCO, CA                           | REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT                                                                                                                                                                                                 | YES            | PARCEL E                         |
| AR_N00217_003533<br>CORRESPONDENCE<br>3  | <b>08-22-1997</b>  | ARC ECOLOGY                                            | REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT                                                                                                                                                                                                 | YES            | PARCEL E                         |
| AR_N00217_003530<br>CORRESPONDENCE<br>7  | <b>09-02-1997</b>  | DTSC - BERKELEY, CA                                    | REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT (INCLUDES DEPARTMENT OF HEALTH SERVICES COMMENTS)                                                                                                                                               | YES            | PARCEL E                         |
| AR_N00217_003669<br>CORRESPONDENCE<br>64 | <b>10-21-1997</b>  | NAVFAC - EFA WEST                                      | TRANSMITTAL OF REQUEST FOR IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (W/ ENCLOSURE)                                                                                                                                          | YES            | PARCEL C<br>PARCEL E<br>PARCEL F |
| AR_N00217_003662<br>REPORT<br>855        | <b>10-27-1997</b>  | NAVFAC - EFA WEST                                      | ASSEMBLY INSTRUCTIONS AND SUBMISSION OF THE DRAFT FINAL REPORT REMEDIAL INVESTIGATION, VOLUMES I TO III AND VARIOUS INSERTS (W/ ENCLOSURES) [SEE RECORD # 3663 THROUGH # 3665 - VOLUMES I THROUGH III, #3666 - VOLUME XXVIII, AND # 3672 - REVISED APPENDIX E] | YES            | PARCEL E                         |
| AR_N00217_003692<br>CORRESPONDENCE<br>7  | <b>12-22-1997</b>  | U.S. EPA - SAN FRANCISCO, CA                           | REVIEW AND COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT                                                                                                                                                                                           | YES            | PARCEL E                         |
| AR_N00217_003693<br>CORRESPONDENCE<br>4  | <b>12-29-1997</b>  | SAN FRANCISCO REDEVELOPMENT AGENCY - SAN FRANCISCO, CA | COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT                                                                                                                                                                                                      | YES            | PARCEL E                         |
| AR_N00217_003694<br>CORRESPONDENCE<br>9  | <b>12-29-1997</b>  | DTSC - BERKELEY, CA                                    | REVIEW AND COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT                                                                                                                                                                                           | YES            | PARCEL E                         |
| AR_N00217_003695<br>CORRESPONDENCE<br>4  | <b>01-08-1998</b>  | U.S. EPA - SAN FRANCISCO, CA                           | REVIEW AND COMMENTS ON THE ECOLOGICAL PORTION OF THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT                                                                                                                                                                 | YES            | PARCEL E                         |

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| AR_N00217_003681<br>CORRESPONDENCE<br>3 | 01-15-1998  | NAVFAC - EFA WEST                                             | TRANSMITTAL OF THE FEASIBILITY STUDY DRAFT REPORT (ENCLOSURES ARE RECORD # 3682 THROUGH # 3685) | YES     | PARCEL E                                                                         |
| AR_N00217_003697<br>CORRESPONDENCE<br>4 | 01-26-1998  | DTSC - BERKELEY, CA                                           | REVIEW AND COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT                            | YES     | PARCEL E                                                                         |
| AR_N00217_003698<br>CORRESPONDENCE<br>7 | 01-29-1998  | NAVFAC - EFA WEST                                             | TRANSMITTAL OF THE PUBLIC SUMMARY FOR THE DRAFT FEASIBILITY STUDY (W/ ENCLOSURES)               | YES     | PARCEL E                                                                         |
| AR_N00217_003718<br>CORRESPONDENCE<br>5 | 03-31-1998  | DTSC - BERKELEY, CA                                           | REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY REPORT                                       | YES     | PARCEL E                                                                         |
| AR_N00217_003725<br>CORRESPONDENCE<br>1 | 03-31-1998  | MICROSEARCH ENVIRONMENTAL CORPORATION                         | REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY                                              | YES     | PARCEL E                                                                         |
| AR_N00217_003743<br>REPORT<br>16        | 04-18-1998  | NAVFAC - EFA WEST                                             | TRANSMITTAL OF APRIL 1998 MONTHLY PROGRESS REPORT AND SCHEDULES (W/ ENCLOSURE)                  | YES     | BASEWIDE<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F |
| AR_N00217_003731<br>CORRESPONDENCE<br>1 | 04-29-1998  | ENVIROCURE                                                    | REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY REPORT CLEANUP                               | YES     | PARCEL E                                                                         |
| AR_N00217_003734<br>CORRESPONDENCE<br>4 | 04-29-1998  | COALITION FOR BETTER WASTEWATER SOLUTIONS - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY REPORT                                       | YES     | PARCEL E                                                                         |

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| AR_N00217_003732<br>CORRESPONDENCE<br>2  | 04-30-1998  | ECDC ENVIRONMENTAL L.C.               | REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY REPORT                                                                                                                                 | YES     | PARCEL E             |
| AR_N00217_003733<br>CORRESPONDENCE<br>5  | 04-30-1998  | DTSC - BERKELEY, CA                   | REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY REPORT                                                                                                                                 | YES     | PARCEL E             |
| AR_N00217_003735<br>CORRESPONDENCE<br>37 | 04-30-1998  | U.S. EPA - SAN FRANCISCO, CA          | REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY REPORT                                                                                                                                 | YES     | PARCEL E             |
| AR_N00217_003736<br>CORRESPONDENCE<br>5  | 04-30-1998  | MICROSEARCH ENVIRONMENTAL CORPORATION | REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY REPORT                                                                                                                                 | YES     | PARCEL E             |
| AR_N00217_003737<br>CORRESPONDENCE<br>14 | 05-01-1998  | DTSC - BERKELEY, CA                   | REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY REPORT                                                                                                                                 | YES     | PARCEL E             |
| AR_N00217_003738<br>CORRESPONDENCE<br>4  | 06-05-1998  | NAVFAC - EFA WEST                     | TRANSMITTAL OF 1) REVISED SCHEDULE FOR THE VALIDATION STUDY AND 2) REVISED FEDERAL FACILITY AGREEMENT SCHEDULE                                                                            | YES     | PARCEL E             |
| AR_N00217_003744<br>CORRESPONDENCE<br>2  | 06-19-1998  | DTSC - BERKELEY, CA                   | FEDERAL FACILITY AGREEMENT EXTENSION APPROVAL FOR THE DRAFT ECOLOGICAL RISK ASSESSMENT VALIDATION WORK PLAN                                                                               | YES     | PARCEL E             |
| AR_N00217_003765<br>CORRESPONDENCE<br>3  | 09-30-1998  | NAVFAC - EFA WEST                     | TRANSMITTAL OF 1) ANALYSIS OF INTEGRATION OF REMEDIAL ALTERNATIVES AND 2) MAJOR ISSUES FROM AGENCIES COMMENTS ON THE FEASIBILITY STUDY (W/ ENCLOSURE 2 AND ENCLOSURE 1) IS RECORD # 3766) | YES     | PARCEL E<br>PARCEL F |
| AR_N00217_003766<br>REPORT<br>69         | 09-30-1998  | TETRA TECH EM, INC.                   | ANALYSIS OF INTEGRATION OF REMEDIAL ALTERNATIVES (SEE RECORD # 3765 - EFAW TRANSMITTAL LETTER)                                                                                            | YES     | PARCEL E<br>PARCEL F |



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| AR_N00217_003769<br>CORRESPONDENCE<br>134 | 10-07-1998  | NAVFAC - EFA WEST                              | TRANSMITTAL OF THE RESPONSE TO COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT (W/ ENCLOSURE)                                                                          | YES     | PARCEL E |
| AR_N00217_003755<br>CORRESPONDENCE<br>3   | 10-14-1998  | NAVFAC - EFA WEST                              | TRANSMITTAL OF THE DRAFT FINAL WORK PLAN AND FIELD SAMPLING PLAN VALIDATION STUDY (ENCLSOURE IS RECORD # 3756)                                                                   | YES     | PARCEL E |
| AR_N00217_003757<br>CORRESPONDENCE<br>3   | 10-26-1998  | NAVFAC - EFA WEST                              | TRANSMITTAL OF THE DRAFT QUALITY ASSURANCE PROJECT PLAN ADDENDUM, VALIDATION STUDY (ENCLOSURE IS RECORD # 3758)                                                                  | YES     | PARCEL E |
| AR_N00217_003759<br>CORRESPONDENCE<br>3   | 10-30-1998  | NAVFAC - EFA WEST                              | TRANSMITTAL OF THE DRAFT DATA GAPS SAMPLING AND ANALYSIS WORK PLAN (ENCLOSURE IS RECORD # 3760)                                                                                  | YES     | PARCEL E |
| AR_N00217_003761<br>CORRESPONDENCE<br>3   | 11-03-1998  | NAVFAC - EFA WEST                              | TRANSMITTAL OF THE FINAL EVALUATION OF THE POTENTIAL FOR WETLANDS CREATION (ENCLOSURE IS RECORD # 3762)                                                                          | YES     | PARCEL E |
| AR_N00217_003762<br>REPORT<br>39          | 11-03-1998  | TETRA TECH EM, INC.                            | FINAL EVALUATION OF THE POTENTIAL FOR WETLANDS CREATION (SEE RECORD # 3761 - EFAW TRANSMITTAL LETTER)                                                                            | YES     | PARCEL E |
| AR_N00217_003798<br>CORRESPONDENCE<br>4   | 11-13-1998  | DEPARTMENT OF HEALTH SERVICES - SACRAMENTO, CA | COMMENTS ON THE RESPONSE TO COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION AND DETERMINATION DISCUSSION OF ACCEPTABLE CONCENTRATIONS OF RESIDUAL RADIOACTIVITY CONTAMINATION | YES     | PARCEL E |
| AR_N00217_003781<br>CORRESPONDENCE<br>3   | 01-14-1999  | NAVFAC - EFA WEST                              | TRANSMITTAL OF THE DRAFT FINAL ECOLOGICAL RISK ASSESSMENT VALIDATION STUDY, QUALITY ASSURANCE PROJECT PLAN ADDENDUM (ENCLOSURE IS RECORD # 3782)                                 | YES     | PARCEL E |
| AR_N00217_003802<br>CORRESPONDENCE<br>5   | 03-01-1999  | NAVFAC - EFA WEST                              | TRANSMITTAL OF RESPONSE TO COMMENTS ON THE DRAFT FINAL REMEDIATION INVESTIGATION (W/ ENCLOSURE)                                                                                  | YES     | PARCEL E |

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| AR_N00217_003825<br>CORRESPONDENCE<br>3 | 04-26-1999  | NAVFAC - EFA WEST                                             | TRANSMITTAL OF THE DRAFT FINAL DATA GAPS<br>SAMPLING AND ANALYSIS PLAN (ENCLOSURE IS<br>RECORD # 3826) | YES     | PARCEL E                                                 |
| AR_N00217_000541<br>CORRESPONDENCE<br>8 | 04-27-1999  | NAVFAC - EFA WEST                                             | RESPONSES TO VARIOUS COMMENTS REGARDING<br>NAVY'S REQUEST FOR SCHEDULE REVISIONS (W/<br>ENCLOSURES)    | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F |
| AR_N00217_003827<br>CORRESPONDENCE<br>2 | 04-28-1999  | DEPARTMENT OF HEALTH<br>SERVICES - SACRAMENTO, CA             | COMMENTS ON THE RESPONSE TO COMMENTS FOR<br>DRAFT FINAL REMEDIAL INVESTIGATION                         | YES     | PARCEL E                                                 |
| AR_N00217_003845<br>CORRESPONDENCE<br>3 | 05-13-1999  | U.S. EPA - SAN FRANCISCO, CA                                  | COMMENTS ON THE DRAFT FINAL DATA GAPS<br>SAMPLING AND ANALYSIS WORK PLAN                               | YES     | PARCEL E                                                 |
| AR_N00217_003835<br>CORRESPONDENCE<br>3 | 06-14-1999  | NAVFAC - EFA WEST                                             | TRANSMITTAL OF THE DRAFT VALIDATION STUDY<br>REPORT (ENCLOSURE IS RECORD # 3836)                       | YES     | PARCEL E                                                 |
| AR_N00217_003902<br>CORRESPONDENCE<br>4 | 07-09-1999  | NAVFAC - EFA WEST                                             | TRANSMITTAL OF FEDERAL FACILITY AGREEMENT<br>SCHEDULE EXTENSION REQUEST (W/ ENCLOSURES)                | YES     | PARCEL E                                                 |
| AR_N00217_003903<br>CORRESPONDENCE<br>8 | 07-15-1999  | DTSC - BERKELEY, CA                                           | REVIEW AND COMMENTS ON THE DRAFT VALIDATION<br>STUDY REPORT                                            | YES     | PARCEL E                                                 |
| AR_N00217_003904<br>CORRESPONDENCE<br>1 | 07-15-1999  | U.S. EPA - SAN FRANCISCO, CA                                  | FEDERAL FACILITY AGREEMENT APPROVAL OF<br>SCHEDULE EXTENSION REQUEST                                   | YES     | PARCEL E                                                 |
| AR_N00217_003905<br>CORRESPONDENCE<br>7 | 07-26-1999  | CALIFORNIA DEPARTMENT OF<br>FISH AND GAME - SACRAMENTO,<br>CA | COMMENTS ON THE DRAFT VALIDATION STUDY<br>REPORT                                                       | YES     | PARCEL E                                                 |

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| AR_N00217_003906<br>CORRESPONDENCE<br>3 | 08-25-1999  | NAVFAC - EFA WEST            | TRANSMITTAL OF FEDERAL FACILITY AGREEMENT<br>REVISED SCHEDULE EXTENSION (W/ ENCLOSURE)                                                                                                                                              | YES     | PARCEL E                                                                           |
| AR_N00217_003896<br>CORRESPONDENCE<br>3 | 10-04-1999  | NAVFAC - EFA WEST            | TRANSMITTAL OF THE REVISED DRAFT FINAL DATA<br>GAPS SAMPLING AND ANALYSIS WORK PLAN<br>(ENCLOSURE IS RECORD # 3897)                                                                                                                 | YES     | PARCEL E                                                                           |
| AR_N00217_000245<br>MINUTES<br>71       | 02-24-2000  | BECHTEL ENVIRONMENTAL, INC.  | 24 FEBRUARY 2000 RESTORATION ADVISORY BOARD<br>(RAB) MEETING HANDOUTS [INCLUDES AGENDA, RAB<br>LISTING, MEETING MINUTES OF 10/21/99, 12/09/99,<br>01/18/00 AND 01/27/00 AND VARIOUS HANDOUTS]                                       | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F               |
| AR_N00217_003938<br>CORRESPONDENCE<br>2 | 04-05-2000  | CRWQCB - OAKLAND, CA         | REVIEW AND NO COMMENT ON THE DRAFT FINAL<br>PROTECTIVE SOIL CONCENTRATIONS TECHNICAL<br>MEMORANDUM AND ECOLOGICAL RISK ASSESSMENT<br>VALIDATION STUDY REPORT                                                                        | YES     | PARCEL E                                                                           |
| AR_N00217_000259<br>CORRESPONDENCE<br>3 | 04-21-2000  | LENNAR, LLC                  | REVIEW AND COMMENTS ON THE DRAFT FINAL<br>PROTECTIVE SOIL CONCENTRATIONS TECHNICAL<br>MEMORANDUM                                                                                                                                    | YES     | PARCEL E<br>SITE 00001<br>SITE 00021                                               |
| AR_N00217_000092<br>CORRESPONDENCE<br>4 | 04-27-2000  | DTSC - BERKELEY, CA          | REVIEW AND COMMENTS ON THE DRAFT FINAL<br>ECOLOGICAL RISK ASSESSMENT VALIDATION STUDY<br>REPORT, AND DRAFT FINAL PROTECTIVE SOIL<br>CONCENTRATIONS TECHNICAL MEMORANDUM                                                             | YES     | PARCEL E                                                                           |
| AR_N00217_000247<br>MINUTES<br>72       | 04-27-2000  | BECHTEL ENVIRONMENTAL, INC.  | 27 APRIL 2000 RESTORATION ADVISORY BOARD (RAB)<br>MEETING HANDOUTS - INCLUDES AGENDA, 23 MARCH<br>2000 MEETING MINUTES, BRAC CLEANUP TEAM (BCT) 3<br>MARCH 2000 MEETING MINUTES AND DRAFT<br>EXPLANATION OF SIGNIFICANT DIFFERENCES | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00001 |
| AR_N00217_000264<br>CORRESPONDENCE<br>4 | 04-27-2000  | U.S. EPA - SAN FRANCISCO, CA | COMMENTS BY REGULATOR ON THE RESPONSE TO<br>COMMENTS OF THE DRAFT FINAL VALIDATION STUDY<br>REPORT                                                                                                                                  | YES     | PARCEL E                                                                           |

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| AR_N00217_003945<br>CORRESPONDENCE<br>2 | 05-05-2000  | U.S. EPA - SAN FRANCISCO, CA | EPA'S REQUEST TO ASSIST IN CALCULATING<br>REALISTIC COST TO COMPLETE ESTIMATE                                                                                                   | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F                                                         |
| AR_N00217_003949<br>CORRESPONDENCE<br>8 | 05-24-2000  | NAVFAC - SOUTHWEST DIVISION  | TRANSMITTAL OF RESPONSE TO COMMENTS FOR THE<br>DRAFT FINAL ECOLOGICAL RISK ASSESSMENT<br>VALIDATION STUDY REPORT (W/ ENCLOSURE) [SEE<br>RECORDS # 92 AND # 264 - COMMENTS]      | YES     | PARCEL E                                                                                                         |
| AR_N00217_000224<br>MINUTES<br>19       | 05-25-2000  | BECHTEL NATIONAL, INC.       | 25 MAY 2000 RESTORATION ADVISORY BOARD (RAB)<br>MEETING MINUTES                                                                                                                 | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                         |
| AR_N00217_000251<br>MINUTES<br>20       | 05-25-2000  | BECHTEL ENVIRONMENTAL, INC.  | 25 MAY 2000 RESTORATION ADVISORY BOARD (RAB)<br>MEETING HANDOUTS [INCLUDES AGENDA, 04/27/00<br>MEETING MINUTES AND VARIOUS HANDOUTS]                                            | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                                     |
| AR_N00217_000257<br>FACT SHEET<br>12    | 06-01-2000  | BECHTEL NATIONAL, INC.       | ENVIRONMENTAL CLEANUP NEWSLETTER:                                                                                                                                               | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00001<br>SITE 00003<br>SITE 00006<br>SITE 00021 |
| AR_N00217_003948<br>CORRESPONDENCE<br>5 | 06-06-2000  | TETRA TECH EM, INC.          | DISTRIBUTION OF ERRATA SHEET FOR DRAFT FINAL<br>ECOLOGICAL RISK ASSESSMENT VALIDATION STUDY<br>(SEE RECORD # 3928 - DRAFT FINAL ECOLOGICAL RISK<br>ASSESSMENT VALIDATION STUDY) | YES     | PARCEL E                                                                                                         |
| AR_N00217_003979<br>CORRESPONDENCE<br>3 | 06-16-2000  | CRWQCB - OAKLAND, CA         | COMMENTS ON DRAFT FIELD SAMPLING PLAN FOR<br>PHASE I DATA GAPS INVESTIGATION                                                                                                    | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                                 |

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| AR_N00217_003962<br>CORRESPONDENCE<br>12 | 06-23-2000  | NAVFAC - EFA WEST            | TRANSMITTAL OF TREATABILITY STUDY WORK PLAN<br>MODIFICATIONS REGARDING THE PHASE II SOIL<br>VAPOR EXTRACTION (W/ ENCLOSURE)                            | YES     | BLDG 0000134<br>BLDG 0000211<br>BLDG 0000231<br>BLDG 0000253<br>BLDG 0000272<br>PARCEL B<br>PARCEL C<br>PARCEL E<br>SITE 00010<br>SITE 00025<br>SITE 00028<br>SITE 00036 |
| AR_N00217_003976<br>CORRESPONDENCE<br>11 | 06-23-2000  | DTSC - BERKELEY, CA          | REVIEW AND COMMENTS ON THE DRAFT QUALITY<br>ASSURANCE PROJECT PLAN AND DRAFT FIELD<br>SAMPLING PLAN FOR PHASE I GROUNDWATER DATA<br>GAPS INVESTIGATION | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00009<br>SITE 00018<br>SITE 00025<br>SITE 00028                                                                     |
| AR_N00217_003973<br>CORRESPONDENCE<br>7  | 06-30-2000  | NAVFAC - EFA WEST            | TRANSMITTAL OF 31 MAY 2000 FINAL PETROLEUM<br>HYDROCARBON PROGRAM MEETING MINUTES                                                                      | YES     | BLDG 0000439<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                             |
| AR_N00217_000063<br>CORRESPONDENCE<br>2  | 07-03-2000  | U.S. EPA - SAN FRANCISCO, CA | COMMENTS ON THE PHASE II SOIL VAPOR<br>EXTRACTION TREATABILITY STUDY WORK PLAN (SEE<br>RECORD # 3962 - TREATABILITY STUDY WORK PLAN)                   | YES     | BLDG 0000123<br>PARCEL B<br>PARCEL C<br>PARCEL E<br>SITE 00010<br>SITE 00025                                                                                             |

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| AR_N00217_000234<br>MINUTES<br>19       | 07-27-2000  | BECHTEL NATIONAL, INC.      | 27 JULY 2000 RESTORATION ADVISORY BOARD (RAB)<br>MEETING MINUTES REPORTER'S TRANSCRIPT                                                                                                                     | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                               |
| AR_N00217_000051<br>REPORT<br>599       | 07-31-2000  | TETRA TECH EM, INC.         | FINAL FIELD SAMPLING PLAN AND QUALITY<br>ASSURANCE PROJECT PLAN - PHASE I GROUNDWATER<br>DATA GAPS INVESTIGATION [INCLUDES SWDIV<br>TRANSMITTAL LETTER]                                                    | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00001<br>SITE 00006<br>SITE 00021<br>SITE 00022                                                                   |
| AR_N00217_000123<br>REPORT<br>134       | 08-17-2000  | TETRA TECH EM, INC.         | FINAL RADIOLOGICAL REMOVAL ACTION, ACTION<br>MEMORANDUM (INCLUDES RESPONSE TO AGENCY<br>COMMENTS ON THE DRAFT RADIOLOGICAL REMOVAL<br>ACTION, ACTION MEMORANDUM, SWDIV TRANSMITTAL<br>LETTER, AND CD COPY) | YES     | BLDG 0000364<br>BLDG 0000509<br>BLDG 0000529<br>BLDG 0000707<br>PARCEL B<br>PARCEL D<br>PARCEL E<br>SITE 00011<br>SITE 00014<br>SITE 00015<br>SITE 00034<br>SITE 00039 |
| AR_N00217_000235<br>MINUTES<br>31       | 08-24-2000  | BECHTEL NATIONAL, INC.      | 24 AUGUST 2000 RESTORATION ADVISORY BOARD<br>(RAB) MEETING MINUTES REPORTER'S TRANSCRIPT                                                                                                                   | YES     | BLDG 0000411<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                           |
| AR_N00217_000399<br>CORRESPONDENCE<br>9 | 08-31-2000  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF JULY 2000 MONTHLY PROGRESS<br>REPORT (W/ ENCLOSURE)                                                                                                                                         | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F                                                                                                               |

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| AR_N00217_000258<br>FACT SHEET<br>10     | 09-01-2000  | BECHTEL NATIONAL, INC.       | ENVIRONMENTAL CLEANUP NEWSLETTER: "CLEANUP MOVING FORWARD"                                                                                                                          | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F |
| AR_N00217_000254<br>MINUTES<br>18        | 09-28-2000  | BECHTEL ENVIRONMENTAL, INC.  | 28 SEPTEMBER 2000 RESTORATION ADVISORY BOARD (RAB) MEETING HANDOUTS [INCLUDES AGENDA, 08/24/00 MEETING MINUTES, FACT SHEETS NO. 1 & 2 AND RECENT FIRE-RELATED EVENTS]               | YES     | PARCEL B<br>PARCEL E                                                 |
| AR_N00217_000240<br>ANALYTICAL DATA<br>8 | 10-19-2000  | NAVFAC - SOUTHWEST DIVISION  | TRANSMITTAL OF THE TECHNICAL JUSTIFICATION FOR THE INTERFACE, BEACH AMORTIZATION CONCEPTUAL DESIGN (W/ ENCLOSURE)                                                                   | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F             |
| AR_N00217_000241<br>CORRESPONDENCE<br>6  | 10-19-2000  | NAVFAC - SOUTHWEST DIVISION  | TRANSMITTAL OF DESIGN SUMMARY, LANDFILL CAP (W/ ENCLOSURE)                                                                                                                          | YES     | PARCEL E                                                             |
| AR_N00217_000244<br>MINUTES<br>6         | 10-24-2000  | NAVFAC - SOUTHWEST DIVISION  | TRANSMITTAL OF 26 SEPTEMBER 2000 FINAL SOIL DATA GAPS MEETING MINUTES (W/ ENCLOSURE)                                                                                                | YES     | PARCEL E                                                             |
| AR_N00217_000256<br>MINUTES<br>19        | 10-26-2000  | BECHTEL ENVIRONMENTAL, INC.  | 26 OCTOBER 2000 RESTORATION ADVISORY BOARD (RAB) MEETING HANDOUTS [INCLUDES AGENDA, MEETING MINUTES, VARIOUS HANDOUTS, SEPTEMBER 2000 MONTHLY PROGRESS REPORT AND FACT SHEET NO. 3] | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F             |
| AR_N00217_000289<br>CORRESPONDENCE<br>2  | 10-31-2000  | U.S. EPA - SAN FRANCISCO, CA | REVIEW OF TECHNICAL JUSTIFICATION FOR THE INTERFACE, BEACH ARMORIZATION CONCEPTUAL DESIGN {SEE RECORD #240 - TECHNICAL JUSTIFICATION}                                               | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F             |

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| AR_N00217_000297<br>CORRESPONDENCE<br>2  | 10-31-2000  | CRWQCB - SAN FRANCISCO, CA                             | COMMENTS ON TECHNICAL JUSTIFICATION FOR THE INTERFACE BEACH ARMORIZATION CONCEPTUAL DESIGN (SEE RECORD # 240 - TECHNICAL JUSTIFICATION FOR THE INTERFACE BEACH ARMORIZATION CONCEPTUAL DESIGN) | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F               |
| AR_N00217_000290<br>CORRESPONDENCE<br>5  | 11-02-2000  | SAN FRANCISCO REDEVELOPMENT AGENCY - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE TECHNICAL JUSTIFICATION FOR THE INTERFACE, BEACH ARMORIZATION CONCEPTUAL DESIGN {SEE RECORD #240 - TECHNICAL JUSTIFICATION}                                         | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F               |
| AR_N00217_000265<br>REPORT<br>36         | 11-07-2000  | TETRA TECH EM, INC.                                    | ACTION MEMORANDUM, LANDFILL FIRE EMERGENCY REMOVAL ACTION (INCLUDES SWDIV TRANSMITTAL LETTER)                                                                                                  | YES     | PARCEL E                                                               |
| AR_N00217_000302<br>REPORT<br>33         | 11-17-2000  | TETRA TECH EM, INC.                                    | GROUNDWATER BENEFICIAL USE EVALUATION (INCLUDES SWDIV TRANSMITTAL LETTER)                                                                                                                      | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                       |
| AR_N00217_000303<br>CORRESPONDENCE<br>37 | 11-21-2000  | NAVFAC - SOUTHWEST DIVISION                            | TRANSMITTAL LETTER OF DOCUMENTS SENT TO REGULATORS FOR REVIEW AND INFORMATION REGARDING LANDFILL FIRE (W/ ENCLOSURES)                                                                          | YES     | PARCEL E                                                               |
| AR_N00217_000325<br>CORRESPONDENCE<br>2  | 11-29-2000  | CRWQCB - SAN FRANCISCO, CA                             | REVIEW AND COMMENTS ON GROUNDWATER BENEFICIAL USE EVALUATION (SEE RECORD # 302 - GROUNDWATER BENEFICIAL USE EVALUATION)                                                                        | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                       |
| AR_N00217_000326<br>CORRESPONDENCE<br>4  | 12-05-2000  | U.S. EPA - SAN FRANCISCO, CA                           | REVIEW AND COMMENTS ON GROUNDWATER BENEFICIAL USE EVALUATION (SEE RECORD # 302 - GROUNDWATER BENEFICIAL USE EVALUATION)                                                                        | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                       |
| AR_N00217_000358<br>MINUTES<br>78        | 12-07-2000  | BECHTEL ENVIRONMENTAL, INC.                            | 07 DECEMBER 2000 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES - INCLUDES MEETING MINUTES OF 26 OCTOBER 2000, REPORTER'S TRANSCRIPT, AGENDA, PUBLIC NOTICE, AND HANDOUTS                    | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00003 |



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| AR_N00217_000342<br>CORRESPONDENCE<br>3  | 12-18-2000  | LENNAR, LLC                                                          | COMMENTS ON THE GROUNDWATER BENEFICIAL USE EVALUATION (W/ ENCLOSURE) {SEE RECORD # 302 - GROUNDWATER BENEFICIAL USE EVALUATION, #325}                                                                                         | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                     |
| AR_N00217_000360<br>REPORT<br>145        | 01-01-2001  | NEW WORLD TECHNOLOGY                                                 | FINAL WORK PLAN FOR SOIL REMOVAL AND PACKAGING, RADIOLOGICAL TIME CRITICAL REMOVAL ACTION, REVISION 4 (INCLUDES RESPONSE TO COMMENTS ON THE DRAFT WORK PLAN, FINAL MARSSIM STATUS SURVEY PLAN, AND SWDIV TRANSMITTAL LETTERS) | YES     | PARCEL D<br>PARCEL E                                                                                 |
| AR_N00217_000404<br>CORRESPONDENCE<br>2  | 01-01-2001  | AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY - SAN FRANCISCO, CA | HEALTH CONSULTATION SUMMARY REGARDING THE LANDFILL FIRE                                                                                                                                                                       | YES     | PARCEL E                                                                                             |
| AR_N00217_000332<br>REPORT<br>249        | 01-08-2001  | TETRA TECH EM, INC.                                                  | FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN ADDENDUM FOR PHASE II GROUNDWATER DATA GAPS INVESTIGATION [INCLUDES SWDIV TRANSMITTAL LETTERS] {CD COPY ENCLOSED}                                                      | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00001<br>SITE 00006<br>SITE 00021<br>SITE 00022 |
| AR_N00217_000363<br>MINUTES<br>64        | 01-25-2001  | BECHTEL ENVIRONMENTAL, INC.                                          | 25 JANUARY 2001 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIAL PACKAGE (INCLUDES REPORTER'S TRANSCRIPT OF 25 JANUARY 2001 MEETING)                                                                      | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F                                             |
| AR_N00217_000384<br>CORRESPONDENCE<br>35 | 02-07-2001  | DTSC - BERKELEY, CA                                                  | REVIEW AND COMMENTS ON THE REVISED INFORMATION PACKAGE FOR THE PHASE I GROUNDWATER DATA GAP INVESTIGATION AND FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN ADDENDA FOR PHASE II GROUNDWATER DATA GAP INVESTIGATION  | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                     |
| AR_N00217_000359<br>CORRESPONDENCE<br>16 | 02-08-2001  | NAVFAC - SOUTHWEST DIVISION                                          | TRANSMITTAL OF RESPONSE TO COMMENTS ON THE GROUNDWATER BENEFICIAL USE EVALUATION FOR (W/ ENCLOSURE)                                                                                                                           | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                     |

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| AR_N00217_000364<br>FACT SHEET<br>13     | <b>02-15-2001</b>  | BECHTEL ENVIRONMENTAL, INC.                                | ENVIRONMENTAL CLEANUP NEWSLETTER: CAPPING AND FIRE UPDATE OCTOBER THROUGH DECEMBER 2000                                                                                                                  | YES            | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E             |
| AR_N00217_000362<br>MINUTES<br>61        | <b>02-22-2001</b>  | BECHTEL ENVIRONMENTAL, INC.                                | 22 FEBRUARY 2001 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIAL PACKAGE (INCLUDES REPORTER'S TRANSCRIPT OF 22 FEBRUARY 2001 MEETING)                                               | YES            | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F |
| AR_N00217_000376<br>REPORT<br>229        | <b>02-28-2001</b>  | TETRA TECH EM, INC.                                        | CALCULATION AND IMPLEMENTATION OF SUPPLEMENTAL MANGANESE AMBIENT LEVELS [INCLUDES SWDIV TRANSMITTAL LETTER AND CD COPY]                                                                                  | YES            | PARCEL B<br>PARCEL E<br>SITE 00007<br>SITE 00018         |
| AR_N00217_000405<br>CORRESPONDENCE<br>30 | <b>03-02-2001</b>  | U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES - ATLANTA, GA | HEALTH CONSULTATION LANDFILL FIRE                                                                                                                                                                        | YES            | PARCEL E                                                 |
| AR_N00217_000395<br>MINUTES<br>87        | <b>03-22-2001</b>  | BECHTEL ENVIRONMENTAL, INC.                                | 22 MARCH 2001 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS (INCLUDES AGENDA, MEETING MINUTES FROM 2/22/01, REPORTER'S TRANSCRIPT FROM THE 3/22/01 MEETING, AND VARIOUS HANDOUTS | YES            | PARCEL D<br>PARCEL E<br>PARCEL F                         |
| AR_N00217_000430<br>REPORT<br>44         | <b>04-12-2001</b>  | TETRA TECH EM, INC.                                        | FINAL GROUNDWATER BENEFICIAL USE DETERMINATION FOR A-AQUIFER (SEE RECORD # 493 - REVISED FINAL GROUNDWATER BENEFICIAL USE)                                                                               | YES            | PARCEL C<br>PARCEL D<br>PARCEL E                         |
| AR_N00217_000446<br>CORRESPONDENCE<br>6  | <b>04-18-2001</b>  | DTSC - BERKELEY, CA                                        | RESPONSES TO RESPONSE TO COMMENTS ON THE FIELD SAMPLING PLAN ADDENDUM FOR PHASE II GROUNDWATER DATA GAPS INVESTIGATION {SEE RECORD # 440 - NAVY'S RESPONSE TO COMMENTS}                                  | YES            | PARCEL E                                                 |
| AR_N00217_000440<br>CORRESPONDENCE<br>5  | <b>04-23-2001</b>  | NAVFAC - SOUTHWEST DIVISION                                | RESPONSES TO 18 APRIL 2001 LETTER, REGARDING THE NAVY'S RESPONSE TO COMMENTS ON THE FIELD SAMPLING PLAN ADDENDUM FOR THE PHASE II GROUNDWATER DATA GAPS INVESTIGATION                                    | YES            | PARCEL E                                                 |

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| AR_N00217_000437<br>MINUTES<br>105      | 04-26-2001  | BECHTEL ENVIRONMENTAL, INC.                            | 26 APRIL 2001 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS PACKAGE (INCLUDES AGENDA, MEETING TRANSCRIPT FROM THE 4/26/01 MEETING, MINUTES FROM THE 3/22/01 MEETING, HANDOUTS, RAB APPLICATIONS AND MAILING LIST) | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F |
| AR_N00217_000456<br>CORRESPONDENCE<br>2 | 05-02-2001  | SAN FRANCISCO REDEVELOPMENT AGENCY - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT PETROLEUM HYDROCARBON CORRECTIVE ACTION PLAN                                                                                                                                                             | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                         |
| AR_N00217_000433<br>FACT SHEET<br>21    | 05-03-2001  | BECHTEL ENVIRONMENTAL, INC.                            | ENVIRONMENTAL CLEANUP NEWSLETTER: JANUARY-MARCH 2001, SMOLDERING AREA AT LANDFILL CAPPED AND EXTINGUISHED                                                                                                                                 | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F |
| AR_N00217_000459<br>CORRESPONDENCE<br>4 | 05-16-2001  | DTSC - BERKELEY, CA                                    | RESPONSES TO NAVY'S LETTER DATED 23 APRIL 2001 REGARDING THE FIELD SAMPLING PLAN ADDENDUM FOR THE PHASE II GROUNDWATER DATA GAPS INVESTIGATION (SEE RECORD # 440 - NAVY'S LETTER DATED 04/23/01)                                          | YES     | PARCEL E                                                 |
| AR_N00217_000465<br>CORRESPONDENCE<br>3 | 06-14-2001  | CRWQCB - OAKLAND, CA                                   | REVIEW AND COMMENTS ON THE DRAFT PETROLEUM HYDROCARBON CORRECTIVE ACTION PLAN                                                                                                                                                             | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                         |
| AR_N00217_000725<br>REPORT<br>26        | 06-21-2001  | IT CORPORATION                                         | PROGRESS REPORT FOR THE SOIL VAPOR EXTRACTION PILOT TEST                                                                                                                                                                                  | YES     | BLDG 0000406<br>PARCEL E                                 |
| AR_N00217_000448<br>CORRESPONDENCE<br>3 | 06-22-2001  | NAVFAC - SOUTHWEST DIVISION                            | RESPONSES TO THE 7 JUNE 2001 LETTER, REGARDING THE ENVIRONMENTAL PROTECTION AGENCY'S INTENTION TO IMPOSE STIPULATED PENALTIES ON THE NAVY REGARDING THE INCIDENTS RELATED TO THE PARCEL E LANDFILL FIRE                                   | YES     | PARCEL E                                                 |

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| AR_N00217_000483<br>MINUTES<br>114        | 06-28-2001  | BECHTEL ENVIRONMENTAL, INC.  | MEETING MATERIALS FOR THE RESTORATION<br>ADVISORY BOARD (RAB) MEETING HELD ON 28 JUNE<br>2001 - INCLUDES AGENDA, PUBLIC NOTICE,<br>REPORTER'S TRANSCRIPT OF 6/28/01 & MEETING<br>MINUTES OF 5/24/01, FACT SHEET DATED 6/19/01<br>SANDBLAST GRIT AND HANDOUTS | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00007                                                                                                                                                     |
| AR_N00217_000368<br>CORRESPONDENCE<br>115 | 06-29-2001  | TETRA TECH EM, INC.          | TRANSMITTAL OF REFERENCE MATERIAL FOR THE<br>DRAFT FIELD SAMPLING PLAN/QUALITY ASSURANCE<br>PROJECT PLAN FOR DATA GAPS INVESTIGATION - [W/<br>ENCLOSURE] (SEE RECORD # 378 - DRAFT FIELD<br>SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN)                    | YES     | PARCEL E<br>SITE 00002<br>SITE 00003<br>SITE 00004<br>SITE 00005<br>SITE 00011<br>SITE 00012<br>SITE 00013<br>SITE 00014<br>SITE 00015<br>SITE 00036<br>SITE 00038<br>SITE 00039<br>SITE 00054<br>SITE 00056<br>SITE 00072 |
| AR_N00217_000449<br>CORRESPONDENCE<br>3   | 07-05-2001  | NAVFAC - SOUTHWEST DIVISION  | RESPONSES TO 07 AND 26 JUNE 2001 LETTERS,<br>REGARDING THE EPA'S INTENTION TO IMPOSE<br>STIPULATED PENALTIES ON THE NAVY REGARDING<br>INCIDENTS RELATED TO THE PARCEL E LANDFILL FIRE                                                                        | YES     | PARCEL E                                                                                                                                                                                                                   |
| AR_N00217_000503<br>CORRESPONDENCE<br>18  | 08-01-2001  | U.S. EPA - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT FIELD<br>SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN<br>FOR DATA GAPS INVESTIGATION                                                                                                                                        | YES     | PARCEL E                                                                                                                                                                                                                   |

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| AR_N00217_000493<br>REPORT<br>42         | 08-10-2001  | TETRA TECH EM, INC.                                    | REVISED FINAL GROUNDWATER BENEFICIAL USE DETERMINATION FOR A-AQUIFER (INCLUDES SWDIV TRANSMITTAL LETTER ) [SEE RECORD # 430 - FINAL GROUNDWATER BENEFICIAL USE]                                                           | YES     | BLDG 0000217<br>BLDG 0000241<br>BLDG 0000258<br>BLDG 0000275<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00002<br>SITE 00006<br>SITE 00008<br>SITE 00011<br>SITE 00012<br>SITE 00025<br>SITE 00028<br>SITE 00029<br>SITE 00030<br>SITE 00033<br>SITE 00039<br>SITE 00058 |
| AR_N00217_000494<br>REPORT<br>579        | 08-10-2001  | TETRA TECH EM, INC.                                    | INFORMATION PACKAGE - PHASE II GROUNDWATER DATA GAPS INVESTIGATION (VOLUME I-II OF II) [INCLUDES SWDIV TRANSMITTAL LETTER] {CD COPY ENCLOSED}                                                                             | YES     | PARCEL E<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00012<br>SITE 00013<br>SITE 00036                                                                                                                                                                             |
| AR_N00217_000553<br>CORRESPONDENCE<br>15 | 08-31-2001  | SAN FRANCISCO REDEVELOPMENT AGENCY - SAN FRANCISCO, CA | COMMENTS ON THE REVISED DRAFT FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN, DATA GAPS INVESTIGATION (SEE RECORD # 378 - DRAFT FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN)                                   | YES     | PARCEL E                                                                                                                                                                                                                                                                 |
| AR_N00217_000514<br>CORRESPONDENCE<br>7  | 09-18-2001  | DTSC - BERKELEY, CA                                    | REVIEW AND COMMENTS ON THE DRAFT REMOVAL ACTION LANDFILL CAP CLOSE-OUT REPORT AND DRAFT FIELD SAMPLING PLAN QUALITY ASSURANCE PROJECT PLAN FOR DATA GAPS-LIQUEFACTION POTENTIAL (SEE RECORD # 451 - DRAFT REMOVAL ACTION) | YES     | PARCEL E                                                                                                                                                                                                                                                                 |

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| AR_N00217_001444<br>CORRESPONDENCE<br>4 | 10-02-2001  | SAN FRANCISCO<br>REDEVELOPMENT AGENCY - SAN<br>FRANCISCO, CA | REVIEW AND COMMENTS ON THE REVISED DRAFT<br>PETROLEUM HYDROCARBON SOIL AND<br>GROUNDWATER SAMPLING PLAN                                                                                                                                                              | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                     |
| AR_N00217_000531<br>MINUTES<br>107      | 11-29-2001  | BECHTEL ENVIRONMENTAL, INC.                                  | 29 NOVEMBER 2001 RESTORATION ADVISORY BOARD<br>(RAB) MEETING PUBLIC INFORMATION MATERIAL<br>PACKAGE (INCLUDES AGENDA, PUBLIC NOTICE,<br>MEETING MINUTES FROM MEETING HELD ON 10/24/01,<br>REPORTERS TRANSCRIPT FROM 11/29/01 MEETING<br>AND HANDOUTS)                | YES     | DRY DOCK 0004<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                        |
| AR_N00217_001449<br>CORRESPONDENCE<br>2 | 12-20-2001  | CRWQCB - OAKLAND, CA                                         | REVIEW AND COMMENTS ON THE REVISED DRAFT<br>PETROLEUM HYDROCARBON SOIL AND<br>GROUNDWATER SAMPLING PLAN                                                                                                                                                              | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                     |
| AR_N00217_000559<br>CORRESPONDENCE<br>5 | 01-15-2002  | NAVFAC - SOUTHWEST DIVISION                                  | TRANSMITTAL OF THE DRAFT FINAL SAMPLING PLAN<br>AND QUALITY ASSURANCE PROJECT PLAN FOR NON-<br>STANDARD DATA GAPS INVESTIGATION (INDUSTRIAL<br>LANDFILL AND WETLANDS DELINEATION) [ENCLOSURE<br>IS RECORD # 554]                                                     | YES     | PARCEL E                                                                                             |
| AR_N00217_000557<br>MINUTES<br>91       | 01-24-2002  | BECHTEL ENVIRONMENTAL, INC.                                  | 24 JANUARY 2002 RESTORATION ADVISORY BOARD<br>(RAB) MEETING PUBLIC INFORMATION MATERIALS<br>PACKAGE (INCLUDES AGENDA, PUBLIC NOTICE,<br>ATTENDANCE LIST, MEETING MINUTES FROM 11/29/01<br>MEETING, REPORTERS TRANSCRIPT OF 01/24/02<br>MEETING AND HANDOUTS)         | YES     | PARCEL B<br>PARCEL C<br>PARCEL E<br>PARCEL F                                                         |
| AR_N00217_000579<br>CORRESPONDENCE<br>5 | 02-05-2002  | U.S. EPA - SAN FRANCISCO, CA                                 | COMMENTS ON THE DRAFT FINAL FIELD SAMPLING<br>PLAN/QUALITY ASSURANCE PROJECT PLAN<br>NONSTANDARD DATA GAPS INVESTIGATION<br>(INDUSTRIAL LANDFILL AND WETLANDS DELINEATION)<br>{SEE RECORD # 554 - DRAFT FINAL FIELD SAMPLING<br>PLAN/QUALITY ASSURANCE PROJECT PLAN} | YES     | PARCEL E                                                                                             |
| AR_N00217_000580<br>REPORT<br>336       | 02-05-2002  | TETRA TECH EM, INC.                                          | FIELD SAMPLING PLAN AND QUALITY ASSURANCE<br>PROJECT PLAN ADDENDUM FOR PHASE III<br>GROUNDWATER DATA GAPS INVESTIGATION<br>(ADDENDUM II) [INCLUDES SWDIV TRANSMITTAL<br>LETTER] {CD COPY ENCLOSED}                                                                   | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00001<br>SITE 00006<br>SITE 00021<br>SITE 00022 |

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| AR_N00217_000589<br>MINUTES<br>79        | 02-28-2002  | BECHTEL ENVIRONMENTAL, INC.              | 28 FEBRUARY 2002 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIAL PACKAGE (INCLUDES AGENDA, PUBLIC NOTICE, MEETING MINUTES FROM 01/24/02 MEETING, REPORTERS TRANSCRIPT OF 02/28/02 MEETING, ATTENDANCE SHEET AND HANDOUTS) | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00010                           |
| AR_N00217_000583<br>FACT SHEET<br>11     | 03-07-2002  | BECHTEL ENVIRONMENTAL, INC.              | ENVIRONMENTAL CLEANUP NEWSLETTER OCTOBER-DECEMBER 2001                                                                                                                                                                                         | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00010<br>SITE 00026 |
| AR_N00217_000590<br>REPORT<br>143        | 03-21-2002  | TETRA TECH EM, INC.                      | BASEWIDE HEALTH AND SAFETY PLAN (CD COPY ENCLOSED)                                                                                                                                                                                             | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                         |
| AR_N00217_000588<br>MINUTES<br>22        | 03-28-2002  | BECHTEL ENVIRONMENTAL, INC.              | PRE-MEETING MAILER FOR THE 28 MARCH 2002 RESTORATION ADVISORY BOARD (RAB) MEETING (INCLUDES AGENDA, PUBLIC NOTICE, MEETING MINUTES FROM THE 02/28/02 MEETING, PROPOSED AMENDED RAB BYLAWS, DATED 03/06/02 - E-MAIL TRANSMITTING RAB BYLAWS)    | YES     | PARCEL E                                                                                         |
| AR_N00217_004089<br>REPORT<br>225        | 04-19-2002  | FOSTER WHEELER ENVIRONMENTAL CORPORATION | FINAL HEALTH AND SAFETY PLAN FOR THE INDUSTRIAL PROCESS EQUIPMENT SURVEY, SAMPLING , DECONTAMINATION, AND WASTE CONSOLIDATION                                                                                                                  | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                 |
| AR_N00217_004150<br>CORRESPONDENCE<br>13 | 04-19-2002  | FOSTER WHEELER ENVIRONMENTAL CORPORATION | RESPONSES TO COMMENTS ON THE DRAFT HEALTH AND SAFETY PLAN INDUSTRIAL PROCESS EQUIPMENT SURVEY, SAMPLING, DECONTAMINATION, AND WASTE CONSOLIDATION                                                                                              | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                 |

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| AR_N00217_000615<br>MINUTES<br>77        | 04-25-2002  | BECHTEL ENVIRONMENTAL, INC. | 25 APRIL 2002 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS (INCLUDES AGENDA, PUBLIC NOTICE, MINUTES FROM 28 MARCH 2002 MEETING, TRANSCRIPT OF MINUTES FROM 25 APRIL 2002 MEETING, MONTHLY PROGRESS REPORT, AND HANDOUTS) | YES     | BLDG 0000123<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00007<br>SITE 00018<br>SITE 00029 |
| AR_N00217_000605<br>REPORT<br>395        | 05-28-2002  | TETRA TECH EM, INC.         | REVISED FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN ADDENDA FOR THE PHASE III GROUNDWATER DATA GAPS INVESTIGATION (ADDENDUM II) {SEE RECORD # 580 - FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN}                            | YES     | PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00003                                                                                 |
| AR_N00217_000607<br>CORRESPONDENCE<br>39 | 05-29-2002  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF COMPILED RESPONSE TO COMMENTS ON THE INFORMATION PACKAGE - PHASE II GROUNDWATER DATA GAPS INVESTIGATION {COMMENTS BY EPA & DTSC} (W/ ENCLOSURE 2) [ENCLOSURE 1 IS RECORD # 606 AND ENCLOSURE 3 IS # 609]                           | YES     | PARCEL E<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00004<br>SITE 00036                                                 |



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| AR_N00217_000609<br>CORRESPONDENCE<br>9 | 05-29-2002  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF COMPILED RESPONSE TO<br>COMMENTS ON THE REVISED FINAL GROUNDWATER<br>BENEFICIAL USE DETERMINATION FOR A-AQUIFER<br>{COMMENTS BY EPA} (W/ ENCLOSURE 3) [ENCLOSURE<br>1 IS RECORD # 606 AND ENCLOSURE 2 IS RECORD #<br>607]                     | YES     | BLDG 0000217<br>BLDG 0000241<br>BLDG 0000258<br>BLDG 0000275<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00002<br>SITE 00006<br>SITE 00011<br>SITE 00012<br>SITE 00028<br>SITE 00029<br>SITE 00030<br>SITE 00033<br>SITE 00039<br>SITE 00058 |
| AR_N00217_000620<br>MINUTES<br>62       | 05-30-2002  | BECHTEL ENVIRONMENTAL, INC. | 30 MAY 2002 RESTORATION ADVISORY BOARD (RAB)<br>MEETING PUBLIC INFORMATION MATERIALS (INCLUDES<br>AGENDA, PUBLIC NOTICE, MINUTES FROM 25 APRIL<br>2002 MEETING, TRANSCRIPT OF MINUTES FROM 30<br>MAY 2002 MEETING, MONTHLY PROGRESS REPORT,<br>AND HANDOUTS) | YES     | BLDG 0000815<br>BLDG 0000830<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00001<br>SITE 00003<br>SITE 00007<br>SITE 00012<br>SITE 00018<br>SITE 00021<br>SITE 00059                                       |

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| AR_N00217_000928<br>CORRESPONDENCE<br>7 | 05-30-2002  | SAN FRANCISCO<br>REDEVELOPMENT AGENCY - SAN<br>FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT HISTORICAL<br>RADIOLOGICAL ASSESSMENT VOLUME II [SEE RECORD<br># 594 - DRAT HISTORICAL RADIOLOGICAL ASSESSMENT]                                                                                                              | YES     | BLDG 0000815<br>BLDG 0000820<br>BLDG 0000821<br>BLDG 0000830<br>BLDG 0000831<br>PARCEL A<br>PARCEL B<br>PARCEL D<br>PARCEL E                                   |
| AR_N00217_000621<br>MINUTES<br>82       | 06-27-2002  | BECHTEL ENVIRONMENTAL, INC.                                  | 27 JUNE 2002 RESTORATION ADVISORY BOARD (RAB)<br>MEETING PUBLIC INFORMATION MATERIALS<br>(INCLUDES: AGENDA, PUBLIC NOTICE, MINUTES FROM<br>30 MAY 2002 MEETING, TRANSCRIPT OF MINUTES<br>FROM 27 JUNE 2002 MEETING, MONTHLY PROGRESS<br>REPORT, AND HANDOUTS) | YES     | BLDG 0000123<br>BLDG 0000816<br>BLDG 0000821<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00007<br>SITE 00018<br>SITE 00059 |
| AR_N00217_000612<br>REPORT<br>211       | 07-02-2002  | TETRA TECH EM, INC.                                          | LANDFILL GAS TECHNICAL MEMORANDUM FOR<br>INDUSTRIAL LANDFILL (INCLUDES SWDIV TRANSMITTAL<br>LETTER) [CD COPY ENCLOSED]                                                                                                                                        | YES     | PARCEL E                                                                                                                                                       |
| AR_N00217_000613<br>REPORT<br>137       | 07-12-2002  | TETRA TECH EM, INC.                                          | SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING<br>PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR<br>BASEWIDE GROUNDWATER SAMPLING FOR<br>PETROLEUM HYDROCARBONS [INCLUDES SWDIV<br>TRANSMITTAL LETTER]                                                                  | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                                   |

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| AR_N00217_000641<br>MINUTES<br>104 | 07-25-2002  | BECHTEL ENVIRONMENTAL, INC. | PUBLIC INFORMATION MATERIAL PACKAGE FOR THE 25 JULY 2002 RESTORATION ADVISORY BOARD (RAB) MEETING - INCLUDES REPORTER'S TRANSCRIPT OF 25 JULY 2002 MEETING, AGENDA, MINUTES FROM 27 JUNE 2002 MEETING, MONTHLY PROGRESS REPORT, PRESENTATION MATERIALS, ETC. | YES     | BLDG 0000103<br>BLDG 0000113<br>BLDG 0000123<br>BLDG 0000130<br>BLDG 0000134<br>BLDG 0000146<br>BLDG 0000211<br>BLDG 0000214<br>BLDG 0000224<br>BLDG 0000241<br>BLDG 0000253<br>BLDG 0000272<br>BLDG 0000274<br>BLDG 0000313<br>BLDG 0000317<br>BLDG 0000322<br>BLDG 0000351<br>BLDG 0000364<br>BLDG 0000365<br>BLDG 0000366<br>BLDG 0000406<br>BLDG 0000414<br>BLDG 0000506<br>BLDG 0000507<br>BLDG 0000509<br>BLDG 0000510<br>BLDG 0000517<br>BLDG 0000520<br>BLDG 0000529<br>BLDG 0000707<br>BLDG 0000708<br>BLDG 0000810<br>BLDG 0000815<br>BLDG 0000816<br>BLDG 0000820<br>BLDG 0000821<br>BLDG 0000830 |

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|                                         |             |                                          |                                                                                                                                                                                                                                                 |         | BLDG 0000831<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00001<br>SITE 00002<br>SITE 00007<br>SITE 00018<br>SITE 00021 |
| AR_N00217_000639<br>FACT SHEET<br>3     | 08-01-2002  | TETRA TECH EM, INC.                      | UPDATE ON THE LANDFILL GAS REMOVAL ACTION                                                                                                                                                                                                       | YES     | PARCEL E                                                                                                                                       |
| AR_N00217_000629<br>CORRESPONDENCE<br>8 | 08-07-2002  | NAVFAC - SOUTHWEST DIVISION              | TRANSMITTAL OF RESPONSE TO COMMENTS ON THE DRAFT DATA QUALITY OBJECTIVES TABLES FOR THE STANDARD DATA GAPS INVESTIGATION                                                                                                                        | YES     | PARCEL E                                                                                                                                       |
| AR_N00217_000630<br>CORRESPONDENCE<br>4 | 08-08-2002  | NAVFAC - SOUTHWEST DIVISION              | TRANSMITTAL OF A CONSENSUS STATEMENT BY THE DISPUTE RESOLUTION COMMITTEE FOR RESOLVING DISPUTE ON LANDFILL FIRE STIPULATED PENALTIES - FOR THE MINIMIZATION OF THE FREQUENCY OF AND POTENTIAL IMPACT FROM BRUSH OR DEBRIS FIRES (W/ ENCLOSURES) | YES     | PARCEL E                                                                                                                                       |
| AR_N00217_000631<br>REPORT<br>328       | 08-16-2002  | FOSTER WHEELER ENVIRONMENTAL CORPORATION | FINAL WORK PLAN - INDUSTRIAL PROCESS EQUIPMENT SURVEY, SAMPLING, DECONTAMINATION, AND WASTE CONSOLIDATION (SEE RECORD # 702 - ADDENDUM TO THE SAMPLING AND ANALYSIS PLAN)                                                                       | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                               |

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| AR_N00217_000646<br>MINUTES<br>98        | 08-22-2002  | BECHTEL ENVIRONMENTAL, INC.          | PUBLIC INFORMATION MATERIALS FROM THE 22 AUGUST 2002 PUBLIC MEETING/ RESTORATION ADVISORY BOARD MEETING (INCLUDES: AGENDA AND PUBLIC NOTICE, MINUTES FROM MEETING OF 25 JULY 2002, PRESENTATION MATERIALS, FACT SHEET, MINUTES FROM VARIOUS OTHER MEETINGS) | YES     | BLDG 0000815<br>BLDG 0000820<br>BLDG 0000821<br>PARCEL A<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00007<br>SITE 00018 |
| AR_N00217_000644<br>REPORT<br>35         | 09-23-2002  | TETRA TECH EM, INC.                  | FINAL LANDFILL GAS TIME-CRITICAL REMOVAL ACTION - ACTION MEMORANDUM [INCLUDES SWDIV TRANSMITTAL LETTER]                                                                                                                                                     | YES     | PARCEL E<br>SITE 00001<br>SITE 00021                                                                                     |
| AR_N00217_000672<br>MINUTES<br>79        | 09-26-2002  | BECHTEL ENVIRONMENTAL, INC.          | 26 SEPTEMBER 2002 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS - INCLUDES AGENDA, MEETING MINUTES FROM 08/22/02, HANDOUTS, AND REPORTER'S TRANSCRIPT FROM THE 09/26/02 MEETING                                                     | YES     | PARCEL E                                                                                                                 |
| AR_N00217_000642<br>REPORT<br>287        | 10-01-2002  | INNOVATIVE TECHNICAL SOLUTIONS, INC. | PROJECT WORK PLAN TIME-CRITICAL LANDFILL GAS REMOVAL ACTION FOR PARCEL E (INCLUDES SWDIV TRANSMITTAL LETTER)                                                                                                                                                | YES     | PARCEL E<br>SITE 00001<br>SITE 00021                                                                                     |
| AR_N00217_000648<br>CORRESPONDENCE<br>53 | 11-01-2002  | NAVFAC - SOUTHWEST DIVISION          | TRANSMITTAL OF RESPONSES TO COMMENTS ON THE LANDFILL GAS TECHNICAL MEMORANDUM FOR INDUSTRIAL LANDFILL (W/ ENCLOSURE)                                                                                                                                        | YES     | PARCEL E<br>SITE 00001<br>SITE 00021                                                                                     |

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| AR_N00217_000649<br>CORRESPONDENCE<br>91 | 11-01-2002  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF RESPONSES TO COMMENTS ON THE REVISED DRAFT FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR STANDARD DATA GAPS INVESTIGATION [W/ ENCLOSURE]    | YES     | BLDG 0000400<br>PARCEL E<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00004<br>SITE 00012<br>SITE 00021<br>SITE 00036<br>SITE 00040<br>SITE 00045<br>SITE 00047<br>SITE 00050<br>SITE 00051<br>SITE 00052<br>SITE 00054<br>SITE 00056<br>SITE 00072<br>SITE 00073<br>SITE 00074<br>SITE 00075<br>SITE 00076 |
| AR_N00217_000656<br>CORRESPONDENCE<br>6  | 11-26-2002  | TETRA TECH EM, INC.         | RESPONSES TO COMMENTS ON THE REVISED DRAFT FINAL SAMPLING AND ANALYSIS PLAN STANDARD DATA GAPS INVESTIGATION (INCLUDES SWDIV TRANSMITTAL LETTER)                                                       | YES     | BLDG 0000704<br>PARCEL E                                                                                                                                                                                                                                                                                         |
| AR_N00217_000671<br>MINUTES<br>78        | 12-05-2002  | BECHTEL ENVIRONMENTAL, INC. | 05 DECEMBER 2002 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS (INCLUDES AGENDA, MEETING MINUTES FROM 10/24/02, HANDOUTS, AND REPORTER'S TRANSCRIPT FROM THE 12/05/02 MEETING) | YES     | PARCEL B<br>PARCEL E                                                                                                                                                                                                                                                                                             |

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| AR_N00217_000657<br>FACT SHEET<br>15     | 12-12-2002  | BECHTEL ENVIRONMENTAL, INC.                 | ENVIRONMENTAL CLEANUP NEWSLETTER<br>SUMMER/FALL EXPANDED ISSUE: "AMBIENT AIR AND<br>SOIL GAS SURVEYS CONDUCTED AT LANDFILL -<br>REMOVAL ACTION UNDERWAY", APRIL-SEPTEMBER<br>2002                                                                     | YES     | BLDG 0000123<br>BLDG 0000364<br>BLDG 0000406<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00007<br>SITE 00018 |
| AR_N00217_000689<br>MINUTES<br>73        | 04-03-2003  | BECHTEL ENVIRONMENTAL, INC.                 | 27 FEBRUARY 2003 RESTORATION ADVISORY BOARD<br>(RAB) MEETING PUBLIC INFORMATION MATERIALS<br>[INCLUDES AGENDA, PUBLIC NOTICE, MEETING<br>MINUTES FROM 01/23/03 MEETING, REPORTER'S<br>TRANSCRIPT OF 27 FEBRUARY 2003 MEETING AND<br>VARIOUS HANDOUTS] | YES     | PARCEL E                                                                                                                                         |
| AR_N00217_000702<br>REPORT<br>36         | 04-08-2003  | FOSTER WHEELER<br>ENVIRONMENTAL CORPORATION | ADDENDUM TO THE SAMPLING AND ANALYSIS PLAN -<br>INDUSTRIAL PROCESS EQUIPMENT SURVEY,<br>SAMPLING, DECONTAMINATION, AND WASTE<br>CONSOLIDATION [SEE RECORD # 631 - SAMPLING AND<br>ANALYSIS PLAN (APPENDIX A) OF FINAL WORK PLAN]                      | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                                 |
| AR_N00217_000699<br>CORRESPONDENCE<br>14 | 04-24-2003  | NAVFAC - SOUTHWEST DIVISION                 | TRANSMITTAL OF RESPONSE TO COMMENTS ON THE<br>DRAFT STORM WATER DISCHARGE MANAGEMENT<br>PLAN, INDUSTRIAL LANDFILL (W/ ENCLOSURE) [SEE<br>RECORD # 679 - DRAFT MANAGEMENT PLAN]                                                                        | YES     | PARCEL E<br>SITE 00001<br>SITE 00021                                                                                                             |
| AR_N00217_003195<br>CORRESPONDENCE<br>6  | 05-15-2003  | NAVFAC - SOUTHWEST DIVISION                 | TRANSMITTAL OF THE DRAFT NONSTANDARD DATA<br>GAPS INVESTIGATION, LANDFILL LATERAL EXTENT<br>EVALUATION (ENCLOSURE IS RECORD # 706)                                                                                                                    | YES     | PARCEL E                                                                                                                                         |
| AR_N00217_003196<br>CORRESPONDENCE<br>6  | 05-15-2003  | NAVFAC - SOUTHWEST DIVISION                 | TRANSMITTAL OF THE DRAFT NONSTANDARD DATA<br>GAPS INVESTIGATION, LANDFILL GAS<br>CHARACTERIZATION (ENCLOSURE IS RECORD # 705)                                                                                                                         | YES     | PARCEL E                                                                                                                                         |
| AR_N00217_003279<br>CORRESPONDENCE<br>6  | 05-15-2003  | NAVFAC - SOUTHWEST DIVISION                 | TRANSMITTAL OF THE DRAFT NONSTANDARD DATA<br>GAPS INVESTIGATION, WETLANDS DELINEATION AND<br>FUNCTIONS AND VALUES ASSESSMENT (ENCLOSURE<br>IS RECORD # 704)                                                                                           | YES     | PARCEL E                                                                                                                                         |

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| AR_N00217_000737<br>REPORT<br>112        | 06-12-2003  | TETRA TECH EM, INC.                  | FINAL STORM WATER DISCHARGE MANAGEMENT PLAN FOR THE INDUSTRIAL LANDFILL (INCLUDES SWDIV TRANSMITTAL LETTER AND CD COPY)                                                                                           | YES     | PARCEL E<br>SITE 00001<br>SITE 00021                                                                                                                                               |
| AR_N00217_000742<br>CORRESPONDENCE<br>42 | 06-25-2003  | TETRA TECH EM, INC.                  | RESPONSES TO REGULATORY AGENCY COMMENTS ON THE TIME-CRITICAL LANDFILL GAS REMOVAL ACTION PROJECT WORK PLAN AND THE FINAL LANDFILL GAS TIME-CRITICAL REMOVAL ACTION MEMORANDUM INCLUDES (SWDIV TRANSMITTAL LETTER) | YES     | PARCEL E                                                                                                                                                                           |
| AR_N00217_000750<br>REPORT<br>106        | 08-14-2003  | TETRA TECH EM, INC.                  | FINAL NONSTANDARD DATA GAPS INVESTIGATION, WETLANDS DELINEATION AND FUNCTIONS AND VALUES ASSESSMENT [INCLUDES SWDIV TRANSMITTAL LETTER] {CD COPY ENCLOSED}                                                        | YES     | PARCEL B<br>PARCEL E                                                                                                                                                               |
| AR_N00217_001600<br>CORRESPONDENCE<br>5  | 10-17-2003  | NAVFAC - SOUTHWEST DIVISION          | TRANSMITTAL OF THE FINAL GROUNDWATER SUMMARY REPORT FOR PHASE III GROUNDWATER DATA GAPS INVESTIGATION (ENCLOSURE IS RECORD # 783)                                                                                 | YES     | PARCEL E                                                                                                                                                                           |
| AR_N00217_004035<br>MINUTES<br>97        | 12-04-2003  | INNOVATIVE TECHNICAL SOLUTIONS, INC. | 04 DECEMBER 2003 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, 23 OCTOBER 2003 MEETING MINUTES, 04 DECEMBER 2003 REPORTER'S TRANSCRIPT, AND VARIOUS HANDOUTS)                                | YES     | BLDG 0000134<br>BLDG 0000231<br>BLDG 0000253<br>BLDG 0000272<br>BLDG 0000281<br>BLDG 0000366<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00002 |
| AR_N00217_000784<br>REPORT<br>336        | 12-23-2003  | TETRA TECH EM, INC.                  | FINAL NONSTANDARD DATA GAPS INVESTIGATION, LANDFILL GAS CHARACTERIZATION [INCLUDES SWDIV TRANSMITTAL LETTER] {CD COPY ENCLOSED}                                                                                   | YES     | PARCEL E                                                                                                                                                                           |



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| AR_N00217_000812<br>REPORT<br>53         | 04-09-2004  | TETRA TECH EM, INC.         | FINAL MONTHLY LANDFILL GAS MONITORING REPORT FOR FEBRUARY 2004 POST-REMOVAL ACTION, INDUSTRIAL LANDFILL (INCLUDES SWDIV TRANSMITTAL LETTER AND CD COPY)                                                                    | YES     | PARCEL E                                          |
| AR_N00217_004124<br>REPORT<br>65         | 04-26-2004  | TETRA TECH FW, INC.         | FINAL BIOLOGICAL ASSESSMENT (SEE RECORD # 2191 - BRAC PMO WEST TRANSMITTAL LETTER)                                                                                                                                         | YES     | PARCEL E                                          |
| AR_N00217_000926<br>CORRESPONDENCE<br>4  | 05-05-2004  | CRWQCB - OAKLAND, CA        | REVIEW AND COMMENTS ON THE DRAFT FIRST MONTHLY LANDFILL GAS MONITORING REPORT, POST-REMOVAL ACTION AND ON THE FINAL MONTHLY LANDFILL GAS MONITORING REPORT FOR FEBRUARY 2004                                               | YES     | PARCEL E                                          |
| AR_N00217_004013<br>REPORT<br>66         | 05-06-2004  | TETRA TECH EM, INC.         | FINAL MONTHLY LANDFILL GAS MONITORING REPORT FOR MARCH 2004, POST-REMOVAL ACTION, INDUSTRIAL LANDFILL [INCLUDES SWDIV TRANSMITTAL LETTER] {CD COPY ENCLOSED}                                                               | YES     | PARCEL E                                          |
| AR_N00217_000783<br>REPORT<br>4894       | 05-11-2004  | TETRA TECH EM, INC.         | REVISED FINAL GROUNDWATER SUMMARY REPORT, PHASE III GROUNDWATER DATA GAPS INVESTIGATION, VOLUMES I THROUGH V OF V (INCLUDES CD COPY, AND REPLACEMENT PAGES CONVERTING THE FINAL DATED 17 OCTOBER 2003 TO REVISED FINAL)    | YES     | "PERCHLORATE<br>" SEARCH -<br>ROUND 1<br>PARCEL E |
| AR_N00217_004014<br>CORRESPONDENCE<br>4  | 05-11-2004  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF REPLACEMENT PAGES CONVERTING THE FINAL GROUNDWATER SUMMARY REPORT, PHASE III GROUNDWATER DATA GAPS INVESTIGATION, DATED 17 OCTOBER 2003, TO REVISED FINAL (ENCLOSURE IS RECORD # 783)                       | YES     | PARCEL E                                          |
| AR_N00217_004009<br>CORRESPONDENCE<br>34 | 05-18-2004  | TETRA TECH FW, INC.         | TRANSPORTATION AND DISPOSAL PLAN, POLYCHLORINATED BIPHENYL HOT SPOTS SOIL EXCAVATION SITE (SEE RECORD #4120 - FINAL TRANSPORTATION AND DISPOSAL PLAN FOR PCB HOT SPOT SOIL EXCAVATION SITE, REVISION 1) {CD COPY ENCLOSED} | YES     | PARCEL E                                          |
| AR_N00217_004020<br>CORRESPONDENCE<br>25 | 05-25-2004  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF COMMENTS ON THE DRAFT CHARACTERIZATION WORK PLAN FOR THE METAL DEBRIS REEF AND METAL SLAG AREAS (W/ ENCLOSURE) [CD COPY ENCLOSED]                                                                           | YES     | PARCEL E                                          |

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| AR_N00217_004031<br>MINUTES<br>130      | 05-27-2004  | INNOVATIVE TECHNICAL<br>SOLUTIONS, INC. | 27 MAY 2004 RESTORATION ADVISORY BOARD (RAB)<br>MEETING MINUTES (INCLUDES AGENDA, MEETING<br>HANDOUTS, AND PUBLIC INFORMATION MATERIALS<br>PACKAGE FOR 27 MAY 2004 PUBLIC<br>MEETING/RESTORATION ADVISORY BOARD (RAB)<br>MEETING) | YES     | BLDG 0000322<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00002 |
| AR_N00217_004021<br>REPORT<br>50        | 06-03-2004  | TETRA TECH EM, INC.                     | FINAL MONTHLY LANDFILL GAS MONITORING REPORT<br>FOR APRIL 2004, POST-REMOVAL ACTION, INDUSTRIAL<br>LANDFILL [INCLUDES SWDIV TRANSMITTAL LETTER]<br>{CD COPY ENCLOSED}                                                             | YES     | PARCEL E                                                                                           |
| AR_N00217_000932<br>CORRESPONDENCE<br>5 | 06-10-2004  | CRWQCB - OAKLAND, CA                    | REVIEW AND COMMENTS ON THE DRAFT WORK PLAN<br>FOR TOTAL PETROLEUM HYDROCARBON PROGRAM -<br>IMPLEMENTATION OR CORRECTIVE ACTION PLAN SOIL<br>REMOVAL (SEE RECORD # 809 - DRAFT WORK PLAN)                                          | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                       |
| AR_N00217_004019<br>REPORT<br>321       | 06-18-2004  | TETRA TECH FW, INC.                     | FINAL CHARACTERIZATION WORK PLAN METAL DEBRIS<br>REEF AND METAL SLAG AREAS [INCLUDES SWDIV<br>TRANSMITTAL LETTER] {CD COPY ENCLOSED}                                                                                              | YES     | PARCEL E                                                                                           |
| AR_N00217_004029<br>REPORT<br>182       | 06-29-2004  | TETRA TECH FW, INC.                     | FINAL SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR<br>THE METAL DEBRIS REEF AND METAL SLAG AREAS                                                                                                                                      | YES     | "PERCHLORATE<br>" SEARCH -<br>ROUND 1<br>PARCEL E                                                  |
| AR_N00217_004069<br>CORRESPONDENCE<br>4 | 06-29-2004  | NAVFAC - SOUTHWEST DIVISION             | TRANSMITTAL OF FINAL 2003-2004 ANNUAL REPORT<br>FOR STORM WATER DISCHARGE MANAGEMENT,<br>INDUSTRIAL LANDFILL                                                                                                                      | YES     | PARCEL E<br>SITE 00001<br>SITE 00021                                                               |
| AR_N00217_004038<br>REPORT<br>55        | 07-01-2004  | TETRA TECH EM, INC.                     | FINAL MONTHLY LANDFILL GAS MONITORING REPORT<br>FOR MAY 2004 POST-REMOVAL ACTION [INCLUDES<br>SWDIV TRANSMITTAL LETTER] {CD COPY ENCLOSED}                                                                                        | YES     | PARCEL E                                                                                           |
| AR_N00217_002163<br>CORRESPONDENCE<br>4 | 07-12-2004  | NAVFAC - SOUTHWEST DIVISION             | TRANSMITTAL OF THE FINAL POST CONSTRUCTION<br>REPORT, DECONTAMINATE PROCESS EQUIPMENT,<br>CONDUCT WASTE CONSOLIDATION AND PROVIDE<br>ASBESTOS SERVICES (ENCLOSURE IS RECORD # 4030)                                               | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                                       |

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| AR_N00217_002165<br>CORRESPONDENCE<br>5 | 08-13-2004  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE FINAL NONSTANDARD DATA GAPS INVESTIGATION LANDFILL LIQUEFACTION POTENTIAL (ENCLOSURE IS RECORD # 4051)                                    | YES     | PARCEL E |
| AR_N00217_002166<br>CORRESPONDENCE<br>5 | 08-13-2004  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE FINAL INTERIM LANDFILL GAS MONITORING AND CONTROL PLAN INDUSTRIAL LANDFILL (ENCLOSURE IS RECORD # 4054)                                   | YES     | PARCEL E |
| AR_N00217_004051<br>REPORT<br>347       | 08-13-2004  | TETRA TECH EM, INC.         | FINAL NONSTANDARD DATA GAPS INVESTIGATION LANDFILL LIQUEFACTION POTENTIAL (CD COPY ENCLOSED) [SEE RECORD # 2165 - SWDIV TRANSMITTAL LETTER]                  | YES     | PARCEL E |
| AR_N00217_004052<br>REPORT<br>83        | 08-13-2004  | TETRA TECH EM, INC.         | FINAL MONTHLY LANDFILL GAS MONITORING REPORT FOR JANUARY 2004 POST-REMOVAL ACTION INDUSTRIAL LANDFILL [INLCUDES SWDIV TRANSMITTAL LETTER] {CD COPY ENCLOSED} | YES     | PARCEL E |
| AR_N00217_004053<br>REPORT<br>56        | 08-13-2004  | TETRA TECH EM, INC.         | FINAL MONTHLY LANDFILL GAS MONITORING REPORT FOR JUNE 2004 POST-REMOVAL ACTION INDUSTRIAL LANDFILL [INCLUDES SWDIV TRANSMITTAL LETTER] {CD COPY ENCLOSED}    | YES     | PARCEL E |
| AR_N00217_004054<br>REPORT<br>348       | 08-13-2004  | TETRA TECH EM, INC.         | FINAL INTERIM LANDFILL GAS MONITORING AND CONTROL PLAN INDUSTRIAL LANDFILL (CD COPY ENCLOSED) [SEE RECORD # 2166 - SWDIV TRANSMITTAL LETTER]                 | YES     | PARCEL E |

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| AR_N00217_000848<br>MINUTES<br>87 | 08-26-2004  | TETRA TECH EM, INC. | 26 AUGUST 2004 RESTORATION ADVISORY BOARD<br>(RAB) MEETING MINUTES (INCLUDES AGENDA, 22 JULY<br>2004 MEETING MINUTES, JULY 2004 MONTHLY<br>PROGRESS REPORT, 11 AUGUST 2004 RAB<br>SUBCOMMITTEE MEETING MINUTES, | YES     | BLDG 0000101<br>BLDG 0000103<br>BLDG 0000114<br>BLDG 0000123<br>BLDG 0000130<br>BLDG 0000134<br>BLDG 0000140<br>BLDG 0000142<br>BLDG 0000146<br>BLDG 0000203<br>BLDG 0000211<br>BLDG 0000253<br>BLDG 0000272<br>BLDG 0000322<br>BLDG 0000364<br>BLDG 0000365<br>BLDG 0000366<br>BLDG 0000521<br>BLDG 0000813<br>BLDG 0000816<br>BLDG 0000819<br>BLDG 0000821<br>BLDG 0000901<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00002<br>SITE 00004<br>SITE 00007<br>SITE 00018 |

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| AR_N00217_000847<br>MINUTES<br>94 | 09-23-2004  | TETRA TECH EM, INC.                  | 23 SEPTEMBER 2004 RESTORATION ADVISORY BOARD (RAB) MEETING (INCLUDES AGENDA, 26 AUGUST 2004 MEETING MINUTES, AUGUST 2004 MONTHLY PROGRESS REPORT, 15 SEPTEMBER 2004 RAB SUBCOMMITTEE MEETING MINUTES, REPORTER'S TRANSCRIPT AND VARIOUS HANDOUTS) | YES     | BLDG 0000101<br>BLDG 0000114<br>BLDG 0000123<br>BLDG 0000130<br>BLDG 0000134<br>BLDG 0000142<br>BLDG 0000146<br>BLDG 0000203<br>BLDG 0000211<br>BLDG 0000253<br>BLDG 0000272<br>BLDG 0000322<br>BLDG 0000364<br>BLDG 0000365<br>BLDG 0000366<br>BLDG 0000408<br>BLDG 0000521<br>BLDG 0000813<br>BLDG 0000816<br>BLDG 0000819<br>BLDG 0000821<br>BLDG 0000901<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00002<br>SITE 00007<br>SITE 00018 |
| AR_N00217_004072<br>REPORT<br>56  | 10-25-2004  | INNOVATIVE TECHNICAL SOLUTIONS, INC. | FINAL MONTHLY LANDFILL GAS MONITORING REPORT FOR JULY 2004, POST-REMOVAL ACTION, INDUSTRIAL LANDFILL [INCLUDES SWDIV TRANSMITTAL LETTER] {CD COPY ENCLOSED}                                                                                       | YES     | PARCEL E<br>SITE 00001<br>SITE 00021                                                                                                                                                                                                                                                                                                                                                                                                                               |

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| AR_N00217_004076<br>REPORT<br>154        | 10-29-2004  | TETRA TECH EM, INC.         | FINAL NONSTANDARD DATA GAPS INVESTIGATION, LANDFILL LATERAL EXTENT EVALUATION [INCLUDES SWDIV TRANSMITTAL LETTER] {CD COPY ENCLOSED                                                                                                                    | YES     | PARCEL E                                                                     |
| AR_N00217_004059<br>REPORT<br>487        | 11-01-2004  | TETRA TECH EM, INC.         | DATA SUMMARY REPORT STANDARD DATA GAPS INVESTIGATION [INCLUDES SWDIV TRANSMITTAL LETTER] {CD COPY ENCLOSED}                                                                                                                                            | YES     | PARCEL E                                                                     |
| AR_N00217_004030<br>REPORT<br>175        | 11-02-2004  | TETRA TECH FW, INC.         | FINAL POST-CONSTRUCTION REPORT - DECONTAMINATE PROCESS EQUIPMENT, CONDUCT WASTE CONSOLIDATION AND ASBESTOS SERVICES [INCLUDES REPLACEMENT PAGES CONVERTING DRAFT FINAL DATED 09 JULY 2004 TO FINAL AND CD COPY)                                        | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                 |
| AR_N00217_004077<br>CORRESPONDENCE<br>10 | 11-02-2004  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF REQUEST FOR IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS                                                                                                                                                 | YES     | PARCEL E                                                                     |
| AR_N00217_004078<br>REPORT<br>10         | 11-02-2004  | TETRA TECH FW, INC.         | RESPONSE TO COMMENTS ON THE DRAFT FINAL POST CONSTRUCTION REPORT [INCLUDES SWDIV TRANSMITTAL LETTER]                                                                                                                                                   | YES     | BLDG 0000231<br>BLDG 0000600<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E |
| AR_N00217_002164<br>CORRESPONDENCE<br>4  | 11-03-2004  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE REPLACEMENT PAGES FOR THE FINAL POST CONSTRUCTION REPORT, DECONTAMINATE PROCESS EQUIPMENT, CONDUCT WASTE CONSOLIDATION AND PROVIDE ASBESTOS SERVICES [REPLACEMENT PAGES WERE INSERTED IN THE DOCUMENT] (ENCLOSURE IS RECORD # 4030) | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                 |

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| AR_N00217_000840<br>MINUTES<br>84 | 12-09-2004  | SULTECH             | 09 DECEMBER 2004 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, 21 OCTOBER 2004 MONTHLY PROGRESS REPORT, REPORTER'S TRANSCRIPT, TECHNICAL REVIEW SUBCOMMITTEE MEETING MINUTES, AND VARIOUS HANDOUTS) | YES     | BLDG 0000101<br>BLDG 0000114<br>BLDG 0000123<br>BLDG 0000134<br>BLDG 0000146<br>BLDG 0000253<br>BLDG 0000272<br>BLDG 0000322<br>BLDG 0000351A<br>BLDG 0000364<br>BLDG 0000366<br>BLDG 0000408<br>BLDG 0000500<br>BLDG 0000503<br>BLDG 0000521<br>BLDG 0000529<br>BLDG 0000813<br>BLDG 0000815<br>BLDG 0000819<br>BLDG 0000839<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>SITE 00001<br>SITE 00002<br>SITE 00007<br>SITE 00018<br>SITE 00021 |
| AR_N00217_004088<br>REPORT<br>5   | 12-20-2004  | TETRA TECH FW, INC. | FINAL KLEINFELDER WASTE SOIL TESTING WORK INSTRUCTION                                                                                                                                                                    | YES     | BLDG 0000241<br>BLDG 0000406<br>PARCEL E                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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| AR_N00217_002168<br>CORRESPONDENCE<br>4 | 01-12-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE DRAFT ACTION MEMORANDUM<br>TIME-CRITICAL REMOVAL ACTION FOR THE<br>POLYCHLORINATED BIPHENYLS HOT SPOT AREA<br>(ENCLOSURE IS RECORD # 4090)                                                                 | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                                       |
| AR_N00217_002176<br>CORRESPONDENCE<br>5 | 02-18-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE DRAFT REMOVAL ACTION<br>DESIGN AND IMPLEMENTATION WORK PLAN AT THE<br>METAL DEBRIS REEF AND METAL SLAG AREAS<br>(ENCLOSURE IS RECORD # 4106)                                                               | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                                       |
| AR_N00217_002191<br>CORRESPONDENCE<br>3 | 02-23-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE 1) FINAL BIOLOGICAL<br>ASSESSMENT, AND 2) DRAFT REMOVAL ACTION<br>DESIGN IMPLEMENTATION WORK PLAN FOR METAL<br>DEBRIS REEF AND METAL SLAG AREAS [ENCLOSURE 1)<br>IS RECORD # 4124 AND 2) IS RECORD # 4106] | YES     | PARCEL E                                                                                                                                                                     |
| AR_N00217_002183<br>CORRESPONDENCE<br>5 | 02-25-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE DRAFT PROJECT WORK PLAN<br>FOR THE POLYCHLORINATED BIPHENYLS HOT SPOT<br>EXCAVATION SITE (ENCLOSURE IS RECORD # 4108)                                                                                      | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                                       |
| AR_N00217_002187<br>CORRESPONDENCE<br>5 | 03-09-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE DRAFT PROJECT WORK PLAN AT<br>NORTHWEST AND CENTRAL (ENCLOSURE IS RECORD #<br>4118)                                                                                                                        | YES     | PARCEL E<br>SITE 00002                                                                                                                                                       |
| AR_N00217_000842<br>MINUTES<br>94       | 03-23-2005  | SULTECH                     | 23 MARCH 2005 RESTORATION ADVISORY BOARD (RAB)<br>MEETING MINUTES (INCLUDES AGENDA, APRIL 2005<br>MONTHLY PROGRESS REPORT, REPORTER'S<br>TRANSCRIPT AND VARIOUS HANDOUTS)                                                     | YES     | BLDG 0000123<br>BLDG 0000134<br>BLDG 0000272<br>PARCEL A<br>PARCEL A-1<br>PARCEL A-2<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>SITE 00002 |
| AR_N00217_002200<br>CORRESPONDENCE<br>4 | 03-24-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE DATA SUMMARY REPORT FOR<br>THE STANDARD DATA GAPS INVESTIGATION<br>(ENCLOSURE IS RECORD # 4133)                                                                                                            | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                                       |



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| AR_N00217_004133<br>REPORT<br>198       | 03-24-2005  | TETRA TECH EM, INC.         | DATA SUMMARY REPORT FOR THE STANDARD DATA GAPS INVESTIGATION, REVISION 1 [CD COPY ENCLOSED] (SEE RECORD # 2200 - BRAC PMO WEST TRANSMITTAL LETTER)                                                                       | YES     | PARCEL E<br>PARCEL E-2                                                                                           |
| AR_N00217_004120<br>REPORT<br>36        | 04-20-2005  | TETRA TECH FW, INC.         | FINAL TRANSPORTATION AND DISPOSAL PLAN FOR POLYCHLORINATED BIPHENYL HOT SPOT SOIL EXCAVATION SITE, REVISION 1 {CD COPY ENCLOSED} (SEE RECORD #4009 - TRANSPORTATION AND DISPOSAL PLAN)                                   | YES     | PARCEL E<br>PARCEL E-2                                                                                           |
| AR_N00217_000839<br>MINUTES<br>75       | 04-27-2005  | SULTECH                     | 27 APRIL 2005 RESTORATION ADVISORY BOARD (RAB) MEETING (INCLUDES AGENDA, 27 APRIL 2008 MEETING MINUTES, RAB SUB COMMITTEE MEETING MINUTES, MAY 2005 MONTHLY PROGRESS REPORT, REPORTER'S TRANSCRIPT AND VARIOUS HANDOUTS) | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>SITE 00002<br>SITE 00007<br>SITE 00018 |
| AR_N00217_002195<br>CORRESPONDENCE<br>4 | 04-29-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE DUST CONTROL PLAN (ENCLOSURE IS RECORD # 4130)                                                                                                                                                        | YES     | PARCEL E<br>PARCEL E-2                                                                                           |
| AR_N00217_004130<br>REPORT<br>50        | 04-29-2005  | TETRA TECH FW, INC.         | DUST CONTROL PLAN (CD COPY ENCLOSED) [SEE RECORD # 2195 - BRAC PMO WEST TRANSMITTAL LETTER]                                                                                                                              | YES     | PARCEL E<br>PARCEL E-2                                                                                           |
| AR_N00217_001711<br>CORRESPONDENCE<br>5 | 05-17-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE DRAFT FINAL PROJECT WORK PLAN, POLYCHLORINATED BIPHENYLS HOT SPOT SOIL EXCAVATION (ENCLOSURE IS RECORD # 4137)                                                                                        | YES     | PARCEL E<br>PARCEL E-2                                                                                           |
| AR_N00217_004138<br>REPORT<br>176       | 05-17-2005  | TETRA TECH FW, INC.         | FINAL SITE-SPECIFIC HEALTH AND SAFETY PLAN AT THE PCB HOT SPOT SOIL EXCAVATION SITE {CD COPY ENCLOSED}                                                                                                                   | YES     | "PERCHLORATE"<br>SEARCH -<br>ROUND 1<br>PARCEL E<br>PARCEL E-2                                                   |

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| AR_N00217_001777<br>CORRESPONDENCE<br>4 | 05-19-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE FINAL ACTION MEMORANDUM FOR THE TIME-CRITICAL REMOVAL ACTION, POLYCHLORINATED BIPHENYLS HOT SPOT AREA (ENCLOSURE IS RECORD # 4140)                                   | YES     | PARCEL E<br>PARCEL E-2                                         |
| AR_N00217_004140<br>REPORT<br>62        | 05-19-2005  | SULTECH                     | FINAL ACTION MEMORANDUM FOR THE TIME-CRITICAL REMOVAL ACTION, POLYCHLORINATED BIPHENYLS HOT SPOT AREA [CD COPY ENCLOSED] (SEE RECORD # 1777 - BRAC PMO WEST TRANSMITTAL LETTER)         | YES     | PARCEL E<br>PARCEL E-2                                         |
| AR_N00217_002204<br>CORRESPONDENCE<br>5 | 05-20-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE DRAFT FINAL REMOVAL ACTION DESIGN AND IMPLEMENTATION WORK PLAN FOR METAL DEBRIS AND METAL SLAG AREAS (ENCLOSURE IS RECORD # 4139)                                    | YES     | PARCEL E<br>PARCEL E-2                                         |
| AR_N00217_000837<br>MINUTES<br>117      | 05-25-2005  | TETRA TECH EM, INC.         | 25 MAY 2005 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES [INCLUDES AGENDA, LIST OF ATTENDEES, ACTION ITEMS, 25 MAY 2005 REPORTER'S TRANSCRIPT AND MAY 2005 MONTHLY PROGRESS REPORT] | YES     | PARCEL A<br>PARCEL E<br>PARCEL E-2                             |
| AR_N00217_004142<br>REPORT<br>167       | 05-25-2005  | TETRA TECH FW, INC.         | FINAL SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR THE REMOVAL ACTION DESIGN AND IMPLEMENTATION PLAN AT THE METAL DEBRIS REEF AND METAL SLAG AREAS (CD COPY ENCLOSED)                       | YES     | "PERCHLORATE"<br>SEARCH -<br>ROUND 2<br>PARCEL E<br>PARCEL E-2 |
| AR_N00217_004145<br>REPORT<br>176       | 06-01-2005  | TETRA TECH EM, INC.         | FINAL SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR NORTHWEST AND CENTRAL (CD COPY ENCLOSED)                                                                                                 | YES     | "PERCHLORATE"<br>SEARCH -<br>ROUND 2<br>PARCEL E<br>SITE 00002 |
| AR_N00217_004153<br>FACT SHEET<br>7     | 06-01-2005  | TETRA TECH FW, INC.         | FACT SHEET NO. 7 - FINAL REMOVAL ACTIONS AT THE SHORELINE (RADIOLOGICAL COMMUNICATION SUPPORT)                                                                                          | YES     | PARCEL E<br>PARCEL E-2                                         |
| AR_N00217_004149<br>REPORT<br>52        | 06-09-2005  | TETRA TECH FW, INC.         | DUST CONTROL AND ASBESTOS MITIGATION PLAN (SEE RECORD # 1998 - BRAC PMO WEST TRANSMITTAL LETTER)                                                                                        | YES     | PARCEL E<br>PARCEL E-2                                         |
| AR_N00217_001998<br>CORRESPONDENCE<br>5 | 06-17-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE DUST CONTROL AND ASBESTOS MITIGATION PLAN (ENCLOSURE IS RECORD # 4149)                                                                                               | YES     | PARCEL E<br>PARCEL E-2                                         |

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| AR_N00217_000838<br>MINUTES<br>152 | 06-22-2005  | NAVFAC - SOUTHWEST DIVISION | 22 JUNE 2005 RESTORATION ADVISORY BOARD (RAB)<br>MEETING MINUTES [INCLUDES AGENDA, LIST OF<br>ATTENDEES, ACTION ITEMS, 22 JUNE 2005 NAVY<br>MONTHLY PROGRESS REPORT, AND 22 JUNE 2005<br>REPORTER'S TRANSCRIPT] | YES     | BLDG 0000103  |
|                                    |             |                             |                                                                                                                                                                                                                 |         | BLDG 0000113  |
|                                    |             |                             |                                                                                                                                                                                                                 |         | BLDG 0000113A |
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|                 |             |                    |       |         | BLDG 0000500  |  |
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|                 |             |                    |       |         | DRY DOCK 0003 |  |
|                 |             |                    |       |         | DRY DOCK 0004 |  |
|                 |             |                    |       |         | DRY DOCK 0005 |  |
|                 |             |                    |       |         | DRY DOCK 0006 |  |
|                 |             |                    |       |         | DRY DOCK 0007 |  |
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|                 |             |                    |       |         | SITE 00506    |  |
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|                 |             |                    |       |         | SITE 00517    |  |
|                 |             |                    |       |         | SITE 00520    |  |
|                 |             |                    |       |         | SITE 00529    |  |
|                 |             |                    |       |         | SITE 00707    |  |

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|                 |             |                    |       |         | WELL IR-01-MW-043A   |  |
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|                 |             |                    |       |         | WELL IR-03-MW-342A   |  |
|                 |             |                    |       |         | WELL IR-03-MW-373B   |  |
|                 |             |                    |       |         | WELL IR-04-MW-013A   |  |
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|                 |             |                    |       |         | WELL IR-28-MW-136A   |  |
|                 |             |                    |       |         | WELL IR-28-MW-140F   |  |
|                 |             |                    |       |         | WELL IR-28-MW-150A   |  |
|                 |             |                    |       |         | WELL IR-28-MW-151A   |  |
|                 |             |                    |       |         | WELL IR-28-MW-211F   |  |
|                 |             |                    |       |         | WELL IR-28-MW-221A   |  |
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|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-403A |  |
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|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-409A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-410A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-412A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-58-MW-031A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-58-MW-033B |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-70-MW-007A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-71-MW-003A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-71-MW-012B |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-91-MW-004A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IW-002        |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL MW-033A       |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL MW-053A       |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL MW-054A       |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL MW-061A       |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL MW-062A       |  |
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| AR_N00217_004155<br>CORRESPONDENCE<br>11 | 06-28-2005  | NAVFAC - SOUTHWEST DIVISION          | TRANSMITTAL OF RESPONSES TO COMMENTS ON THE DUST CONTROL PLAN (W/ ENCLOSURE) {CD COPY ENCLOSED} [SEE RECORD # 4130 - DUST CONTROL PLAN]                                              | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                               |
| AR_N00217_004165<br>CORRESPONDENCE<br>7  | 07-27-2005  | NAVFAC - SOUTHWEST DIVISION          | TRANSMITTAL OF RESPONSE TO COMMENTS ON FINAL ACTION MEMORANDUM TIME CRITICAL REMOVAL ACTION FOR THE PCB HOT SPOT AREA (W/ ENCLOSURE) [SEE RECORD # 4140 - FINAL ACTION MEMORANDUM]   | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                               |
| AR_N00217_000835<br>MINUTES<br>64        | 07-28-2005  | SULTECH                              | 28 JULY 2005 RESTORATION ADVISORY BOARD (RAB) MEETING (INCLUDES AGENDA, 20 JULY 2005 MEETING MINUTES, JUNE 2005 MONTHLY PROGRESS REPORT, REPORTER'S TRANSCRIPT AND VARIOUS HANDOUTS) | YES     | BLDG 0000366<br>PARCEL B<br>PARCEL C<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>SITE 00002                                                                             |
| AR_N00217_000834<br>MINUTES<br>59        | 08-25-2005  | SULTECH                              | 25 AUGUST 2005 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, AUGUST 2005 MONTHLY PROGRESS REPORT, REPORTER'S TRANSCRIPT AND VARIOUS HANDOUTS)                   | YES     | BLDG 0000103<br>BLDG 0000104<br>BLDG 0000115<br>BLDG 0000116<br>BLDG 0000600<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>SITE 00002 |
| AR_N00217_000832<br>REPORT<br>62         | 08-31-2005  | INNOVATIVE TECHNICAL SOLUTIONS, INC. | FINAL JUNE 2005 MONTHLY LANDFILL GAS MONITORING REPORT FOR POST-REMOVAL ACTION AT THE INDUSTRIAL LANDFILL (INCLUDES BRAC PMO WEST TRANSMITTAL LETTER)                                | YES     | BLDG 0000830<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00021                                                                                       |

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| AR_N00217_004170<br>REPORT<br>13        | 10-03-2005  | TETRA TECH EC, INC.              | FINAL ADDENDUM 1 TO THE DRAFT FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN), POLYCHLORINATED BIPHENYLS HOT SPOT SOIL EXCAVATION SITE                                                        | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                                                                                                                                       |
| AR_N00217_001876<br>CORRESPONDENCE<br>5 | 11-01-2005  | BRAC PMO WEST                    | TRANSMITTAL OF THE DRAFT SHORELINE CHARACTERIZATION TECHNICAL MEMORANDUM (ENCLOSURE IS RECORD # 4177)                                                                                                                                   | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                                                                                                                                       |
| AR_N00217_004178<br>REPORT<br>238       | 11-01-2005  | CE2 - KLEINFELDER, JOINT VENTURE | FINAL WORK PLAN FOR CONTAMINATION DELINEATION AT (INCLUDES REVISED FIGURE A-14 AND CD COPY) [SEE RECORD # 863 - BRAC PMO WEST TRANSMITTAL LETTER]                                                                                       | YES     | BLDG 0000108<br>BLDG 0000130<br>BLDG 0000134<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>SITE 00006<br>SITE 00025<br>WELL IR-06-MW-034A<br>WELL IR-06-MW-046A<br>WELL IR-25-MW-037B<br>WELL IR-25-MW-038B<br>WELL IR-25-MW-039B |
| AR_N00217_001712<br>CORRESPONDENCE<br>5 | 11-10-2005  | NAVFAC - SOUTHWEST DIVISION      | TRANSMITTAL OF REPLACEMENT PAGES CONVERTING DRAFT FINAL PROJECT WORK PLAN, POLYCHLORINATED BIPHENYLS HOT SPOT SOIL EXCAVATION DATED 17 MAY 2005 TO FINAL (ENCLOSURE IS RECORD # 4137) [REPLACEMENT PAGES WERE INSERTED IN THE DOCUMENT] | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                                                                                                                                       |



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| AR_N00217_002205<br>CORRESPONDENCE<br>5 | 11-10-2005  | NAVFAC - SOUTHWEST DIVISION | TRANSMITTAL OF THE REPLACEMENT PAGES CONVERTING THE DRAFT FINAL REMOVAL ACTION DESIGN AND IMPLEMENTATION WORK PLAN FOR METAL DEBRIS REEF AND METAL SLAG AREAS, DATED 20 MAY 2005, TO FINAL (REPLACEMENT PAGES WERE INSERTED IN THE DOCUMENT) | YES     | PARCEL E<br>PARCEL E-2                                                                     |
| AR_N00217_004137<br>REPORT<br>357       | 11-10-2005  | TETRA TECH EM, INC.         | FINAL PROJECT WORK PLAN, POLYCHLORINATED BIPHENYL HOT SPOT SOIL EXCAVATION SITE (INCLUDES REPLACEMENT PAGES CONVERTING DRAFT FINAL DATED 17 MAY 2005 TO A FINAL AND CD                                                                       | YES     | "PERCHLORATE"<br>SEARCH -<br>ROUND 2<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00021 |
| AR_N00217_004139<br>REPORT<br>746       | 11-10-2005  | TETRA TECH FW, INC.         | FINAL REMOVAL ACTION DESIGN AND IMPLEMENTATION WORK PLAN AT THE METAL DEBRIS REEF AND METAL SLAG AREAS (INCLUDES REPLACEMENT PAGES CONVERTING DRAFT FINAL DATED 20 MAY 2005 TO FINAL, SUPPLEMENTAL REPLACEMENT PAGES, AND CD COPY)           | YES     | PARCEL E<br>PARCEL E-2                                                                     |
| AR_N00217_004143<br>REPORT<br>359       | 11-10-2005  | TETRA TECH EC, INC.         | FINAL PROJECT WORK PLAN, TIME-CRITICAL REMOVAL ACTION FOR NORTHWEST AND CENTRAL (INCLUDES REPLACEMENT PAGES CONVERTING DRAFT FINAL DATED 27 MAY 2005 TO A FINAL)                                                                             | YES     | PARCEL E<br>SITE 00002                                                                     |
| AR_N00217_000830<br>REPORT<br>1221      | 12-01-2005  | KLEINFELDER                 | REVISED FINAL SECOND QUARTER (APRIL - JUNE) 2004 GROUNDWATER SAMPLING REPORT (INCLUDES REPLACEMENT PAGES REVISING THE DATE OF 29 JULY 2005) [SEE RECORD # 1457 - BRAC PMO WEST TRANSMITTAL LETTER]                                           | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                           |
| AR_N00217_001457<br>CORRESPONDENCE<br>8 | 12-01-2005  | BRAC PMO WEST               | TRANSMITTAL OF THE RESPONSES TO COMMENTS ON THE 1) FINAL APRIL - JUNE 2004, EIGHTEENTH QUARTERLY GROUNDWATER SAMPLING REPORT, 2) FINAL JULY - SEPTEMBER 2004, NINETEENTH QUARTERLY GROUNDWATER SAMPLING REPORT,                              | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E                                               |

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| AR_N00217_000871<br>REPORT<br>241       | 12-05-2005  | STANFORD UNIVERSITY | FINAL DEMONSTRATION PLAN FOR FIELD TESTING OF ACTIVATED CARBON MIXING AND IN SITU STABILIZATION OF POLYCHLORINATED BIPHENYLS IN SEDIMENT [SEE RECORD # 872 - BRAC PMO WEST TRANSMITTAL LETTER] {                   | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F |
| AR_N00217_001713<br>CORRESPONDENCE<br>5 | 12-12-2005  | BRAC PMO WEST       | TRANSMITTAL OF SUPPLEMENTAL REPLACEMENT PAGES FOR FINAL PROJECT WORK PLAN, POLYCHLORINATED BIPHENYLS HOT SPOT SOIL EXCAVATION (ENCLOSURE IS RECORD # 4137) [REPLACEMENT PAGES WERE INSERTED IN THE DOCUMENT]       | YES     | PARCEL E<br>PARCEL E-2                                                             |
| AR_N00217_002206<br>CORRESPONDENCE<br>5 | 12-12-2005  | BRAC PMO WEST       | TRANSMITTAL OF THE SUPPLEMENTAL REPLACEMENT PAGES FOR THE FINAL REMOVAL ACTION DESIGN AND IMPLEMENTATION WORK PLAN AT THE METAL DEBRIS REEF AND METAL SLAG AREAS (REPLACEMENT PAGES WERE INSERTED IN THE DOCUMENT) | YES     | PARCEL E<br>PARCEL E-2                                                             |
| AR_N00217_001459<br>CORRESPONDENCE<br>4 | 12-14-2005  | BRAC PMO WEST       | TRANSMITTAL OF THE FINAL FOURTH QUARTER (OCTOBER - DECEMBER) 2004 GROUNDWATER SAMPLING REPORT (ENCLOSURE IS RECORD # 4181)                                                                                         | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                   |

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| AR_N00217_004181<br>REPORT<br>920 | 12-14-2005  | KLEINFELDER        | FINAL FOURTH QUARTER (OCTOBER - DECEMBER) 2004<br>GROUNDWATER SAMPLING REPORT (CD COPY<br>ENCLOSED) [SEE RECORD # 916 - REVISED FINAL<br>FOURTH QUARTER REPORT, AND # 1459 - BRAC PMO<br>WEST TRANSMITTAL LETTER] | YES     | BLDG 0000134<br>BLDG 0000156<br>BLDG 0000228<br>BLDG 0000253<br>BLDG 0000400<br>BLDG 0000405<br>BLDG 0000406<br>BLDG 0000411<br>BLDG 0000413<br>BLDG 0000414<br>DRY DOCK 0002<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>WELL IR-02-MW-<br>114A-2<br>WELL IR-06-MW-<br>045A<br>WELL IR-06-MW-<br>054F<br>WELL IR-06-MW-<br>055F<br>WELL IR-06-MW-<br>057F<br>WELL IR-09<br>WELL IR-71 VOC<br>WELL RU-C1<br>VOC<br>WELL RU-C2<br>VOC<br>WELL RU-C4<br>VOC |

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| AR_N00217_000852<br>REPORT<br>68 | 01-16-2006  | INNOVATIVE TECHNICAL<br>SOLUTIONS, INC. | FINAL MONTHLY LANDFILL GAS MONITORING REPORT<br>FOR OCTOBER 2005 POST-REMOVAL ACTION,<br>INDUSTRIAL LANDFILL (INCLUDES REPLACEMENT<br>PAGES CONVERTING DRAFT DATED 29 NOVEMBER<br>2005 TO FINAL, CD COPY, AND BRAC TRANSMITTAL<br>LETTERS}      | YES     | BLDG 0000830<br>PARCEL A<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00021                                                                                                                                                                                                                                         |
| AR_N00217_000865<br>REPORT<br>50 | 02-14-2006  | TETRA TECH EC, INC.                     | REVISED FINAL BASEWIDE RADIOLOGICAL REMOVAL<br>ACTION, ACTION MEMORANDUM (CD COPY ENCLOSED)<br>[SEE RECORD # 529 - FINAL BASEWIDE RADIOLOGICAL<br>REMOVAL ACTION, ACTION MEMORANDUM, AND<br>RECORD # 866 - BRAC PMO WEST TRANSMITTAL<br>LETTER] | YES     | BASEWIDE<br>BLDG 0000114<br>BLDG 0000146<br>BLDG 0000322<br>BLDG 0000364<br>BLDG 0000509<br>BLDG 0000517<br>BLDG 0000529<br>BLDG 0000707<br>BLDG 0000819<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>SITE 00001<br>SITE 00003<br>SITE 00011<br>SITE 00014<br>SITE 00015<br>SITE 00021 |

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| AR_N00217_000942<br>MINUTES<br>14 | 02-23-2006  | BARAJAS AND ASSOCIATES, INC. | 23 FEBRUARY 2006 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES LIST OF ATTENDEES AND ACTION ITEMS) | YES     | BLDG 0000103<br>BLDG 0000113<br>BLDG 0000113A<br>BLDG 0000114<br>BLDG 0000130<br>BLDG 0000142<br>BLDG 0000146<br>BLDG 0000157<br>BLDG 0000211<br>BLDG 0000406<br>BLDG 0000813<br>BLDG 0000819<br>PARCEL B<br>PARCEL D<br>PARCEL E<br>PARCEL F<br>SITE 00007<br>SITE 00018 |
| AR_N00217_004185<br>MINUTES<br>24 | 02-23-2006  | BARAJAS AND ASSOCIATES, INC. | 23 FEBRUARY 2006 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING REPORTER'S TRANSCRIPT                                 | YES     | BLDG 0000103<br>BLDG 0000113<br>BLDG 0000113A<br>BLDG 0000114<br>BLDG 0000142<br>BLDG 0000146<br>BLDG 0000157<br>BLDG 0000211<br>BLDG 0000406<br>BLDG 0000813<br>BLDG 0000819<br>PARCEL B<br>PARCEL D<br>PARCEL E<br>PARCEL F                                             |

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| AR_N00217_000952<br>CORRESPONDENCE<br>30 | 03-02-2006  | TETRA TECH EC, INC.                  | ADDITIONAL RESPONSE TO COMMENTS ON DRAFT FINAL PROJECT WORK PLAN FOR PCB HOT SPOT SOIL EXCAVATION SITE AND RESPONSE TO COMMENTS ON FIELD CHANGE REQUEST 035 (FCR-PCBHS-035) [CD COPY ENCLOSED]                                                  | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                                                                                                                                                                                                                                         |
| AR_N00217_000923<br>CORRESPONDENCE<br>5  | 03-06-2006  | BRAC PMO WEST                        | TRANSMITTAL OF 1) ADDITIONAL COMMENTS TO THE RESPONSE TO COMMENTS ON DRAFT FINAL PROJECT WORK PLAN FOR PCB HOT SPOT SOIL EXCAVATION SITE, AND 2) RESPONSE TO COMMENTS ON FIELD CHANGE REQUEST 035 (FCR-PCBHS-035) [ENCLOSURES ARE RECORD # 952] | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                                                                                                                                                                                                                                         |
| AR_N00217_004184<br>REPORT<br>63         | 03-13-2006  | INNOVATIVE TECHNICAL SOLUTIONS, INC. | FINAL MONTHLY LANDFILL GAS MONITORING REPORT FOR DECEMBER 2005 POST-REMOVAL ACTION, INDUSTRIAL LANDFILL (INCLUDES BRAC PMO WEST TRANSMITTAL LETTER AND CD COPY) (SEE RECORD # 890 - BRAC PMO WEST TRANSMITTAL)                                  | YES     | BLDG 0000830<br>PARCEL A<br>PARCEL E<br>PARCEL E-2<br>SITE 00010<br>SITE 00021<br>WELL EW-108A<br>WELL EW-108B<br>WELL EW-122A<br>WELL EW-122B<br>WELL EW-134A<br>WELL EW-134B<br>WELL EW-138A<br>WELL EW-138B<br>WELL EW-142A<br>WELL EW-142B<br>WELL EW-146A<br>WELL EW-146B<br>WELL EW-150A<br>WELL EW-150B<br>WELL EW-154A<br>WELL EW-154B<br>WELL EW-158A<br>WELL EW-158B |

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| AR_N00217_000885<br>REPORT<br>37         | 03-20-2006  | TETRA TECH EC, INC.          | WASTE CONSOLIDATION FINAL STATUS REPORT (CD COPY ENCLOSED) [SEE RECORD # 885 - BRAC PMO WEST TRANSMITTAL LETTER]                                                                           | YES     | BLDG 0000115<br>BLDG 0000704<br>PARCEL E<br>PARCEL E-2                                                           |
| AR_N00217_000874<br>CORRESPONDENCE<br>5  | 03-22-2006  | BRAC PMO WEST                | TRANSMITTAL OF THE DRAFT JANUARY TO MARCH 2005 FIFTH QUARTERLY/FIRST ANNUAL GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 873)                                                      | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                                 |
| AR_N00217_000943<br>MINUTES<br>25        | 03-23-2006  | BARAJAS AND ASSOCIATES, INC. | 23 MARCH 2006 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING REPORTER'S TRANSCRIPT                                                                                                         | YES     | BLDG 0000123<br>BLDG 0000134<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00010<br>SITE 00026         |
| AR_N00217_004186<br>MINUTES<br>11        | 03-23-2006  | BARAJAS AND ASSOCIATES, INC. | 23 MARCH 2006 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES LIST OF ATTENDEES AND ACTION ITEMS)                                                                         | YES     | BLDG 0000153<br>PARCEL B<br>PARCEL C<br>PARCEL E<br>SITE 00007<br>SITE 00010<br>SITE 00026<br>WELL IR-26-MW-047A |
| AR_N00217_000889<br>CORRESPONDENCE<br>62 | 03-31-2006  | BRAC PMO WEST                | TRANSMITTAL OF 1) FEDERAL FACILITY AGREEMENT SCHEDULE, 2) PROJECT SCHEDULE, AND 3) RESPONSE TO COMMENTS ON THE FEDERAL FACILITY AGREEMENT SCHEDULE, DATED 23 SEPTEMBER 2005 (W/ENCLOSURES) | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F                                           |

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| AR_N00217_000947<br>CORRESPONDENCE<br>14 | 03-31-2006  | BRAC PMO WEST      | TRANSMITTAL OF ADDITIONAL RESPONSE TO<br>COMMENTS AND REPLACEMENT PAGES FOR 1) FINAL<br>Q18 (APRIL TO JUNE 2004), 2) FINAL Q19 (JULY TO<br>SEPT. 2004), AND 3) FINAL Q3 (JULY TO SEPT 2004)<br>GROUNDWATER MONITORING REPORTS (W/<br>ENCLOSURE) | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E |



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| AR_N00217_004161<br>REPORT<br>964 | 03-31-2006  | KLEINFELDER        | REVISED FINAL THIRD QUARTER (JULY - SEPTEMBER)<br>2004 GROUNDWATER SAMPLING REPORT (INCLUDES<br>REPLACEMENT PAGES, REVISED CD COPY, AND BRAC<br>PMO WEST TRANSMITTAL LETTERS) (SEE RECORD #<br>947 AND # 1457 - BRAC PMO WEST TRANSMITTAL<br>LETTERS) | YES     | BLDG 0000134<br>BLDG 0000156<br>BLDG 0000228<br>BLDG 0000253<br>BLDG 0000406<br>BLDG 0000408<br>BLDG 0000413<br>BLDG 0000414<br>BLDG 0000439<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00006<br>SITE 00007<br>SITE 00018<br>SITE 00025<br>SITE 00071<br>WELL IR-01-MW-<br>012A<br>WELL IR-02-MW-<br>114A-2<br>WELL IR-06-MW-<br>050F<br>WELL IR-06-MW-<br>057F<br>WELL IR-06-P-<br>054F<br>WELL IR-25-MW-<br>039A<br>WELL IR-26-MW-<br>041A<br>WELL IR-28-MW-<br>155A<br>WELL IR-28-MW-<br>311A<br>WELL IR-30-MW-<br>001F |

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|                                         |             |                              |                                                                                                                                                                                                    |         | WELL PA-50-MW-006A                                                                                                                                                                                                                                 |
| AR_N00217_000974<br>REPORT<br>51        | 04-21-2006  | TETRA TECH EC, INC.          | FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION, ACTION MEMORANDUM - REVISION 2006 (CD COPY ENCLOSED) [SEE RECORD # 973 - BRAC PMO WEST TRANSMITTAL LETTER, AND RECORD # 529 - FINAL ACTION MEMORANDUM] | YES     | BLDG 0000114<br>BLDG 0000146<br>BLDG 0000322<br>BLDG 0000364<br>BLDG 0000506<br>BLDG 0000509<br>BLDG 0000517<br>BLDG 0000529<br>BLDG 0000707<br>BLDG 0000819<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F |
| AR_N00217_000910<br>CORRESPONDENCE<br>4 | 04-27-2006  | BRAC PMO WEST                | TRANSMITTAL OF DRAFT OCTOBER TO DECEMBER 2005 GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 909)                                                                                            | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                                                                                                                                   |
| AR_N00217_000944<br>MINUTES<br>11       | 04-27-2006  | BARAJAS AND ASSOCIATES, INC. | 27 APRIL 2006 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES LIST OF ATTENDEES AND ACTION ITEMS)                                                                                 | YES     | BLDG 0000272<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00010<br>WELL IR-10-MW-071A<br>WELL IR-25-MW-0544                                                                                                                 |

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| AR_N00217_000945<br>MINUTES<br>23       | 04-27-2006  | BARAJAS AND ASSOCIATES, INC.         | 27 APRIL 2006 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING REPORTER'S TRANSCRIPT                                                                                                                                                            | YES     | BLDG 0000123<br>BLDG 0000134<br>BLDG 0000272<br>DRY DOCK 0004<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>WELL 00054A<br>WELL 00071A<br>WELL 00211F |
| AR_N00217_000917<br>CORRESPONDENCE<br>4 | 05-08-2006  | BRAC PMO WEST                        | TRANSMITTAL OF REVISED FINAL FOURTH QUARTER (OCTOBER - DECEMBER) 2004 GROUNDWATER SAMPLING REPORT (ENCLOSURE IS RECORD # 916)                                                                                                                 | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                                           |
| AR_N00217_000876<br>REPORT<br>75        | 05-10-2006  | INNOVATIVE TECHNICAL SOLUTIONS, INC. | FINAL FEBRUARY 2006 MONTHLY LANDFILL GAS MONITORING REPORT, POST-REMOVAL ACTION [INCLUDES REPLACEMENT PAGES CONVERTING DRAFT FINAL DATED 29 MARCH 2006 TO FINAL, AND CD COPY] (SEE RECORD # 877 AND # 911- BRAC PMO WEST TRANSMITTAL LETTERS) | YES     | BLDG 0000830<br>PARCEL A<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00021                                                                 |
| AR_N00217_000948<br>REPORT<br>8         | 05-18-2006  | TETRA TECH EC, INC.                  | FINAL ADDENDUM 1 TO THE FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) PCB HOT SPOT SOIL EXCAVATION [CD COPY ENCLOSED]                                                                             | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                     |
| AR_N00217_001015<br>MINUTES<br>14       | 05-25-2006  | BARAJAS AND ASSOCIATES, INC.         | 25 MAY 2006 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES LIST OF ATTENDEES AND ACTION ITEMS)                                                                                                                                    | YES     | BLDG 0000813<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>SITE 00007<br>SITE 00018                                                                   |

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| AR_N00217_000950<br>CORRESPONDENCE<br>5  | 05-31-2006  | BRAC PMO WEST                        | TRANSMITTAL OF THE FINAL ADDENDUM 1 TO THE FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) PCB HOT SPOT SOIL EXCAVATION SITE [ENCLOSURE IS RECORD # 948]  | YES     | PARCEL E<br>PARCEL E-2                                                                                 |
| AR_N00217_004226<br>CORRESPONDENCE<br>35 | 06-30-2006  | BRAC PMO WEST                        | TRANSMITTAL OF NAVY RESPONSE TO COMMENTS ON THE DRAFT SHORELINE CHARACTERIZATION TECHNICAL MEMORANDUM (W/ ENCLOSURE)                                                                                | YES     | PARCEL E<br>PARCEL E-2                                                                                 |
| AR_N00217_001356<br>REPORT<br>57         | 07-01-2006  | SHAW ENVIRONMENTAL, INC.             | FINAL REPORT MECHANOCHEMICAL DESTRUCTION TREATABILITY STUDY POLYCHLORINATED BIPHENYLS CONTAMINATED SOILS PARCEL SHORELINE (CD COPY ENCLOSED) [SEE RECORD # 1355 - BRAC PMO WEST TRANSMITTAL LETTER] | YES     | PARCEL E                                                                                               |
| AR_N00217_001355<br>CORRESPONDENCE<br>4  | 07-10-2006  | BRAC PMO WEST                        | TRANSMITTAL OF THE FINAL MECHANOCHEMICAL DESTRUCTION TREATABILITY STUDY POLYCHLORINATED BIPHENYLS CONTAMINATED SOILS REPORT, SHORELINE (ENCLOSURE IS RECORD # 1356)                                 | YES     | PARCEL E                                                                                               |
| AR_N00217_000920<br>REPORT<br>57         | 07-17-2006  | INNOVATIVE TECHNICAL SOLUTIONS, INC. | FINAL MONTHLY LANDFILL GAS MONITORING REPORT FOR APRIL 2006, POST REMOVAL ACTION, INDUSTRIAL LANDFILL (INCLUDES REPLACEMENT PAGES CONVERTING THE DRAFT DATED 30 MAY 2006 TO FINAL AND CD COPY)      | YES     | BLDG 0000830<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00021                         |
| AR_N00217_000991<br>REPORT<br>2904       | 08-01-2006  | CE2 - KLEINFELDER, JOINT VENTURE     | QUARTERLY GROUNDWATER MONITORING REPORT (OCTOBER-DECEMBER 2005), REVISION 1 [SEE RECORD # 990 - BRAC PMO WEST TRANSMITTAL, AND RECORD # 909 - DRAFT QUARTERLY GROUNDWATER MONITORING REPORT]        | YES     | "PERCHLORATE"<br>SEARCH -<br>ROUND 1<br>BLDG 0000819<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2 |

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| AR_N00217_000966<br>REPORT<br>58         | 08-14-2006  | INNOVATIVE TECHNICAL<br>SOLUTIONS, INC. | FINAL MONTHLY LANDFILL GAS MONITORING REPORT<br>FOR MAY 2006, POST-REMOVAL ACTION, INDUSTRIAL<br>LANDFILL (INCLUDES REPLACEMENT PAGES<br>CONVERTING DRAFT DATED 26 JUNE 2006 TO FINAL,<br>RESPONSE TO REGULATORY AGENCY COMMENTS ON<br>THE DRAFT REPORT AND CD COPY) | YES     | BLDG 0000830<br>PARCEL A<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00021<br>WELL IR-74-MW-<br>001A |
| AR_N00217_001021<br>MINUTES<br>12        | 08-24-2006  | BARAJAS AND ASSOCIATES, INC.            | 24 AUGUST 2006 RESTORATION ADVISORY BOARD<br>(RAB) MEETING MINUTES (INCLUDES LIST OF<br>ATTENDEES AND ACTION ITEMS)                                                                                                                                                  | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F                                   |
| AR_N00217_000990<br>CORRESPONDENCE<br>4  | 08-31-2006  | BRAC PMO WEST                           | TRANSMITTAL OF THE QUARTERLY GROUNDWATER<br>MONITORING REPORT, (OCTOBER-DECEMBER 2005),<br>REVISION 1 [ENCLOSURE IS RECORD # 991]                                                                                                                                    | YES     | PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2                                                           |
| AR_N00217_000992<br>CORRESPONDENCE<br>52 | 09-08-2006  | BRAC PMO WEST                           | TRANSMITTAL OF 1) FEDERAL FACILITY AGREEMENT<br>SCHEDULE, AND 2) PROJECT SCHEDULE<br>(W/ENCLOSURES) [SEE RECORD # 889 - FEDERAL<br>FACILITY AGREEMENT SCHEDULE]                                                                                                      | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F                                   |
| AR_N00217_000980<br>REPORT<br>62         | 09-18-2006  | INNOVATIVE TECHNICAL<br>SOLUTIONS, INC. | FINAL MONTHLY LANDFILL GAS MONITORING REPORT<br>FOR JUNE 2006, POST-REMOVAL ACTION, INDUSTRIAL<br>LANDFILL (INCLUDES REPLACEMENT PAGES<br>CONVERTING DRAFT DATED 02 AUGUST 2006 TO FINAL)<br>{REPLACEMENT PAGES ISSUED ON 18 SEPTEMBER<br>2006}                      | YES     | BLDG 0000830<br>PARCEL A<br>PARCEL E<br>PARCEL E-2<br>WELL MW-001A                                       |
| AR_N00217_000916<br>REPORT<br>3794       | 09-29-2006  | KLEINFELDER                             | REVISED FINAL FOURTH QUARTER (OCTOBER -<br>DECEMBER) 2004 GROUNDWATER SAMPLING REPORT<br>(INCLUDES REPLACEMENT PAGES REVISING THE DATE<br>OF 28 APRIL 2006 TO 29 SEPTEMBER 2006 AND CD<br>COPY)                                                                      | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                         |

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| AR_N00217_001458<br>CORRESPONDENCE<br>5 | 09-29-2006  | BRAC PMO WEST                    | TRANSMITTAL OF REPLACEMENT PAGES REVISING THE DATE ON THE FINAL FOURTH QUARTER (OCTOBER-DECEMBER) 2004 GROUNDWATER SAMPLING REPORT (ENCLOSURE IS RECORD # 916)                                       | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                                                                                                                                                                                                                                                                                                                               |
| AR_N00217_000989<br>REPORT<br>3362      | 10-01-2006  | CE2 - KLEINFELDER, JOINT VENTURE | QUARTERLY GROUNDWATER MONITORING REPORT, OCTOBER - DECEMBER 2005, AND ANNUAL REPORT 2005, REVISION 2 [INCLUDES REPLACEMENT PAGES CONVERTING REVISION 1 DATED 01 JULY 2006 TO REVISION 2 AND CD COPY] | YES     | BLDG 0000123<br>BLDG 0000134<br>BLDG 0000141<br>PARCEL A<br>PARCEL B<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>WELL IR-06-MW-014A<br>WELL IR-06-MW-054A<br>WELL IR-07-MW-S-002<br>WELL IR-07-MW-S-003<br>WELL IR-10-MW-012A<br>WELL IR-10-MW-013A-1<br>WELL IR-10-MW-028A<br>WELL IR-10-MW-059A<br>WELL IR-10-MW-061A<br>WELL IR-10-MW-071A<br>WELL IR-26-MW-046A<br>WELL IR-26-MW-047A<br>WELL IR-26-MW-048A<br>WELL PA-24-MW-002A |

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| AR_N00217_001010<br>CORRESPONDENCE<br>4 | 10-11-2006  | BRAC PMO WEST                        | TRANSMITTAL OF FINAL (APRIL - JUNE) 2005, SIXTH QUARTER GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 1011)                                                                                                                     | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                     |
| AR_N00217_001011<br>REPORT<br>3538      | 10-11-2006  | KLEINFELDER                          | FINAL (APRIL - JUNE) 2005, SIXTH QUARTER GROUNDWATER SAMPLING REPORT (CD COPY ENCLOSED) [SEE RECORD # 1010 - BRAC PMO WEST TRANSMITTAL LETTER]                                                                                         | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                     |
| AR_N00217_001013<br>REPORT<br>1025      | 10-17-2006  | KLEINFELDER                          | FINAL JULY TO SEPTEMBER 2005, SEVENTH QUARTER, GROUNDWATER MONITORING REPORT (CD COPY ENCLOSED) [SEE RECORD # 1012 - BRAC PMO WEST TRANSMITTAL LETTER]                                                                                 | YES     | PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2                                       |
| AR_N00217_000984<br>REPORT<br>62        | 10-18-2006  | INNOVATIVE TECHNICAL SOLUTIONS, INC. | FINAL MONTHLY LANDFILL GAS MONITORING REPORT FOR JULY 2006, POST-REMOVAL ACTION, INDUSTRIAL LANDFILL (INCLUDES REPLACEMENT PAGES CONVERTING DRAFT DATED 28 AUGUST 2006 TO FINAL) [SEE RECORD # 983 - BRAC PMO WEST TRANSMITTAL LETTER] | YES     | BLDG 0000830<br>PARCEL A<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>WELL IR-74-MW-001A |
| AR_N00217_001028<br>REPORT<br>26        | 10-23-2006  | TETRA TECH EC, INC.                  | AIR MONITORING PLAN, BASE-WIDE STORM DRAIN AND SANITARY SEWER REMOVAL                                                                                                                                                                  | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F               |
| AR_N00217_001065<br>CORRESPONDENCE<br>5 | 11-17-2006  | BRAC PMO WEST                        | TRANSMITTAL OF THE FINAL JANUARY TO MARCH 2005 FIFTH QUARTERLY/FIRST ANNUAL GROUNDWATER MONITORING REPORT, VOLUMES I - II OF II (ENCLOSURE IS RECORD # 1066)                                                                           | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                     |

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| AR_N00217_001066<br>REPORT<br>15662     | 11-17-2006  | KLEINFELDER                  | FINAL JANUARY TO MARCH 2005, FIFTH<br>QUARTERLY/FIRST ANNUAL GROUNDWATER SAMPLING<br>REPORT, VOLUMES I AND II OF II (CD COPY ENCLOSED)<br>[SEE RECORD # 1065 - BRAC PMO WEST TRANSMITTAL<br>LETTER] | YES     | "PERCHLORATE<br>" SEARCH -<br>ROUND 1<br>BLDG 0000231<br>BLDG 0000251<br>BLDG 0000253<br>BLDG 0000272<br>BLDG 0000406<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00028 |
| AR_N00217_001055<br>CORRESPONDENCE<br>4 | 11-21-2006  | BRAC PMO WEST                | TRANSMITTAL OF THE QUARTERLY GROUNDWATER<br>MONITORING REPORT (APRIL - JUNE 2006)<br>[ENCLOSURE IS RECORD # 1056]                                                                                   | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                                                                      |
| AR_N00217_001067<br>CORRESPONDENCE<br>4 | 11-28-2006  | BRAC PMO WEST                | TRANSMITTAL OF DRAFT WETLANDS MITIGATION AND<br>MONITORING PLAN, METAL DEBRIS REEF AND METAL<br>SLAG AREAS (ENCLOSURE IS RECORD # 1069)                                                             | YES     | PARCEL E<br>PARCEL E-2                                                                                                                                                                |
| AR_N00217_004208<br>MINUTES<br>15       | 12-07-2006  | BARAJAS AND ASSOCIATES, INC. | 07 DECEMBER 2006 RESTORATION ADVISORY BOARD<br>(RAB) MEETING MINUTES (INCLUDES AGENDA AND<br>ATTACHMENTS A AND B)                                                                                   | YES     | BLDG 0000123<br>BLDG 0000157<br>BLDG 0000164<br>BLDG 0000813<br>BLDG 0000819<br>PARCEL A<br>PARCEL B<br>PARCEL D<br>PARCEL E-2<br>SITE 00002<br>SITE 00003                            |



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| AR_N00217_001034<br>REPORT<br>60        | 12-19-2006  | INNOVATIVE TECHNICAL<br>SOLUTIONS, INC. | FINAL MONTHLY LANDFILL GAS MONITORING REPORT<br>FOR SEPTEMBER 2006, POST-REMOVAL ACTION,<br>INDUSTRIAL LANDFILL (INCLUDES REPLACEMENT<br>PAGES CONVERTING THE DRAFT DATED 01 NOVEMBER<br>2006 TO FINAL AND CD COPY) | YES     | BLDG 0000830<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00021<br>WELL IR-74-MW-<br>001A                                                                                    |
| AR_N00217_004210<br>MINUTES<br>18       | 01-25-2007  | BARAJAS AND ASSOCIATES, INC.            | 25 JANUARY 2007 RESTORATION ADVISORY BOARD<br>(RAB) MEETING MINUTES (INCLUDES AGENDA AND<br>ATTACHMENTS A AND B)                                                                                                    | YES     | BLDG 0000113<br>BLDG 0000113A<br>BLDG 0000130<br>BLDG 0000133<br>BLDG 0000142<br>BLDG 0000144<br>BLDG 0000146<br>BLDG 0000157<br>PARCEL A<br>PARCEL B<br>PARCEL D<br>PARCEL E<br>SITE 00002 |
| AR_N00217_004191<br>CORRESPONDENCE<br>4 | 01-31-2007  | BRAC PMO WEST                           | TRANSMITTAL OF QUARTERLY GROUNDWATER<br>MONITORING REPORT, JULY-SEPTEMBER 2006<br>(ENCLOSURE IS RECORD # 4192)                                                                                                      | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                                                                                                            |
| AR_N00217_004212<br>MINUTES<br>17       | 02-22-2007  | BARAJAS AND ASSOCIATES, INC.            | 22 FEBRUARY 2007 RESTORATION ADVISORY BOARD<br>(RAB) MEETING MINUTES (INCLUDES AGENDA AND<br>ATTACHMENTS A AND B)                                                                                                   | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00009                                                                                                        |

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| AR_N00217_004229<br>REPORT<br>63        | 03-19-2007  | INNOVATIVE TECHNICAL<br>SOLUTIONS, INC. | FINAL MONTHLY LANDFILL GAS MONITORING REPORT<br>DECEMBER 2006 POST REMOVAL ACTION INDUSTRIAL<br>LANDFILL (INCLUDES REPLACEMENT PAGES<br>CONVERTING DRAFT DATED 31 JANUARY 2007 TO<br>FINAL, AND CD COPY] | YES     | BLDG 0000830<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00021<br>WELL IR-74-MW-<br>001A |
| AR_N00217_001125<br>MINUTES<br>18       | 03-22-2007  | BARAJAS AND ASSOCIATES, INC.            | 22 MARCH 2007 RESTORATION ADVISORY BOARD (RAB)<br>MEETING MINUTES (INCLUDES AGENDA, LIST OF<br>ATTENDEES, AND VARIOUS HANDOUTS)                                                                          | YES     | PARCEL E<br>PARCEL E-2                                                                                   |
| AR_N00217_004232<br>CORRESPONDENCE<br>4 | 03-30-2007  | BRAC PMO WEST                           | TRANSMITTAL OF REPLACEMENT PAGES CONVERTING<br>THE QUARTERLY GROUNDWATER MONITORING<br>REPORT (JANUARY-MARCH 2006) DATED 01 AUGUST<br>2006 TO REVISION 1 (ENCLOSURE IS RECORD # 1000)                    | YES     | PARCEL C<br>PARCEL D<br>PARCEL E                                                                         |
| AR_N00217_001126<br>MINUTES<br>17       | 04-26-2007  | BARAJAS AND ASSOCIATES, INC.            | 26 APRIL 2007 RESTORATION ADVISORY BOARD (RAB)<br>MEETING MINUTES (INCLUDES AGENDA, LIST OF<br>ATTENDEES, AND VARIOUS HANDOUTS)                                                                          | YES     | PARCEL B<br>PARCEL E<br>PARCEL E-2<br>PARCEL E-3<br>SITE 00001<br>SITE 00002<br>SITE 00026               |

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| AR_N00217_004190<br>REPORT<br>3450 | 05-01-2007  | CE2 - KLEINFELDER, JOINT<br>VENTURE | QUARTERLY GROUNDWATER MONITORING REPORT,<br>JULY-SEPTEMBER 2006, REVISION 1 (INCLUDES<br>REPLACEMENT PAGES CONVERTING THE DOCUMENT,<br>DATED 01 JANUARY 2007, TO REVISION 1, AND CD<br>COPY) {SEE RECORD # 1083 - BRAC PMO WEST<br>TRANSMITTAL LETTER} | YES     | BLDG 0000123<br>BLDG 0000134<br>BLDG 0000141<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>SITE 00010<br>SITE 00026<br>WELL IR-05-MW-<br>050A<br>WELL IR-06-MW-<br>049A<br>WELL IR-07-MW-<br>019A<br>WELL IR-07-MW-<br>020A-1<br>WELL IR-10-MW-<br>0012A<br>WELL IR-10-MW-<br>082A<br>WELL IR-26-MW-<br>046A<br>WELL IR-26-MW-<br>047A<br>WELL IR-26-MW-<br>048A<br>WELL IR-26-MW-<br>049A<br>WELL IR-26-MW-<br>050A<br>WELL IR-60-MW-<br>008A |

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| AR_N00217_004192<br>REPORT<br>4120 | 05-01-2007  | CE2 - KLEINFELDER, JOINT<br>VENTURE | QUARTERLY GROUNDWATER MONITORING REPORT<br>(JULY-SEPTEMBER 2006), REVISION 1 [INCLUDES<br>REPLACEMENT PAGES CONVERTING REVISION 0<br>DATED 01 JANUARY 2007 TO REVISION 1, ANALYTICAL<br>DATA - PAPER ONLY, AND CD COPY] | YES     | BLDG 0000058<br>BLDG 0000134<br>BLDG 0000211<br>BLDG 0000231<br>BLDG 0000251<br>BLDG 0000253<br>BLDG 0000272<br>BLDG 0000281<br>BLDG 0000600<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00006<br>SITE 00009<br>SITE 00012<br>SITE 00025<br>SITE 00033<br>SITE 00036<br>SITE 00056<br>SITE 00072<br>WELL IR-09-<br>PPY-001<br>WELL IR-12-MW-<br>021A<br>WELL IR-28-MW-<br>151A<br>WELL IR-33-MW-<br>061A<br>WELL IR-39-MW-<br>021A<br>WELL PA-36-<br>MW-008A |

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| AR_N00217_001099<br>CORRESPONDENCE<br>4 | 06-03-2007  | BRAC PMO WEST                                                | TRANSMITTAL OF QUARTERLY GROUNDWATER MONITORING REPORT (JANUARY - MARCH 2007) AND ANNUAL REPORT (ENCLOSURE IS RECORD # 1100)                                                                                                                              | YES     | PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2                         |
| AR_N00217_001194<br>CORRESPONDENCE<br>5 | 06-29-2007  | BRAC PMO WEST                                                | TRANSMITTAL OF 1) RESPONSES TO COMMENTS ON THE DRAFT SHORELINE CHARACTERIZATION TECHNICAL MEMORANDUM AND 2) REPLACEMENT PAGES FOR THE DRAFT SHORELINE CHARACTERIZATION TECHNICAL MEMORANDUM (ENCLOSURE 1) IS RECORD # 1195 AND #1198 2) IS RECORD # 4177) | YES     | PARCEL E<br>PARCEL E-2                                                 |
| AR_N00217_004314<br>CORRESPONDENCE<br>4 | 07-05-2007  | CALIFORNIA DEPARTMENT OF PARKS AND RECREATION - PETALUMA, CA | REVIEW AND COMMENTS ON THE 1) DRAFT WETLANDS MITIGATION AND MONITORING PLAN, METAL DEBRIS REEF AND METAL SLAG AREAS; AND 2) DRAFT REMEDIAL INVESTIGATION/FEASIBILITY STUDY                                                                                | YES     | PARCEL E<br>PARCEL E-2                                                 |
| AR_N00217_001106<br>REPORT<br>19        | 07-06-2007  | BARAJAS AND ASSOCIATES, INC.                                 | FEDERAL FACILITIES AGREEMENT SCHEDULE (SEE RECORD # 1105 - BRAC PMO WEST TRANSMITTAL LETTER)                                                                                                                                                              | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F |
| AR_N00217_004313<br>CORRESPONDENCE<br>3 | 07-19-2007  | ARC ECOLOGY                                                  | REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION/FEASIBILITY STUDY (SEE RECORD # 1316 - DRAFT REMEDIAL INVESTIGATION/FEASIBILITY STUDY)                                                                                                            | YES     | PARCEL E<br>PARCEL E-2                                                 |
| AR_N00217_001135<br>CORRESPONDENCE<br>7 | 07-27-2007  | BRAC PMO WEST                                                | TRANSMITTAL OF THE DRAFT REVISED REMEDIAL INVESTIGATION REPORT (ENCLOSURE IS RECORD # 1137)                                                                                                                                                               | YES     | PARCEL E                                                               |
| AR_N00217_001108<br>CORRESPONDENCE<br>5 | 07-31-2007  | BRAC PMO WEST                                                | TRANSMITTAL OF DRAFT REMOVAL ACTION COMPLETION REPORT, POLYCHLORINATED BIPHENYLS HOT SPOT SOIL EXCAVATION SITE (ENCLOSURE IS RECORD # 1109)                                                                                                               | YES     | PARCEL E<br>PARCEL E-2                                                 |

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| Record Type                        |             |                                     |                                                                                                                                                                                                                         |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| Approx. # Pages                    | Record Date | Author Affiliation                  | Title                                                                                                                                                                                                                   | Imaged? | Sites                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| AR_N00217_001089<br>REPORT<br>4710 | 08-01-2007  | CE2 - KLEINFELDER, JOINT<br>VENTURE | QUARTERLY GROUNDWATER MONITORING REPORT<br>(OCTOBER - DECEMBER 2006) REVISION 1 (INCLUDES<br>REPLACEMENT PAGES CONVERTING APRIL 2007<br>REPORT TO REVISION 1) [SEE RECORD # 1191 - BRAC<br>PMO WEST TRANSMITTAL LETTER] | YES     | BLDG 0000134<br>BLDG 0000211<br>BLDG 0000231<br>NORTH<br>BLDG 0000231<br>SOUTH<br>BLDG 0000251<br>BLDG 0000253<br>BLDG 0000258<br>BLDG 0000272<br>BLDG 0000281<br>BLDG 0000600<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00002<br>SITE 00003<br>SITE 00009<br>SITE 00012<br>SITE 00025<br>SITE 00028<br>SITE 00032<br>SITE 00033<br>SITE 00036<br>SITE 00056<br>SITE 00071<br>SITE 00072<br>WELL IR-02-MW-<br>179A<br>WELL IR-02-MW-<br>209A<br>WELL IR-06-MW-<br>035A1<br>WELL IR-06-MW-<br>040A<br>WELL IR-06-MW-<br>059A-1 |

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| Record Type | Record Date | Author Affiliation | Title | Imaged? | Sites                 |
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|             |             |                    |       |         | WELL IR-09-MW-051F    |
|             |             |                    |       |         | WELL IR-09-MW-PPY-001 |
|             |             |                    |       |         | WELL IR-12-MW-021A    |
|             |             |                    |       |         | WELL IR-25-MW-011A    |
|             |             |                    |       |         | WELL IR-25-MW-016A    |
|             |             |                    |       |         | WELL IR-25-MW-054A    |
|             |             |                    |       |         | WELL IR-25-MW-0902B   |
|             |             |                    |       |         | WELL IR-28-MW-136A    |
|             |             |                    |       |         | WELL IR-28-MW-151A    |
|             |             |                    |       |         | WELL IR-28-MW-169A    |
|             |             |                    |       |         | WELL IR-28-MW-188F    |
|             |             |                    |       |         | WELL IR-28-MW-211F    |
|             |             |                    |       |         | WELL IR-28-MW-300F    |
|             |             |                    |       |         | WELL IR-28-MW-406A    |
|             |             |                    |       |         | WELL IR-28-MW-407     |
|             |             |                    |       |         | WELL IR-28-MW-407A    |
|             |             |                    |       |         | WELL IR-33-MW-061A    |
|             |             |                    |       |         | WELL IR-36-MW-008A    |
|             |             |                    |       |         | WELL IR-39-MW-021A    |
|             |             |                    |       |         | WELL IR-50-MW-007A    |
|             |             |                    |       |         | WELL IR-58-MW-031A    |

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| Approx. # Pages                         | Record Date | Author Affiliation           | Title                                                                                                                                          | Imaged? | Sites                                          |
|                                         |             |                              |                                                                                                                                                |         | WELL IR-58-MW-033B<br>WELL IR-71-MW-003A       |
| AR_N00217_001133<br>CORRESPONDENCE<br>5 | 08-17-2007  | BRAC PMO WEST                | TRANSMITTAL OF THE DRAFT REMOVAL ACTION COMPLETION REPORT, METAL DEBRIS REEF AND METAL SLAG AREA EXCAVATION SITES (ENCLOSURE IS RECORD # 1134) | YES     | PARCEL E<br>PARCEL E-2                         |
| AR_N00217_001436<br>MINUTES<br>46       | 08-23-2007  | BARAJAS AND ASSOCIATES, INC. | 23 AUGUST 2007 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES LIST OF ATTENDEES, VARIOUS HANDOUTS, TRANSCRIPT, AND CD COPY)        | YES     | PARCEL A<br>PARCEL B<br>PARCEL E<br>PARCEL E-2 |



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| Approx. # Pages                    | Record Date | Author Affiliation                  | Title                                                                                                 | Imaged? | Sites                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| AR_N00217_001091<br>REPORT<br>4118 | 10-01-2007  | CE2 - KLEINFELDER, JOINT<br>VENTURE | QUARTERLY GROUNDWATER MONITORING REPORT<br>(OCTOBER - DECEMBER 2006) AND ANNUAL REPORT,<br>REVISION 1 | YES     | BLDG 0000123<br>BLDG 0000130<br>BLDG 0000141<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>SITE 00010<br>SITE 00025<br>SITE 00026<br>WELL IR-07-MW-<br>022A-1<br>WELL IR-10-MW-<br>012A<br>WELL IR-10-MW-<br>013A-1<br>WELL IR-10-MW-<br>033A<br>WELL IR-10-MW-<br>059A<br>WELL IR-10-MW-<br>061A<br>WELL IR-10-MW-<br>062A<br>WELL IR-10-MW-<br>071A<br>WELL IR-24-MW-<br>006A<br>WELL IR-26-MW-<br>047A<br>WELL IR-26-MW-<br>048A<br>WELL IR-26-MW-<br>049A<br>WELL IR-26-MW-<br>050A |

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| Record Type<br>Approx. # Pages          | Record Date | Author Affiliation               | Title                                                                                                                                                                                                                | Imaged? | Sites                                                      |
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| AR_N00217_001191<br>CORRESPONDENCE<br>4 | 10-18-2007  | BRAC PMO WEST                    | TRANSMITTAL OF REPLACEMENT PAGES CONVERTING THE QUARTERLY GROUNDWATER MONITORING REPORT (OCTOBER - DECEMBER 2006) TO REVISION 1 [ENCLOSURE IS RECORD # 1089]                                                         | YES     | PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2             |
| AR_N00217_001100<br>REPORT<br>4990      | 11-01-2007  | CE2 - KLEINFELDER, JOINT VENTURE | QUARTERLY GROUNDWATER MONITORING REPORT (JANUARY - MARCH 2007) AND ANNUAL REPORT, REVISION 1 (INCLUDES REPLACEMENT PAGES CONVERTING DOCUMENT, DATED 01 JUNE 2007, TO REVISION 1, AND CD COPY)                        | YES     | PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2             |
| AR_N00217_004312<br>CORRESPONDENCE<br>8 | 11-07-2007  | DTSC - BERKELEY, CA              | REVIEW AND COMMENTS ON THE DRAFT RADIOLOGICAL ADDENDUM TO THE DRAFT REMEDIAL INVESTIGATION/FEASIBILITY STUDY (SEE RECORD # 1318 - DRAFT RADIOLOGICAL ADDENDUM TO THE DRAFT REMEDIAL INVESTIGATION/FEASIBILITY STUDY) | YES     | PARCEL E<br>PARCEL E-2                                     |
| AR_N00217_001231<br>CORRESPONDENCE<br>4 | 11-15-2007  | BRAC PMO WEST                    | TRANSMITTAL OF REPLACEMENT PAGES CONVERTING QUARTERLY GROUNDWATER MONITORING REPORT (JANUARY - MARCH 2007) AND ANNUAL REPORT, DATED 1 JUNE 2007, TO REVISION 1 (ENCLOSURE IS RECORD # 1100)                          | YES     | PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2             |
| AR_N00217_001246<br>CORRESPONDENCE<br>5 | 12-31-2007  | BRAC PMO WEST                    | TRANSMITTAL OF THE FINAL REMOVAL ACTION COMPLETION REPORT (ENCLOSURE IS RECORD # 1247)                                                                                                                               | YES     | PARCEL E<br>SITE 00002                                     |
| AR_N00217_001264<br>REPORT<br>99        | 01-18-2008  | BARAJAS AND ASSOCIATES, INC.     | FINAL TECHNICAL MEMORANDUM: NONREPRESENTATIVE GROUNDWATER SAMPLES AND INFLUENCES ON RESULTS OF HUMAN HEALTH, RISK ASSESSMENTS (CD COPY ENCLOSED) [SEE RECORD # 1263 - BRAC PMO WEST TRANSMITTAL LETTER]              | YES     | PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2 |

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| AR_N00217_001487<br>MINUTES<br>45       | 01-24-2008  | BARAJAS AND ASSOCIATES, INC. | 24 JANUARY 2008 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES AND TRANSCRIPT (INCLUDES LIST OF ATTENDEES, ACTION ITEMS, AND CD COPY)  | YES     | BLDG 0000117<br>BLDG 0000140<br>BLDG 0000813<br>BLDG 0000819<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>SITE 00007<br>SITE 00009<br>SITE 00018<br>SITE 00026<br>SITE 00033<br>SITE 00071<br>WELL 00046A<br>WELL 00047A<br>WELL 00048A<br>WELL 00049A |
| AR_N00217_001278<br>CORRESPONDENCE<br>7 | 02-04-2008  | BRAC PMO WEST                | TRANSMITTAL OF THE DRAFT FINAL REVISED REMEDIAL INVESTIGATION REPORT (ENCLOSURE IS RECORD # 1281                                         | YES     | PARCEL E                                                                                                                                                                                                                                                                               |
| AR_N00217_001488<br>MINUTES<br>40       | 02-28-2008  | BARAJAS AND ASSOCIATES, INC. | 28 FEBRUARY 2008 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES AND TRANSCRIPT (INCLUDES LIST OF ATTENDEES, ACTION ITEMS, AND CD COPY) | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2                                                                                                                                                                                                                 |
| AR_N00217_001489<br>MINUTES<br>38       | 03-27-2008  | BARAJAS AND ASSOCIATES, INC. | 27 MARCH 2008 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES AND TRANSCRIPT (INCLUDES LIST OF ATTENDEES, ACTION ITEMS, AND CD COPY)    | YES     | PARCEL A<br>PARCEL E<br>PARCEL E-2<br>SITE 00002                                                                                                                                                                                                                                       |

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| AR_N00217_001328<br>ANALYTICAL DATA<br>99999 | 04-30-2008  | TETRA TECH EC, INC.          | COMBINED ANALYTICAL DATA FOR FINAL REMOVAL ACTION COMPLETION REPORT DATED 12 DECEMBER 2007 [SEE RECORD #1247], AND FOR FINAL REMOVAL ACTION COMPLETION REPORT DATED 30 NOVEMBER 2007 [SEE RECORD # 1256]      | NO      | PARCEL E<br>PARCEL E-2<br>SITE 00002                                                                                                                                                                                                                                              |
| AR_N00217_001281<br>REPORT<br>232814         | 05-02-2008  | BARAJAS AND ASSOCIATES, INC. | FINAL REVISED REMEDIAL INVESTIGATION REPORT , (INCLUDES ANALYTICAL DATA - PAPER ONLY AND CD COPY ENCLOSED) {SEE RECORDS # 1278 AND # 1344 - BRAC PMO WEST TRANSMITTAL LETTERS}                                | YES     | PARCEL E                                                                                                                                                                                                                                                                          |
| AR_N00217_001344<br>CORRESPONDENCE<br>6      | 05-02-2008  | BRAC PMO WEST                | TRANSMITTAL OF THE REPLACEMENT PAGES CONVERTING THE DRAFT FINAL REVISED REMEDIAL INVESTIGATION REPORT, DATED 04 FEBRUARY 2008 TO THE FINAL REVISED REMEDIAL INVESTIGATION REPORT (ENCLOSURE IS RECORD # 1281) | YES     | PARCEL E                                                                                                                                                                                                                                                                          |
| AR_N00217_001492<br>MINUTES<br>44            | 06-26-2008  | BARAJAS AND ASSOCIATES, INC. | 26 JUNE 2008 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES AND TRANSCRIPT (INCLUDES LIST OF ATTENDEES, ACTION ITEMS, AND CD COPY)                                                                          | YES     | BLDG 0000140<br>BLDG 0000144<br>BLDG 0000317<br>BLDG 0000351<br>BLDG 0000351A<br>BLDG 0000364<br>BLDG 0000365<br>BLDG 0000366<br>BLDG 0000401<br>BLDG 0000408<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL D-2<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>SITE 00007<br>SITE 00317 |
| AR_N00217_001404<br>CORRESPONDENCE<br>5      | 08-31-2008  | BRAC PMO WEST                | TRANSMITTAL OF THE FINAL ANNUAL LANDFILL CAP OPERATION AND MAINTENANCE REPORT FOR 2007-2008, INDUSTRIAL LANDFILL [ENCLOSURE IS RECORD # 1405]                                                                 | YES     | PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00021                                                                                                                                                                                                                                |

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| AR_N00217_001498<br>CORRESPONDENCE<br>6 | 01-29-2009  | BRAC PMO WEST                | TRANSMITTAL OF THE DRAFT FINAL WETLANDS<br>MITIGATION AND MONITORING PLAN (ENCLOSURE IS<br>RECORD # 1499)                                                                            | YES     | PARCEL B<br>PARCEL E<br>PARCEL E-2 |
| AR_N00217_001568<br>CORRESPONDENCE<br>5 | 05-05-2009  | BRAC PMO WEST                | TRANSMITTAL OF THE DRAFT WORK PLAN FOR THE<br>GROUNDWATER TREATABILITY STUDY (ENCLOSURE IS<br>RECORD # 1569)                                                                         | YES     | PARCEL E                           |
| AR_N00217_001625<br>CORRESPONDENCE<br>6 | 05-22-2009  | BRAC PMO WEST                | TRANSMITTAL OF THE DRAFT PETROLEUM<br>HYDROCARBON CORRECTIVE ACTION PLAN REVISION<br>2009 (CD COPY ENCLOSED) [ENCLOSURE IS RECORD #<br>1626]                                         | YES     | PARCEL E                           |
| AR_N00217_004301<br>CORRESPONDENCE<br>2 | 06-12-2009  | ARC ECOLOGY                  | REVIEW AND COMMENTS ON THE DRAFT FINAL<br>REMEDIAL INVESTIGATION/FEASIBILITY STUDY<br>REPORT (SEE RECORD # 1636 - DRAFT FINAL<br>REMEDIAL INVESTIGATION/FEASIBILITY STUDY<br>REPORT) | YES     | PARCEL E<br>PARCEL E-2             |
| AR_N00217_004310<br>CORRESPONDENCE<br>6 | 06-12-2009  | U.S. EPA - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT FINAL<br>REMEDIAL INVESTIGATION/FEASIBILITY STUDY<br>REPORT (SEE RECORD # 1636 - DRAFT FINAL<br>REMEDIAL INVESTIGATION/FEASIBILITY STUDY<br>REPORT) | YES     | PARCEL B<br>PARCEL E<br>PARCEL E-2 |

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| Approx. # Pages                    | Record Date | Author Affiliation                  | Title                                                                                                                                                    | Imaged? | Sites                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| AR_N00217_001673<br>REPORT<br>5263 | 07-01-2009  | CE2 - KLEINFELDER, JOINT<br>VENTURE | SEMI-ANNUAL GROUNDWATER MONITORING REPORT<br>(OCTOBER 2008 - MARCH 2009) [CD COPY ENCLOSED]<br>{SEE RECORD # 1672 - BRAC PMO WEST TRANSMITTAL<br>LETTER} | YES     | "PERCHLORATE<br>" SEARCH -<br>ROUND 2<br>PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL D-2<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-1<br>WELL IR-01-MW-<br>065A<br>WELL IR-02-MW-<br>024A<br>WELL IR-02-MW-<br>183A<br>WELL IR-02-MW-<br>206A-1<br>WELL IR-02-MW-<br>206A-2<br>WELL IR-02-MW-<br>374A<br>WELL IR-02-MW-<br>375A<br>WELL IR-04-MW-<br>031A<br>WELL IR-07-MW-<br>020A-1<br>WELL IR-07-MW-<br>021A-1<br>WELL IR-07-MW-<br>025A<br>WELL IR-07-MW-<br>026A<br>WELL IR-07-MW-<br>093A<br>WELL IR-07-MW-<br>S-004<br>WELL IR-12-MW-<br>011A |

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| Approx. # Pages                         | Record Date | Author Affiliation | Title                                                                                                  | Imaged? | Sites                                                                                                                                                                                                                                                                                                             |
|                                         |             |                    |                                                                                                        |         | WELL IR-25-MW-060A-1<br>WELL IR-26-MW-049A<br>WELL IR-26-MW-051A<br>WELL IR-28-MW-394B<br>WELL IR-28-MW-914A<br>WELL IR-33-MW-002A<br>WELL IR-34-MW-036B<br>WELL IR-46-MW-049A<br>WELL IR-46-MW-050A<br>WELL IR-46-MW-051A<br>WELL IR-46-MW-052A<br>WELL IR-73-MW-004A<br>WELL PA-36-MW-004A<br>WELL UT03-MW-011A |
| AR_N00217_001652<br>CORRESPONDENCE<br>5 | 07-02-2009  | BRAC PMO WEST      | TRANSMITTAL OF THE DRAFT FEASIBILITY STUDY REPORT (ENCLOSURE IS RECORD # 1653)                         | YES     | PARCEL E                                                                                                                                                                                                                                                                                                          |
| AR_N00217_001706<br>CORRESPONDENCE<br>4 | 07-27-2009  | BRAC PMO WEST      | TRANSMITTAL OF THE FINAL WORK PLAN FOR THE GROUNDWATER TREATABILITY STUDY (ENCLOSURE IS RECORD # 1709) | YES     | PARCEL E                                                                                                                                                                                                                                                                                                          |

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| AR_N00217_001709<br>REPORT<br>1593 | 07-27-2009  | SHAW ENVIRONMENTAL, INC. | FINAL WORK PLAN FOR THE GROUNDWATER<br>TREATABILITY STUDY (CD COPY ENCLOSED) | YES     | BLDG 0000406<br>BLDG 0000809<br>BLDG 0000810<br>PARCEL E<br>WELL 00001A<br>WELL 00003-A<br>WELL 00009A<br>WELL 00013A<br>WELL 00014A<br>WELL 00017A<br>WELL 00018A<br>WELL 00019A<br>WELL 00021A<br>WELL 00035A<br>WELL 00037A<br>WELL 00085A<br>WELL 00122A<br>WELL 00125A<br>WELL IR-01-MW-<br>042A<br>WELL IR-01-MW-<br>366A<br>WELL IR-04-MW-<br>009A<br>WELL IR-04-MW-<br>013A<br>WELL IR-04-MW-<br>031A<br>WELL IR-04-MW-<br>037A<br>WELL IR-04-MW-<br>038A<br>WELL IR-05-MW-<br>073A<br>WELL IR-05-MW-<br>085A<br>WELL IR-12-MW-<br>011A<br>WELL IR-12-MW-<br>013A |



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|                                         |             |                    |                                                                                                                          |         | WELL IR-12-MW-014A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-12-MW-017A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-12-MW-018A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-12-MW-019A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-12-MW-020A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-13-MW-012A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-36-MW-009A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-36-MW-121A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-36-MW-125A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-36-MW-127A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-36-MW-128A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-39-MW-021A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-56-MW-039A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-72-MW-032A |  |
|                                         |             |                    |                                                                                                                          |         | WELL IR-74-MW-001A |  |
|                                         |             |                    |                                                                                                                          |         | WELL PA-36-MW-003A |  |
|                                         |             |                    |                                                                                                                          |         | WELL PA-36-MW-004A |  |
|                                         |             |                    |                                                                                                                          |         | WELL PA-36-MW-007A |  |
| AR_N00217_001638<br>CORRESPONDENCE<br>6 | 07-31-2009  | BRAC PMO WEST      | TRANSMITTAL OF THE FINAL PETROLEUM<br>HYDROCARBONS CORRECTIVE ACTION PLAN,<br>REVISION 2009 (ENCLOSURE IS RECORD # 1639) | YES     | PARCEL E           |  |

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| AR_N00217_001639<br>REPORT<br>707       | 07-31-2009  | SHAW ENVIRONMENTAL, INC.                                | FINAL PETROLEUM HYDROCARBONS CORRECTIVE ACTION PLAN, REVISION 2009 (CD COPY ENCLOSED) [SEE RECORD # 1638 - BRAC PMO WEST TRANSMITTAL LETTER]      | YES     | CAA 000006<br>CAA 000007<br>CAA 000008<br>CAA 000008A<br>CAA 000009<br>CAA 000009A<br>CAA 000010<br>CAA 000012<br>CAA 000015<br>CAA 000016<br>CAA 000019<br>PARCEL E |
| AR_N00217_001703<br>CORRESPONDENCE<br>7 | 12-30-2009  | BRAC PMO WEST                                           | TRANSMITTAL OF THE FINAL WETLANDS MITIGATION AND MONITORING PLAN (ENCLOSURE IS RECORD # 1704)                                                     | YES     | PARCEL B<br>PARCEL E<br>PARCEL E-2                                                                                                                                   |
| AR_N00217_001704<br>REPORT<br>144       | 12-30-2009  | SHAW ENVIRONMENTAL, INC.                                | FINAL WETLANDS MITIGATION AND MONITORING PLAN (CD COPY ENCLOSED) [SEE RECORD # 1703 - BRAC PMO WEST TRANSMITTAL LETTER]                           | YES     | PARCEL B<br>PARCEL E<br>PARCEL E-2                                                                                                                                   |
| AR_N00217_001732<br>CORRESPONDENCE<br>6 | 01-25-2010  | BRAC PMO WEST                                           | TRANSMITTAL OF THE FINAL EXECUTION PLAN, CRISP ROAD SANITARY SEWER AND STORM DRAIN REMOVAL (ENCLOSURE IS RECORD # 1734)                           | YES     | PARCEL E                                                                                                                                                             |
| AR_N00217_001734<br>REPORT<br>174       | 01-25-2010  | TETRA TECH EC, INC.                                     | FINAL EXECUTION PLAN, CRISP ROAD SANITARY SEWER AND STORM DRAIN REMOVAL (CD COPY ENCLOSED) [SEE RECORD # 1732 - BRAC PMO WEST TRANSMITTAL LETTER] | YES     | BLDG 0000406<br>BLDG 0000414<br>BLDG 0000701<br>BLDG 0000810<br>PARCEL E-1<br>PARCEL UC-3                                                                            |
| AR_N00217_004321<br>CORRESPONDENCE<br>7 | 04-19-2010  | CALIFORNIA DEPARTMENT OF FISH AND GAME - SACRAMENTO, CA | REVIEW AND COMMENTS ON THE FINAL WETLANDS MITIGATION AND MONITORING PLAN (SEE RECORD # 1704 - FINAL WETLANDS MITIGATION AND MONITORING PLAN)      | YES     | PARCEL B<br>PARCEL E<br>PARCEL E-2                                                                                                                                   |

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| AR_N00217_001874<br>CORRESPONDENCE<br>6 | 04-21-2010  | BRAC PMO WEST              | TRANSMITTAL OF THE DRAFT PROJECT WORK PLAN<br>PETROLEUM HYDROCARBON CORRECTIVE ACTION<br>IMPLEMENTATION REPORT (ENCLOSURE IS RECORD #<br>1875) | YES     | PARCEL E                                                                                                                         |
| AR_N00217_001858<br>CORRESPONDENCE<br>6 | 04-23-2010  | BRAC PMO WEST              | TRANSMITTAL OF THE DRAFT RADIOLOGICAL<br>ADDENDUM TO THE FEASIBILITY STUDY REPORT<br>(ENCLOSURE IS RECORD # 1859)                              | YES     | PARCEL E                                                                                                                         |
| AR_N00217_001821<br>REPORT<br>56        | 04-30-2010  | CHADUX - TT, JOINT VENTURE | FINAL MEMORANDUM: APPROACH FOR DEVELOPING<br>SOIL GAS ACTION LEVELS FOR VAPOR INTRUSION<br>EXPOSURE (CD COPY ENCLOSED)                         | YES     | PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL D-2<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2 |
| AR_N00217_002057<br>REPORT<br>2536      | 06-17-2010  | SHAW ENVIRONMENTAL, INC.   | FINAL WORK PLAN ADDENDUM TIME-CRITICAL<br>REMOVAL ACTION FOR THE POLYCHLORINATED<br>BIPHENYL HOT SPOT AREA                                     | YES     | PARCEL E<br>PARCEL E-2                                                                                                           |

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| AR_N00217_001961<br>REPORT<br>1516 | 07-01-2010  | CE2 - KLEINFELDER, JOINT<br>VENTURE | TECHNICAL MEMORANDUM FOR NON-BASEWIDE<br>GROUNDWATER MONITORING PROGRAM<br>GROUNDWATER SAMPLING (JULY 2008 - MARCH 2009)<br>[CD COPY ENCLOSED] | YES     | PARCEL B<br>PARCEL D-1<br>PARCEL E<br>PARCEL G<br>WELL IR-07-MW-<br>024A<br>WELL IR-07-MW-<br>026A<br>WELL IR-18-MW-<br>100B<br>WELL IR-24-MW-<br>005A<br>WELL IR-26-MW-<br>047A<br>WELL IR-26-MW-<br>049A<br>WELL IR-46-MW-<br>048A<br>WELL IR-46-MW-<br>049A<br>WELL IR-46-MW-<br>050A<br>WELL IR-46-MW-<br>051A<br>WELL IR-46-MW-<br>052A |
| AR_N00217_001987<br>REPORT<br>508  | 07-30-2010  | TETRA TECH EC, INC.                 | FINAL PROJECT WORK PLAN, BASE-WIDE STORM<br>DRAIN AND SANITARY SEWER REMOVAL, REVISION 4<br>(CD COPY ENCLOSED)                                 | YES     | BASEWIDE<br>BLDG 0000364<br>BLDG 0000815<br>BLDG 0000816<br>BLDG 0000819<br>PARCEL B<br>PARCEL C<br>PARCEL D<br>PARCEL E<br>PARCEL E-2                                                                                                                                                                                                       |

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| AR_N00217_002055<br>REPORT<br>406 | 09-01-2010  | CE2 - KLEINFELDER, JOINT<br>VENTURE | TECHNICAL MEMORANDUM FOR NON-BASEWIDE<br>GROUNDWATER MONITORING PROGRAM SAMPLING<br>(APRIL 2009 - FEBRUARY 2010) [CD COPY ENCLOSED] | YES     | PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL D-2<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2<br>WELL IR-05-MW-<br>085A<br>WELL IR-09-MW-<br>038A<br>WELL IR-10-MW-<br>028A<br>WELL IR-12-B-<br>069<br>WELL IR-12-MW-<br>013A<br>WELL IR-12-MW-<br>014A<br>WELL IR-12-MW-<br>018A<br>WELL IR-12-MW-<br>019A<br>WELL IR-33-MW-<br>002A<br>WELL IR-36-MW-<br>004A<br>WELL IR-36-MW-<br>125A<br>WELL IR-36-MW-<br>127A<br>WELL IR-36-MW-<br>128A<br>WELL IR-56-MW-<br>039A<br>WELL IR-72-MW-<br>032A<br>WELL PA-36-<br>MW-003A |

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| AR_N00217_002539<br>CORRESPONDENCE<br>12 | 11-10-2010  | CE2 - KLEINFELDER, JOINT<br>VENTURE | MEMORANDUM: GROUNDWATER ANALYTICAL RESULTS<br>EXCEEDING REMEDIATION GOALS OR TRIGGER<br>LEVELS, THIRD QUARTER 2010 (CD COPY ENCLOSED)<br>[SEE RECORD # 2538 - BRAC PMO WEST TRANSMITTAL<br>LETTER] | YES     | PARCEL B<br>PARCEL C<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-2<br>SITE 00007<br>SITE 00018<br>WELL IR-01-MW-<br>038A<br>WELL IR-01-MW-<br>048A<br>WELL IR-01-MW-<br>060A<br>WELL IR-01-MW-<br>062A<br>WELL IR-01-MW-<br>063A<br>WELL IR-01-MW-<br>366B<br>WELL IR-01-MW-<br>403B<br>WELL IR-02-MW-<br>373A<br>WELL IR-02-MW-<br>B-002<br>WELL IR-03-MW-<br>218A-1<br>WELL IR-03-MW-<br>218A-2<br>WELL IR-03-MW-<br>O-001<br>WELL IR-06-MW-<br>022A<br>WELL IR-06-MW-<br>032A<br>WELL IR-06-MW-<br>040A<br>WELL IR-06-MW-<br>054A<br>WELL IR-06-MW-<br>059A-1 |

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|                 |             |                    |       |         | WELL IR-09-MW-051A   |  |
|                 |             |                    |       |         | WELL IR-10-MW-013A-1 |  |
|                 |             |                    |       |         | WELL IR-10-MW-059A   |  |
|                 |             |                    |       |         | WELL IR-10-MW-061A   |  |
|                 |             |                    |       |         | WELL IR-12-MW-017A   |  |
|                 |             |                    |       |         | WELL IR-12-MW-019A   |  |
|                 |             |                    |       |         | WELL IR-20-MW-017A   |  |
|                 |             |                    |       |         | WELL IR-25-MW-016A   |  |
|                 |             |                    |       |         | WELL IR-26-MW-049A   |  |
|                 |             |                    |       |         | WELL IR-26-MW-051A   |  |
|                 |             |                    |       |         | WELL IR-28-MW-125A   |  |
|                 |             |                    |       |         | WELL IR-28-MW-151A   |  |
|                 |             |                    |       |         | WELL IR-28-MW-188F   |  |
|                 |             |                    |       |         | WELL IR-28-MW-190F   |  |
|                 |             |                    |       |         | WELL IR-28-MW-211F   |  |
|                 |             |                    |       |         | WELL IR-28-MW-355F   |  |
|                 |             |                    |       |         | WELL IR-28-MW-407    |  |
|                 |             |                    |       |         | WELL IR-33-MW-064A   |  |
|                 |             |                    |       |         | WELL IR-58-MW-031A   |  |
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| AR_N00217_002336<br>REPORT<br>219 | 11-19-2010  | TETRA TECH EC, INC. | FINAL STORMWATER POLLUTION PREVENTION PLAN<br>(CD COPY ENCLOSED) [SEE RECORD # 2335 - BRAC<br>PMO WEST TRANSMITTAL LETTER] | YES     | PARCEL C<br>PARCEL D-1<br>PARCEL E<br>PARCEL UC-3<br>SITE 00002<br>SITE 00003<br>SITE 00004<br>SITE 00005<br>SITE 00006<br>SITE 00008<br>SITE 00011<br>SITE 00012<br>SITE 00013<br>SITE 00014<br>SITE 00015<br>SITE 00016<br>SITE 00017<br>SITE 00025<br>SITE 00027<br>SITE 00028<br>SITE 00029<br>SITE 00030<br>SITE 00032<br>SITE 00035<br>SITE 00036<br>SITE 00038<br>SITE 00039<br>SITE 00053<br>SITE 00054<br>SITE 00055<br>SITE 00056<br>SITE 00058<br>SITE 00063<br>SITE 00064<br>SITE 00068<br>SITE 00069<br>SITE 00070 |

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|                                         |             |                     |                                                                                                                                                      |         | SITE 00072<br>SITE 00073                                                                                                                                                                                  |
| AR_N00217_002326<br>REPORT<br>519       | 12-29-2010  | TETRA TECH EC, INC. | FINAL ACCIDENT PREVENTION PLAN/SITE SAFETY AND HEALTH PLAN, 500 SERIES AREA RADIOLOGICAL REMEDIATION AND SUPPORT (CD COPY ENCLOSED)                  | YES     | PARCEL E                                                                                                                                                                                                  |
| AR_N00217_002531<br>CORRESPONDENCE<br>6 | 01-20-2011  | BRAC PMO WEST       | TRANSMITTAL OF THE FINAL EXECUTION PLAN, 500 SERIES AREA RADIOLOGICAL REMEDIATION AND SUPPORT (ENCLOSURE IS RECORD # 2535)                           | YES     | PARCEL E                                                                                                                                                                                                  |
| AR_N00217_002535<br>REPORT<br>451       | 01-20-2011  | TETRA TECH EC, INC. | FINAL EXECUTION PLAN, 500 SERIES AREA RADIOLOGICAL REMEDIATION AND SUPPORT (CD COPY ENCLOSED) [SEE RECORD # 2531 - BRAC PMO WEST TRANSMITTAL LETTER] | YES     | BLDG 0000500<br>BLDG 0000503<br>BLDG 0000506<br>BLDG 0000507<br>BLDG 0000508<br>BLDG 0000509<br>BLDG 0000510<br>BLDG 0000510A<br>BLDG 0000517<br>BLDG 0000520<br>BLDG 0000521<br>BLDG 0000527<br>PARCEL E |
| AR_N00217_002436<br>CORRESPONDENCE<br>6 | 02-16-2011  | BRAC PMO WEST       | TRANSMITTAL OF THE DRAFT GROUNDWATER TREATABILITY STUDY TECHNICAL REPORT (ENCLOSURE IS RECORD # 2437)                                                | YES     | PARCEL E                                                                                                                                                                                                  |

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| AR_N00217_002541<br>CORRESPONDENCE<br>9 | 03-04-2011  | CE2 - KLEINFELDER, JOINT<br>VENTURE | MEMORANDUM: GROUNDWATER ANALYTICAL RESULTS<br>EXCEEDING REMEDIATION GOALS OR TRIGGER<br>LEVELS, FOURTH QUARTER 2010 (CD COPY<br>ENCLOSED) [SEE RECORD # 2540 - BRAC PMO WEST<br>TRANSMITTAL LETTER] | YES     | PARCEL C<br>PARCEL D-1<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2<br>WELL IR-01-MW-<br>038A<br>WELL IR-01-MW-<br>060A<br>WELL IR-02-MW-<br>373A<br>WELL IR-02-MW-<br>B-002<br>WELL IR-03-MW-<br>218A-1<br>WELL IR-03-MW-<br>218A-2<br>WELL IR-03-MW-<br>371A<br>WELL IR-03-MW-<br>O-001<br>WELL IR-04-MW-<br>039A<br>WELL IR-06-MW-<br>022A<br>WELL IR-06-MW-<br>040A<br>WELL IR-06-MW-<br>059A-1<br>WELL IR-12 -<br>MW-017A<br>WELL IR-12-MW-<br>019A<br>WELL IR-25-MW-<br>016A<br>WELL IR-28-MW-<br>125A<br>WELL IR-28-MW-<br>211F |

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|                                   |             |                                           |                                                                                                                                                                           |         | WELL IR-28-MW-355F<br>WELL IR-28-MW-407<br>WELL IR-36-MW-237A<br>WELL IR-36-MW-239A<br>WELL IR-58-MW-031A                        |
| AR_N00217_002973<br>REPORT<br>818 | 04-20-2011  | CE2 - KLEINFELDER, JOINT<br>VENTURE       | FINAL AMENDED SAMPLING AND ANALYSIS PLAN<br>(FIELD SAMPLING PLAN AND QUALITY ASSURANCE<br>PROJECT PLAN) FOR BASEWIDE GROUNDWATER<br>MONITORING PROGRAM (CD COPY ENCLOSED) | YES     | BASEWIDE<br>PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-2                              |
| AR_N00217_002910<br>REPORT<br>188 | 05-01-2011  | CH2M HILL - KLEINFELDER, JOINT<br>VENTURE | FINAL COMMUNITY INVOLVEMENT PLAN (CD COPY<br>ENCLOSED) [SEE RECORD # 2908 - BRAC PMO WEST<br>TRANSMITTAL LETTER]                                                          | YES     | PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL D-2<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2 |

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| AR_N00217_002774<br>CORRESPONDENCE<br>6 | 05-03-2011  | CE2 - KLEINFELDER, JOINT<br>VENTURE | MEMORANDUM: GROUNDWATER ANALYTICAL RESULTS<br>EXCEEDING REMEDIATION GOALS OR TRIGGER<br>LEVELS, FIRST QUARTER 2011 (CD COPY ENCLOSED)<br>[SEE RECORD # 2772 - BRAC PMO WEST TRANSMITTAL<br>LETTER] | YES     | PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2<br>SITE 00007<br>SITE 00018<br>WELL IR-01-MW-<br>038A<br>WELL IR-01-MW-<br>048A<br>WELL IR-01-MW-<br>060A<br>WELL IR-01-MW-<br>063A<br>WELL IR-01-MW-<br>064A<br>WELL IR-01-MW-<br>403B<br>WELL IR-02-MW-<br>373A<br>WELL IR-02-MW-<br>B-002<br>WELL IR-03-MW-<br>218A-1<br>WELL IR-03-MW-<br>218A-2<br>WELL IR-03-MW-<br>371A<br>WELL IR-03-MW-<br>O-001<br>WELL IR-04-MW-<br>039A<br>WELL IR-06-MW-<br>022A<br>WELL IR-06-MW-<br>032A<br>WELL IR-06-MW-<br>040A |

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|                 |  |             |  |                    |  |       |  |         |  | WELL IR-06-MW-059A-1 |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-09-MW-007A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-10-MW-013A-1 |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-10-MW-059A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-10-MW-061A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-10-MW-071A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-12-MW-019A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-20-MW-017A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-016A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-26-MW-049A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-125A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-151A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-190F   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-200A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-211F   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-355F   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-407    |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-36-MW-237A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-36-MW-239A   |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-71-MW-003A   |  |

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|                                         |             |                    |                                                                                                            |         | WELL PA-28-<br>MW-052A |
| AR_N00217_002905<br>CORRESPONDENCE<br>6 | 05-16-2011  | BRAC PMO WEST      | TRANSMITTAL OF THE FINAL GROUNDWATER<br>TREATABILITY STUDY TECHNICAL (ENCLOSURE IS<br>RECORD # 2907)REPORT | YES     | PARCEL E               |

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| AR_N00217_002907<br>REPORT<br>8262 | 05-16-2011  | SHAW ENVIRONMENTAL, INC. | FINAL GROUNDWATER TREATABILITY STUDY<br>TECHNICAL REPORT (CD COPY ENCLOSED) [SEE<br>RECORD # 2905 - BRAC PMO WEST TRANSMITTAL<br>LETTER] | YES     | PARCEL E<br>SITE 00004<br>SITE 00005<br>SITE 00012A<br>SITE 00012B<br>SITE 00012C<br>SITE 00036<br>SITE 00039<br>SITE 00056<br>WELL IR-12-MW-<br>043A<br>WELL IR-12-MW-<br>044A<br>WELL IR-12-MW-<br>045A<br>WELL IR-12-MW-<br>046A<br>WELL IR-36-MW-<br>230A<br>WELL IR-36-MW-<br>231A<br>WELL IR-36-MW-<br>232A<br>WELL IR-36-MW-<br>233A<br>WELL IR-36-MW-<br>234A<br>WELL IR-36-MW-<br>235A<br>WELL IR-36-MW-<br>236B<br>WELL IR-36-MW-<br>237A<br>WELL IR-36-MW-<br>238A<br>WELL IR-36-MW-<br>239A<br>WELL IR-36-MW-<br>240A<br>WELL IR-36-MW-<br>241A |



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|                                         |             |                    |                                                                                                                          |         | WELL IR-36-MW-242A     |
| AR_N00217_003298<br>CORRESPONDENCE<br>6 | 05-16-2011  | BRAC PMO WEST      | TRANSMITTAL OF THE DRAFT WORK PLAN SITE CHARACTERIZATION AND BENCH-SCALE TREATABILITY STUDY (ENCLOSURE IS RECORD # 3299) | YES     | PARCEL E<br>SITE 00003 |
| AR_N00217_003315<br>CORRESPONDENCE<br>6 | 07-08-2011  | BRAC PMO WEST      | TRANSMITTAL OF THE DRAFT FINAL FEASIBILITY STUDY REPORT (ENCLOSURE IS RECORD # 3316)                                     | YES     | PARCEL E               |

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| AR_N00217_003554<br>CORRESPONDENCE<br>7 | 08-05-2011  | CE2 - KLEINFELDER, JOINT<br>VENTURE | MEMORANDUM: GROUNDWATER ANALYTICAL RESULTS<br>EXCEEDING REMEDIATION GOALS OR TRIGGER<br>LEVELS, SECOND QUARTER 2011 (CD COPY<br>ENCLOSED) [SEE RECORD # 3575 - BRAC PMO WEST<br>TRANSMITTAL LETTER] | YES     | PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2<br>SITE 00007<br>SITE 00018<br>WELL IR-01-MW-<br>038A<br>WELL IR-01-MW-<br>048A<br>WELL IR-01-MW-<br>060A<br>WELL IR-01-MW-<br>064A<br>WELL IR-02-MW-<br>373A<br>WELL IR-02-MW-<br>B-002<br>WELL IR-03-MW-<br>218A-1<br>WELL IR-03-MW-<br>218A-2<br>WELL IR-03-MW-<br>O-001<br>WELL IR-06-MW-<br>022A<br>WELL IR-06-MW-<br>032A<br>WELL IR-06-MW-<br>035A<br>WELL IR-06-MW-<br>040A<br>WELL IR-06-MW-<br>059A-1<br>WELL IR-25-MW-<br>016A<br>WELL IR-28-MW-<br>125A |

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|                                         |             |                                      |                                                                                                                                                    |         | WELL IR-28-MW-200A<br>WELL IR-28-MW-211F<br>WELL IR-28-MW-298A<br>WELL IR-28-MW-355F<br>WELL IR-28-MW-407<br>WELL PA-28-MW-052A |
| AR_N00217_003631<br>CORRESPONDENCE<br>6 | 08-19-2011  | BRAC PMO WEST                        | TRANSMITTAL OF THE FINAL WORK PLAN SITE CHARACTERIZATION AND BENCH-SCALE TREATABILITY STUDY (ENCLOSURE IS RECORD # 3632)                           | YES     | PARCEL E<br>SITE 00003                                                                                                          |
| AR_N00217_003632<br>REPORT<br>906       | 08-22-2011  | INNOVATIVE TECHNICAL SOLUTIONS, INC. | FINAL WORK PLAN SITE CHARACTERIZATION AND BENCH-SCALE TREATABILITY STUDY (CD COPY ENCLOSED) [SEE RECORD # 3631 - BRAC PMO WEST TRANSMITTAL LETTER] | YES     | PARCEL E<br>SITE 00003                                                                                                          |

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| AR_N00217_003615<br>CORRESPONDENCE<br>9 | 11-04-2011  | CE2 - KLEINFELDER, JOINT<br>VENTURE | MEMORANDUM: GROUNDWATER ANALYTICAL RESULTS<br>EXCEEDING REMEDIATION GOALS OR TRIGGER<br>LEVELS, THIRD QUARTER 2011 (CD COPY ENCLOSED) | YES     | PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2<br>SITE 00007<br>SITE 00018<br>WELL IR-01-MW-<br>026B<br>WELL IR-01-MW-<br>038A<br>WELL IR-01-MW-<br>048A<br>WELL IR-01-MW-<br>060A<br>WELL IR-01-MW-<br>062A<br>WELL IR-01-MW-<br>063A<br>WELL IR-01-MW-<br>064A<br>WELL IR-02-MW-<br>126A<br>WELL IR-02-MW-<br>218A-2<br>WELL IR-02-MW-<br>373A<br>WELL IR-02-MW-<br>403B<br>WELL IR-02-MW-<br>B-002<br>WELL IR-03-MW-<br>O-001<br>WELL IR-04-MW-<br>039A<br>WELL IR-06-MW-<br>022A<br>WELL IR-06-MW-<br>032A |

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WELL IR-19-MW-040A  
WELL IR-20-MW-017A  
WELL IR-25-MW-016A  
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WELL IR-26-MW-051A  
WELL IR-28-EW-001A  
WELL IR-28-IW-901A  
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WELL IR-28-IW-903A  
WELL IR-28-MW-125A  
WELL IR-28-MW-151A  
WELL IR-28-MW-200A  
WELL IR-28-MW-211F  
WELL IR-28-MW-298A

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|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-407  |
|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-475A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-476A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-916A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-919A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-920A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-921A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-932A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-933A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-934A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-28-MW-936A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-36-MW-237A |
|                                         |             |                    |                                                                                                                         |         | WELL IR-71-MW-003A |
| AR_N00217_003627<br>CORRESPONDENCE<br>6 | 11-17-2011  | BRAC PMO WEST      | TRANSMITTAL OF THE DRAFT FINAL RADIOLOGICAL<br>ADDENDUM TO THE FEASIBILITY STUDY REPORT<br>(ENCLOSURE IS RECORD # 3628) | YES     | PARCEL E           |

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| AR_N00217_004241<br>REPORT<br>61   | 12-02-2011  | CHADUX - TT, JOINT VENTURE | REVISED FINAL MEMORANDUM: APPROACH FOR DEVELOPING SOIL GAS ACTION LEVELS FOR VAPOR INTRUSION EXPOSURE (CD COPY ENCLOSED)                                                                                           | YES     | PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL D-2<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2                            |
| AR_N00217_004387<br>REPORT<br>1857 | 12-20-2011  | TETRA TECH EC, INC.        | FINAL EXECUTION PLAN, REVISION 1, BASEWIDE RADIOLOGICAL SUPPORT (CD COPY ENCLOSED) [SEE RECORD # 4386 - BRAC PMO WEST TRANSMITTAL LETTER; AND RECORD # 2537 - FINAL EXECUTION PLAN, BASEWIDE RADIOLOGICAL SUPPORT] | YES     | BASEWIDE<br>PARCEL A<br>PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL D-2<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2    |
| AR_N00217_004293<br>REPORT<br>162  | 02-03-2012  | TETRA TECH EC, INC.        | FINAL BASEWIDE RADIOLOGICAL MANAGEMENT PLAN (CD COPY ENCLOSED) [THIS DOCUMENT SUPERSEDES RECORD # 4235 AND # 1987]                                                                                                 | YES     | BASEWIDE<br>PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL D-2<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2<br>PARCEL UC-3 |

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| AR_N00217_004268<br>CORRESPONDENCE<br>6 | 02-22-2012  | BRAC PMO WEST                       | TRANSMITTAL OF THE DRAFT WORK PLAN ADDENDUM<br>TO THE GROUNDWATER TREATABILITY STUDY<br>(ENCLOSURE IS RECORD # 4269)                                                                                        | YES     | PARCEL E                                                                                                                                     |
| AR_N00217_004326<br>REPORT<br>263       | 02-22-2012  | CE2 - KLEINFELDER, JOINT<br>VENTURE | REVISED FINAL ACCIDENT PREVENTION PLAN,<br>BASEWIDE GROUNDWATER MONITORING PROGRAM<br>(CD COPY ENCLOSED) {SEE RECORD # 2225 - FINAL<br>ACCIDENT PREVENTION PLAN BASEWIDE<br>GROUNDWATER MONITORING PROGRAM} | YES     | BASEWIDE<br>PARCEL B<br>PARCEL C<br>PARCEL D-1<br>PARCEL D-2<br>PARCEL E<br>PARCEL E-2<br>PARCEL F<br>PARCEL G<br>PARCEL UC-1<br>PARCEL UC-2 |
| AR_N00217_004375<br>CORRESPONDENCE<br>6 | 04-09-2012  | BRAC PMO WEST                       | TRANSMITTAL OF THE DRAFT SOIL EXCAVATION<br>CHARACTERIZATION WORK PLAN (ENCLOSURE IS<br>RECORD # 4376)                                                                                                      | YES     | PARCEL E                                                                                                                                     |



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| AR_N00217_004381<br>REPORT<br>49233 | 04-18-2012  | TETRA TECH EC, INC. | FINAL RADIOLOGICAL CONSTRUCTION SUMMARY<br>REPORT (INCLUDES ANALYTICAL DATA PROVIDED IN<br>PAPER ONLY, AND CD COPY) | YES     | AREA 00020<br>AREA 00022<br>AREA 00023<br>BLDG 0000406<br>BLDG 0000414<br>BLDG 0000701<br>BLDG 0000704<br>BLDG 0000810<br>PARCEL E<br>SITE 00004<br>SURVEY UNIT<br>0152<br>SURVEY UNIT<br>0154<br>SURVEY UNIT<br>0155<br>SURVEY UNIT<br>0156<br>SURVEY UNIT<br>0157<br>SURVEY UNIT<br>0158<br>SURVEY UNIT<br>0159<br>SURVEY UNIT<br>0160<br>SURVEY UNIT<br>0161<br>SURVEY UNIT<br>0162<br>SURVEY UNIT<br>0163<br>SURVEY UNIT<br>0165<br>SURVEY UNIT<br>0201 |

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| AR_N00217_004841<br>REPORT<br>8 | 06-20-2012  | CE2 - KLEINFELDER, JOINT<br>VENTURE | MEMORANDUM: GROUNDWATER ANALYTICAL RESULTS<br>EXCEEDING REMEDIATION GOALS OR TRIGGER<br>LEVELS, FIRST QUARTER 2012 (CD COPY ENCLOSED) | NO      | PARCEL B<br>PARCEL C<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-2<br>WELL IR-01-MW-<br>038A<br>WELL IR-01-MW-<br>048A<br>WELL IR-01-MW-<br>060A<br>WELL IR-01-MW-<br>063A<br>WELL IR-01-MW-<br>064A<br>WELL IR-01-MW-<br>366B<br>WELL IR-01-MW-<br>403B<br>WELL IR-02-MW-<br>373A<br>WELL IR-02-MW-<br>B-002<br>WELL IR-04-MW-<br>039A<br>WELL IR-06-MW-<br>022A<br>WELL IR-06-MW-<br>040<br>WELL IR-06-MW-<br>054F<br>WELL IR-06-MW-<br>059A-1<br>WELL IR-10-MW-<br>059A<br>WELL IR-10-MW-<br>061A<br>WELL IR-10-MW-<br>071A<br>WELL IR-12-MW-<br>019A |

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|                 |  |             |  |                    |  |       |  |         |  | WELL IR-20-MW-017A |  |
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|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-066B |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-068A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-26-MW-041A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-26-MW-049A |  |
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|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-EW-001A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-IW-901A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-IW-902A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-IW-903A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-151A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-151A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-190F |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-200A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-211F |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-354A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-355F |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-475A |  |

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|                                         |             |                                             |                                                                                                                                                                                                                  |         | WELL IR-28-MW-916A<br>WELL IR-28-MW-919A<br>WELL IR-28-MW-921A<br>WELL IR-28-MW-931A<br>WELL IR-28-MW-932A<br>WELL IR-28-MW-933A<br>WELL IR-28-MW-934A<br>WELL IR-28-MW-936A<br>WELL IR-33-MW-064A<br>WELL IR-36-MW-237A<br>WELL IR-36-MW-239A<br>WELL IR-71-MW-003A |
| AR_N00217_004478<br>CORRESPONDENCE<br>7 | 07-09-2012  | BRAC PMO WEST                               | TRANSMITTAL OF THE FINAL WORK PLAN ADDENDUM TO THE GROUNDWATER TREATABILITY STUDY (ENCLOSURE IS RECORD # 4479)                                                                                                   | YES     | PARCEL E                                                                                                                                                                                                                                                             |
| AR_N00217_004479<br>REPORT<br>527       | 07-09-2012  | SHAW ENVIRONMENTAL AND INFRASTRUCTURE, INC. | FINAL WORK PLAN ADDENDUM TO THE GROUNDWATER TREATABILITY STUDY (CD COPY ENCLOSED) [SEE RECORD # 4478 - BRAC PMO WEST TRANSMITTAL LETTER; RECORD # 1709 - FINAL WORK PLAN FOR THE GROUNDWATER TREATABILITY STUDY] | YES     | BLDG 0000406<br>BLDG 0000413<br>PARCEL E<br>SITE 00004<br>SITE 00005<br>SITE 00006<br>SITE 00012A<br>SITE 00012B<br>SITE 00012C<br>SITE 00036<br>SITE 00039<br>SITE 00056                                                                                            |

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| AR_N00217_004477<br>REPORT<br>75        | 07-17-2012  | CKY, INC.                                     | LANDFILL GAS MONITORING REPORT FOR APRIL-JUNE 2012, POST-REMOVAL ACTION, INDUSTRIAL LANDFILL (CD COPY ENCLOSED) [SEE RECORD # 4476 - BRAC PMO WEST TRANSMITTAL LETTER]                    | YES     | BLDG 0000830<br>PARCEL E<br>PARCEL E-2<br>SITE 00001<br>SITE 00021 |
| AR_N00217_004837<br>REPORT<br>1195      | 08-01-2012  | ARCADIS U.S., INC.                            | FINAL SOIL EXCAVATION CHARACTERIZATION WORK PLAN (CD COPY ENCLOSED) [SEE RECORD # 4836 - BRAC PMO WEST TRANSMITTAL LETTER] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}           | NO      | PARCEL E                                                           |
| AR_N00217_004836<br>CORRESPONDENCE<br>4 | 08-06-2012  | BRAC PMO WEST                                 | TRANSMITTAL OF THE FINAL SOIL EXCAVATION CHARACTERIZATION WORK PLAN (ENCLOSURE IS RECORD # 4837)                                                                                          | NO      | PARCEL E                                                           |
| AR_N00217_004487<br>CORRESPONDENCE<br>8 | 08-28-2012  | BRAC PMO WEST                                 | LETTER DOCUMENTING A BOUNDARY CHANGE (CD COPY ENCLOSED) [W/ ENCLOSURE]                                                                                                                    | YES     | PARCEL E<br>PARCEL E-2                                             |
| AR_N00217_004630<br>CORRESPONDENCE<br>4 | 08-31-2012  | BRAC PMO WEST                                 | TRANSMITTAL OF THE FINAL FEASIBILITY STUDY REPORT (ENCLOSURE IS RECORD # 4631)                                                                                                            | NO      | PARCEL E                                                           |
| AR_N00217_004631<br>REPORT<br>1463      | 08-31-2012  | ENGINEERING/REMEDIATION RESOURCES GROUP, INC. | FINAL FEASIBILITY STUDY REPORT (CD COPY ENCLOSED) [SEE RECORD # 4630 - BRAC PMO WEST TRANSMITTAL LETTER]                                                                                  | NO      | PARCEL E                                                           |
| AR_N00217_004632<br>CORRESPONDENCE<br>4 | 08-31-2012  | BRAC PMO WEST                                 | TRANSMITTAL OF THE FINAL RADIOLOGICAL ADDENDUM TO THE FEASIBILITY STUDY REPORT (ENCLOSURE IS RECORD # 4633)                                                                               | NO      | PARCEL E                                                           |
| AR_N00217_004633<br>REPORT<br>4457      | 08-31-2012  | ENGINEERING/REMEDIATION RESOURCES GROUP, INC. | FINAL RADIOLOGICAL ADDENDUM TO THE FEASIBILITY STUDY REPORT (CD COPY ENCLOSED) [SEE RECORD # 4632 - BRAC PMO WEST TRANSMITTAL LETTER, AND RECORD # 4631 - FINAL FEASIBILITY STUDY REPORT] | NO      | PARCEL E                                                           |
| AR_N00217_004504<br>CORRESPONDENCE<br>7 | 09-24-2012  | BRAC PMO WEST                                 | TRANSMITTAL OF THE DRAFT SITE CHARACTERIZATION AND BENCH-SCALE TREATABILITY STUDY REPORT (ENCLOSURE IS RECORD # 4505)                                                                     | YES     | PARCEL E<br>SITE 00003                                             |

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| AR_N00217_004537<br>CORRESPONDENCE<br>2 | 10-26-2012  | BRAC PMO WEST                                      | TRANSMITTAL OF THE DRAFT PROPOSED PLAN<br>(ENCLOSURE IS RECORD # 4538)                                               | NO      | PARCEL E<br>PARCEL UC-3               |
| AR_N00217_004638<br>CORRESPONDENCE<br>3 | 11-21-2012  | U.S. EPA - SAN FRANCISCO, CA                       | REVIEW AND COMMENTS ON THE DRAFT PROPOSED<br>PLAN (SEE RECORD # 4538 - DRAFT PROPOSED PLAN)                          | NO      | PARCEL E<br>PARCEL UC-3<br>SITE 00003 |
| AR_N00217_004639<br>CORRESPONDENCE<br>3 | 11-27-2012  | DTSC - BERKELEY, CA                                | REVIEW AND COMMENTS ON THE DRAFT PROPOSED<br>PLAN (SEE RECORD # 4538 - DRAFT PROPOSED PLAN)                          | NO      | PARCEL E<br>PARCEL UC-3               |
| AR_N00217_004641<br>CORRESPONDENCE<br>7 | 11-27-2012  | DEPARTMENT OF PUBLIC<br>HEALTH - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT PROPOSED<br>PLAN (SEE RECORD # 4538 - DRAFT PROPOSED PLAN)                          | NO      | PARCEL E<br>PARCEL UC-3               |
| AR_N00217_004640<br>CORRESPONDENCE<br>4 | 11-29-2012  | CRWQCB - OAKLAND, CA                               | REVIEW AND COMMENTS ON THE DRAFT PROPOSED<br>PLAN (SEE RECORD # 4538 - DRAFT PROPOSED PLAN)                          | NO      | PARCEL E<br>PARCEL UC-3               |
| AR_N00217_004558<br>CORRESPONDENCE<br>3 | 12-20-2012  | BRAC PMO WEST                                      | TRANSMITTAL OF THE DRAFT GROUNDWATER<br>TREATABILITY STUDY TECHNICAL REPORT ADDENDUM<br>(ENCLOSURE IS RECORD # 4559) | NO      | PARCEL E                              |

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| AR_N00217_004842<br>REPORT<br>6 | 12-20-2012  | CE2 - KLEINFELDER, JOINT<br>VENTURE | MEMORANDUM: GROUNDWATER ANALYTICAL RESULTS<br>EXCEEDING REMEDIATION GOALS OR TRIGGER<br>LEVELS, THIRD QUARTER 2012 (CD COPY ENCLOSED) | NO      | PARCEL B<br>PARCEL C<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-2<br>WELL IR-01-MW-<br>038A<br>WELL IR-01-MW-<br>048A<br>WELL IR-01-MW-<br>060A<br>WELL IR-01-MW-<br>064A<br>WELL IR-01-MW-<br>366B<br>WELL IR-01-MW-<br>403B<br>WELL IR-02-MW-<br>126A<br>WELL IR-02-MW-<br>373A<br>WELL IR-02-MW-<br>B-002<br>WELL IR-03-MW-<br>218A-1<br>WELL IR-03-MW-<br>218A-2<br>WELL IR-03-MW-<br>226A<br>WELL IR-03-MW-<br>O-001<br>WELL IR-06-MW-<br>022A<br>WELL IR-06-MW-<br>042A<br>WELL IR-06-MW-<br>054F<br>WELL IR-06-MW-<br>059A-1<br>WELL IR-10-MW-<br>059A |

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WELL IR-10-MW-061A  
WELL IR-20-MW-017A  
WELL IR-25-MW-016A  
WELL IR-25-MW-062A  
WELL IR-25-MW-063A  
WELL IR-25-MW-064A  
WELL IR-25-MW-065B  
WELL IR-26-MW-041A  
WELL IR-26-MW-049  
WELL IR-26-MW-051A  
WELL IR-28-EW-001A  
WELL IR-28-IW-902A  
WELL IR-28-IW-903A  
WELL IR-28-MW-125A  
WELL IR-28-MW-190F  
WELL IR-28-MW-211F  
WELL IR-28-MW-352A  
WELL IR-28-MW-354A  
WELL IR-28-MW-355F  
WELL IR-28-MW-407  
WELL IR-28-MW-475A



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|                                         |             |                              |                                                                                                                                                       |         | WELL IR-28-MW-476A<br>WELL IR-28-MW-916A<br>WELL IR-28-MW-919A<br>WELL IR-28-MW-931A<br>WELL IR-28-MW-932A<br>WELL IR-28-MW-933A<br>WELL IR-28-MW-934A<br>WELL IR-28-MW-936A<br>WELL IR-36-MW-125A<br>WELL IR-36-MW-237A<br>WELL IR-58-MW-031A<br>WELL IR-71-MW-003A |
| AR_N00217_004593<br>CORRESPONDENCE<br>2 | 12-21-2012  | BRAC PMO WEST                | TRANSMITTAL OF THE DRAFT FINAL PROPOSED PLAN<br>(ENCLOSURE IS RECORD # 4594)                                                                          | NO      | PARCEL E<br>PARCEL UC-3                                                                                                                                                                                                                                              |
| AR_N00217_004535<br>CORRESPONDENCE<br>3 | 01-08-2013  | BRAC PMO WEST                | TRANSMITTAL OF THE DRAFT POTHOLE AREA<br>CHARACTERIZATION WORK PLAN (ENCLOSURE IS<br>RECORD # 4536)                                                   | NO      | PARCEL E                                                                                                                                                                                                                                                             |
| AR_N00217_004567<br>CORRESPONDENCE<br>4 | 01-08-2013  | BRAC PMO WEST                | TRANSMITTAL OF THE DRAFT TECHNICAL<br>MEMORANDUM FOR SOIL EXCAVATION<br>CHARACTERIZATION (ENCLOSURE IS RECORD # 4568)                                 | NO      | PARCEL E                                                                                                                                                                                                                                                             |
| AR_N00217_004877<br>CORRESPONDENCE<br>5 | 01-22-2013  | U.S. EPA - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT POTHOLE<br>AREA CHARACTERIZATION WORK PLAN (SEE RECORD<br># 4536 - DRAFT POTHOLE AREA CHARACTERIZATION<br>WORK PLAN) | NO      | PARCEL E                                                                                                                                                                                                                                                             |

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| Record Type<br>Approx. # Pages          | Record Date | Author Affiliation                              | Title                                                                                                                                         | Imaged? | Sites                                                                              |
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| AR_N00217_004705<br>PUBLIC NOTICE<br>2  | 02-01-2013  | SAN FRANCISCO BAY VIEW - SAN FRANCISCO, CA      | PUBLIC NOTICE ANNOUNCING THE PUBLIC COMMENT PERIOD FOR THE PROPOSED PLAN (CD COPY ENCLOSED)                                                   | NO      | PARCEL E<br>PARCEL UC-3                                                            |
| AR_N00217_004720<br>REPORT<br>42        | 02-01-2013  | ENGINEERING/REMEDATION RESOURCES GROUP, INC.    | FINAL PROPOSED PLAN FOR CLEANUP (INCLUDES FACT SHEET OF SUMMARY OF THE PROPOSED PLAN; AND CD COPY)                                            | NO      | BLDG 0000406<br>PARCEL E<br>PARCEL E-2<br>PARCEL UC-1<br>PARCEL UC-3<br>SITE 00002 |
| AR_N00217_004752<br>REPORT<br>6643      | 02-06-2013  | ITSI GILBANE COMPANY                            | FINAL SITE CHARACTERIZATION AND BENCH-SCALE TREATABILITY STUDY REPORT (CD COPY ENCLOSED) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS] | NO      | PARCEL E<br>SITE 00003                                                             |
| AR_N00217_004874<br>CORRESPONDENCE<br>3 | 02-06-2013  | DTSC - BERKELEY, CA                             | REVIEW AND COMMENTS ON THE DRAFT POTHOLE AREA CHARACTERIZATION WORK PLAN (SEE RECORD # 4536 - DRAFT POTHOLE AREA CHARACTERIZATION WORK PLAN)  | NO      | PARCEL E                                                                           |
| AR_N00217_004706<br>PUBLIC NOTICE<br>2  | 02-07-2013  | SUN-REPORTER - SAN FRANCISCO, CA                | PUBLIC NOTICE ANNOUNCING THE PUBLIC COMMENT PERIOD FOR THE PROPOSED PLAN (CD COPY ENCLOSED)                                                   | NO      | PARCEL E<br>PARCEL UC-3                                                            |
| AR_N00217_004875<br>CORRESPONDENCE<br>3 | 02-07-2013  | DEPARTMENT OF PUBLIC HEALTH - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT POTHOLE AREA CHARACTERIZATION WORK PLAN (SEE RECORD # 4536 - DRAFT POTHOLE AREA CHARACTERIZATION WORK PLAN)  | NO      | PARCEL E                                                                           |
| AR_N00217_004707<br>PUBLIC NOTICE<br>2  | 02-10-2013  | SAN FRANCISCO CHRONICLE - SAN FRANCISCO, CA     | PUBLIC NOTICE ANNOUNCING THE PUBLIC COMMENT PERIOD FOR THE PROPOSED PLAN (CD COPY ENCLOSED)                                                   | NO      | PARCEL E<br>PARCEL UC-3                                                            |
| AR_N00217_004876<br>CORRESPONDENCE<br>2 | 02-12-2013  | CRWQCB - OAKLAND, CA                            | REVIEW AND COMMENTS ON THE DRAFT POTHOLE AREA CHARACTERIZATION WORK PLAN (SEE RECORD # 4536 - DRAFT POTHOLE AREA CHARACTERIZATION WORK PLAN)  | NO      | PARCEL E                                                                           |
| AR_N00217_004755<br>CORRESPONDENCE<br>4 | 02-15-2013  | BRAC PMO WEST                                   | TRANSMITTAL OF THE FINAL SITE CHARACTERIZATION AND BENCH-SCALE TREATABILITY STUDY REPORT (ENCLOSURE IS RECORD # 4752)                         | NO      | PARCEL E<br>SITE 00003                                                             |

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| AR_N00217_004756<br>REPORT<br>1860      | 03-19-2013  | SHAW ENVIRONMENTAL AND<br>INFRASTRUCTURE, INC.                                      | FINAL GROUNDWATER TREATABILITY STUDY<br>TECHNICAL REPORT ADDENDUM (CD COPY<br>ENCLOSED) [SEE RECORD # 2907 - FINAL<br>GROUNDWATER TREATABILITY STUDY TECHNICAL<br>REPORT AND RECORD # 4761 - BRAC PMO WEST<br>TRANSMITTA LETTER] | NO      | PARCEL E<br>SITE 00004<br>SITE 00036 |
| AR_N00217_004761<br>CORRESPONDENCE<br>3 | 03-21-2013  | BRAC PMO WEST                                                                       | TRANSMITTAL OF THE FINAL GROUNDWATER<br>TREATABILITY STUDY TECHNICAL REPORT ADDENDUM<br>(ENCLOSURE IS RECORD # 4756)                                                                                                             | NO      | PARCEL E<br>SITE 00004<br>SITE 00036 |
| AR_N00217_004882<br>CORRESPONDENCE<br>2 | 04-05-2013  | U.S. EPA - SAN FRANCISCO, CA                                                        | REVIEW AND COMMENTS ON THE RESPONSES TO<br>COMMENTS ON THE DRAFT POTHOLE AREA<br>CHARACTERIZATION WORK PLAN (SEE RECORD #<br>4878 - RESPONSES TO COMMENTS)                                                                       | NO      | PARCEL E                             |
| AR_N00217_004879<br>CORRESPONDENCE<br>2 | 04-08-2013  | DTSC - BERKELEY, CA                                                                 | REVIEW AND NO COMMENTS ON THE RESPONSES TO<br>COMMENTS ON THE DRAFT POTHOLE AREA<br>CHARACTERIZATION WORK PLAN (SEE RECORD #<br>4878 - RESPONSES TO COMMENTS)                                                                    | NO      | PARCEL E                             |
| AR_N00217_004880<br>CORRESPONDENCE<br>3 | 04-15-2013  | DEPARTMENT OF PUBLIC<br>HEALTH - SAN FRANCISCO, CA                                  | REVIEW AND NO COMMENTS ON THE RESPONSES TO<br>COMMENTS ON THE DRAFT POTHOLE AREA<br>CHARACTERIZATION WORK PLAN (SEE RECORD #<br>4878 - RESPONSES TO COMMENTS)                                                                    | NO      | PARCEL E                             |
| AR_N00217_004827<br>CORRESPONDENCE<br>5 | 04-16-2013  | DTSC - BERKELEY, CA                                                                 | REVIEW AND COMMENTS ON THE DRAFT<br>NONAQUEOUS PHASE LIQUID TREATMENT PILOT<br>STUDY WORK PLAN (SEE RECORD # 4824 - DRAFT<br>NONAQUEOUS PHASE LIQUID TREATMENT PILOT<br>STUDY WORK PLAN)                                         | NO      | SITE 00003                           |
| AR_N00217_004828<br>CORRESPONDENCE<br>2 | 04-16-2013  | SAN FRANCISCO CITY AND<br>COUNTY DEPARTMENT OF PUBLIC<br>HEALTH - SAN FRANCISCO, CA | REVIEW AND COMMENTS ON THE DRAFT<br>NONAQUEOUS PHASE LIQUID TREATMENT PILOT<br>STUDY WORK PLAN (SEE RECORD # 4824 - DRAFT<br>NONAQUEOUS PHASE LIQUID TREATMENT PILOT<br>STUDY WORK PLAN)                                         | NO      | SITE 00003                           |
| AR_N00217_004881<br>CORRESPONDENCE<br>4 | 04-16-2013  | CRWQCB - OAKLAND, CA                                                                | REVIEW AND COMMENTS ON THE RESPONSES TO<br>COMMENTS ON THE DRAFT POTHOLE AREA<br>CHARACTERIZATION WORK PLAN (SEE RECORD #<br>4878 - RESPONSES TO COMMENTS)                                                                       | NO      | PARCEL E                             |

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| AR_N00217_004825<br>CORRESPONDENCE<br>12 | 04-17-2013  | U.S. EPA - SAN FRANCISCO, CA                   | REVIEW AND COMMENTS ON THE DRAFT<br>NONAQUEOUS PHASE LIQUID TREATMENT PILOT<br>STUDY WORK PLAN (SEE RECORD # 4824 - DRAFT<br>NONAQUEOUS PHASE LIQUID TREATMENT PILOT<br>STUDY WORK PLAN)                                                                         | NO      | SITE 00003 |
| AR_N00217_004826<br>CORRESPONDENCE<br>4  | 04-22-2013  | CRWQCB - OAKLAND, CA                           | REVIEW AND COMMENTS ON THE DRAFT<br>NONAQUEOUS PHASE LIQUID TREATMENT PILOT<br>STUDY WORK PLAN (SEE RECORD # 4824 - DRAFT<br>NONAQUEOUS PHASE LIQUID TREATMENT PILOT<br>STUDY WORK PLAN)                                                                         | NO      | SITE 00003 |
| AR_N00217_004851<br>REPORT<br>214        | 05-01-2013  | TRIECO - TETRA TECH EM, INC.,<br>JOINT VENTURE | FINAL ACCIDENT PREVENTION PLAN FOR POTHOLE<br>AREA CHARACTERIZATION (CD COPY ENCLOSED)<br>[DOCUMENT ALSO CONTAINS SENSITIVE STREET<br>LEVEL MAPS]                                                                                                                | NO      | PARCEL E   |
| AR_N00217_004850<br>REPORT<br>772        | 05-24-2013  | TRIECO - TETRA TECH EM, INC.,<br>JOINT VENTURE | FINAL POTHOLE AREA CHARACTERIZATION WORK<br>PLAN (INCLUDES RESPONSES TO COMMENTS WITH<br>DCN TRIE-2205-0024-0003 ON THE DRAFT, AND CD<br>COPY) [SEE RECORD # 4849 - BRAC PMO WEST<br>TRANSMITTAL LETTER] {DOCUMENT ALSO CONTAINS<br>SENSITIVE STREET LEVEL MAPS} | NO      | PARCEL E   |
| AR_N00217_004849<br>CORRESPONDENCE<br>6  | 05-31-2013  | BRAC PMO WEST                                  | TRANSMITTAL OF THE FINAL POTHOLE AREA<br>CHARACTERIZATION WORK PLAN (ENCLOSURE IS<br>RECORD # 4850)                                                                                                                                                              | NO      | PARCEL E   |
| AR_N00217_004878<br>CORRESPONDENCE<br>20 | 05-31-2013  | TRIECO - TETRA TECH EM, INC.,<br>JOINT VENTURE | RESPONSES TO COMMENTS ON THE DRAFT POTHOLE<br>AREA CHARACTERIZATION WORK PLAN (CD COPY<br>ENCLOSED)                                                                                                                                                              | NO      | PARCEL E   |

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| AR_N00217_004843<br>REPORT<br>6 | 06-12-2013  | CE2 - KLEINFELDER, JOINT<br>VENTURE | MEMORANDUM: GROUNDWATER ANALYTICAL RESULTS<br>EXCEEDING REMEDIATION GOALS OR TRIGGER<br>LEVELS, FIRST QUARTER 2013 (CD COPY ENCLOSED) | NO      | PARCEL B<br>PARCEL C<br>PARCEL E<br>PARCEL E-2<br>PARCEL G<br>PARCEL UC-2<br>WELL IR-01-MW-<br>038A<br>WELL IR-01-MW-<br>048A<br>WELL IR-01-MW-<br>060A<br>WELL IR-01-MW-<br>063A<br>WELL IR-01-MW-<br>064A<br>WELL IR-01-MW-<br>366B<br>WELL IR-01-MW-<br>403B<br>WELL IR-02-MW-<br>373A<br>WELL IR-03-MW-<br>218A-1<br>WELL IR-03-MW-<br>218A-2<br>WELL IR-03-MW-<br>O-001<br>WELL IR-06-MW-<br>022A<br>WELL IR-06-MW-<br>032A<br>WELL IR-06-MW-<br>054F<br>WELL IR-06-MW-<br>059A-1<br>WELL IR-10-MW-<br>013A-1<br>WELL IR-10-MW-<br>059A<br>WELL IR-10-MW-<br>061A |

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|                 |  |             |  |                    |  |       |  |         |  | WELL IR-10-MW-071A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-20-MW-017A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-011A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-016A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-062A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-063A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-064A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-065B |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-066B |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-25-MW-068A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-26-MW-049A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-26-MW-051A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-EW-001A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-IW-902A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-IW-903A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-125A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-151A |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-188F |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-190F |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-211F |  |
|                 |  |             |  |                    |  |       |  |         |  | WELL IR-28-MW-352A |  |

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|                                         |             |                                     |                                                                                                                                                                                                       |         | WELL IR-28-MW-354A<br>WELL IR-28-MW-355F<br>WELL IR-28-MW-407<br>WELL IR-28-MW-475A<br>WELL IR-28-MW-476A<br>WELL IR-28-MW-916A<br>WELL IR-28-MW-919A<br>WELL IR-28-MW-931A<br>WELL IR-28-MW-932A<br>WELL IR-28-MW-933A<br>WELL IR-28-MW-934A<br>WELL IR-28-MW-936A<br>WELL IR-33-MW-064A<br>WELL IR-58-MW-031A<br>WELL IR-71-MW-003A |
| AR_N00217_004747<br>CORRESPONDENCE<br>7 | 06-21-2013  | BRAC PMO WEST                       | TRANSMITTAL OF THE DRAFT RECORD OF DECISION<br>(ENCLOSURE IS RECORD # 4748)                                                                                                                           | NO      | PARCEL E                                                                                                                                                                                                                                                                                                                              |
| PF_N00217_004884<br>REPORT<br>123       | 11-01-2013  | CABRERA - INSIGHT, JOINT<br>VENTURE | FINAL IN SITU THERMAL REMEDIATION DESIGN<br>NONAQUEOUS PHASE LIQUID TREATMENT PILOT<br>STUDY, FORMER OILY WASTE PONDS (CD COPY<br>ENCLOSED) [SEE RECORD # 4883 - BRAC PMO WEST<br>TRANSMITTAL LETTER] | NO      | PARCEL E<br>SITE 00003                                                                                                                                                                                                                                                                                                                |

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| PF_N00217_004883<br>CORRESPONDENCE<br>3 | 11-25-2013  | BRAC PMO WEST      | TRANSMITTAL OF THE FINAL IN SITU THERMAL<br>REMEDATION DESIGN NONAQUEOUS PHASE LIQUID<br>TREATMENT PILOT STUDY, FORMER OILY WASTE<br>PONDS (ENCLOSURE IS RECORD # 4884) | NO      | PARCEL E<br>SITE 00003 |

**Total Estimated Record Page Count: 506,153**

**Total Records: 499**

(( OWNER="R") AND ( [SSIC NUMBER]="5090.3.A.") ) OR (( [RECORD NUMBER]=4883 Or [RECORD NUMBER]=4884) AND ( OWNER="R")) AND [UIC NUMBER]='N00217'

No Keywords

Sites=PARCEL E;PARCEL UC-3;SITE 00003

No Distribution

No FRC Box number

No Litigation Case Number



## Attachment 2. References

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*(Reference documents provided on CD only)*

| Item | Reference or Phrase in ROD                         | Location in ROD             | Identification of the Referenced Document Available in the Administrative Record <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                             |
|------|----------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Parcel E                                           | Section 2.1                 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.2.1, page 2-10.<br>Proposed Plan for Parcels E and UC-3, Hunters Point Naval Shipyard, San Francisco, California. Department of the Navy. February 2013. Page 1.                                                                                                                                                                                                             |
| 2    | IR sites                                           | Section 2.1                 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Table 2-1.                                                                                                                                                                                                                                                                                                                                                                             |
| 3    | Radiologically impacted areas                      | Section 2.1                 | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Table 1.                                                                                                                                                                                                                                                                                                                                         |
| 4    | 2010 redevelopment plan for HPNS                   | Section 2.1 and Section 2.4 | Hunters Point Shipyard Redevelopment Plan. City and County of San Francisco. Map 2, titled "Land Use Districts Map." August 3, 2010 (amendment to July 14, 1997 plan).<br><a href="http://www.sfredevelopment.org/index.aspx?page=160">http://www.sfredevelopment.org/index.aspx?page=160</a>                                                                                                                                                                                                             |
| 5    | Hydrostratigraphy                                  | Section 2.2                 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 3.5.1, pages 3-8 through 3-10.                                                                                                                                                                                                                                                                                                                  |
| 6    | Drinking water                                     | Section 2.2 and Section 2.4 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 3.6, pages 3-18 through 3-20.                                                                                                                                                                                                                                                                                                                   |
| 7    | Groundwater flow patterns                          | Section 2.2                 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.2.7.3, pages 2-16 through 2-18.                                                                                                                                                                                                                                                                                                                                              |
| 8    | Parcel E ecology                                   | Section 2.2                 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 3.7, pages 3-20 through 3-23.                                                                                                                                                                                                                                                                                                                   |
| 9    | Basewide Time-Critical Removal Action Memorandum   | Section 2.3                 | Final Basewide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California. Department of the Navy. April 2006.                                                                                                                                                                                                                                                                                                                                     |
| 10   | Chemicals in soil that exceeded screening criteria | Section 2.3.1               | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Table 2-5.<br>Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Table 4-1.                                                                                                                                                                                                             |
| 11   | Potential source of contamination to Parcel F      | Section 2.3.1               | Draft Parcels E and E-2 Shoreline Characterization Technical Memorandum, Hunters Point Shipyard, San Francisco, California. SulTech. June 2007. Pages 24 and 25. <i>(note: this document was accepted as final and was provided as Appendix G to the Final Revised Remedial Investigation Report for Parcel E)</i>                                                                                                                                                                                        |
| 12   | Groundwater plumes                                 | Section 2.3.2               | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.3.3, pages 2-29 through 2-34.                                                                                                                                                                                                                                                                                                                                                |
| 13   | VOCs in soil gas                                   | Section 2.3.2               | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.1.3.4.2, pages 2-8 through 2-9.<br>Final Parcel E Groundwater Treatability Study Technical Report, Hunters Point Shipyard, San Francisco, California. Shaw. May 2011. Figures 31, 32, 35 and 36.<br>Final Parcel E Groundwater Treatability Study Technical Report Addendum, Hunters Point Naval Shipyard, San Francisco, California. Shaw. March 2013. Figures 4 through 7. |

| Item | Reference or Phrase in ROD                                       | Location in ROD | Identification of the Referenced Document Available in the Administrative Record <sup>1</sup>                                                                                                                                                                                                                                                                                                    |
|------|------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14   | <b>NAPL across large portions of the Former Oily Waste Ponds</b> | Section 2.3.3   | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.3.1, page 2-22.                                                                                                                                                                                                                                                     |
| 15   | <b>Approach for testing thermally-enhanced extraction</b>        | Section 2.3.3   | Final In Situ Thermal Remediation Design NAPL Treatment Pilot Study, Installation Restoration Program Site 03 Former Oily Waste Ponds, Hunters Point Naval Shipyard, San Francisco, California. TPS Tech. November 2013. Executive Summary, pages vii through ix. Responses to Comments, pages 1 and 2.                                                                                          |
| 16   | <b>Several radiological investigations</b>                       | Section 2.3.4   | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Sections 2.3.1.1 and 2.3.1.2, pages 2-29 through 2-43.                                                                                                                                                                                  |
| 17   | <b>Radiological groundwater investigations</b>                   | Section 2.3.5   | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Section 2.3.2, pages 2-44 through 2-48.                                                                                                                                                                                                 |
| 18   | <b>CSM for human health</b>                                      | Section 2.5.1   | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Appendix I, Figure I-1.<br>Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix B, Figure B-1.                                    |
| 19   | <b>Quantitative HHRA</b>                                         | Section 2.5.1   | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Appendix I, pages I-15 through I-22.<br>Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix B, pages B-11 and B-12.              |
| 20   | <b>Cancer risks and noncancer hazards</b>                        | Section 2.5.1   | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Appendix I, pages I-26 through I-31.                                                                                                                                                                                                           |
| 21   | <b>Assumptions and uncertainties</b>                             | Section 2.5.1   | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. Appendix I, pages I-40 through I-44.<br>Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Section 2.5.2, pages 2-52 and 2-53.                     |
| 22   | <b>Total excess and incremental excess risks</b>                 | Section 2.5.1.1 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Sections 5.1.2 and 5.1.3, pages 5-5 through 5-10.<br>Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix B, pages B-16 and B-17. |
| 23   | <b>HHRA results for nonradioactive chemicals in soil</b>         | Section 2.5.1.1 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 5.0, Tables 5-5, 5-6, 5-7, 5-11, 5-12, and 5-13.                                                                                                                                                                                       |
| 24   | <b>Cancer risks from exposure to radionuclides in soil</b>       | Section 2.5.1.1 | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix B, Tables B-4, B-5, and B-6.                                                                                                                                                                                                   |
| 25   | <b>Direct exposure to shoreline sediment</b>                     | Section 2.5.1.2 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 5.3.1, pages 5-18 through 5-20; Attachment 1, Tables 1-1, 1-2, 1-3, 1-4, and 1-5.                                                                                                                                                      |

| Item | Reference or Phrase in ROD                               | Location in ROD | Identification of the Referenced Document Available in the Administrative Record <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------|----------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 26   | HHRA results for nonradioactive chemicals in groundwater | Section 2.5.1.3 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 5.0, Tables 5-14 through 5-16.                                                                                                                                                                                                                                                                                                                           |
| 27   | Baseline ecological risk assessment                      | Section 2.5.2   | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 5.2, pages 5-11 through 5-18, and Table 5-17.                                                                                                                                                                                                                                                                                                            |
| 28   | Screening-level ecological risk assessment               | Section 2.5.2   | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 5.3.2, pages 5-20 through 5-22.<br><br>Draft Parcels E and E-2 Shoreline Characterization Technical Memorandum, Hunters Point Shipyard, San Francisco, California. SulTech. June 2007. Tables 4 and 5. <i>(note: this document was accepted as final and was provided as Appendix G to the Final Revised Remedial Investigation Report for Parcel E)</i> |
| 29   | Risks to aquatic wildlife                                | Section 2.5.2   | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.5.2.3, page 2-45; Table 2-14.                                                                                                                                                                                                                                                                                                                                                         |
| 30   | Trigger levels                                           | Section 2.5.2.3 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix A, pages A-1 through A-10.                                                                                                                                                                                                                                                                                                                                                             |
| 31   | Nonradioactive chemicals in soil                         | Section 2.5.3   | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Figures 5-5, 5-6, and 6-1.                                                                                                                                                                                                                                                                                                                                       |
| 32   | Groundwater                                              | Section 2.5.3   | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Figures 5-8, 5-9, and 6-2.                                                                                                                                                                                                                                                                                                                                       |
| 33   | SLERA results                                            | Section 2.5.3   | Draft Parcels E and E-2 Shoreline Characterization Technical Memorandum, Hunters Point Shipyard, San Francisco, California. SulTech. June 2007. Figures 11, 12, and 13. <i>(note: this document was accepted as final and was provided as Appendix G to the Final Revised Remedial Investigation Report for Parcel E)</i><br><br>Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Figure 2-9.                                                    |
| 34   | Remediation goals                                        | Section 2.5.3   | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 3.1.1.3 and Table 3-1.                                                                                                                                                                                                                                                                                                                                                                  |
| 35   | Protective soil concentrations                           | Table 4         | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Appendix J, Section J5.1, pages J-20 through J-24.                                                                                                                                                                                                                                                                                                               |
| 36   | Potential principal threat wastes at Parcel E            | Section 2.6     | Proposed Plan for Parcels E and UC-3, Hunters Point Naval Shipyard, San Francisco, California. Department of the Navy. February 2013. Page 6.                                                                                                                                                                                                                                                                                                                                                                      |
| 37   | RAOs                                                     | Section 2.7     | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 3.1, pages 3-1 and 3-2.                                                                                                                                                                                                                                                                                                                                                                 |
| 38   | Table 7 of the final soil gas memorandum                 | Section 2.7     | Revised Final Memorandum: Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Naval Shipyard. ChaduxTt. December 2011. Table 7.                                                                                                                                                                                                                                                                                                                                           |
| 39   | Surface water quality criteria for aquatic wildlife      | Section 2.7     | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix A, Tables A-1, A-2, and A-3.                                                                                                                                                                                                                                                                                                                                                           |

| Item | Reference or Phrase in ROD                                | Location in ROD | Identification of the Referenced Document Available in the Administrative Record <sup>1</sup>                                                                                                                                                                                                                                             |
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| 40   | <b>General response actions and remedial technologies</b> | Section 2.8     | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Sections 3.3.1 and 3.3.2, pages 3-27 through 3-29; Tables 3-6 through 3-11.                                                                                                                                            |
| 41   | <b>Capital Cost: \$24.6M</b>                              | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-1, E-5, E-9, E-10, E-11, and E-12.                                                                                                                                                                |
| 42   | <b>Capital Cost: \$36.1M</b>                              | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-1, E-6, E-18, and E-19.                                                                                                                                                                           |
| 43   | <b>Capital Cost: \$37.3M</b>                              | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-1, E-7, E-23, E-24, and E-26.                                                                                                                                                                     |
| 44   | <b>Capital Cost: \$0.28M</b>                              | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-27, E-32, E-33, and E-35.                                                                                                                                                                         |
| 45   | <b>Capital Cost: \$1.2M</b>                               | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-27, E-36, E-37, E-38, E-39, and E-40.                                                                                                                                                             |
| 46   | <b>Capital Cost: \$2.0M</b>                               | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-27, E-41, E-42, and E-43.                                                                                                                                                                         |
| 47   | <b>Capital Cost: \$1.1M</b>                               | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-45, E-52, E-53, E-66, E-69, and E-71.                                                                                                                                                             |
| 48   | <b>Capital Cost: \$11.2M</b>                              | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-45 and E-54.                                                                                                                                                                                      |
| 49   | <b>Capital Cost: \$12.5M</b>                              | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-45, E-55, and E-68.                                                                                                                                                                               |
| 50   | <b>Capital Cost: \$18.7M</b>                              | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-45, E-56, and E-59.                                                                                                                                                                               |
| 51   | <b>Capital Cost: \$17.9M</b>                              | Table 9         | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-45, E-60, and E-63.                                                                                                                                                                               |
| 52   | <b>Capital Cost: \$29.5M</b>                              | Table 9         | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix D, Tables D-1, D-3, D-8, D-9, D-10, D-11, D-12, and D-13.                                                                                                               |
| 53   | <b>Capital Cost: \$30.5M</b>                              | Table 9         | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix D, Tables D-1, D-5, and D-15.                                                                                                                                           |
| 54   | <b>Nine evaluation criteria</b>                           | Section 2.8.2   | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 5.1, pages 5-1 and 5-2.                                                                                                                                                                                        |
| 55   | <b>Further developed in the RD</b>                        | Section 2.9.2   | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Table 4-8.                                                                                                                                                                                                             |
| 56   | <b>Exposure depth for aquatic wildlife</b>                | Section 2.9.2.1 | Draft Parcels E and E-2 Shoreline Characterization Technical Memorandum, Hunters Point Shipyard, San Francisco, California. SulTech. June 2007. Appendix G, Sections 2.1, 2.2, and 2.3. <i>(note: this document was accepted as final and was provided as Appendix G to the Final Revised Remedial Investigation Report for Parcel E)</i> |

| Item | Reference or Phrase in ROD              | Location in ROD | Identification of the Referenced Document Available in the Administrative Record <sup>1</sup>                                |
|------|-----------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------|
| 57   | <b>Community Involvement Plan</b>       | Section 2.10    | Final Community Involvement Plan, Hunters Point Shipyard, San Francisco, California. Department of Navy. May 2011.           |
| 58   | <b>IR Program website</b>               | Section 2.10    | <a href="http://www.bracpmo.navy.mil/">http://www.bracpmo.navy.mil/</a>                                                      |
| 59   | <b>The associated fact sheet</b>        | Section 2.10    | Fact Sheet, Summary of the Proposed Plan for Parcels E and UC-3, Hunters Point Naval Shipyard. BRAC PMO West. February 2013. |
| 60   | <b>Transcript of the public meeting</b> | Section 2.10    | <i>(note: this document is being published as part of this Record of Decision for Parcel E)</i>                              |

<sup>1</sup> Bold blue text indicates hyperlinks available on reference CD to detailed site information contained in the publically available Administrative Record.

For access to information contained in the Administrative Record for Hunters Point Naval Shipyard, please contact:

Naval Facilities Engineering Command Southwest  
 Attention: Diane Silva, Command Records Manager  
 2965 Mole Road, Building 3519  
 San Diego, CA 92136  
 Phone: (619) 556-1280

| Item | Reference or Phrase in ROD | Location in ROD | Identification of the Referenced Document Available in the Administrative Record <sup>1</sup>                                                                                                                                                                                                 |
|------|----------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Parcel E                   | Section 2.1     | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.2.1, page 2-10.<br>Proposed Plan for Parcels E and UC-3, Hunters Point Naval Shipyard, San Francisco, California. Department of the Navy. February 2013. Page 1. |

### 2.2.1. HPS and Surrounding Land Use

The main portion of HPS is situated on a long headland located in the southeastern part of San Francisco, extending eastward into San Francisco Bay (see [Figure 1-1](#)). HPS is bounded on the north, south, and east by the bay and on the west by the Bayview/Hunters Point district of San Francisco. HPS consists of 866 acres: 420 acres on land and 446 acres under water in the bay.

Parcel E includes about 139 acres of relatively flat shoreline and lowland coast along the southwestern portion of HPS (see [Figure 1-2](#)). Parcel E is bounded to the north by non-Navy property, to the east by Parcels D-1, G, and UC-1, to the south by intertidal shoreline areas along San Francisco Bay, and to the west by Parcel E-2 and non-Navy-property. Parcel E contains 44 buildings, and the adjoining offshore area contains 14 ship berths and 2 piers.

Historically, most of Parcel E was used as industrial support area, consisting of supply and public works facilities for HPS. Shoreline areas at Parcel E were used to store construction and industrial materials, as well as to dispose of industrial waste and construction debris. The NRDL used several Parcel E buildings during the 1950s and 1960s to conduct practical and applied research on radiation decontamination methods and on the effects of radiation on living organisms and natural and synthetic materials. The NRDL ceased operations in 1969 ([NAVSEA, 2004](#)). Many operations conducted by the Navy at Parcel E are well documented, including the locations where routine and planned activities and waste disposal occurred. Undocumented activities also may have been conducted, such as storage of materials and equipment, short-term industrial activities, and waste disposal ([TtEMI, LFR, and U&A, 1997](#)). The Revised RI Report evaluated all available environmental data and made conservative conclusions regarding the nature and extent of contamination, particularly in areas where possible contamination may have resulted from undocumented activities ([Barajas & Associates, 2008b](#)).

### 2.2.2. Parcel E Historic Areas

No structures within Parcel E have been identified as qualifying for placement on the National Register of Historic Places ([TtEMI, 1998a and 1998b](#)). Enclosure 2 of the Memorandum of Agreement among the Navy, the Advisory Council on Historic Preservation (ACHP), and the State Historic Preservation Office (SHPO) identified archaeologically sensitive zones at HPS ([Navy, ACHP, and SHPO, 2000](#)). Based on this archaeological inventory, a historic shellmound site may be present along Crisp Avenue in the northwest portion of Parcel E (north of IR-75, a formerly used defense site). Future CERCLA actions in





# Hunters Point Naval Shipyard Parcels E and UC-3



San Francisco, California

February 2013

## NAVY ANNOUNCES PROPOSED PLAN

The U.S. Navy encourages the public to comment on its **Proposed Plan**\* for cleanup of Parcels E and UC-3 at Hunters Point Naval Shipyard (HPNS) in San Francisco, California (see Figure 1). Parcel E includes a former industrial support area, consisting of supply and public works facilities for HPNS. Parcel E also includes shoreline areas used to dispose of industrial waste and construction debris. Parcel UC-3 consists of Crisp Road and an adjoining railroad right-of-way. Parcel UC-3 was formerly part of Parcel E; however, this planned utility corridor is now designated as a separate parcel for remedy selection. Two separate **Records of Decision (RODs)** will be prepared for Parcel E and Parcel UC-3, although both are discussed in this Proposed Plan. This approach will allow the final cleanup at Parcel UC-3 to be completed sooner than the final cleanup at Parcel E, which is more complicated.

This Proposed Plan presents several remedial alternatives for the final cleanup actions and identifies the Navy's **Preferred Alternatives**. The Navy and the **U.S. Environmental Protection Agency (EPA)**, in consultation with the **California Environmental Protection Agency's Department of Toxic Substances Control (DTSC)** and **San Francisco Bay Regional Water Quality Control Board (Water Board)**, will co-select **remedial actions** for Parcels E and UC-3 in the RODs after reviewing and considering all information submitted during the public comment period. The Navy may modify the Preferred Alternatives or select other remedial alternatives presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives presented in this Proposed Plan. A final decision will not be made until all comments submitted during the review period are considered. See how to comment in the box below.

This Proposed Plan summarizes the remedial (cleanup) alternatives evaluated by the Navy and explains the reasons for identifying the preferred alternative to address contamination at Parcels E and UC-3. The Navy estimates the cost of the preferred alternatives to be \$105.5 million. The Navy proposes the following cleanup actions at Parcel E:

- Remove and dispose of contaminated soil and shoreline sediment in selected areas.
- Separate and dispose of materials and soil with **residual radiological contamination**.
- Remove or treat contaminated material at the **Former Oily Waste Ponds**.

- Operate a **soil vapor extraction (SVE)** system to remove and treat **volatile organic compounds (VOCs)** in soil and **soil gas** at Building 406.
- Install durable covers to prevent contact with soil containing **metals** (found throughout the fill material quarried from local rock and soil) and chemical or radiological contamination (found at low levels in areas not proposed for excavation).
- Protect the shoreline using natural materials (such as sand) and large rocks.



Figure 1. Location of HPNS.

### How to Comment on the Proposed Plan for Parcels E and UC-3

- Provide written comments no later than March 15, 2013, by one of the following methods:  
E-mail: keith.s.forman@navy.mil  
Fax: (619) 532-0995  
Mail: See address on page 28
- Attend the public meeting and provide verbal or written comments:  
February 28, 2013, from 6:00 p.m. to 8:00 p.m.  
Southeast Community Facility Commission  
Building, Alex L. Pitcher, Jr. Room  
1800 Oakdale Avenue in San Francisco



|   |          |             |                                                                                                                               |
|---|----------|-------------|-------------------------------------------------------------------------------------------------------------------------------|
| 2 | IR sites | Section 2.1 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Table 2-1. |
|---|----------|-------------|-------------------------------------------------------------------------------------------------------------------------------|

**Table 2-1. IR Sites and Redevelopment Blocks**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| IR Site         | IR Site Significant Features                                                                                           | Corresponding Redevelopment Block(s) | Past Activities and Potential Sources                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IR-02 Northwest | Bay Fill Area; Triple A Sites 2 and 14 <sup>(a)</sup>                                                                  | EOS-1                                | Radium dial disposal area; disposal of construction debris, industrial debris, and liquid wastes (Triple A sites)                                                                                                                                                                                                                                                                                                                                                                                   |
| IR-02 Central   | Bay Fill Area; Triple A Sites 17, 18, and 19 <sup>(a)</sup>                                                            | EOS-2 and EOS-3                      | Former and current firing ranges; disposal of construction and industrial debris; dumping of industrial debris and liquid and sandblast waste (Triple A Sites 17 and 18); dumping and burning waste liquids (Triple A Site 19)                                                                                                                                                                                                                                                                      |
| IR-02 Southeast | Bay Fill Area; Metal Debris Reef; AST S-505; Triple A Site 13 <sup>(a)</sup>                                           | EOS-4                                | Removed AST S-505 used to store PCB-containing liquid waste that was dumped along shoreline (Triple A Site 13); former burn disposal area (metal debris reef)                                                                                                                                                                                                                                                                                                                                       |
| IR-03           | Former oil reclamation ponds area; Triple A Site 17 <sup>(a)</sup>                                                     | EOS-3                                | Former oil reclamation ponds; dumping of liquid and sandblast waste (Triple A Site 17)                                                                                                                                                                                                                                                                                                                                                                                                              |
| IR-04           | Former Building 807 (scrap yard shed); Triple A Site 3 <sup>(a)</sup>                                                  | MU-3                                 | Scrap yard used to store scrap metal, drums, pipe lagging, liquid waste, and batteries (Triple A Site 3)                                                                                                                                                                                                                                                                                                                                                                                            |
| IR-05           | Old transformer storage site                                                                                           | MU-1                                 | Fenced area of unknown use (Triple A Site); former transformer storage                                                                                                                                                                                                                                                                                                                                                                                                                              |
| IR-08           | Former Building 503; PCB Spill Area (1988)                                                                             | MU-2                                 | Spill of PCB-containing oil in 1988; removed AST at Building 503                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| IR-11/14/15     | Building 521; Triple A Sites 6, 7, 12, and 13 <sup>(a)</sup> ; former NRDL Buildings 506, 509, 510, 510A, 517, and 529 | EOS-3, EOS-4, and MU-2               | Oily liquid waste disposal (Triple A Sites 6 and 7); incineration of unknown industrial materials (Triple A Site 12); waste pond area (Triple A Site 13); steam generating power plant in Building 521; formerly contained buildings used by NRDL as Chemistry Laboratory (Building 506), Animal Irradiation Laboratory (Building 509), Physics Laboratories (Buildings 510 and 510A), Biomedical Facility (Building 517), and Radioisotope Storage and Cockroft-Walton Accelerator (Building 529). |

N:\Projects\2005 Projects\25-049\_Navy\_HPS\_E-2\_RI-FS\B\_Originals\Parcel-E\_FS\05Final\Tables\Table 2-1.doc

**Table 2-1. IR Sites and Redevelopment Blocks (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| IR Site     | IR Site Significant Features           | Corresponding Redevelopment Block(s) | Past Activities and Potential Sources                                                                                                                                                                                                                                  |
|-------------|----------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IR-12       | Triple A Sites 3 and 4 <sup>(a)</sup>  | EOS-1, EOS-5A, MU-1, and MU-3        | Scrap yard used to store scrap metal, drums, pipe lagging, liquid waste, and batteries (Triple A Site 3); disposal trench for waste liquids and concrete pad where waste liquid drums were crushed (Triple A Site 4)                                                   |
| IR-13       | Triple A Sites 5 and 15 <sup>(a)</sup> | MU-1                                 | Oily soil pile and drums containing waste liquids (Triple A Site 5); sandblast waste storage (Triple A Site 15)                                                                                                                                                        |
| IR-36 North | Buildings 400 and 405                  | MU-1, MU-2, and MU-3                 | Disposal of construction debris; storage of solvents in Buildings 400 and 405, decommissioned ship parts and equipment                                                                                                                                                 |
| IR-36 South | Buildings 406, 413, and 414            | MU-1 and MU-2                        | Degreasing operations, including solvent releases from floor drains (Building 406); waste oil drums stored in Building 413; stained oily area between Buildings 413 and 414 where drums of waste oil were stored                                                       |
| IR-36 West  | Buildings 371, 704, and 709            | MU-1                                 | Automotive repair shop stored oils, solvents, acids, and battery solutions (Building 704); area around Buildings 371 and 704 used to store vehicles, equipment, and two ASTs for oils and solvents; former Navy Exchange gas station (Building 709) with 7 former USTs |
| IR-38       | Former Buildings 507 and 508           | EOS-4 and MU-2                       | Formerly contained buildings used by NRDL as a biological laboratory (Building 507) and health physics office (Building 508)                                                                                                                                           |
| IR-39       | Buildings 707, and 708                 | MU-1 and MU-2                        | Pole-mounted transformer (Building 707); buildings used by NRDL for animal research (Building 707) and as a Biomedical Facility (Building 708)                                                                                                                         |
| IR-40       | Building 527                           | EOS-4                                | Pier 2 and electrical substation (Building 527)                                                                                                                                                                                                                        |

**Table 2-1. IR Sites and Redevelopment Blocks (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| IR Site              | IR Site Significant Features                                                | Corresponding Redevelopment Block(s)             | Past Activities and Potential Sources                                                                                                                                                                                                                                                        |
|----------------------|-----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IR-45 <sup>(b)</sup> | Steam line system                                                           | EOS-1, EOS-2, EOS-3, EOS-4, MU-1, MU-2, and MU-3 | Triple A is suspected of having used the steam line system to transport waste oil from Berth 29 in Parcel D and Dry Dock 4 in Parcel C to Building 521 and former AST S-505 (SFDA, 1986; DHS, 1988).                                                                                         |
| IR-47 <sup>(b)</sup> | Fuel distribution lines                                                     | EOS-3 and EOS-4                                  | Fuel was transported from Berth 29 in Parcel D to Building 521 and former AST S-505. Triple A is suspected of having used the fuel lines to transport waste oil from Berth 29 in Parcel D to Building 521, former AST S-505, and the former oil reclamation ponds (IR-03) (SFDA, 1986).      |
| IR-50 <sup>(b)</sup> | Storm drain and sanitary sewer systems                                      | All                                              | Potential radioactive contamination at systems associated with former NRDL sites (NAVSEA, 2004).                                                                                                                                                                                             |
| IR-51 <sup>(b)</sup> | Former electrical transformer locations                                     | --                                               | Transformers located throughout HPS were removed from their original locations in 1988 (HLA, 1990b). All remaining transformers were inspected, inventoried, and sampled (TtEMI, 1998b). IR-51 soil data were evaluated as part of the physical IR site in which the samples were collected. |
| IR-52                | Railroad right-of-way                                                       | --                                               | Railroad yard area and Railroad right-of-way                                                                                                                                                                                                                                                 |
| IR-54                | Building 511A                                                               | EOS-4                                            | Former woodworking hobby shop, demolished                                                                                                                                                                                                                                                    |
| IR-56                | Building 809                                                                | EOS-5B, EOS-5C, and MU-3                         | Lumber storehouse (Building 809); railroad yard area used to clean metal parts; open storage yard for scrap metal, motors, and batteries                                                                                                                                                     |
| IR-72                | Buildings 810 and 811; USTs S-801 and S-802; Triple A Site 3 <sup>(a)</sup> | EOS-5B and MU-3                                  | Scrap yard used to store scrap metal, drums, pipe lagging, liquid waste, and batteries (Triple A Site 3); storage of paint, oil, and liquid waste (Building 810); diesel station for fueling train engines (Building 811); two closed-in-place USTs (S-801 and S-802)                        |
| IR-73                | Removed ASTs                                                                | EOS-4                                            | Former asphalt manufacturing plant; removed ASTs; storage of drums containing oily liquids                                                                                                                                                                                                   |

**Table 2-1. IR Sites and Redevelopment Blocks (continued)**  
**Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California**

Notes: Information provided in table from Table 1-2 in the Final Revised RI Report for Parcel E (Barajas & Associates, Inc., 2008b).

- (a) During its occupancy of HPS, Triple A allegedly generated hazardous substances and wastes at the shipyard and allegedly engaged in the improper disposal of hazardous substances and wastes at various locations throughout Parcel E; further information is provided in the Revised Remedial Investigation Report for Parcel E (Barajas & Associates, 2008)
- (b) Facility-wide IR site that was established for the former utility network at HPS

-- = not applicable

AST = aboveground storage tank

DHS = Department of Health Services

HLA = Harding and Lawson Associates

HPS = Hunters Point Shipyard

IR = Installation Restoration

NAVSEA = Naval Sea Systems Command

NRDL = Naval Radiological Defense Laboratory

SFDA = San Francisco District Attorney

TtEMI = Tetra Tech EM Inc.

UST = underground storage tank

Sources:

Barajas & Associates, Inc., 2008b. "Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California." May 2.

DHS, 1988. "Remedial Action Order, Docket No. HSA87/88-034RA." January 7.

HLA, 1990b. "Draft Preliminary Assessment, Other Areas/Utilities, Naval Station Treasure Island, Hunters Point Annex, San Francisco." October 19.

NAVSEA, 2004. "Historical Radiological Assessment, Volume II, Use of General Radioactive Materials, 1939-2003, Hunters Point Shipyard, San Francisco, California." Prepared by Radiological Affairs Support Office. August 31.

SFDA, 1986. "People of California -v- Triple A Machine Shop Inc., et al., Exhibit to People's Memorandum of Points and Authorities in Support of Temporary Restraining Order Construction Trust, and Appointment of Receiver filed by Arlo Smith, District Attorney, et al., in the Superior Court of the State of California, in and of the City of San Francisco."

TtEMI, 1998b. "Final Basewide Environmental Baseline Survey, Revision 01, Hunters Point Shipyard, San Francisco, California." September 4.

|   |                               |             |                                                                                                                                                                   |
|---|-------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | Radiologically impacted areas | Section 2.1 | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Table 1. |
|---|-------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table 1. Parcel E Impacted Sites, Radionuclides of Concern, Historical Uses, and Planned Reuse**

| Building/<br>Site Number | Impacted Redevelopment<br>Block | Radionuclides<br>of Interest                                                                                 | Historic Use                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Redevelopment<br>Block Planned<br>Reuse |
|--------------------------|---------------------------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 406                      | MU-2                            | <sup>137</sup> Cs, <sup>226</sup> Ra                                                                         | Shipping, packing, and preserving                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Mixed Use                               |
| 414                      | MU-2                            | <sup>226</sup> Ra                                                                                            | LLRW storage area for RI IDW, Public Works/Supply storehouse                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mixed Use                               |
| 500                      | MU-2                            | <sup>137</sup> Cs, <sup>226</sup> Ra                                                                         | NRDL storage, barracks, bachelor officers' quarters, and NRDL administrative offices                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Mixed Use                               |
| 500 Building Series      | Various                         | <sup>241</sup> Am, <sup>137</sup> Cs, <sup>239</sup> Pu, <sup>226</sup> Ra, <sup>90</sup> Sr                 | Original RADLAB/NRDL administrative and laboratory facilities and outdoor storage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Various                                 |
| 503 Site<br>(Demolished) | MU-2                            | <sup>137</sup> Cs, <sup>226</sup> Ra, <sup>90</sup> Sr                                                       | Ships Galley and Military Support Services and NRDL contaminated laundry facility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Mixed Use                               |
| 506 Site<br>(Demolished) | MU-2 / EOS-4                    | <sup>241</sup> Am, <sup>137</sup> Cs, <sup>3</sup> H, <sup>239</sup> Pu, <sup>226</sup> Ra, <sup>90</sup> Sr | Radioactive waste containers stored on pad behind building; NRDL biology and health physics laboratories; animal, nuclear, and physical chemistry laboratories; radioactive waste storage tank located behind building; NRDL chemistry laboratories; radiochemistry laboratory; NRDL instrument repair, darkroom, and densitometer for film badges; counting rooms; electro-physical and surface chemistry laboratories; administrative offices; storerooms; duty watch berthing; personnel decontamination; and RADLAB/NRDL Headquarters and main facility prior to move to Building 815 in 1955 | Mixed Use / Open Space                  |
| 507 Site<br>(Demolished) | MU-2 / EOS-4                    | <sup>137</sup> Cs, <sup>239</sup> Pu, <sup>226</sup> Ra, <sup>90</sup> Sr                                    | NRDL biology laboratories, NRDL change house and animal quarters; Radiological Decontamination Center, Biochemistry Branch, Physiology-Psychology Branch, and Experimental Pathology Branch                                                                                                                                                                                                                                                                                                                                                                                                       | Mixed Use / Open Space                  |

**Table 1. Parcel E Impacted Sites, Radionuclides of Concern Historical Uses, and Planned Reuse (continued)**

| Building/<br>Site Number  | Impacted Redevelopment<br>Block | Radionuclides<br>of Interest                                                    | Historic Use                                                                                                                                                                                                                                                                                                | Redevelopment<br>Block Planned<br>Reuse |
|---------------------------|---------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 508 Site<br>(Demolished)  | MU-2 / EOS-4                    | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$                        | NRDL chemistry branch, library, personnel branch, photographic section of publications branch, radiological safety branch, barracks, health services division, chemical technology and nucleonics division, security division, health physics division, employee relations branch, and pathology laboratory | Mixed Use                               |
| 509 Site<br>(Demolished)  | EOS-4                           | $^{137}\text{Cs}$ , $^{90}\text{Sr}$                                            | Library                                                                                                                                                                                                                                                                                                     | Open Space                              |
| 510 Site<br>(Demolished)  | EOS-4                           | $^{137}\text{Cs}$ , $^{239}\text{Pu}$ ,<br>$^{226}\text{Ra}$ , $^{90}\text{Sr}$ | Weapons test sample storage, non-NRDL training facility, NRDL radiation facility, glassblowing, woodworking, and machine shops; physics branch; nuclear radiation branch; and research engineering section physics branch                                                                                   | Open Space                              |
| 510A Site<br>(Demolished) | EOS-4                           | $^{137}\text{Cs}$ , $^{90}\text{Sr}$                                            | NRDL kevatron facility, NRDL x-ray facility, SUPSHIPS record storage, and fire research facility                                                                                                                                                                                                            | Open Space                              |
| 517 Site<br>(Demolished)  | EOS-4                           | $^{137}\text{Cs}$ , $^{60}\text{Co}$ , $^{90}\text{Sr}$                         | Former brig and NRDL cobalt animal irradiation facility                                                                                                                                                                                                                                                     | Open Space                              |
| 520 Site<br>(Demolished)  | MU-2 / EOS-3                    | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$                        | Shipyard dental clinic and NRDL administrative offices                                                                                                                                                                                                                                                      | Mixed Use / Open Space                  |
| 521 Site                  | EOS-4                           | $^{137}\text{Cs}$ , $^{239}\text{Pu}$ ,<br>$^{226}\text{Ra}$ , $^{90}\text{Sr}$ | Power plant; also one of two suspected sites of fuel oil burning from three OPERATION CROSSROADS target ships                                                                                                                                                                                               | Open Space                              |
| 527                       | N/A                             | $^{137}\text{Cs}$ , $^{239}\text{Pu}$ ,<br>$^{226}\text{Ra}$ , $^{90}\text{Sr}$ | Motor generator building (located on offshore pier that is not planned to be reused)                                                                                                                                                                                                                        | N/A                                     |

**Table 1. Parcel E Impacted Sites, Radionuclides of Concern Historical Uses, and Planned Reuse (continued)**

| Building/<br>Site Number                    | Impacted Redevelopment<br>Block | Radionuclides<br>of Interest                                                                       | Historic Use                                                                                                                                                     | Redevelopment<br>Block Planned<br>Reuse |
|---------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 529 Site<br>(Demolished)                    | MU-2                            | $^{137}\text{Cs}$ , $^3\text{H}$ ,<br>$^{226}\text{Ra}$ , $^{90}\text{Sr}$                         | NRDL isotope storage facility (vault) and neutron generator                                                                                                      | Mixed Use                               |
| 701 Site                                    | MU-3                            | $^{137}\text{Cs}$ , $^{239}\text{Pu}$ ,<br>$^{226}\text{Ra}$ , $^{90}\text{Sr}$                    | Storage building that NRDL requested for "temporary" (120 days) storage of samples in 1947                                                                       | Mixed Use                               |
| 704 Area<br>Animal Pens                     | MU-1                            | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$                                           | Animal pens for NRDL                                                                                                                                             | Mixed Use                               |
| 704 Radioactive<br>Material Storage<br>Area | MU-1                            | $^{137}\text{Cs}$ , $^{239}\text{Pu}$ ,<br>$^{226}\text{Ra}$ , $^{90}\text{Sr}$                    | Radioactive material storage area                                                                                                                                | Mixed Use                               |
| 707 and Kennels                             | MU-1                            | $^{137}\text{Cs}$ , $^{239}\text{Pu}$ ,<br>$^{226}\text{Ra}$ , $^{90}\text{Sr}$                    | Research animal facility used by NRDL for animal breeding and housing; waste processing and storage facility, formerly leased to Pet Express as an animal clinic | Mixed Use                               |
| 707B Site<br>(Demolished)                   | MU-1                            | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$                                           | NRDL animal colony                                                                                                                                               | Mixed Use                               |
| 707C Site<br>(Demolished)                   | MU-1                            | $^{137}\text{Cs}$ , $^{239}\text{Pu}$ ,<br>$^{226}\text{Ra}$ , $^{90}\text{Sr}$                    | Nuclear weapons test support and experimentation and equipment issue and receiving area                                                                          | Mixed Use                               |
| 707 Triangle Area                           | MU-1                            | $^{137}\text{Cs}$ , $^{239}\text{Pu}$ ,<br>$^{226}\text{Ra}$ , $^{90}\text{Sr}$ , $^{235}\text{U}$ | NRDL radioactive waste receiving, packaging, and storage area and suspected septic tank and leach field from early operations                                    | Mixed Use                               |
| 708                                         | MU-1                            | $^{137}\text{Cs}$ , $^{90}\text{Sr}$                                                               | Research animal facility, bio-medical facility and animal psychology facility                                                                                    | Mixed Use                               |
| 807 Site<br>(Demolished)                    | MU-13                           | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$                                           | Scrap yard processing shed                                                                                                                                       | Mixed Use                               |

**Table 1. Parcel E Impacted Sites, Radionuclides of Concern Historical Uses, and Planned Reuse (continued)**

| Building/<br>Site Number                           | Impacted Redevelopment<br>Block  | Radionuclides<br>of Interest                             | Historic Use                                                                                                                                                                                                                                                                                                                   | Redevelopment<br>Block Planned<br>Reuse |
|----------------------------------------------------|----------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 810                                                | MU-3 / EOS-5B                    | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$ | LLRW and IDW storage location; storehouse, paint shop, and paint and oil storage                                                                                                                                                                                                                                               | Mixed Use / Open Space                  |
| S-719 Site<br>(Demolished)                         | EOS-1                            | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$ | Incinerator; potentially used by NRDL animal facility at Building 707                                                                                                                                                                                                                                                          | Open Space                              |
| Shack 79 Site<br>(Demolished)                      | MU-2                             | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$ | NRDL support for radioactive material                                                                                                                                                                                                                                                                                          | Mixed Use                               |
| Shack 80 Site<br>(Demolished)                      | MU-2                             | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$ | NRDL support; shack reported to have been moved from behind Building 506 to Building 704 area for "lab operations"                                                                                                                                                                                                             | Mixed Use                               |
| IR-02<br>(Bay Fill Area)                           | EOS-1 / EOS-2 /<br>EOS-3 / EOS-4 | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$ | Bay Fill Area was used for disposal of assorted shipyard wastes, which included $^{90}\text{Sr}$ and $^{226}\text{Ra}$ devices. The area known as IR-02 Northwest and Central contains a suspected concentration of these devices. Potentially used for disposal of wastes from decontamination of OPERATION CROSSROADS ships. | Open Space                              |
| IR-03<br>(Former Oil<br>Reclamation Ponds<br>Area) | EOS-3                            | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$ | HPS fuel oil reclaiming plant; possible area for disposal of assorted shipyard wastes, which may have included $^{90}\text{Sr}$ and $^{226}\text{Ra}$ devices and oil                                                                                                                                                          | Open Space                              |
| IR-04<br>(Former Scrap Yard)                       | MU-3                             | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$ | Post-disassembly area for metals, equipment, and other unusable items from the salvage yard that could have contained $^{226}\text{Ra}$ devices and other contaminants                                                                                                                                                         | Mixed Use                               |
| Former Salvage<br>Yard                             | MU-3 / MU-1                      | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$ | Predisposal disassembly area for metals, equipment, and other reusable items that could have contained $^{226}\text{Ra}$ devices and other contaminants                                                                                                                                                                        | Mixed Use                               |



**Table 1. Parcel E Impacted Sites, Radionuclides of Concern Historical Uses, and Planned Reuse (continued)**

| Building/<br>Site Number | Impacted Redevelopment<br>Block  | Radionuclides<br>of Interest                                                    | Historic Use                                                                                                                                                                   | Redevelopment<br>Block Planned<br>Reuse |
|--------------------------|----------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Parcel E Shoreline       | EOS-1 / EOS-2 / EOS-3 /<br>EOS-4 | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$                        | Debris disposal                                                                                                                                                                | Open Space                              |
| Piers and Berths         | N/A                              | $^{137}\text{Cs}$ , $^{239}\text{Pu}$ ,<br>$^{226}\text{Ra}$ , $^{90}\text{Sr}$ | Berthing of OPERATION CROSSROADS ships,<br>berthing of the YGN-73 (radioactive waste<br>disposal barge), and NRDL usage (berthing of<br>experimental barges YAG-39 and YAG-40) | N/A                                     |
| Sanitary Sewer<br>System | Various                          | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$                        | Sanitary sewer system                                                                                                                                                          | Various                                 |
| Storm Drain Lines        | Various                          | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$                        | Combined storm and sanitary sewer drains                                                                                                                                       | Various                                 |
| Septic Sewer Lines       | Various                          | $^{137}\text{Cs}$ , $^{226}\text{Ra}$ , $^{90}\text{Sr}$                        | Septic sewage system (predating sanitary sewer<br>system; potentially associated with impacted<br>Building 810)                                                                | Various                                 |

Notes:

$^{241}\text{Am}$  = americium-241

$^{60}\text{Co}$  = cobalt-60

$^{137}\text{Cs}$  = cesium-137

$^3\text{H}$  = hydrogen-3

IDW = investigation-derived waste

IR = Installation Restoration

LLRW = low-level radioactive waste

N/A = not applicable (offshore piers and berths are considered part of the offshore Parcel F but are included in this document for completeness; these structures are not planned for reuse)

NRDL = Naval Radiological Defense Laboratory

$^{239}\text{Pu}$  = plutonium-239

$^{226}\text{Ra}$  = radium-226

RADLAB = radiation laboratory

RI = remedial investigation

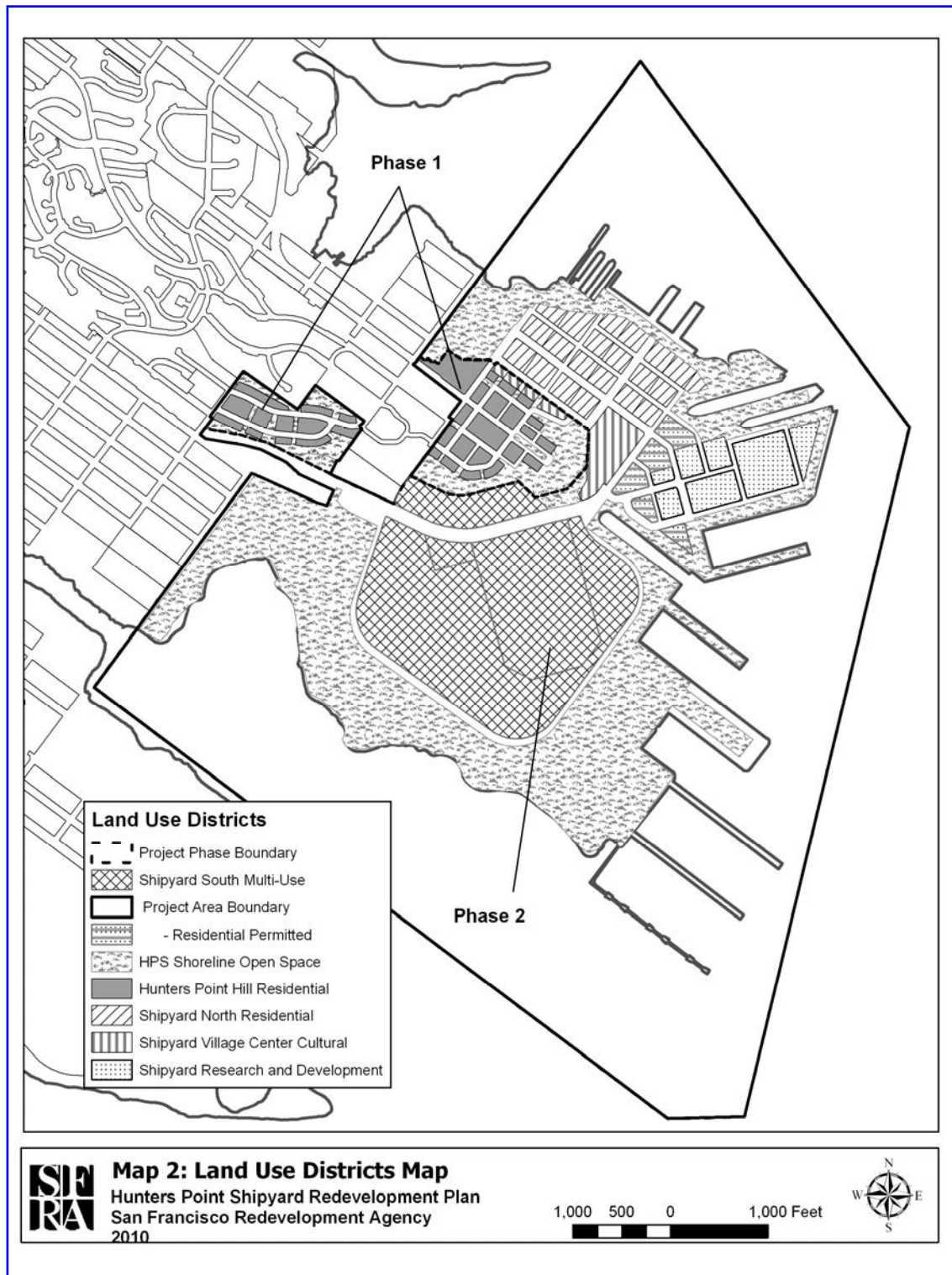
$^{90}\text{Sr}$  = strontium-90

SUPSHIPS = Superintendent of Shipbuilding

$^{235}\text{U}$  = uranium-235

|   |                                  |                             |                                                                                                                                                                                                                                                                                            |
|---|----------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | 2010 redevelopment plan for HPNS | Section 2.1 and Section 2.4 | Hunters Point Shipyard Redevelopment Plan. City and County of San Francisco. Map 2, titled "Land Use Districts Map." August 3, 2010 (amendment to July 14, 1997 plan). <a href="http://www.sfredevelopment.org/index.aspx?page=160">http://www.sfredevelopment.org/index.aspx?page=160</a> |
|---|----------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Map 2: Land Use Districts Map



|   |                   |             |                                                                                                                                                                                          |
|---|-------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | Hydrostratigraphy | Section 2.2 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 3.5.1, pages 3-8 through 3-10. |
|---|-------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 3.5 HYDROGEOLOGY

This section briefly discusses the local hydrogeologic setting and Parcel E hydrostratigraphy, groundwater flow patterns, hydraulic characteristics, and tidal effects at Parcel E. The original RI Report discusses in detail the regional hydrogeologic setting ([Tetra Tech, LFR, and U&A 1997](#)).

### 3.5.1 Local Hydrogeologic Setting and Parcel E Hydrostratigraphy

Two aquifers and one water-bearing zone are present at HPS: (1) the A-aquifer, (2) the B-aquifer, and (3) the bedrock water-bearing zone. Additionally, an aquitard composed of the Bay Mud separates the A-aquifer from the B-aquifer over most of Parcel E.

This section summarizes the A-aquifer, the Bay Mud aquitard, the B-aquifer, and the bedrock water-bearing zone present at Parcel E. The relationships between the stratigraphic and hydrostratigraphic units at Parcel E are presented in the table below.

| Stratigraphic Unit                                 | Corresponding Hydrostratigraphic Unit   |
|----------------------------------------------------|-----------------------------------------|
| Artificial Fill ( $Q_{af}$ )                       | A-aquifer <sup>a</sup>                  |
| Undifferentiated Upper Sand Deposits ( $Q_{uus}$ ) | A-aquifer <sup>a</sup>                  |
| Bay Mud ( $Q_{bm}$ )                               | Aquitard <sup>b</sup>                   |
| Undifferentiated Sedimentary Deposits ( $Q_u$ )    | B-aquifer <sup>c</sup>                  |
| Franciscan Complex Bedrock ( $K_f$ )               | Bedrock Water-Bearing Zone <sup>d</sup> |

Notes:

- a Hydrostratigraphic unit comprises permeable portions of the Artificial Fill and Undifferentiated Upper Sand deposits, and includes weathered portions of the bedrock that directly underlie saturated Artificial Fill or Undifferentiated Upper Sand deposits and localized areas where Undifferentiated Upper Sand deposits are interbedded with Bay Mud deposits.
- b Hydrostratigraphic unit also includes low-permeability Artificial Fill deposits.
- c Unit comprises the permeable portions of the Undifferentiated Sedimentary deposits.
- d Unit consists of portions of saturated bedrock that are not in direct contact with the A- or B-aquifers.

#### 3.5.1.1 A-Aquifer

The A-aquifer primarily consists of the extremely heterogeneous Artificial Fill described in [Section 3.4.2.1](#), although the A-aquifer may also include (1) Undifferentiated Upper Sands (where present); (2) sandy units within the Bay Mud, when these units are hydraulically connected to the A-aquifer; and (3) the upper weathered bedrock zone, when the A-aquifer directly overlies bedrock (such as in the southeastern portion of Parcel E at Building 521).

The A-aquifer covers almost all of Parcel E, from a few feet to over 50 feet thick (see cross section G-G' on [Figure 3-6](#)). However, the lateral continuity of the A-aquifer is disrupted by numerous low-permeability zones because of the heterogeneous nature of the Artificial Fill (see cross sections C-C' and D-D' on [Figures 3-4 and 3-5](#)). The A-aquifer is unconfined throughout most of Parcel E, but semiconfined conditions may exist in many places where fine-grained sediments below the water table overlie more permeable materials, as shown in cross sections C-C', D-D', and G-G' on [Figures 3-4, 3-5, and 3-6](#). Depth to groundwater ranges from 4 to 15 feet bgs, with an average depth to groundwater across Parcel E of about 8 feet bgs.

The A-aquifer is separated from the B-aquifer and the bedrock water-bearing zone by the Bay Mud aquitard, except for the northern portion of Parcel E in the vicinity of Buildings 809 and 810 (see cross sections C-C' and D-D' on [Figures 3-4 and 3-5](#)), and the southeastern portion of Parcel E in the vicinity of Building 521 (see cross section I-I' on [Figure 3-6](#)), where the Bay Mud aquitard is absent. The A-aquifer directly overlies shallow weathered bedrock at two bedrock highs (see [Section 3.4.2.5](#)), where both the Bay Mud aquitard and the B-aquifer are absent. As shown on cross section I-I' on [Figure 3-6](#) by color shading, shallow bedrock in contact with A-aquifer is considered part of this aquifer.

Groundwater flow in the A-aquifer at HPS is complex because of the high variability in hydraulic properties of the subsurface fill materials, tidal influences, effects of storm drain and sanitary sewer systems, and variations in topography and drainage. Large variations in hydraulic properties result from variations in fill type, soil texture, degree of compaction, and distribution of sediments. Groundwater in the A-aquifer at HPS generally flows radially toward San Francisco Bay, except where reversed because of the possible influence of leaking storm and sanitary sewer utility lines and along the shoreline where tidal influences are apparent ([Tetra Tech, LFR, and U&A 1997](#)). Groundwater flow in the A-aquifer is discussed in more detail in [Section 3.5.2.1](#), and the hydraulic characteristics of the A-aquifer are discussed in [Section 3.5.3.1](#).

#### **3.5.1.2 Bay Mud Aquitard**

The Bay Mud aquitard, composed mostly of clay and silt, typically separates the A-aquifer from the underlying B-aquifer. The Bay Mud deposits range from 5 to 76 feet thick under most of Parcel E, with the maximum thickness of 76 feet at boring DMB241. A Bay Mud thickness contour (isopach) map is provided on [Figure 3-7](#). This figure shows that the aquitard is absent in the northern portion of Parcel E, along Crisp Avenue, and in the areas of the bedrock highs (see [Section 3.4.2.3](#)). The aquitard is generally thickest in the southern portion of the parcel, along the shoreline.

#### **3.5.1.3 B-Aquifer**

The B-aquifer in Parcel E is composed of the permeable portions of the Undifferentiated Sediments (see [Section 3.4.2.4](#)), consisting of a sequence of relatively thick (about 30 to 40 feet), laterally continuous layers of sand and silty and clayey sand (see cross sections A-A', D-D', and G-G' on [Figures 3-4, 3-5, and 3-6](#)), which are separated by laterally continuous layers of silt and

clay. Across all of Parcel E, monitoring wells were installed in the uppermost portion of the B-aquifer primarily because its lower portions are overlain by layers of silts and clay and, therefore, are less likely to be affected by contamination from site activities. Therefore, in this report the discussion of the B-aquifer mainly refers to its uppermost portion.

The uppermost B-aquifer generally corresponds to the upper 20- to 40-foot thick layer of sand and silty sand of Undifferentiated Sedimentary deposits (see cross-section A-A' on [Figure 3-4](#)). The B-aquifer is generally confined by the Bay Mud aquitard, which separates it from the A-aquifer across most of Parcel E. The aquitard is absent along the northern border of Parcel E, (see [Figure 3-7](#) and cross sections C-C' and D-D' on [Figures 3-4 and 3-5](#)). In these locations, the A- and B-aquifers are in hydraulic communication, and behave as a single aquifer. As indicated by color shading on cross sections, the upper portion of the saturated weathered bedrock that is in direct contact with the more permeable layers of the B-aquifer is considered part of the B-aquifer. These upper weathered portions of the Franciscan Complex bedrock are more similar to porous sedimentary media than the deeper portions of massive and fractured bedrock. Groundwater flow in the poorly weathered and unweathered bedrock is limited to the fracture zones, which minimizes the amount of available groundwater. The fractured, unweathered bedrock is not considered an aquifer because of its limited flow capability and low storage capacity.

#### **3.5.1.4      *Bedrock Water-Bearing Zone***

Deeper portions of saturated fractured bedrock that are not in direct contact with the A- or B-aquifers are hydrostratigraphically classified as the bedrock water-bearing zone. The cross sections identify the portions of bedrock considered to be part of the A- or B-aquifers; other portions of bedrock are considered to be the bedrock water-bearing zone ([Tetra Tech 2004c](#)).

### **3.5.2              Groundwater Flow Patterns**

This section discusses the pattern of groundwater flow at Parcel E, including the A-aquifer, uppermost B-aquifer, and the bedrock water-bearing zone. Water levels were measured during the wet and dry seasons during periods of low tidal fluctuation to minimize the impact of the tides on groundwater elevations. Additionally, this section summarizes the vertical flow of groundwater at Parcel E and recharge and discharge of groundwater in each aquifer and water-bearing zone.

#### **3.5.2.1      *A-Aquifer Flow***

Groundwater levels in the A-aquifer are generally higher during the wet season (winter and spring) than during the dry season (summer and fall), indicating that precipitation is a primary recharge source for groundwater in the A-aquifer. Additional recharge sources for the A-aquifer are discussed in [Section 3.5.2.5](#). [Figure 3-9](#) shows A-aquifer groundwater elevations measured during the wet season (on February 20, 2002), and [Figure 3-10](#) shows A-aquifer groundwater elevations measured during the dry season (on November 18, 2004).



|   |                |                             |                                                                                                                                                                                         |
|---|----------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | Drinking water | Section 2.2 and Section 2.4 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 3.6, pages 3-18 through 3-20. |
|---|----------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- Based on typical hydraulic conductivities and gradients measured at Parcel E, the estimated average groundwater velocities in the A-aquifer are 408 ft/yr and in the B-aquifer are 2 ft/yr. Because of the heterogeneity of the A-aquifer, groundwater flow rates are expected to vary over several orders of magnitude.
- The bedrock water-bearing zone is a fractured, massive rock matrix that consists of serpentinite and greenstone, with lesser amounts of shale, greywacke, and chert. The upper portions are generally highly weathered to a friable, gravelly clay to clayey gravel and are considered part of the overlying A- or B-aquifer. The poorly weathered to unweathered fractured bedrock is not considered an aquifer because of its limited flow capability and low storage capacity.
- The A-aquifer tidal influence zone in Parcel E generally extends about 100 to 400 feet inland from the Bay but extends up to 600 feet inland at the southeastern tip of Parcel E.
- The tidal mixing zone, where groundwater discharging from Parcel E physically mixes with the Bay water during the tidal cycle, extends at least 70 feet inland and was not observed in the next closest well studied at 335 feet inland from the shoreline.

### 3.6 GROUNDWATER BENEFICIAL USE EVALUATION

This section summarizes the evaluation of beneficial use of groundwater in the A-aquifer and B-aquifer at Parcel E. [Appendix F](#) provides a detailed discussion of the beneficial use evaluation of groundwater at Parcel E.

The following beneficial use evaluations were previously conducted for Parcel E:

- **Parcel E RI and FS Reports.** The original Parcel E RI and FS Reports evaluated beneficial use of groundwater and concluded that A-aquifer and B-aquifer groundwater underlying Parcel E had a beneficial use only as a source of water recharge to the South Bay ([Tetra Tech, LFR, and U&A 1997](#); [Tetra Tech 1998a](#)).
- **Revised Final Groundwater Beneficial Use Determination for the A-Aquifer in Parcels C, D, and E.** The Parcel E beneficial use evaluation was updated in 2001. The updated evaluation identified groundwater areas that met federal and state groundwater classification criteria and recommended further evaluation of the beneficial use of groundwater in the FS with respect to site-specific factors (SSF) ([Tetra Tech 2001](#)). EPA provided nine SSFs to the Navy ([EPA 1999](#)).
- **Letter to Water Board Requesting A-Aquifer Exemption.** The Navy requested exemption of the A-aquifer at HPS from consideration as a municipal or domestic water supply source in a letter to the Water Board, dated August 11, 2003 ([Navy 2003](#)). On September 25, 2003, the Water Board concurred that A-aquifer groundwater at HPS meets the TDS exemption criteria in the SWRCB Sources of Drinking Water Resolution No. 88-63 ([Water Board 2003](#); [SWRCB 1988](#)).

EPA has not concurred with the Water Board's letter. As such, the evaluation of the municipal and domestic drinking water beneficial uses of Parcel E groundwater presented in [Appendix F](#) of this Revised Parcel E RI Report focuses on the A-aquifer with respect to federal criteria and the B-aquifer with respect to federal and state criteria. The Basin Plan also provides for agricultural and industrial beneficial uses for groundwater at the site.

The primary drinking water beneficial use evaluation criteria are TDS content and well yield. The federal TDS and well yield criteria are TDS content less than 10,000 milligrams per liter (mg/L) and sustained yield of 150 gallons per day (gpd). The state TDS and well yield criteria are TDS content less than 3,000 mg/L and sustained yield of 200 gpd. At Parcel E, the A-aquifer exceeds the federal TDS content criteria with a mean A-aquifer TDS content of 10,309 mg/L (approximately 40 percent of Parcel E area is underlain by groundwater with TDS content above 10,000 mg/L); meets the federal well yield criteria with potential well yields of 1,720 to 72,000 gpd; and is exempt from the state criteria. Based on limited data, the B-aquifer generally is expected to meet the federal and state TDS content and well yield criteria. [Figure 3-15](#) shows the maximum A-aquifer TDS concentrations. [Figure F-2](#) in [Appendix F](#) shows the maximum TDS concentrations in the B-aquifer. The TDS content is below 3,000 mg/L in four of the six B-aquifer wells. [Table 3-7](#) provides a summary of TDS information.

In addition to the primary drinking water beneficial use criteria, EPA provided nine SSFs for inclusion in the beneficial use evaluation ([EPA 1999](#)). The table below summarizes the beneficial use evaluation with respect to EPA's nine SSFs. The conclusions for the B-aquifer are based on limited information. [Appendix F](#) provides detailed descriptions of each criterion and the evaluation of each criterion for the A- and B-aquifers.

| Site-Specific Factors                                        | Potential for A-Aquifer Drinking Water Beneficial Use | Potential for B-Aquifer Drinking Water Beneficial Use |
|--------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
| Aquifer Thickness                                            | Low                                                   | Moderate                                              |
| Actual TDS Levels                                            | Low                                                   | Moderate to High                                      |
| Actual Groundwater Yield                                     | High                                                  | High                                                  |
| Depth to Groundwater                                         | Low                                                   | Moderate                                              |
| Proximity to Saltwater and Potential for Saltwater Intrusion | Low                                                   | Moderate                                              |
| Quality of Underlying Water-bearing Units                    | Low                                                   | Insufficient data                                     |
| Existence of Institutional Controls on Aquifer Use           | Low                                                   | Low                                                   |
| Historic and Current Groundwater Use                         | Low                                                   | Low                                                   |
| Cost of Cleanup to Federal Drinking Water Standards          | Low                                                   | High                                                  |

Based on the federal groundwater classification criteria and the evaluation of SSFs, the weight of evidence indicates that the A-aquifer and the B-aquifer have low potential for use as potable water supplies at Parcel E. However, for the purposes of the HHRA (see [Section 5.1](#) and [Appendix I](#)), exposure pathways associated with domestic use of the B-aquifer (for example, ingestion) are assumed to be complete and are assessed for potential risks. This assumption provides an additional measure of conservatism with respect to the protection of human health at HPS.

In addition, based on the SSF evaluation, the A-aquifer is not a viable source of drinking water, and federal maximum contaminant levels (MCL) are not applicable or relevant and appropriate requirements (ARAR) for the CERCLA action. Furthermore, based on the SSF evaluation, the B-aquifer has potential beneficial use as drinking water across most of the site, and MCLs are ARARs; however, City controls prevent use of groundwater at the site. Agricultural beneficial use of the A- and B-aquifer groundwater is limited to areas with TDS at concentrations less than 1,500 mg/L for irrigation and less than 10,000 mg/L for livestock. Both the A- and B-aquifers have potential industrial beneficial use.

### **3.7 ECOLOGY**

This section describes the terrestrial and aquatic ecological habitat (including flora and fauna) identified at Parcel E. This ecological information is used to assess adequately exposure pathways and potential risks to ecological receptors. The ecological habitat description in this section was derived from several different projects that entailed site walkthrough inspections at HPS. The following reports document these projects:

- Preliminary Draft ERA Data Summary Report ([HLA 1991b](#)), which listed species reported to be present at HPS
- Phase 1A ERA Report ([PRC 1994a](#)), which identified habitats and species present at HPS
- Parcel E ERA Validation Study ([Tetra Tech and LFR 2000a](#)), which entailed collecting tissue samples from plants and animals to complete the baseline ecological risk assessment (BERA) and update the assessment of habitat types and included observation of species present at Parcel E
- Wetlands Delineation and Functions and Values Assessment ([Tetra Tech 2003c](#)), which delineated all wetlands at HPS, assessed their functions and values, and included observation of species present at Parcel E

Risks to terrestrial ecological receptors only are evaluated in this Revised Parcel E RI Report (see [Section 5.0](#)). Risks to aquatic ecological receptors are evaluated as part of investigations at Parcel F. A preliminary evaluation of the potential for groundwater to impact the Bay is presented in [Section 4.3](#).

#### **3.7.1 Terrestrial Flora**

Parcel E is characterized by patches of ruderal vegetation, industrial areas, and wetlands (freshwater, saline emergent, and intertidal) and intertidal areas ([PRC 1994a](#)). Each type of area is discussed below and is shown on [Figure 3-3](#).



|   |                           |             |                                                                                                                                                              |
|---|---------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7 | Groundwater flow patterns | Section 2.2 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.2.7.3, pages 2-16 through 2-18. |
|---|---------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|

of Undifferentiated Sedimentary deposits. The B-aquifer is generally confined by the Bay Mud aquitard, which separates it from the A-aquifer across most of Parcel E. The aquitard is absent along the northern border of Parcel E. In these locations, the A- and B-aquifers are in hydraulic communication and behave as a single aquifer.

Deeper portions of saturated fractured bedrock that are not in direct contact with the A- or B-aquifers are hydrostratigraphically classified as the bedrock water-bearing zone. The fractured, unweathered bedrock is not considered an aquifer because of its limited flow capability and low storage capacity.

Groundwater monitoring has been limited to the uppermost B-aquifer, and no monitoring has been required in the lower portions of the B-aquifer or the bedrock WBZ. The A-aquifer and uppermost B-aquifer present at HPS are potentially affected by contamination from Parcel E.

#### 2.2.7.2. Hydraulic Characteristics

The calculated hydraulic conductivities of the A-aquifer at Parcel E range from 2.7 feet per day (ft/day) to 1,520 ft/day (Barajas & Associates, Inc., 2008b; TtEMI, 2004b). The 1,520 ft/day value is likely not representative of aquifer characteristics because (1) the value was calculated solely from recovery data collected from a pumping well; (2) documentation on this pumping test does not indicate the duration of the test; and (3) no observation wells were included or drawdown in the observation wells was insufficient to calculate hydraulic conductivity, suggesting that the cone of depression for this test may have been limited. If this value is considered an outlier, the actual range for hydraulic conductivities in the A-aquifer at Parcel E would be 2.7 to 510 ft/day (Barajas & Associates, Inc., 2008b). Based on average hydraulic conductivities and gradients measured in the A-aquifer, the estimated average groundwater velocity in the A-aquifer is 408 feet per year (ft/yr).

The calculated hydraulic conductivities in the B-aquifer ranged from 0.18 to 3.1 ft/day. Based on the average hydraulic conductivity and gradients measured in the B-aquifer, the estimated average groundwater velocity for the B-aquifer is approximately 2 ft/yr. Only two slug tests were performed for the bedrock-water bearing zone, and calculated hydraulic conductivities were 0.34 and 0.12 ft/day. The slug tests assumed a porous medium such as sand, rather than the fractured porosity of the bedrock. Therefore, these calculated values are, at best, approximations of the flow velocity (Barajas & Associates, Inc., 2008b).

#### 2.2.7.3. Groundwater Flow

This section discusses the pattern of groundwater flow at Parcel E, including the vertical flow of groundwater and recharge and discharge of groundwater in each aquifer and water-bearing zone. During previous investigations, water levels were measured during wet and dry seasons during periods of low tidal fluctuation to minimize the effect of tides on groundwater elevations. Water levels continue to be

monitored on a quarterly basis using similar procedures. The ongoing water level data should be reevaluated, prior to preparing the remedial design, to verify groundwater flow directions.

A-aquifer groundwater flow patterns at Parcel E are complex. The predominant flow directions have historically been influenced by two major features: (1) a groundwater depression along the boundary between Parcels E and G, and (2) a groundwater divide in the central shoreline area. The natural flow of groundwater toward San Francisco Bay from the topographically high area of the former Parcel A has typically been disrupted by these two features. The groundwater depression is most likely the residual effect of groundwater infiltrating damaged sanitary sewer lines during pumping at a nearby lift station. The sanitary sewer lift station, located at the former Parcel A, ceased operation in May 2007. The lateral extent of the groundwater depression had decreased from approximately 73 acres in May 2007 to 5 acres in March 2008 ([CE2-Kleinfelder Joint Venture, 2008b](#)). In March 2009, the groundwater depression was nearly nonexistent at 0.1 acres, indicating that natural hydrogeological conditions were being reestablished ([CE2-Kleinfelder Joint Venture, 2009b](#)). The influence of the groundwater divide along the central shoreline area remains unchanged. [Figure 2-2](#) presents the groundwater elevations for A-aquifer wells in Parcel E for March 2009, which show the reduced size of the groundwater depression along the boundary between Parcels E and G.

Two groundwater mounds are associated with groundwater flow within the A-aquifer: one mound (about 2,000 feet long) is parallel to the shoreline in the central portion of Parcel E and extends into Parcel E-2; and one is a small mound in the southeastern portion of Parcel E that coincides with the bedrock high at Building 521. Groundwater on the inland side of the first mound flows to the south-southeast toward bay at an average gradient of less than 0.001 feet per foot (ft/ft). Groundwater on the bayward side flows toward San Francisco Bay at an average gradient of 0.011 ft/ft. Groundwater has historically flowed radially away from the second mound at an average gradient of 0.018 ft/ft ([Barajas & Associates, Inc., 2008b](#)); however, recent groundwater elevations have indicated limited influence on groundwater flow (likely the result of lower than normal rainfall in recent years). Groundwater levels in the A-aquifer are generally higher during the wet season (winter and spring) than during the dry season (summer and fall), indicating that precipitation is a primary recharge source for groundwater in the A-aquifer.

The groundwater flow direction in the uppermost B-aquifer appears to be to the southeast at a gradient of 0.002 ft/ft ([Barajas & Associates, Inc., 2008b](#)). [Figure 2-3](#) presents groundwater elevations for B-aquifer wells in Parcel E for the March 2008 measurement event. Similar to the A-aquifer, groundwater elevations in the uppermost B-aquifer are generally higher in the wet season than in the dry season.

Groundwater elevations in the B-aquifer wells are generally higher than in the A-aquifer wells indicating an upward vertical hydraulic gradient. Based on data in the Revised RI Report ([Barajas & Associates, Inc., 2008b](#)), the differences in groundwater elevations are more pronounced in the northeastern portion of the parcel near the Parcel G boundary and less pronounced near the shoreline. Additionally, elevation

differences are more pronounced during the wet season than the dry season. The B-aquifer appears to exhibit an upward vertical gradient; however, the Bay Mud aquitard separates the B-aquifer from the A-aquifer across most of Parcel E, suggesting little hydraulic communication between the two aquifers in areas where the aquitard is present (Barajas & Associates, Inc., 2008b).

The groundwater elevation has only been measured in one bedrock water-bearing zone well (February 2002). Given the limited data, the direction of groundwater flow in the bedrock water-bearing zone is unknown, but it is assumed to follow the regional flow pattern from the upland areas toward San Francisco Bay (Barajas & Associates, Inc., 2008b).

The primary sources of recharge to the A-aquifer in Parcel E are (1) infiltration of precipitation and ponded runoff in unpaved areas, (2) leakage from utility supply lines, (3) intrusion of bay water, (4) horizontal flow (lateral influx or baseflow) of groundwater from areas upgradient of Parcel E, and (5) vertical flow of water in some areas from the underlying B-aquifer. Discharge from the A-aquifer occurs through lateral flow to San Francisco Bay (outflux).

The primary source of recharge to the B-aquifer in Parcel E is considered to be (1) infiltration of precipitation and ponded runoff in outcrop areas in the northern portion of Parcels E and E-2 and (2) horizontal groundwater flow (baseflow) from upgradient areas to the north and west of Parcel E. The upper B-aquifer may discharge to San Francisco Bay in some areas (TtEMI, 2004b), although the deeper B-aquifer may have connate water (i.e., water trapped in sediment or rock at the time of deposition), with discharge to the surface or to the bay limited or prevented by overlying confining layers.

Recharge to the bedrock water-bearing zone is similarly derived from infiltration of precipitation at outcrop areas to the north and northwest of Parcels E and E-2. Groundwater in the bedrock water-bearing zone likely discharges into the B-aquifer (recharging the B-aquifer) at upgradient contacts.

#### 2.2.7.4. Tidal Effects

Tidal effects at HPS have been studied and generally categorized into either tidal influence or tidal mixing. Tidal influence refers to the hydraulic response of near-shore groundwater by daily tidal action. Tidal influence is measured at near-shore groundwater wells and quantified as tidal fluctuations (difference in near-shore groundwater level between consecutive high and low tides), mean tidal efficiency (the ratio of tidally induced changes in groundwater levels to the tidal changes in the surface water), and mean time lag (time difference between the tidal changes in the surface water body and corresponding changes in groundwater levels). Tidal mixing refers to the influx and mixing of San Francisco Bay's saline surface water into near-shore groundwater by daily tidal action; this results in degradation of groundwater with a significant increase of total dissolved solids (TDS) to above 10,000 milligrams per liter (mg/L). Figure 3-14 in the Revised RI Report for Parcel E shows the location of the tidal influence and tidal mixing zone study wells in Parcel E (Barajas & Associates, Inc., 2008b).

In addition, based on the SSF evaluation, the A-aquifer is not a viable source of drinking water, and federal maximum contaminant levels (MCL) are not applicable or relevant and appropriate requirements (ARAR) for the CERCLA action. Furthermore, based on the SSF evaluation, the B-aquifer has potential beneficial use as drinking water across most of the site, and MCLs are ARARs; however, City controls prevent use of groundwater at the site. Agricultural beneficial use of the A- and B-aquifer groundwater is limited to areas with TDS at concentrations less than 1,500 mg/L for irrigation and less than 10,000 mg/L for livestock. Both the A- and B-aquifers have potential industrial beneficial use.

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Risks to terrestrial ecological receptors only are evaluated in this Revised Parcel E RI Report (see [Section 5.0](#)). Risks to aquatic ecological receptors are evaluated as part of investigations at Parcel F. A preliminary evaluation of the potential for groundwater to impact the Bay is presented in [Section 4.3](#).

#### 3.7.1 Terrestrial Flora

Parcel E is characterized by patches of ruderal vegetation, industrial areas, and wetlands (freshwater, saline emergent, and intertidal) and intertidal areas ([PRC 1994a](#)). Each type of area is discussed below and is shown on [Figure 3-3](#).

#### **3.7.1.1 Ruderal Vegetation**

Ruderal habitat (weedy, dominated by nonnative species) is the largest habitat type at Parcel E, making up about 30 percent of the area (see [Figure 3-3](#)). Recent field observations indicated that conditions ranged from areas cluttered with concrete, patches of pavement, and other debris to undeveloped areas characterized by scattered shrubs. The scattered shrubs consisted mostly of fennel (*Foeniculum vulgare*), pampas grass (*Cortaderia selloana*), and Scotch broom (*Cytisus scoparius*) interspersed with nonnative grasses such as wild oats (*Avena fatua*), perennial ryegrass (*Lolium perenne*), and barley (*Hordeum* spp.). Nonnative herbaceous plants are also present, including wild radish (*Raphanus sativa*), black mustard (*Brassica nigra*), vetch (*Vicia* sp.), plantain (*Plantago lanceolata*), dock (*Rumex crispus* and *R. conglomeratus*), and St. John's wort (*Hypericum* sp.). Some native plants, such as coyote brush (*Baccharis pilularis*), California broom (*Lotus scoparius*), and cheeseweed (*Malva sylvestris*), have also been observed in Parcel E. Vegetation generally is denser and more diverse at IR-02 Northwest, IR-02 Central, and IR-11/14/15 than elsewhere at Parcel E ([Tetra Tech and LFR 2000a](#)).

#### **3.7.1.2 Industrial Areas**

About 65 percent of Parcel E is covered by pavement, associated pavement debris, hardpan soil, and former industrial buildings (see [Figure 3-3](#)). Some industrial areas are sparsely vegetated with pampas grass and fennel ([Tetra Tech and LFR 2000a](#)).

#### **3.7.1.3 Beach, Intertidal Areas, and Wetlands**

The remaining 5 percent of Parcel E consists of beach area, intertidal areas, and five discontinuous wetland areas, which vary in length and width along the shoreline ([Tetra Tech and LFR 2000a](#); [Tetra Tech 2003c](#)). These areas primarily consist of intertidal salt marsh and saline emergent wetlands separated by segments of riprap. The largest areas of intertidal salt marsh are at the extreme eastern and western ends of Parcel E shoreline. Emergent saline wetlands are present in only one area along the Parcel E shoreline: the extreme southeast corner of the property. The dominant plants in both the salt marsh and emergent saline wetlands are saltgrass and pickleweed. No special-status plant species are expected to be present within these habitat types at Parcel E ([Tetra Tech, LFR, and U&A 1997](#)).

### **3.7.2 Terrestrial Fauna**

The following sections discuss the terrestrial fauna that potentially occur at Parcel E, including mammals, birds, reptiles and amphibians, and terrestrial invertebrates.

#### **3.7.2.1 Mammals**

Signs of pocket gopher (*Thomomys bottae*) burrows and the western harvest mouse (*Reithrodontomys megalotis*) have been observed at Parcel E. Red foxes (*Vulpes fulva*) have been observed at HPS and may be present at Parcel E. Bats also have been observed at HPS and

probably live in abandoned buildings at Parcel E (HLA 1991b). Based on information gathered during the Parcel E Validation Study, it does not appear that the salt marsh harvest mouse occurs at Parcel E at HPS. Raccoons probably visit the shoreline area in search of food but are not expected to live within Parcel E. No special status mammal species have been observed or are expected to occur at Parcel E (Tetra Tech, LFR, and U&A 1997; Tetra Tech and LFR 2000a).

### **3.7.2.2 Birds**

Ruderal and landscaped habitats at HPS typically support resident and migratory birds common to urban areas of northern California. Previous surveys at HPS identified granivorous (seed-eating) species such as the house finch (*Carpodacus mexicanus*) and purple finch (*Carpodacus purpureus*), but most bird species observed at HPS are insectivores or insect-eating omnivores, such as the western meadowlark (*Sturnella neglecta*), northern mockingbird (*Mimus polyglottos*), and bushtit (*Psaltiriparus minimus*). The red-tailed hawk and American kestrel (*Falco sparverius*) were observed numerous times at Parcel E.

Previous surveys noted that the turkey vulture (*Cathartes aura*) was observed foraging in ruderal and landscaped habitat at HPS. Intertidal and saline emergent wetlands may be used by shorebirds and wading birds such as the willet (*Catoptrophorus semipalmatus*), killdeer (*Charadrius vociferous*), great blue heron (*Ardea herodias*), and double-crested cormorant (*Phalacrocorax auritus*) (HLA 1991b).

The following special-status bird species were observed at HPS during previous surveys: peregrine falcon (*Falco peregrinus*), a state endangered species; double-crested cormorant, a state species of special concern; and loggerhead shrike (*Lanius ludovicianus*), a state species of special concern (HLA 1991b). The Navy conducted a thorough biological assessment of the potential occurrence of species protected under the Endangered Species Act at Parcel E (Tetra Tech 2004b).

### **3.7.2.3 Reptiles and Amphibians**

Ruderal and landscaped habitats at HPS are used by reptile species such as the gopher snake (*Pituophis melanoleucus*), western fence lizard (*Sceloporus occidentalis*), and coast garter snake (*Thamnophis elegans terrestris*), which have been observed in the area. The oak salamander (*Aneides lugubris lugubris*) and California slender salamander (*Batrachoseps attenuatus*) may also occur in nonnative grassland and near freshwater wetland habitats (PRC 1994a). No special-status reptiles or amphibians have been observed or are expected to occur at HPS (Tetra Tech, LFR, and U&A 1997; Tetra Tech and LFR 2000a).

### **3.7.2.4 Terrestrial Invertebrates**

Terrestrial invertebrates such as earthworms, grasshoppers, spiders, beetles, and other insects use ruderal and landscaped habitats at Parcel E. The parcel is dominated by non-native vegetation growing on fill material in an arid, disturbed setting. No special-status invertebrates are expected to occur at Parcel E (Tetra Tech and LFR 2000a).



### 3.7.3 Aquatic Fauna

Aquatic fauna are organisms that live in the shoreline area of Parcel E. The major groups of organisms that use the shoreline habitat are invertebrates and birds (discussed above).

Aquatic invertebrates hide under the rocks and feed on other small invertebrates or plant materials, such as crustacean crabs and isopods. Mussels (usually *Mytilus edulis*) have been observed at low tide attached to the rocks. Barnacles attach to rocks and to the shells of mussels, and can be seen at low tide (Tetra Tech and LFR 2000a). In comments to the Navy, EPA reported that harbor seals (*Phoca vitulina*) have been observed pulling out onto a concrete platform just southeast of the metal debris reef area. Sea lions (*Zalophus californianus*) have also been observed in the Bay near Parcel E (EPA 2007).

## 3.8 CONCEPTUAL SITE MODEL

This section describes the CSM developed for Parcel E. The purpose of the CSM is to illustrate and describe a basic understanding of potential sources of contamination and media pathways, and possible receptors based on available site information. The CSM is not intended to provide details or quantification of these potential sources and pathways. However, it is intended to provide the framework for characterizing site contamination and assessing risks. More detailed information about potential sources and pathways is presented in Section 4.3 for each redevelopment block and further information on exposure pathways and potential risks are presented in Section 5.0. The CSM developed for Parcel E includes the following:

- Generalized subsurface conditions
- Potential sources of contamination
- Potentially affected media, migration and exposure pathways, and receptors

### 3.8.1 Generalized Subsurface Conditions

The subsurface conditions at Parcel E can be illustrated by two generalized cross sections presented on Figures 3-16 and 3-17. Figure 3-16 shows typical subsurface conditions throughout Parcel E. The figure illustrates the aquifer system consisting of A- and B-aquifers that are separated by the Bay Mud aquitard, except for in the northernmost portion of Parcel E, where the aquitard is not present. The aquifer system at Parcel E is underlain by bedrock that slopes from former Parcel A toward the Bay.

Two locations at Parcel E are less typical but have somewhat similar subsurface structure: (1) Building 406 area and (2) Building 521 area. Figure 3-17 shows the second generalized subsurface conditions presented at Parcel E. At the Building 406 area, bedrock can be as shallow as 9 feet bgs and is overlain by silty and clayey gravel of Artificial Fill. Except for a relatively

|   |                                                        |             |                                                                                                                                                                       |
|---|--------------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9 | Basewide Time-Critical<br>Removal Action<br>Memorandum | Section 2.3 | Final Basewide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California. Department of the Navy. April 2006. |
|---|--------------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**FINAL**

**BASEWIDE RADIOLOGICAL REMOVAL ACTION  
ACTION MEMORANDUM – REVISION 2006  
HUNTERS POINT SHIPYARD  
SAN FRANCISCO, CALIFORNIA**

**April 21, 2006**

**DEPARTMENT OF THE NAVY  
Naval Facilities Engineering Command, Southwest  
San Diego, California**



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| 2 | ADDITIONAL POTENTIAL RADIONUCLIDES OF CONCERN |
| 3 | BUILDING/AREA ASSESSMENT AND CLASSIFICATION   |

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#### **Figure**

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### **APPENDICES**

#### **Appendix**

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| B | ADMINISTRATIVE RECORD INDEX                                                                                                                                                |

## ACRONYMS AND ABBREVIATIONS

|                 |                                                                                   |
|-----------------|-----------------------------------------------------------------------------------|
| §               | Section                                                                           |
| AEC             | Atomic Energy Commission                                                          |
| AM              | Action Memorandum                                                                 |
| ARAR            | applicable or relevant and appropriate requirement                                |
| BRAC            | Base Realignment and Closure                                                      |
| Ca-HSC          | California Health and Safety Code                                                 |
| CERCLA          | Comprehensive Environmental Response, Compensation, and Liability Act             |
| CFR             | Code of Federal Regulations                                                       |
| cm <sup>2</sup> | square centimeters                                                                |
| DHS             | California Department of Health Services                                          |
| dpm             | disintegrations per minute                                                        |
| DTSC            | California Environmental Protection Agency Department of Toxic Substances Control |
| EPA             | U.S. Environmental Protection Agency                                              |
| FUDS            | Formerly Used Defense Sites                                                       |
| HPS             | Hunters Point Shipyard                                                            |
| HRA             | Historical Radiological Assessment                                                |
| IC              | institutional control                                                             |
| IR              | Installation Restoration                                                          |
| MARSSIM         | Multi-Agency Radiation Survey and Site Investigation Manual                       |
| MDA             | minimum detectable activity                                                       |
| mrem/yr         | millirem per year                                                                 |
| NaI             | sodium iodide                                                                     |
| Navy            | U.S. Department of the Navy                                                       |
| NCP             | National Oil and Hazardous Substances Pollution Contingency Plan                  |
| NPL             | National Priorities List                                                          |
| NRC             | U.S. Nuclear Regulatory Commission                                                |
| NRDL            | Naval Radiological Defense Laboratory                                             |
| NWT             | New World Technology                                                              |
| O&M             | operation and maintenance                                                         |
| PCB             | polychlorinated biphenyl                                                          |
| PCB Hot Spot    | Polychlorinated Biphenyl Hot Spot Soil Excavation Site                            |

## ACRONYMS AND ABBREVIATIONS

(Continued)

|             |                                                                           |
|-------------|---------------------------------------------------------------------------|
| pCi/g       | picocurie per gram                                                        |
| pCi/L       | picocurie per liter                                                       |
| PRC         | PRC Environmental Management, Inc.                                        |
| PRG         | preliminary remediation goal                                              |
| PRP         | potentially responsible party                                             |
| RI/FS       | remedial investigation and feasibility study                              |
| SARA        | Superfund Amendments and Reauthorization Act of 1986                      |
| TCRA        | time-critical removal action                                              |
| TPH         | total petroleum hydrocarbons                                              |
| TMSRA       | Technical Memorandum in Support of Record Of Decision Amendment           |
| TtEC        | Tetra Tech EC, Inc.                                                       |
| TtEMI       | Tetra Tech EM, Inc.                                                       |
| USC         | United States Code                                                        |
| Water Board | California Regional Water Quality Control Board, San Francisco Bay Region |

## ACTION MEMORANDUM

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**Hunters Point Shipyard  
San Francisco, California 94124**

**April 21, 2006**

**Subject: Final Action Memorandum for Time-Critical Removal Action of  
Radiological Materials in Soils, Debris, or Structures at Hunters Point  
Shipyard, San Francisco, California**

**Site Status: National Priorities List: listed in November 1989;  
Parcel A was transferred in December 2004**

**Removal Category: Time-Critical Removal Action  
CERCLIS ID: CA1170090087  
Site ID: 0902722**

### **I. PURPOSE**

The purpose of this Action Memorandum (AM) is to document for the administrative record the U.S. Department of Navy's (Navy) decision to undertake time-critical removal actions (TCRAs), at areas throughout the base that may contain localized radioactive contamination in soils, debris/slag, and buildings at Hunters Point Shipyard (HPS), as identified in the *Historical Radiological Assessment, Volume II, Use of General Radioactive Materials, 1939-2003, Hunters Point Shipyard (HRA)*. The Department of Defense has the authority to undertake Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions, including removal actions, under Title 10 of the United States Code (USC) Section (§)§2701- 2705 and the federal Executive Order 12580. Further, this removal action is consistent, to the maximum extent possible, with Chapter 6.8 of California Health and Safety Code (Ca-HSC).

The proposed removal actions described in this AM will substantially eliminate identified pathways of exposure to radioactive contamination for surrounding populations and nearby ecosystems, such as nearby wetlands and the San Francisco Bay. Removal actions performed per this AM are anticipated to be complete cleanups to, or below, the cleanup goals specified in this document.

Removal actions performed per this AM are deemed consistent with (1) the factors set forth within the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) Title 40 of the Code of Federal Regulations (CFR) Part 300, and (2) Chapter 6.8, Ca-HSC, based on the findings below.

Threats to public health or welfare:

- Nearby human populations may be affected by exposure to low-level radioactive materials.
- Low-level radioactive materials may migrate or be released because of their presence near the surface.
- Low-level radioactive materials may migrate or be released because of weather conditions.

Threats to the environment:

- Nearby animals, and food chains may be affected by exposure to low-level radioactive materials.
- Radioactive materials can have very long half-lives. Their release into the environment could be detrimental.

No nationally significant or precedent setting issues exist for this site.

## **II. SITE CONDITIONS AND BACKGROUND**

This section describes the site history and background of HPS, summarizes each action conducted to date, and presents the findings of previous characterizations of radioactivity at HPS.

### **A. SITE DESCRIPTION**

The following sections summarize characteristics of the site, any releases or threatened releases of contaminants, and the status of the site on the National Priorities List (NPL).

#### **1. Removal Site Evaluation**

To date, several radiological site investigations have been conducted at HPS to assess the presence of radioactive materials remaining from past operations associated with shipyard operations, the Naval Radiological Defense Laboratory (NRDL) and ship decontamination and maintenance procedures. Those investigations delineated certain areas at which low-level radioactive contaminants were found, and some of those areas have been addressed under a previous radiological removal action.

As investigations continue, additional areas throughout HPS are being considered for their potential to contain low-level radioactive contamination. This AM addresses those potential areas through proposed removal and off-site disposal actions.

Three general types of media exist in which radioactive contamination may be found:

1. Soils
2. Debris/Slag
3. Buildings: walls, foundations, slabs, and so on
4. Sanitary sewer and storm drain systems

Examples of previously identified low-level radioactive contamination include anomalies found in soils near buildings; debris/slag containing embedded radium dials; and surface contamination on concrete slabs, walls, and piping associated with buildings.

#### **2. Physical Location**

HPS is located in the City and County of San Francisco, California, shown on Figure 1. HPS is situated on a long promontory in southeast San Francisco, extending eastward into San Francisco Bay. The primary mission of HPS was naval shipyard activities. HPS consists of 848 acres, 416 acres of which are on land, and is divided into six parcels (B, C, D, E, E-2, and F) to facilitate environmental investigation and cleanup activities. A seventh parcel, Parcel A, was conveyed to the City of San Francisco in December 2004.

The climate is characterized as temperate, or Mediterranean, which typically has moist mild winters and dry summers. The average annual precipitation in the area is 21.79 inches. The precipitation occurs mostly during the months of December, January, and February. There are public residences within a mile radius of HPS and the nearest major thoroughfare is I-280, located roughly 5 miles west of the site.

### **3. Site Characteristics**

HPS is a federally owned facility, which began using radioactive materials in the early 1940s. Radioactive materials were used in shipyard operations and NRDL research. In 1969, radiological studies by NRDL ended, and NRDL buildings were decontaminated and cleared for unrestricted reuse to the standards of the time. Shipyard operations ceased in 1974. The Navy also conducted ship decontamination, repair, and dismantling activities, which generated radium dial and sandblast grit waste streams. During NRDL operations, the Navy managed a radioactive waste disposal program, which included removal of high-level and low-level radioactive materials from HPS for transport and disposal of the materials to an off-site ocean-bottom disposal area.

As a result of past radiological operations, some buildings have been found to contain low-level radioactive contaminants and radium dials have been found embedded in both debris and slag, or buried in disposal areas. Hazardous materials have also been found at HPS. The site was placed on the NPL in 1989, pursuant to CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986.

In 1991, HPS was slated for closure pursuant to the terms of the Defense Base Closure and Realignment Act of 1990 (Public Law 101-510). Closure of HPS includes conducting environmental remediation activities and transfer of the property to the City of San Francisco for future non-defense reuse.

### **4. Release or Threatened Release into the Environment of a Hazardous Substance or Pollutant or Contaminant**

The radioisotopes encountered to date, and likely to be encountered during future investigations, include americium-241, cobalt-60, strontium-90, cesium-137 (and daughter products), europium-152, europium-154, plutonium-239, radium-226, tritium, thorium-232, and uranium-235 (and daughter products), which are hazardous substances, as defined by §101(14) of CERCLA, and pollutants or contaminants, as defined by §101(33) of CERCLA.

Because of the presence of low-level radioactive materials in areas exposed to erosion and weathering, a threat of migration and release to surrounding populations and the environment could exist.

To date, almost all radioactive materials encountered at HPS have been isolated from human contact and located in restricted-access areas. However, the threat of release does exist because of the persistence of radioactive materials in areas designated for future unrestricted use and areas that may be affected by weather and erosion.

Removal actions conducted in accordance with this AM are therefore designed to (1) substantially reduce ionizing radiation to cleanup goals and (2) eliminate identified pathways of exposure to ionizing radiation.

### **5. National Priorities List Status**

HPS was placed on the NPL on November 21, 1989, with a Hazard Ranking Score of 48.77. Parcel A was delisted in February 1999 and transferred in December 2004. Each parcel has undergone, or is undergoing, a CERCLA remedial investigation and feasibility study (RI/FS). RI/FSs have been completed for Parcels A and B, and an Addendum to the Technical Memorandum in Support of Record of

Decision Amendment (TMSRA) is being prepared for Parcel B. RI/FSs are currently being conducted for Parcels C, D, E and E-2. Radiological Addenda will be issued subsequent to the RI/FSs for the remaining parcels at HPS.

## **6. Maps, Pictures, and Other Geographical Representations**

Figure 1 shows the location of HPS, and Figure 2 presents all currently known radiologically impacted areas at HPS. Many radiological areas have already been addressed by previous investigations and by previous radiological removal actions.

### **B. OTHER ACTIONS TO DATE**

Several radiological investigations and radiological removal actions have been conducted at HPS. The following sections summarize those actions.

#### **1. Previous Actions**

Five phases of radiological investigations, as well as interim investigations, were performed at HPS, beginning in 1991. Phases I and II delineated the surface and subsurface distribution of radium-containing devices. Phases III and IV recommended and performed the removal of anomalies near Buildings 364, 509, 529, and 707 in Parcels D and E. Phase V conducted radiological surveys and remedial actions in Parcels B, C, D, and E. Each investigation is summarized below.

##### **1.1 Phase I**

In 1991, the Phase I radiological investigation to evaluate the extent of radium-containing devices identified in a surface radiation survey was conducted by Harding Lawson Associates (1990) in 1988. The Phase I investigation included Installation Restoration (IR) Sites 01/21, 02, 03 and portions of IR Sites 11/14/15.

Over 300 radium-containing point sources were detected in a centralized area in IR-02 Northwest during the Phase I investigation, and additional anomalies were observed in IR-01/21 and IR-02 Southeast. A dial with anomalously high gamma activity was also found on the door of a combination safe in IR-11/14/15.

Thirteen soil samples collected from the disposal area in IR-02 Northwest contained radium-226 at concentrations exceeding background levels. One soil sample collected from IR-01/21 and two soil samples collected from IR-02 Southeast contained radium-226 at concentrations exceeding background levels (PRC Environmental Management, Inc. [PRC], 1992).

The Phase I investigation concluded that elevated gamma activity was a result of the presence of radium-containing devices in surface soil at scattered locations at IR-01/21 and on the surface and in the subsurface of the centralized disposal area in IR-02 Northwest, which extends into IR-02 Central.

The Phase I radiation investigation recommended an investigation of the subsurface distribution of radium-containing devices in soil in IR-02 Northwest, removal of the combination safe from IR-11/14/15, and further investigation of radioactive analytes in groundwater. The first and second recommendations have been performed, and the third is ongoing.

##### **1.2 Phase II**

The Phase II radiological investigation was conducted in 1993 to delineate the subsurface distribution of radium-containing devices in the IR-01/21 landfill and in the disposal areas in IR-02 Northwest and IR-02



Central. Field activities included excavation of trenches and test pits, collection of soil samples, and collection of air samples (PRC, 1996).

Excavation activities at the disposal area in IR-02 Northwest and in IR-02 Central revealed 111 discrete subsurface gamma-emitting point sources, all located within a well-defined disposal area. A large amount of industrial and construction debris was also found mixed with soils in the disposal area. Radium-containing devices and industrial debris were detected at the surface in IR-01/21, but not in the subsurface of IR-01/21 or at the beach and intertidal areas of IR-02 Northwest (PRC, 1996).

The Phase II radiological investigation concluded that the disposal area in IR-02 Northwest and IR-02 Central was the primary disposal area for all radium-containing devices generated at HPS as a result of ship repair and maintenance activities, and that radium-containing devices were only present on the surface of the landfill in IR-01/21.

### **1.3 Phase III**

The Phase III radiological investigation was conducted in 1997 to address concerns about the use, storage, and disposal of radioactive materials during past NRDL operations at HPS. The goal of the Phase III investigation was the eventual release, for unrestricted use, of all remaining buildings and sites not previously released, including three formerly used defense sites. Radiological surveys were conducted within and around Buildings 506, 509, 517, and 529.

The Phase III radiological investigation recommended the following actions (Tetra Tech EM, Inc. [TtEMI], 1997):

- Excavation of a potential buried point source behind Building 529
- Excavation of an area with an anomalous count rate of 9,374 counts per minute near Building 509
- Further study of Buildings 364 and 707 (TtEMI, 1997)

All Phase III recommendations were implemented in the Phase IV investigation, or removal action.

### **1.4 Phase IV**

The Phase IV radiological investigation was conducted in 1999 to quantify ambient concentrations of specific radionuclides and to further characterize two radiological sites located near Buildings 364 and 707. The goal of the Phase IV investigation was free release, for industrial use, of the areas located near Buildings 364 and 707.

The Phase IV investigation recommended the following actions:

- Removal of a cesium-137 spill site near Building 364
- Removal of anomalies near the former locations of Buildings 509, 529, and 707

Both Phase IV recommendations were implemented in the remedial action, which began in February 2001.

### **1.5 Interim Investigations Between Phase IV and Phase V**

Three interim investigations were conducted after the Phase IV radiological investigation and before the Phase V radiological investigation. Available information for each investigation is summarized below:

### **1.5.1 1999 October IT Corporation Investigation**

Sandblast waste was discovered and removed from an excavation site at IR-07. Five samples were collected and analyzed for radioactivity. Results were indicative of background concentrations. Several other areas containing sandblast waste have been investigated and sampled since this investigation. To date, none of the sandblast waste has been found to contain radionuclide concentrations above normal background levels.

### **1.5.2 2001 TtEMI Investigation**

In June and July 2001, TtEMI contracted a survey of the Gun Mole Pier (Regunning Pier). Gamma and beta measurements were obtained on the surface of the pier to determine whether elevated radioactivity levels remained from previous operations. The measurement points were based on a newly found drawing, indicating the previous location of the concrete test pad and NRDL barge on the pier. Gamma levels were measured using a portable detection instrument equipped with a sodium iodide (NaI) scintillation probe. The measurements were made both in a systematic grid pattern and biased locations specifically over drains, surface cracks, and other unusual features.

Surface radioactivity at selected locations was also measured using a Geiger-Mueller detector sensitive to beta radiations.

Findings indicated that only background levels of radioactivity were present in the areas surveyed.

### **1.5.3 NWT Interim Investigation and Removal Action**

During 2001, New World Technology (NWT) performed a removal action at the tank vault behind Building 364. The tanks, piping, and support equipment had been previously removed, and the remaining vault surfaces had been identified as exceeding site release criteria. After the concrete vault was removed, surveys and soil sampling indicated that no residual contamination remained that exceeded site release criteria.

Additionally, a Characterization Survey of the Parcel E shoreline was performed. The shoreline survey encompassed areas within approximately 50 feet on either side of the mean tide line. Several areas were noted during the survey that exceeded background gamma radiation levels, most significantly the areas known as the "Metal Debris Reef" and "Metal Slag Area." Samples obtained from those locations identified radium-226 as the contaminant. Although no removal actions were taken at the time of the survey, the Navy is still investigating and considering removal actions.

## **1.6 Phase V Investigations**

Beginning in January 2002, NWT conducted Scoping and Characterization Surveys, soil and other media sampling programs, remediations, and Final Status Surveys at various open areas and in various buildings at HPS in accordance with *Multi-Agency Radiation Site Survey and Investigation Manual* (MARSSIM) guidelines. The investigations and surveys were in support of the release of buildings or areas that had been identified as areas where radioactive materials had been used or areas where remedial actions to remove known contamination had occurred.

Each site was assessed for potential radionuclides of concern with surveys designed according to the MARSSIM area classification (Class 1, 2, or 3). The extent of the surveys depended upon the classification of the area. Class 1 surveys covered 100 percent of the area, Class 2 surveys covered 50 percent of the area, and Class 3 surveys covered 20 percent of the area. If contamination was found in a Class 3 area, a 100 percent Characterization Survey was conducted followed by remediation as appropriate. A Class 1 Final Status Survey followed any remediation.

## 1.7 Historical Radiological Assessment

The HRA was conducted to evaluate all previous uses of radioactive materials at HPS and to assess their potential to impact the site. The final version of the HRA was issued in August 2004. Based on the recommendations of the HRA, a total of 84 HPS sites have been designated as “impacted.” This indicates that the site has a potential for radioactive contamination based on historic information or is known to contain radioactive contamination. These impacted sites, broken out by parcel, include:

- Parcel B – 14 sites
- Parcel C – 12 sites
- Parcel D – 19 sites
- Parcel E – 33 sites
- Parcel F – 2 sites
- Off-Base Facilities – 1 site
- Base-Wide Areas – 3 sites

## 2. Current Actions

Current radiological actions at HPS include TCRAs and surveys that were initiated under this AM and implementation of recommended actions identified in the HRA. These actions are described below.

### 2.1 TCRAs

Three TCRAs are currently being conducted on site in accordance with the requirements of the CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

#### **Metal Debris Reef / Metal Slag Area**

The TCRA at the Metal Debris Reef in Parcel E and Metal Slag Area in Parcel E-2 involves the removal of radioactively contaminated metal debris and slag.

As described in *Final Removal Action Design and Implementation Work Plan, Metal Debris Reef and Metal Slag Areas* [Tetra Tech EC, Inc. (TtEC), 2005a], this TCRA includes radiological surveying and remediation, excavation of metal slag and debris, site restoration, and waste disposal.

#### **PCB Hot Spot**

The TCRA for the Polychlorinated Biphenyl Hot Spot Soil Excavation Site (PCB Hot Spot) in Parcel E-2 involves the removal of soils containing PCBs, total petroleum hydrocarbons (TPH), and any radioactive contaminants.

As described in *Final Removal Action Design and Implementation Work Plan, PCB Hot Spot Soil Excavation Site* (TtEC, 2005b), this TCRA includes radiological surveying and remediation, excavation of PCB- and TPH-contaminated soil, site restoration, and waste disposal.

#### **IR-02 Northwest and Central**

This TCRA is for the extraction of debris and soil containing radioactive contaminants present in the IR-02 Northwest and Central area of Parcel E.

As described in *Final Removal Action Design and Implementation Work Plan, TCRA for IR-02 Northwest and Central* (TtEC, 2005c), this TCRA includes radiological surveying and remediation, excavation of soil and debris, site restoration, and waste disposal.

## **2.2 Radiologically Impacted Site Surveys**

### **Building 322**

This survey was performed to support release of the building for demolition and disposal. After the building was demolished, a Final Status Survey was performed that allowed release of the site for unrestricted reuse.

### **Building 819**

This survey was performed to determine if residual radioactivity was present at the site. The survey was designed so that if no contamination was found above the release criteria, the data could be used to support release of the site for unrestricted reuse. The report is currently under review and a final determination will be made in 2006.

### **Building 114 Site**

The Building 114 Site is the former location of the demolished Building 114. This survey was performed to determine if residual radioactivity is present at the site. The survey was designed using the *Base-wide Radiological Work Plan* (TtEC, 2005d) so that if no contamination is found above the release criteria, the data could be used to support unrestricted reuse. The report is currently being prepared for review by the regulatory agencies.

### **Building 146**

This survey was performed to determine if residual radioactivity is present at Building 146. The survey was designed using the *Base-wide Radiological Work Plan* (TtEC, 2005d) to allow unrestricted reuse if no contamination was found above the release criteria. The report is currently being prepared for review by the regulatory agencies.

## **C. STATE AND LOCAL AUTHORITIES ROLE**

The California Department of Health Services (DHS) and U.S. Environmental Protection Agency (EPA) have actively participated in the radiological investigations and the radiological removal actions at HPS. In the past, EPA has provided site-specific input for the establishment of removal action cleanup goals and investigative strategies.

The California Environmental Protection Agency Department of Toxic Substances Control (DTSC) and California Regional Water Quality Control Board, San Francisco Bay Region (Water Board) are also regulatory agency stakeholders.

### **1. State and Local Actions to Date**

As previously discussed, federal Executive Order 12580 delegates to the Department of Defense the President's authority to undertake CERCLA response actions. Congress further outlined this authority in its Defense Environmental Restoration Program Amendments, which can be found at 10 USC §2701-2705. Both CERCLA §120(f) and 10 USC §2705 require Navy facilities to ensure that state and local officials be given timely opportunity to review and comment on Navy response actions. CERCLA §120 further requires the Navy to apply state removal and remedial action law requirements at its facilities.

Accordingly, DHS, DTSC, and Water Board have provided technical advice and oversight during phases of the RI/FS process, during previous radiological investigations, and during current and future radiological removal actions.

## **2. Potential for Continued State or Local Response**

DHS, Water Board, and DTSC deferred to EPA for development of cleanup goals for the previous radiological removal action. Those cleanup goals were also chosen for this removal action. DHS, Water Board, and DTSC will continue to provide input through review of radiological documents and participation in the Base Realignment and Closure (BRAC) Cleanup Team.

## **III. THREATS TO PUBLIC HEALTH, WELFARE, OR THE ENVIRONMENT AND STATUTORY AND REGULATORY AUTHORITIES**

In accordance with the NCP, the following threats must be considered in determining the appropriateness of a removal action (40 CFR §300.415[b][2]):

- Actual or potential exposure to hazardous substances, pollutants, or contaminants of nearby populations, animals, and food chains
- Actual or potential contamination of drinking water supplies and sensitive ecosystems
- Hazardous substances, pollutants, or contaminants in drums, barrels, tanks, and other bulk storage containers that may pose a threat of release
- High levels of hazardous substances or pollutants or contaminants in soils largely at, or near, the surface that may migrate
- Weather conditions that may cause hazardous substances, pollutants, or contaminants to migrate or to be released
- Threat of fire or explosion
- Other situations or factors that may pose threats to human health or the environment

### **A. THREATS TO PUBLIC HEALTH OR WELFARE**

Three potential threats to public health or welfare exist:

- Nearby human populations may be affected by exposure to low-level radioactive materials.
- Low-level radioactive materials may migrate or be released because of their presence near the surface.
- Low-level radioactive materials may migrate or be released because of weather conditions.

Because of the possible adverse health effects from ionizing radiation (EPA, 1998) and the long decay periods (half-lives) for many radionuclides, removal and off-site disposal is considered the most effective option for most of the radioactive contaminants found at HPS. Physical removal of radioactive materials will ensure that the potential for diffuse radioactivity is reduced to levels that meet or are below cleanup goals.

### **B. THREATS TO THE ENVIRONMENT**

Two potential threats to the environment exist:

- Nearby animals and food chains may be affected by exposure to low-level radioactive materials.
- Radioactive materials can have very long half-lives; therefore, their release into the environment could be detrimental.

Physical removal of radioactive materials from HPS also provides the most effective option for mitigation of threats to the environment from ionizing radiation.

#### **IV. DETERMINATION OF ENDANGERMENT**

Results of radiological investigations conducted to date (TtEMI, 1997; 2000a) demonstrate that current conditions at HPS may present immediate and severe threats to the aquatic ecosystem, public health, welfare, or the environment.

Actual or threatened releases of radioactive materials from HPS, if not addressed by implementing the response action selected in this AM, may present an imminent and substantial endangerment to public health, welfare, or the environment. The primary endangerment mechanism is through migration: If radioactive contaminants migrate, they have the potential to contaminate water and soils. Water and soil contamination could be long lasting, since some radionuclides have half-lives in the tens of thousands of years.

The HRA provides a comprehensive review and assessment of the affect of past radiological operations at HPS.

#### **V. PROPOSED ACTIONS AND ESTIMATED COSTS**

The following sections summarize the actions proposed for any TCRA performed per this AM.

##### **A. PROPOSED ACTION**

The proposed action for localized radioactive material present at HPS is to physically remove it and dispose of the material at an off-site disposal facility. For purposes of this AM, localized is defined as any area less than approximately 3 acres in which radioactive material is the primary risk driver. The definition for “localized” is based on the results of past radiological investigations, the size of the radium dial disposal area in IR-02 Northwest and IR-02 Central, and the size of the intertidal debris area; these areas are assumed to be the largest probable areas this AM would address.

Estimates on the quantity of radioactive materials that will be removed per this AM remain pending, until more accurate information is gathered. Removal actions performed per this AM will comply with the off-site policy by using a fully licensed off-site disposal facility for low-level radioactive waste.

Removal actions performed per this AM are subject to the cleanup goals listed in Table 1, for soils/debris, surfaces, and water, respectively. Before initiating a removal action per this AM, the area being considered will be characterized using real-time radiation detection devices or soil sampling and analyses.

MARSSIM guidance is being used to apply the cleanup goals. Table 2 lists additional radionuclides that could be encountered at HPS, based on information from the HRA. If these additional radionuclides are encountered during surveys or removal actions, cleanup goals will be derived using regulatory involvement.

Areas where radioactive contamination may be too pervasive to conduct a localized removal action, where radioactive contamination is not the primary risk driver, or where excavation activities pose a high risk to workers, will be addressed as part of the ongoing CERCLA process. The IR-01/21 landfill is one example of an area that has multiple risk drivers, has a large affected area, and would pose excessive hazards to workers performing excavation activities.

Table 3 provides a listing of radiologically impacted sites at HPS that were identified in the HRA (NAVSEA, 2004). Table 3 does not include those sites in the former Parcel A that have received

regulatory release or the Formerly Used Defense Sites (FUDS). The remaining impacted sites (Buildings 813 and 819) in the former Parcel A have been reassigned to Parcel D after the Parcel A boundary was adjusted. Assessments of potentially contaminated media and migration pathways, as well as recommended actions are detailed in Table 3. The impacted sites listed in Table 3 will be addressed under this AM.

## **1. Proposed Action Description**

Physical removal and off-site disposal of radioactive materials will follow the general steps listed below for three types of environmental media in which radioactive contamination is likely to be encountered at HPS. Removal actions will be preceded by preparation of site-specific work plans or task-specific plans in consonance with the *Base-Wide Radiological Work Plan* (TtEC, 2005d). To the extent practicable, radioactive materials will be segregated from other materials (such as construction debris or nonaffected soils) to minimize radioactive waste stream generation.

- **Soils**
  - Delineation of radioactive contamination using real-time radiation detection instruments or soil sampling and analyses
  - Excavation of radioactive materials and proper off-site disposal
  - Soil confirmation sampling and analyses; comparison of results against cleanup goals listed in Table 1 using MARSSIM methodology
  - Site backfilling and restoration
- **Debris/Slag**
  - Delineation of contamination, or general area of suspected contamination, using real-time radiation detection instruments or sampling and analyses
  - Collection and segregation of radioactive materials
  - Proper off-site disposal of materials
  - Comparison of remediated area against cleanup goals listed in Table 1, depending on the surrounding environmental media (soils or surfaces) using MARSSIM methodology
  - Site backfilling or restoration
- **Concrete Surfaces (walls, slabs, and foundations)**
  - Delineation of radioactive contamination using real-time radiation detection instruments or wipe samples and analyses
  - Decontamination of surfaces by acid or solvent washing or mechanical removal such as scabbling (scabbling will be preferred in order to reduce mixed-waste stream generation)
  - Proper off-site disposal
  - Comparison of residual radioactivity to the cleanup goals listed in Table 1, using MARSSIM methodology

**Note:** if surface decontamination is not technically feasible, the entire structure may be removed and disposed of appropriately.

If radiological areas are found in or near wetlands or intertidal areas, removal actions will be modified to minimize the affect to those areas.

The following laboratory analyses are associated with characterization of the radioactive materials that may be addressed by this AM:

- Isotopic americium, plutonium (238 and 239), thorium (228 and 232) and uranium (234, 235, 238) analyses
- Gamma spectroscopy analyses
- Strontium analyses
- Gross alpha/beta analysis
- Swipes for removable contamination (including tritium)

Removal actions performed under this AM will not include institutional controls (ICs); therefore, any ICs which may be required will be discussed in the CERCLA Record of Decision. Radiological sites not addressed under this AM will continue to have restricted access, until a final remedy is selected.

Post-removal site controls will not be required following removal actions performed per this AM, since the intent of each removal action is to reduce radioactive contaminants to or below the cleanup goals.

## **2. Contribution to Remedial Performance**

Removal of radioactive contamination per this AM will allow for the ongoing CERCLA process to address any remaining contamination and will avoid future “mixed waste” (waste with both chemical and radioactive contamination). Each removal action taken per this AM is an interim action, and that the final action for radiological site cleanup will be selected in the Record of Decision. Removal actions taken per this AM will also take into account the City of San Francisco’s reuse plan for the site.

## **3. Description of Removal Alternative**

Several removal action alternatives were considered for use in this AM; however, physical removal and proper off-site disposal was the only viable alternative retained for evaluation.

Other actions such as in-place stabilization, and removal and consolidation in the closed HPS industrial landfill, were considered; however, those alternatives would not physically remove the contamination (requiring long operation and maintenance [O&M] periods), would involve large costs, or would require restricted reuse of certain areas of HPS for long periods of time.

The steps required to remove and properly dispose of low-level radioactive materials at an approved off-site facility were detailed in Section V.A.1.

Removal and proper disposal of radioactive materials will provide a timely response and the best option for protection of human health and the environment. Previous radiological soil removals have been completed within several months, and achievement of cleanup goals ensures that human health risks related to radioactive materials are eliminated from the site in question.

Sections 3.1 and 3.2 summarize the criteria used to evaluate the proposed alternative and results of the evaluation.

### **3.1 Evaluation Criteria**

Three criteria were used to evaluate the removal and disposal alternative proposed in this AM: effectiveness, implementability, and cost.



### **Effectiveness**

Three general factors were considered in evaluating effectiveness: (1) overall protection of human health and the environment, (2) short-term effectiveness, and (3) long-term effectiveness and permanence.

### **Implementability**

This criterion addresses the technical and administrative feasibility of implementing the removal action. Items evaluated include (1) the availability of services and materials required during implementation of the action, (2) the institutional or social concerns that could preclude the action, and (3) state and community concerns that could affect implementation. The following factors were considered:

- Technical feasibility: the ease or difficulty of implementing the alternative and the reliability of the technology
- Administrative feasibility: activities, such as obtaining waivers or permits, requiring coordination with other offices and agencies

### **Cost**

This criterion is concerned with the estimated costs of the alternatives, and is based on previous radiological removal actions for soils and building surfaces. O&M costs were not considered in the cost evaluation since removal actions will be performed in less than a year, and no follow-on costs are associated once this removal action has been completed.

## **3.2 Evaluation of Proposed Removal and Off-site Disposal Action**

The removal and off-site disposal alternative provides the highest degree of effectiveness, is feasible to implement, and is also economically feasible.

### **Effectiveness**

Removal and off-site disposal provides the highest degree of protection for human health and the environment by physically removing the materials from HPS. Removal and off-site disposal will also comply with chemical-, action-, and location-specific ARARs.

### **Implementability**

This alternative does not have administrative constraints and has few technical constraints. Most of the radioactive contamination identified at HPS to date has been in localized areas. Surface scans performed in the past have found point-source anomalies and specific disposal areas containing radioactive contamination. Subsurface investigations have found concentrated areas where disposal of dials or other radioactive materials occurred. Physical removal is very feasible for these types of situations. If large quantities of radioactive materials are found, physical removal and off-site disposal may have significant technical constraints. Any areas found to contain large quantities of low-level radioactive waste will not be addressed by this AM, but will be evaluated further in the ongoing CERCLA process.

### **Cost**

Unit costs for labor, mobilization, and site remediation are comparable with a standard soil removal and disposal project involving chemical contamination. The unit cost for disposal of radioactive materials is on average greater than the unit cost of chemical contamination in soils; however, the cost does not become prohibitive unless very large volumes of radioactive materials are removed and disposed. Further details regarding the unit costs for this alternative are provided in Section V.B.

#### **4. Engineering Evaluation and Cost Analysis**

Since this is a TCRA, an engineering evaluation and cost analysis is not applicable.

#### **5. Applicable or Relevant and Appropriate Requirements**

Section 300.415(j) of the NCP provides that removal actions must attain applicable or relevant and appropriate requirements (ARARs) to the extent practicable, considering the exigencies of the situation.

Section 300.5 of the NCP defines applicable requirements as cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstances at a CERCLA site.

Section 300.5 of the NCP defines relevant and appropriate requirements as cleanup standards, standards of control and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that, while not “applicable” to a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site and are well-suited to the particular site.

Because CERCLA on-site response actions do not require permitting, only substantive requirements are considered as possible ARARs. Administrative requirements such as approval of, or consultation with administrative bodies, issuance of permits, documentation, reporting, record keeping, and enforcement are not ARARs for CERCLA actions confined to the site.

Only those state standards that are identified by a state in a timely manner and are more stringent than federal requirements may be applicable or relevant and appropriate.

There are three types of ARARs: contaminant-specific, location-specific, and action-specific. The first type includes contaminant-specific requirements. These ARARs set limits on concentrations of specific hazardous substances, contaminants, and pollutants in the environment. Examples of this type of ARAR are ambient water quality criteria and drinking water standards. The second type of ARAR includes location-specific requirements that set restrictions on certain types of activities based on site characteristics. These include restrictions on activities in wetlands, floodplains, and historic sites. The third type of ARAR includes action-specific requirements. These are technology-based restrictions that are triggered by the type of action under consideration. Examples of action-specific ARARs are Resource Conservation and Recovery Act regulations for waste treatment, storage, and disposal.

ARARs must be identified on a site-specific basis from information about specific chemicals at the site, specific features of the site location, and actions that are being considered as removal actions.

The ARARs used to prepare this AM are presented in Appendix A.

The cleanup goals presented in this AM were derived by considering the following:

- Soil cleanup goals: EPA decay-corrected PRGs (EPA, 1991)
- Radium-226 contamination in soils: per agreement with EPA
- Radioactive contamination on structures: These limits are based on 25 millirem per year (mrem/y), using RESRAD or Atomic Energy Commission’s (AEC’s) *Regulatory Guide 1.86* (1974), whichever is lower.

- Radioactive contamination on surfaces designated as equipment or waste: These limits are based on AEC's *Regulatory Guide 1.86*. Limits for removable surface activity are 20 percent of these values.
- Application of soils, debris, and surface cleanup goals to sites: MARSSIM guidance (EPA et al., 2001)
- Radioactive contamination in wastewater: A release criterion for water has been derived from *Radionuclides Notice of Data Availability Technical Document* (EPA, 2000) by comparing the limits from two criteria and using the most conservative limit.

The cleanup goals derived for the project are considered to be the most conservative available. For example, use of EPA decay-corrected preliminary remediation goals (PRGs) for soil removal actions is more conservative than use of other federal ARARs listed in Appendix A.

## 6. Project Schedule

Individual removal action project schedules will be generated as each site is identified for survey or removal of radioactive materials. Based on previous removal actions for radioactive materials, field events are expected to last from 1 to 4 months. Prior to commencing fieldwork, detailed work plans/task-specific plans and health and safety plans will be generated. Following field events, analytical reports, data validation reports, or summary reports will also be generated to summarize actions taken.

## B. ESTIMATED COSTS

The Navy has made a present worth estimate of the removal action costs. The Navy has estimated the cost to complete the required radiological removal actions at \$60 million. The estimated costs include the direct and indirect capital costs. The items listed below are considered capital costs. They are based on a previous removal action, which removed and disposed of 13 cubic yards of contaminated soils. Costs for removal actions involving debris or surfaces will be comparable, if the quantity of radioactive materials disposed of is similar.

### Estimated Costs – Typical 13-cubic-yards Soil Removal Action

#### Direct Capital Costs

|                                       |          |
|---------------------------------------|----------|
| Construction/Equipment/Materials:     | \$17,000 |
| Soil excavation (\$75.00/cubic yard): | \$ 1,275 |
| Transport and disposal:               | \$21,250 |
| Analytical (12 confirmation samples)  | \$ 5,400 |

#### Indirect Capital Costs

|                               |          |
|-------------------------------|----------|
| Work plans, engineering, etc. | \$ 2,000 |
|-------------------------------|----------|

|                             |          |
|-----------------------------|----------|
| Soils Removal Action Total: | \$46,925 |
|-----------------------------|----------|

## VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If action should be delayed or not taken, exposure of human populations to low-level radioactive materials may occur. Contamination may spread from HPS to nearby areas from wind erosion, surface water runoff, or other erosion mechanisms. Migration of radioactive contamination could result in an

increased health risk to local populations because of prolonged exposure to low-level radioactive materials.

Since the half-lives of radioactive contaminants can range up to tens of thousands of years, the associated risk could be very long term, and migration over this time period may result in a greater volume of material to be remediated. This would also result in an increase in treatment or disposal costs.

## **VII. PUBLIC INVOLVEMENT**

This document will be added to the Administrative Record (Appendix B) and will be made available for public review at the following locations:

San Francisco Public Library  
Government Documents  
100 Larkin Street  
San Francisco, California 94102

Anna E. Waden Library  
5075 Third Street  
San Francisco, California 94124

## **VIII. OUTSTANDING POLICY ISSUES**

No outstanding policy issues exist for this removal action.

## **IX. RECOMMENDATION**

To date, the Navy has not acquired evidence identifying other potentially responsible parties (PRP) at this site. However, information acquired in the future, including but not limited to, information acquired during the implementation of this removal action or future response actions at the site, could result in the identification of other PRPs.

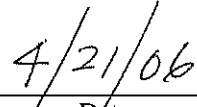
This AM was prepared in accordance with current EPA and Navy guidance documents for TCRAs under CERCLA. The purpose of this AM is to identify and analyze removal actions to address localized radioactive contamination in soils, debris/slag and buildings base-wide.

Based on the analysis of the removal action alternatives completed in Section V.A.3, the recommended removal action is removal of radioactive contamination from localized areas in soils, debris/slag, and buildings, followed by appropriate off-site disposal at a fully licensed low-level radioactive waste disposal facility. This alternative will apply to localized areas throughout HPS, provide a high degree of protection for human health and the environment, does not have significant administrative or technical constraints, and is not cost prohibitive.

This decision document represents the selected removal action for HPS located in San Francisco, California, developed in accordance with CERCLA, as amended, and is consistent with the NCP. This decision is based on the Administrative Record for the site (included in Appendix B).

Base Realignment and  
Closure Environmental  
Coordinator:

  
Keith S. Forman

  
Date

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## **TABLES**

**TABLE 1**  
**RELEASE CRITERIA**

| Radionuclide  | Surfaces                                                       |                                                       |                                            | Soil <sup>d</sup> (pCi/g)                 |                                            |                                     |                                            | Water <sup>h</sup><br>(pCi/L) |
|---------------|----------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------|-------------------------------------------|--------------------------------------------|-------------------------------------|--------------------------------------------|-------------------------------|
|               | Equipment,<br>Waste<br>(dpm/100 cm <sup>2</sup> ) <sup>a</sup> | Structures<br>(dpm/100 cm <sup>2</sup> ) <sup>b</sup> | Residual<br>Dose<br>(mrem/yr) <sup>c</sup> | Outdoor<br>Worker<br>(pCi/g) <sup>e</sup> | Residual<br>Dose<br>(mrem/yr) <sup>c</sup> | Residential<br>(pCi/g) <sup>e</sup> | Residual<br>Dose<br>(mrem/yr) <sup>c</sup> |                               |
| Americium-241 | 100                                                            | 100                                                   | 18.7                                       | 5.67                                      | 0.8661                                     | 1.36                                | 24.84                                      | 15                            |
| Cesium-137    | 5,000                                                          | 5,000                                                 | 1.72                                       | 0.113                                     | 0.2142                                     | 0.113                               | 0.2561                                     | 119                           |
| Cobalt-60     | 5,000                                                          | 5,000                                                 | 6.01                                       | 0.0602                                    | 0.5164                                     | 0.0361                              | 0.3918                                     | 100                           |
| Europium-152  | 5,000                                                          | 5,000                                                 | 3.21                                       | 0.13 <sup>f</sup>                         | 0.5018                                     | 0.13 <sup>f</sup>                   | 0.502                                      | 60                            |
| Europium-154  | 5,000                                                          | 5,000                                                 | 3.49                                       | 0.23 <sup>f</sup>                         | 0.9593                                     | 0.23 <sup>f</sup>                   | 0.9599                                     | 200                           |
| Plutonium-239 | 100                                                            | 100                                                   | 18.1                                       | 14.0                                      | 1.743                                      | 2.59                                | 1.138                                      | 15                            |
| Radium-226    | 100                                                            | 100                                                   | 0.612                                      | 1.0 <sup>g</sup>                          | 6.342                                      | 1.0 <sup>g</sup>                    | 14.59                                      | 5 <sup>i</sup>                |
| Strontium-90  | 1,000                                                          | 1,000                                                 | 0.685                                      | 10.8                                      | 0.1931                                     | 0.331                               | 1.648                                      | 8                             |
| Thorium-232   | 1,000                                                          | 36.5                                                  | 24.9                                       | 2.7                                       | 24.91                                      | 1.69                                | 25                                         | 15                            |
| Tritium       | 5,000                                                          | 5,000                                                 | 0.00053                                    | 4.23                                      | 0.00179                                    | 2.28                                | 0.05263                                    | 20,000                        |
| Uranium-235+D | 5,000                                                          | 488                                                   | 25                                         | 0.398                                     | 0.178                                      | 0.195                               | 0.8453                                     | 30                            |

**Notes:**

<sup>a</sup> These limits are based on AEC *Regulatory Guide 1.86* (1974). Limits for removable surface activity are 20 percent of these values.

<sup>b</sup> These limits are based on 25 mrem/yr, using RESRAD-Build Version 3.3 or *Regulatory Guide 1.86*, whichever is lower.

<sup>c</sup> The resulting dose is based on modeling using RESRAD-Build Version 3.3 or RESRAD Version 6.3, with radon pathways turned off.

<sup>d</sup> EPA PRGs for two future-use scenarios.

<sup>e</sup> The on-site and off-site laboratory will ensure that the MDA meets the listed release criteria by increasing sample size or counting time as necessary. The MDA is defined as the lowest net response level, in counts, that can be seen with a fixed level of certainty, customarily 95 percent. The MDA is calculated per sample by considering background counts, amount of sample used, and counting time.



# TABLE 1

## RELEASE CRITERIA

- <sup>f</sup> Based on EPA-decay corrected PRGs for commercial reuse and a previous action memorandum (TtEMI, 2000a, 2001).
- <sup>g</sup> Limit is 1 pCi/g above background, per agreement with EPA.
- <sup>h</sup> Release criteria for water have been derived from *Radionuclides Notice of Data Availability Technical Document*, (EPA, 2000) by comparing the limits from two criteria and using the most conservative limit.
- <sup>i</sup> Limit is for total radium concentration.

AEC – Atomic Energy Commission

cm<sup>2</sup> – square centimeters

dpm – disintegrations per minute

EPA – U.S. Environmental Protection Agency

MDA – minimum detectable activity

mrem/yr – millirem per year

pCi/g – picocurie per gram

pCi/L – picocurie per liter

PRG – preliminary remediation goal

TtEMI – Tetra Tech EM, Inc.

**TABLE 2**  
**ADDITIONAL POTENTIAL RADIONUCLIDES OF CONCERN**

| <b>Radionuclide</b> | <b>Half-Life</b>           | <b>Radiations</b>  |
|---------------------|----------------------------|--------------------|
| Actinium-227        | 21.8 years                 | Alpha, beta, gamma |
| Americium-243       | 7,370 years                | Alpha, gamma       |
| Barium-133          | 10.5 years                 | Beta, gamma        |
| Bismuth-207         | 32 years                   | Beta, gamma        |
| Carbon-214          | 5,715 years                | Beta               |
| Chlorine-36         | $3.01 \times 10^5$ years   | Beta               |
| Curium-244          | 18.1 years                 | Alpha, gamma       |
| Europium-152        | 13.5 years                 | Beta, gamma        |
| Europium-154        | 8.6 years                  | Beta, gamma        |
| Gadolinium-152      | $1.1 \times 10^{14}$ years | Alpha              |
| Indium-115          | $4.4 \times 10^{14}$ years | Beta               |
| Potassium-40        | $1.27 \times 10^9$ years   | Beta, gamma        |
| Niobium-94          | $2 \times 10^4$ years      | Beta, gamma        |
| Nickel-63           | 100 years                  | Beta               |
| Neptunium-237       | $2.14 \times 10^6$ years   | Alpha, gamma       |
| Lead-210            | 22.6 years                 | Beta, gamma        |
| Plutonium-238       | 87.7 years                 | Alpha, gamma       |
| Technetium-97       | $2.6 \times 10^6$ years    | Beta, gamma        |
| Technetium-99       | $2.1 \times 10^5$ years    | Beta, gamma        |
| Titanium-44         | 67 years                   | Gamma              |
| Thallium-204        | 3.78 years                 | Beta               |
| Uranium-233         | $1.59 \times 10^5$ years   | Alpha, gamma       |
| Uranium-236         | $2.34 \times 10^7$ years   | Alpha, gamma       |
| Uranium-238         | $4.478 \times 10^9$ years  | Alpha, gamma       |

**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area   | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 |                                   |
|---------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|-----------------------------------|
|                           | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System | Recommended Actions               |
| Parcel B                  |                         |                        |        |          |         |                    |                  |               |             |     |            |                 |                              |                 |               |             |     |            |                 |                                   |
| 103                       |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | L               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report |
| 113                       |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report |
| 113A                      |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report |
| 114                       |                         |                        |        | ✓        |         | L                  | N                | N             | N           | N   | N          | N               | L                            | N               | N             | N           | N   | N          | N               | Scoping Survey                    |
| 130                       |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report |
| 140 and Discharge Channel |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | L               | N                            | N               | N             | N           | N   | L          | L               | Scoping Survey                    |
| 142                       |                         |                        |        | ✓        |         | L                  | N                | N             | N           | N   | L          | N               | L                            | N               | N             | N           | N   | L          | N               | Scoping Survey                    |
| 146                       |                         |                        | ✓      |          |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Characterization Survey           |
| 157                       |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Scoping Survey                    |

**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area   | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 | Recommended Actions                 |
|---------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|-------------------------------------|
|                           | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System |                                     |
| IR-07                     |                         |                        |        | ✓        |         | L                  | L                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Scoping Survey                      |
| IR-18                     |                         |                        |        | ✓        |         | L                  | L                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Scoping Survey                      |
| Drydock 5                 |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | L               | N                            | N               | N             | N           | N   | L          | L               | Scoping Survey                      |
| Drydock 6                 |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | L               | N                            | N               | N             | N           | N   | L          | L               | Review Final Status Survey Report   |
| Drydock 7                 |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | L               | N                            | N               | N             | N           | N   | L          | L               | Scoping Survey                      |
| Parcel C                  |                         |                        |        |          |         |                    |                  |               |             |     |            |                 |                              |                 |               |             |     |            |                 |                                     |
| 203                       |                         |                        |        | ✓        |         | L                  | N                | N             | N           | N   | L          | N               | L                            | N               | N             | N           | N   | L          | N               | Scoping Survey                      |
| 205 and Discharge Channel |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | L               | N                            | N               | N             | N           | N   | L          | L               | Scoping Survey                      |
| 211                       |                         | ✓                      |        |          |         | N                  | N                | N             | N           | N   | M          | L               | N                            | N               | N             | N           | N   | L          | L               | Remediation and Final Status Survey |
| 214                       |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report   |

**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 | Recommended Actions                 |
|-------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|-------------------------------------|
|                         | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System |                                     |
| 224                     |                         |                        | ✓      |          |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report   |
| 241                     |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report   |
| 253                     |                         | ✓                      |        |          |         | N                  | N                | N             | N           | N   | H          | H               | N                            | N               | N             | N           | N   | M          | M               | Remediation and Final Status Survey |
| 271                     |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report   |
| 272                     |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report   |
| Drydock 2               |                         |                        | ✓      |          |         | N                  | N                | N             | N           | N   | M          | L               | N                            | N               | N             | N           | N   | L          | L               | Review Final Status Survey Report   |
| Drydock 3               |                         |                        | ✓      |          |         | N                  | N                | N             | N           | N   | M          | L               | N                            | N               | N             | N           | N   | L          | L               | Review Final Status Survey Report   |
| Drydock 4               |                         |                        | ✓      |          |         | N                  | N                | N             | N           | N   | M          | L               | N                            | N               | N             | N           | N   | L          | L               | Review Final Status Survey Report   |

**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 |                                     |
|-------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|-------------------------------------|
|                         | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System | Recommended Actions                 |
| Parcel D                |                         |                        |        |          |         |                    |                  |               |             |     |            |                 |                              |                 |               |             |     |            |                 |                                     |
| 274                     |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report   |
| 313 Site                |                         |                        | ✓      |          |         | L                  | L                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Review Final Status Survey Report   |
| 313A Site               |                         |                        | ✓      |          |         | M                  | L                | N             | N           | N   | N          | M               | L                            | L               | N             | N           | N   | N          | L               | Review Final Status Survey Report   |
| 317 Site                |                         |                        | ✓      |          |         | L                  | L                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Review Final Status Survey Report   |
| 322 Site                |                         |                        | ✓      |          |         | L                  | N                | N             | N           | N   | N          | N               | L                            | N               | N             | N           | N   | N          | N               | Review Final Status Survey Report   |
| 351                     |                         |                        | ✓      |          |         | N                  | N                | N             | N           | N   | M          | L               | N                            | N               | N             | N           | N   | L          | L               | Review Final Status Survey Report   |
| 351A                    |                         | ✓                      |        |          |         | M                  | N                | N             | N           | N   | M          | M               | M                            | N               | N             | N           | N   | L          | L               | Characterization Survey             |
| 364                     |                         | ✓                      |        |          |         | H                  | M                | N             | N           | N   | H          | H               | M                            | L               | N             | N           | N   | M          | M               | Remediation and Final Status Survey |
| 365                     |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | L               | N                            | N               | N             | N           | N   | L          | L               | Review Final Status Survey Report   |

**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 |                                     |
|-------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|-------------------------------------|
|                         | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System | Recommended Actions                 |
| 366/351B                |                         | ✓                      |        |          |         | N                  | N                | N             | N           | N   | M          | M               | N                            | N               | N             | N           | N   | L          | L               | Remediation and Final Status Survey |
| 383                     |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report   |
| 408                     |                         |                        | ✓      |          |         | N                  | N                | N             | N           | N   | M          | N               | N                            | N               | N             | N           | N   | L          | N               | Scoping Survey                      |
| 411                     |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report   |
| Gun Mole(Regunning)Pier |                         |                        | ✓      |          |         | L                  | L                | N             | N           | N   | L          | N               | L                            | L               | N             | N           | N   | L          | N               | Review Characterization Report      |
| 500                     |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Scoping Survey                      |
| 503 Site                |                         |                        | ✓      |          |         | N                  | L                | N             | N           | N   | N          | L               | N                            | L               | N             | N           | N   | N          | L               | Scoping Survey                      |
| Mahan Street-NRDL       |                         |                        | ✓      |          |         | M                  | M                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Review Final Status Survey Report   |
| 813                     |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Scoping Survey                      |
| 819                     |                         |                        | ✓      |          |         | N                  | N                | N             | N           | N   | L          | M               | N                            | N               | N             | N           | N   | L          | M               | Scoping Survey                      |

**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 |                                   |                                   |
|-------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|-----------------------------------|-----------------------------------|
|                         | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System | Recommended Actions               |                                   |
| Parcel E                |                         |                        |        |          |         |                    |                  |               |             |     |            |                 |                              |                 |               |             |     |            |                 |                                   |                                   |
| 406                     |                         |                        | ✓      |          |         | N                  | N                | N             | N           | N   | M          | N               | N                            | N               | N             | N           | N   | L          | N               | Review Final Status Survey Report |                                   |
| 414                     |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | N          | L               | N                                 | Review Final Status Survey Report |
| 500 Building Series     |                         |                        | ✓      |          |         | M                  | H                | N             | N           | N   | N          | H               | L                            | M               | N             | N           | N   | N          | H               | Scoping Survey                    |                                   |
| 506 Site                |                         |                        | ✓      |          |         | M                  | M                | N             | N           | N   | N          | M               | L                            | L               | N             | N           | N   | N          | M               | Scoping Survey                    |                                   |
| 507 Site                |                         |                        | ✓      |          |         | L                  | L                | N             | N           | N   | N          | M               | L                            | L               | N             | N           | N   | N          | L               | Characterization Survey           |                                   |
| 508 Site                |                         |                        | ✓      |          |         | L                  | L                | N             | N           | N   | N          | M               | L                            | L               | N             | N           | N   | N          | L               | Characterization Survey           |                                   |
| 509 Site                |                         |                        | ✓      |          |         | L                  | L                | N             | N           | N   | N          | M               | L                            | L               | N             | N           | N   | N          | L               | Characterization Survey           |                                   |
| 510 Site                |                         |                        | ✓      |          |         | L                  | L                | N             | N           | N   | N          | M               | L                            | L               | N             | N           | N   | N          | L               | Characterization Survey           |                                   |
| 510A Site               |                         |                        | ✓      |          |         | L                  | L                | N             | N           | N   | N          | M               | L                            | L               | N             | N           | N   | N          | L               | Scoping Survey                    |                                   |



**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 |                                                               |
|-------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|---------------------------------------------------------------|
|                         | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System | Recommended Actions                                           |
| 517 Site                |                         |                        | ✓      |          |         | L                  | L                | N             | N           | N   | N          | M               | L                            | L               | N             | N           | N   | N          | L               | Characterization Survey                                       |
| 520 Site                |                         | ✓                      |        |          |         | M                  | M                | N             | N           | N   | N          | M               | M                            | M               | N             | N           | N   | N          | L               | Characterization Survey                                       |
| 521                     |                         |                        |        | ✓        |         | L                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | N          | N               | Scoping Survey                                                |
| 529 Site                |                         | ✓                      |        |          |         | M                  | M                | N             | N           | N   | M          | H               | L                            | L               | N             | N           | N   | L          | M               | Scoping Survey                                                |
| 701 Site                |                         |                        |        | ✓        |         | L                  | N                | N             | N           | N   | N          | N               | L                            | N               | N             | N           | N   | N          | N               | Review Final Status Survey Report                             |
| 704 Area                |                         |                        | ✓      |          |         | L                  | L                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Scoping Survey                                                |
| 704/Pens                |                         |                        |        | ✓        |         | L                  | L                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Scoping Survey                                                |
| 707/Kennels             |                         | ✓                      |        |          |         | L                  | L                | N             | N           | N   | L          | M               | L                            | L               | N             | N           | N   | L          | M               | Characterization Survey                                       |
| 707 B Site              |                         |                        |        | ✓        |         | L                  | L                | N             | N           | N   | N          | N               | N                            | L               | N             | N           | N   | N          | L               | Characterization Survey (as part of 707 Triangle Area Survey) |

**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area      | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 |                                                                  |
|------------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|------------------------------------------------------------------|
|                              | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System | Recommended Actions                                              |
| 707 C Site                   |                         |                        |        | ✓        |         | L                  | L                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Characterization Survey as<br>(part of 707 Triangle Area Survey) |
| 707 Triangle Area            |                         | ✓                      |        |          |         | L                  | H                | N             | N           | N   | N          | H               | L                            | M               | N             | N           | N   | N          | M               | Characterization Survey                                          |
| 708                          |                         |                        |        | ✓        |         | L                  | N                | N             | N           | N   | L          | N               | L                            | N               | N             | N           | N   | N          | N               | Review Final Status Survey Report                                |
| 719 Site                     |                         |                        |        | ✓        |         | L                  | L                | N             | N           | N   | N          | N               | L                            | N               | N             | N           | N   | N          | N               | Scoping Survey                                                   |
| 807 Site                     |                         |                        |        | ✓        |         | L                  | L                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | L          | N               | Scoping Survey                                                   |
| 810                          |                         | ✓                      |        |          |         | M                  | N                | N             | N           | N   | M          | N               | L                            | N               | N             | N           | N   | L          | N               | Remediation and Scoping Survey                                   |
| Shack 79 Site                |                         |                        | ✓      |          |         | M                  | L                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Final Status Survey                                              |
| Shack 80 Site                |                         | ✓                      |        |          |         | H                  | M                | N             | N           | N   | N          | N               | M                            | L               | N             | N           | N   | N          | N               | Remediation and Final Status Survey                              |
| Experimental Shielding Range |                         |                        | ✓      |          |         | M                  | L                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Review Final Status Survey Report                                |

**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area       | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 | Recommended Actions                                                         |
|-------------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|-----------------------------------------------------------------------------|
|                               | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System |                                                                             |
| IR-01/21, Industrial Landfill |                         | ✓                      |        |          |         | H                  | H                | N             | N           | N   | N          | N               | M                            | M               | N             | N           | N   | N          | N               | Review Characterization Survey Report, Remediation, and Final Status Survey |
| IR-02, Bay Fill               |                         | ✓                      |        |          |         | H                  | H                | N             | L           | N   | N          | N               | M                            | M               | N             | L           | N   | N          | N               | Characterization Survey                                                     |
| IR-03                         |                         |                        | ✓      |          |         | M                  | M                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Scoping Survey                                                              |
| IR-04                         |                         | ✓                      |        |          |         | H                  | M                | N             | N           | N   | N          | N               | M                            | L               | N             | N           | N   | N          | N               | Characterization Survey                                                     |
| Former Salvage Yard           |                         |                        | ✓      |          |         | M                  | M                | N             | N           | N   | N          | N               | L                            | L               | N             | N           | N   | N          | N               | Scoping Survey                                                              |
| Shoreline                     |                         | ✓                      |        |          |         | H                  | M                | L             | N           | N   | N          | N               | M                            | M               | L             | N           | N   | N          | N               | Characterization Survey                                                     |

**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 | Recommended Actions                                                                                        |
|-------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|------------------------------------------------------------------------------------------------------------|
|                         | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System |                                                                                                            |
| Base-wide               |                         |                        |        |          |         |                    |                  |               |             |     |            |                 |                              |                 |               |             |     |            |                 |                                                                                                            |
| Storm Drain lines       |                         | ✓                      |        |          |         | N                  | L                | N             | N           | N   | L          | H               | N                            | L               | N             | N           | N   | L          | M               | Scoping/Characterization Surveys of systems associated with NRDL sites or sites associated with radium use |
| Sanitary Sewers         |                         | ✓                      |        |          |         | N                  | L                | N             | N           | N   | L          | H               | N                            | L               | N             | N           | N   | L          | M               | Scoping/Characterization Survey of systems associated with NRDL sites or sites associated with radium use  |
| Septic Systems          |                         |                        | ✓      |          |         | N                  | M                | N             | N           | N   | N          | H               | N                            | L               | N             | N           | N   | N          | M               | Scoping/Characterization Surveys of systems associated with NRDL buildings                                 |
| Parcel F                |                         |                        |        |          |         |                    |                  |               |             |     |            |                 |                              |                 |               |             |     |            |                 |                                                                                                            |
| Underwater Areas        |                         |                        | ✓      |          |         | N                  | L                | N             | N           | N   | N          | N               | L                            | N               | N             | N           | N   | N          | N               | Scoping Surveys in areas of Operation CROSSROADS decontamination activities and site outfall discharge     |

**TABLE 3**  
**BUILDING/AREA ASSESSMENT AND CLASSIFICATION**

| Building No.<br>or Area | Contamination Potential |                        |        |          |         | Contaminated Media |                  |               |             |     |            |                 | Potential Migration Pathways |                 |               |             |     |            |                 | Recommended Actions                                                                 |
|-------------------------|-------------------------|------------------------|--------|----------|---------|--------------------|------------------|---------------|-------------|-----|------------|-----------------|------------------------------|-----------------|---------------|-------------|-----|------------|-----------------|-------------------------------------------------------------------------------------|
|                         | Known-restricted Access | Known-continued Access | Likely | Unlikely | Unknown | Surface Soil       | Subsurface Soils | Surface Water | Groundwater | Air | Structures | Drainage System | Surface Soil                 | Subsurface Soil | Surface Water | Groundwater | Air | Structures | Drainage System |                                                                                     |
| All Ships' Berths       |                         |                        |        | ✓        |         | L                  | L                | N             | N           | N   | L          | N               | N                            | L               | N             | N           | N   | L          | N               | Review Final Status Survey Report for completed berths; Scoping Survey on remainder |
| Off-site Facility       |                         |                        |        |          |         |                    |                  |               |             |     |            |                 |                              |                 |               |             |     |            |                 |                                                                                     |
| ICW 418                 |                         |                        |        | ✓        |         | N                  | N                | N             | N           | N   | L          | N               | N                            | N               | N             | N           | N   | L          | N               | Scoping Survey                                                                      |

**Notes:**

- H High = Evidence of contamination in the media or migration pathway has been identified.
- L Low = The potential for contamination in the type of media or migration pathway is remote.
- M Moderate = The potential for contamination in the media or migration pathway exists, although the extent has not been fully assessed.
- N None = Evidence of contamination in the specific media or migration pathway has not been found, or known contamination has been removed, and surveys indicate that the media or migration pathway meets today's release criteria.

NRDL – Navy Radiological Defense Laboratory

## **FIGURES**

|                            |                                    |                 |                        |                                |
|----------------------------|------------------------------------|-----------------|------------------------|--------------------------------|
| DRAWING NO:<br>0606761.DWG | DCN: FWSD-RAC-06-0676<br>CTO: 0072 | APPROVED BY: JS | CHECKED BY: JS<br>REV: | DRAWN BY: MD<br>DATE: 04/07/06 |
|----------------------------|------------------------------------|-----------------|------------------------|--------------------------------|

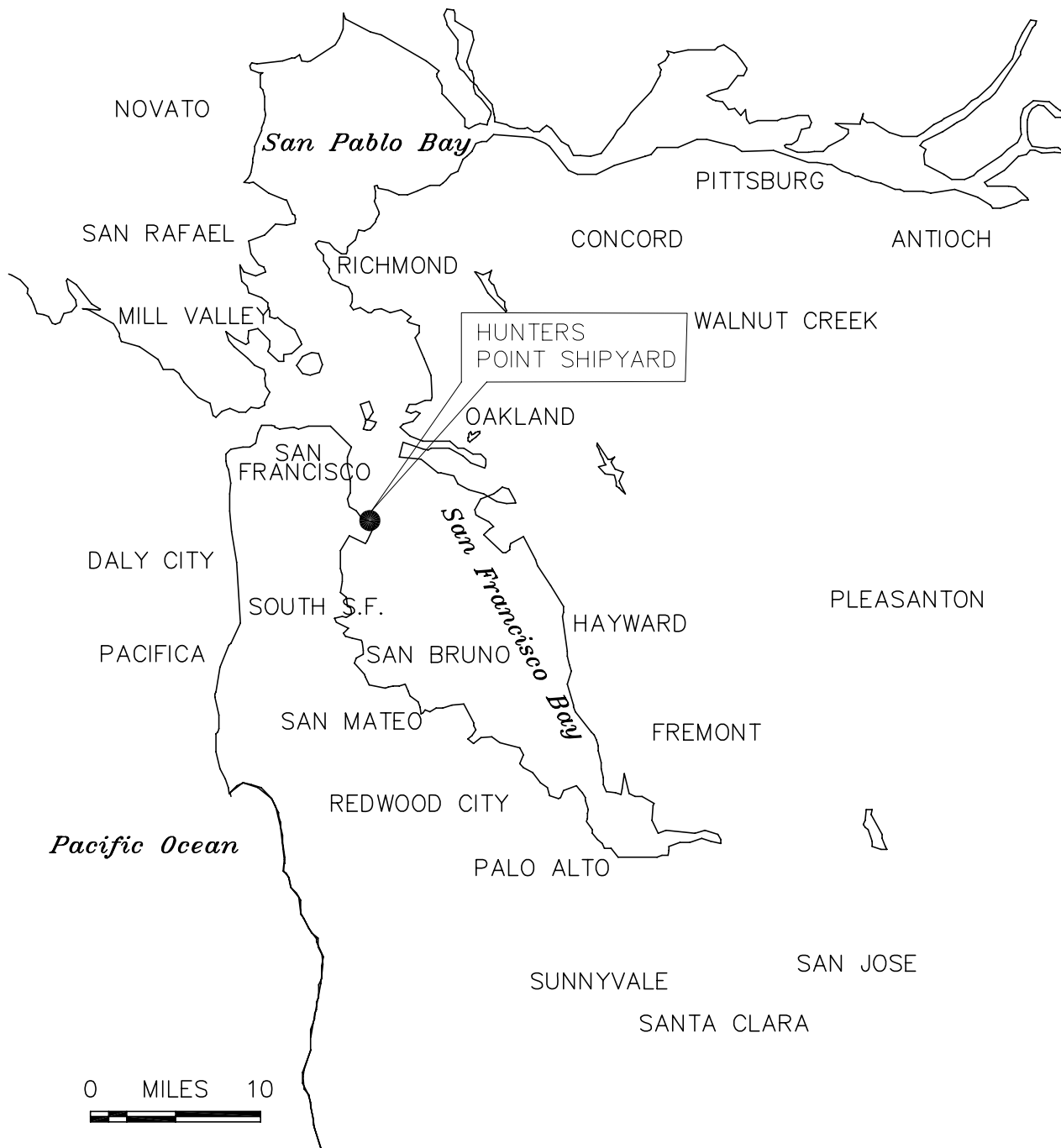


FIGURE 1  
HUNTERS POINT SHIPYARD LOCATION

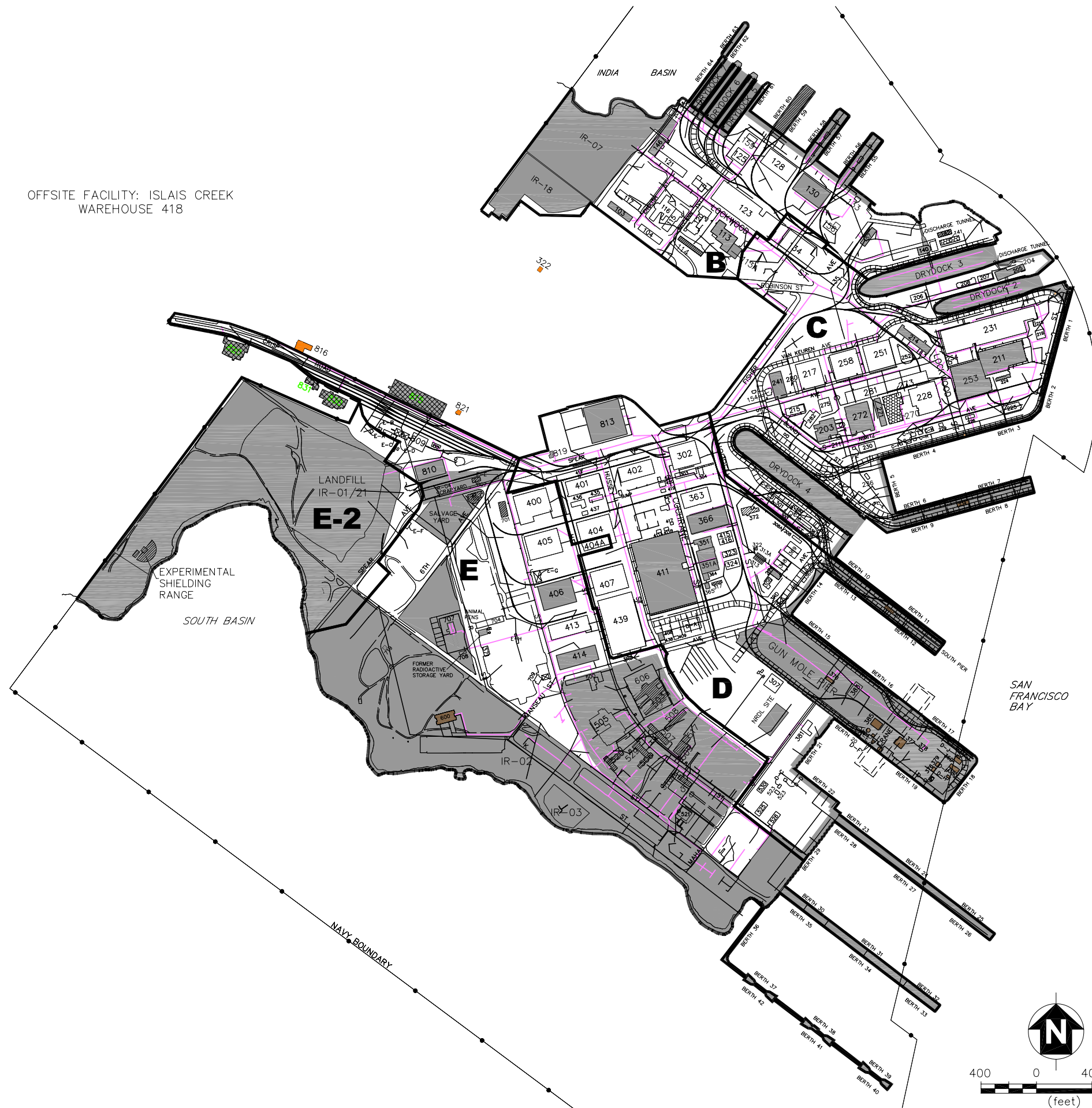
HUNTERS POINT SHIPYARD-SAN FRANCISCO, CA



TETRA TECH EC, INC.

|                |                |                 |                       |                         |
|----------------|----------------|-----------------|-----------------------|-------------------------|
| DRAWN BY: MD   | CHECKED BY: JS | APPROVED BY: JS | DCN: FMSD-RAC-06-0676 | DRAWING NO: 0606762.DWG |
| DATE: 04/07/06 | REV: 0         |                 | CTO: 0072             |                         |

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#### LEGEND

- NAVY PROPERTY BOUNDARY (OFFSHORE)
- PARCEL BOUNDARY
- IMPACTED SANITARY SEWER SYSTEM
- IMPACTED STORM DRAIN SYSTEM
- IMPACTED BUILDINGS OR SITES
- DEMOLISHED IMPACTED BUILDINGS/STRUCTURES
- DEMOLISHED BUILDINGS/STRUCTURES
- IMPACTED SITES THAT HAVE OBTAINED REGULATORY RELEASE
- IMPACTED FUDS SITES
- NON-IMPACTED BUILDINGS WITHIN AN IMPACTED SITE, RADIOLOGICAL PRECAUTIONS MAY BE REQUIRED

#### NOTE

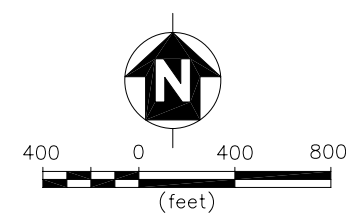
IMPACTED SITES ARE SITES THAT HAVE KNOWN RADIOLOGICAL CONTAMINATION OR WHERE SITE HISTORY INDICATES THAT RADIOLOGICAL CONTAMINATION MAY BE PRESENT.

FIGURE 2  
RADIOLOGICALLY IMPACTED SITES MAP

HUNTERS POINT SHIPYARD—SAN FRANCISCO, CA



TETRA TECH EC, INC.





**APPENDIX A**

**POTENTIAL FEDERAL AND STATE  
APPLICABLE OR RELEVANT AND  
APPROPRIATE REQUIREMENTS AND  
TO-BE-CONSIDERED CRITERIA  
FOR POTENTIALLY CONTAMINATED SITES  
AT HUNTERS POINT SHIPYARD**

## APPENDIX A

**POTENTIAL FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS  
AND TO-BE-CONSIDERED CRITERIA FOR POTENTIALLY CONTAMINATED SITES  
AT HUNTERS POINT SHIPYARD**

| Regulation                                                                    | Requirement                                                                                                                                                                                                                                                                                                                                                       | Citation <sup>b</sup> | ARAR Determination       | Comments                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Chemical-specific<sup>a</sup> ARAR</b>                                     |                                                                                                                                                                                                                                                                                                                                                                   |                       |                          |                                                                                                                                                                                                                             |
| Health and Environmental Standards for Drinking Water                         | MCLs for radionuclides <ul style="list-style-type: none"> <li>• Combined radium-226 and radium-228 – 5 pCi/L</li> <li>• Gross alpha (including radium-226 but excluding radon and uranium) – 15 pCi/L</li> <li>• Tritium – 20,000 pCi/L</li> <li>• Strontium-90 – 8 pCi/L</li> <li>• Beta and photon – 4 mrem/yr</li> <li>• Uranium – 30 µg/L</li> </ul>          | 40 CFR §141.66        | Applicable               | This requirement is applicable to the wastewater limits established for the site.                                                                                                                                           |
| Radiological Criteria for Unrestricted Use at Closing NRC Licensed Facilities | A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in TEDE to an average member of the critical group that does not exceed 25 mrem/yr, including that from groundwater sources of drinking water, and that the residual radioactivity has been reduced to ALARA.   | 10 CFR § 20.1402      | Relevant and Appropriate | The Navy would apply this requirement, with the exception that 15 mrem/yr TEDE is substituted for 25 mrem, as ALARA.                                                                                                        |
| Radiological Criteria for License Termination Under Restricted Conditions     | As a condition for license termination with restricted site use, the licensee must demonstrate that further reductions in residual radioactivity necessary to comply with the provisions of 10 USC § 20.1402 would result in net public or environmental harm or were not being made because the residual levels associated with restricted conditions are ALARA. | 10 CFR § 20.1403(a)   | Relevant and Appropriate | Potentially relevant and appropriate for a restricted land use scenario since radioactive materials may be left on site at fill areas.                                                                                      |
| Radiological Criteria for License Termination Under Restricted Conditions     | As a condition for license termination with restricted site use, the licensee must make provisions for legally enforceable institutional controls that provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem/yr.                             | 10 CFR § 20.1403(b)   | Applicable               | Restricted land use scenarios may be used in areas that are associated with fill and surveys will not be performed at depths greater than 1 foot below ground surface. The 25 mrem/yr will still apply to the surface dose. |

**APPENDIX A**

**POTENTIAL FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS  
AND TO-BE-CONSIDERED CRITERIA FOR POTENTIALLY CONTAMINATED SITES  
AT HUNTERS POINT SHIPYARD**

| <b>Regulation</b>                                        | <b>Requirement</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Citation<sup>b</sup></b>        | <b>ARAR<br/>Determination</b> | <b>Comments</b>                                                                                                                                                                        |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Chemical-specific<sup>a</sup> ARAR (Continued)</b>    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                    |                               |                                                                                                                                                                                        |
| Alternate Radiological Criteria for License Termination  | Alternate criteria are allowed for license termination as long as assurance is provided that public health and safety would continue to be protected and that it is unlikely that the dose from all man-made sources combined, other than medical, would be more than the 100 mrem/yr limit of subpt. D, by submitting an analysis of possible sources of exposure; to the extent practical restrictions on site use are employed according to the provisions of § 20.1403 in minimizing exposures at the site; and doses are reduced to ALARA levels, taking into consideration any detriments such as traffic accidents expected to potentially result from decontamination and waste disposal. | 10 CFR §20.1404(a)(1) - (a)(3)     | Applicable                    | Sites will be dose modeled to show that residual radioactivity present does not exceed 25 mrem/yr. Therefore, members of the public are not expected to receive more than 100 mrem/yr. |
| Dose Limits for Individual Members of the Public         | Requires that the TEDE to individual members of public not exceed 0.1 rem from licensed operation: construction, operation, and decommissioning of commercial reactors and fuel cycle facilities; possession, use, processing, exporting, and certain aspects of transporting nuclear materials and waste; and siting, design, construction, operations, and closure of waste disposal sites.                                                                                                                                                                                                                                                                                                     | 10 CFR §20.1301(a)(1)              | Applicable                    | This requirement is a health-based standard that is applicable for exposure to members of the public during removal actions.                                                           |
| ALIs and DACs of Radionuclides for Occupational Exposure | Establishes limits for effluent releases to unrestricted area particularly in the implementation of the provisions of §20.1302, which implement the radiation dose limits for the public as listed in 10 CFR §20.1301                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10 CFR pt. 20, Appendix B, Table 2 | Applicable                    | This requirement is applicable to all removal actions performed as gaseous emissions of radionuclides may occur and is addressed by 10 CFR §20.1301.                                   |
| <b>Location-specific ARAR</b>                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                    |                               |                                                                                                                                                                                        |
| Federal Coastal Zone Management Act                      | This act specifies that federal actions that affect the coastal zone must be consistent with the policies of the San Francisco Bay Conservation and Development Commission's federally approved coastal management program.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 16 USC 1456(c)(1)(A)               | Applicable                    | This requirement is applicable to all removal actions performed in proximity to San Francisco Bay.                                                                                     |

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**POTENTIAL FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS  
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AT HUNTERS POINT SHIPYARD**

| Regulation                                                          | Requirement                                                                                                                                                                                                                                                                                                                          | Citation <sup>b</sup> | ARAR Determination       | Comments                                                                                                                        |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Action-specific ARAR</b>                                         |                                                                                                                                                                                                                                                                                                                                      |                       |                          |                                                                                                                                 |
| Storage and Control of Licensed Material                            | The licensee shall secure from unauthorized removal or access licensed materials that are stored in controlled or unrestricted areas.                                                                                                                                                                                                | 10 CFR §20.1801       | Relevant and Appropriate | Potentially relevant and appropriate for a restricted land use scenario since waste will be left on site.                       |
|                                                                     | The licensee shall control and maintain constant surveillance of licensed material that is in a controlled or unrestricted area and that is not in storage.                                                                                                                                                                          | 10 CFR §20.1802       | Relevant and Appropriate | Potentially relevant and appropriate for sites where radioactive material may remain on site if the site can meet the criteria. |
| Protection of the General Population from Releases of Radioactivity | Performance objectives for the land disposal of LLRW. Concentrations of radioactive material that may be released to the general environment must not result in an annual dose exceeding 25 mrem to the body or any organ of a member of the general public.                                                                         | 10 CFR §61.41         | Applicable               | Applicable for sites where radioactive materials may remain on site if the site can meet the criteria.                          |
| Protection of the Individuals from Inadvertent Intrusion            | Design, operation, and closure of the land disposal facility must ensure protection of any individual inadvertently intruding into the disposal site and occupying the site or contacting the waste at any time after active institutional controls over the disposal site are removed.                                              | 10 CFR §61.42         | Relevant and Appropriate | Potentially relevant and appropriate for sites where radioactive waste may remain on site if the site can meet the criteria.    |
| Protection of Individuals During Operation                          | Every reasonable effort shall be made to maintain radiation exposures ALARA.                                                                                                                                                                                                                                                         | 10 CFR §61.43         | Applicable               | Potentially relevant and appropriate for sites where radioactive waste will remain on site.                                     |
| Stability of the Disposal Site After Closure                        | The disposal facility must be sited, designed, used, operated, and closed to achieve long-term stability of the disposal site and to eliminate to the extent practicable the need for ongoing active maintenance of the disposal site following closure so that only surveillance, monitoring, or minor custodial care are required. | 10 CFR §61.44         | Relevant and Appropriate | Potentially relevant and appropriate for a site with radionuclides.                                                             |

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**POTENTIAL FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS  
AND TO-BE-CONSIDERED CRITERIA FOR POTENTIALLY CONTAMINATED SITES  
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| <b>Regulation</b>                              | <b>Requirement</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Citation<sup>b</sup></b> | <b>ARAR<br/>Determination</b> | <b>Comments</b>                                                                                                                                                                                                                           |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Action-specific ARAR (Continued)</b>        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |                               |                                                                                                                                                                                                                                           |
| Waste Disposal by Release into Sanitary Sewage | A licensee may discharge licensed material into sanitary sewerage if each of the following conditions is satisfied: the material is readily soluble in water; and the quantity that the licensee releases into the sewer in 1 month divided by the average monthly volume of water released does not exceed the concentration listed in Table 3 of appendix B to pt. 20; and if more than one radionuclide is released, the licensee shall determine the fraction of the limit in Table 3 of appendix B to pt. 20 represented by discharges into sanitary sewerage by dividing the actual monthly average concentration of each radionuclide released by the licensee into the sewer by the concentration of that radionuclide listed in Table 3 of appendix B to pt. 20; and the sum of the fractions for each radionuclide required by paragraph (a)(3)(i) of this section does not exceed unity; and the total quantity of licensed and other radioactive material that the licensee releases into the sanitary sewerage system in a year does not exceed 5 Ci (185 GBq) of hydrogen-3, 1 Ci (37 GBq) of carbon-14, and 1 Ci (37 GBq) of all other radioactive materials combined. | 10 CFR §20.2003             | Relevant and Appropriate      | The Navy would apply this requirement, with the exception that waste water discharged to the sanitary sewer system will meet the release criteria established in Table 1, which is more conservative than the values listed in this ARAR. |

## APPENDIX A

### POTENTIAL FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND TO-BE-CONSIDERED CRITERIA FOR POTENTIALLY CONTAMINATED SITES AT HUNTERS POINT SHIPYARD

#### *Notes:*

- <sup>a</sup> Many potential action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables.
- <sup>b</sup> Only the substantive provisions of the requirements cited in this table are potential ARARs.

#### *Abbreviations and Acronyms:*

µg/L – microgram per liter  
ALARA – as low as reasonably achievable  
ALI – Annual Limit of Intake  
ARAR – applicable or relevant and appropriate requirement  
CFR – Code of Federal Regulations  
Ci – curie  
DAC – derived airborne concentration  
GBq – gigabecquerel  
LLRW – low-level radioactive waste  
MCL – Maximum Contaminant Level  
mrem – millirem  
mrem/yr – millirem per year  
Navy – U.S. Department of the Navy  
NRC – Nuclear Regulatory Commission  
pCi/L – picocurie per Liter  
pt. – part  
subpt. – subpart  
TEDE – total effective dose equivalent  
USC – United States Code

**APPENDIX B**

**ADMINISTRATIVE RECORD INDEX**

**APPENDIX B****ADMINISTRATIVE RECORD INDEX**

| <b>Document Date</b> | <b>Document Type</b> | <b>Classification</b> | <b>Author Affiliation</b> | <b>Title or Subject</b>                                                                                                                            |
|----------------------|----------------------|-----------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 11/03/92             | Report               | AR                    | PRC                       | Surface Confirmation Radiation Survey (Phase I Investigation)                                                                                      |
| 05/08/96             | Report               | AR                    | PRC                       | Results of Subsurface Radiation Investigation in Parcels B and E, HPS, San Francisco, California (Phase II Investigation)                          |
| 10/27/97             | Report               | AR                    | TtEMI                     | Draft Final Parcel E RI Report, HPS, San Francisco, California (Phase I-III Investigation Summary)                                                 |
| 05/15/00             | Report               | AR                    | TtEMI                     | Draft Phase IV Radiation Investigation Report, HPS, San Francisco, California                                                                      |
| 08/17/00             | Report               | AR                    | TtEMI                     | Radiological Removal Action, Action Memorandum, HPS, San Francisco, California                                                                     |
| 11/19/01             | Report               | AR                    | DON                       | Basewide Radiological Removal Action, Action Memorandum, HPS, San Francisco, California                                                            |
| 8/31/04              | Report               | AR                    | DON                       | Final Historical Radiological Assessment Volume II, History of the Use of General Radioactive Materials, 1939-2003, HPS, San Francisco, California |

**Notes:**

AR – Administrative Record  
HPS – Hunters Point Shipyard  
Navy – U.S. Department of the Navy  
PRC – PRC Environmental Management, Inc.  
RI – remedial investigation  
TtEMI – Tetra Tech EM, Inc.



**RESPONSE TO COMMENTS ON  
REVISED FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION  
ACTION MEMORANDUM  
DATED FEBRUARY 14, 2006  
HUNTERS POINT SHIPYARD  
SAN FRANCISCO, CALIFORNA**

Comments dated: Sent via e-mail on March 24, 2006

Comments by: Thomas P. Lanphar, Senior Hazardous Substance Scientist  
Office of Military Facilities  
Department of Toxic Substances Control (DTSC)

**SPECIFIC COMMENTS**

**Comment 1:** *Section I. Purpose, page 1 and Section III, Threats to Public Health, Welfare, or the Environment and Statutory and Regulatory Authorities, page 9: While DTSC agrees that interim actions are often appropriate for the removal of radiological contamination at Hunters Point, DTSC continues to disagree with the Navy on the application of Time Critical Removal Actions. Please explain how the planned removal actions meet the requirements of Code of Federal Regulations Section 300.415(b)(4).*

**Response 1:** Title 40 Code of Federal Regulations (CFR) 300.415(b)(4) states the following:

“Whenever a planning period of at least six months exists before on-site activities must be initiated, and the lead agency determines, based on a site evaluation, that a removal action is appropriate:

- (i) The lead agency shall conduct an engineering evaluation/cost analysis (EE/CA) or its equivalent. The EE/CA is an analysis of removal alternatives for a site.
- (ii) If environmental samples are to be collected, the lead agency shall develop sampling and analysis plans that shall provide a process for obtaining data of sufficient quality and quantity to satisfy data needs. Sampling and analysis plans shall be reviewed and approved by EPA. The sampling and analysis plans shall consist of two parts:
  - (A) The field sampling plan, which describes the number, type, and location of samples and the type of analyses; and

- (B) The quality assurance project plan, which describes policy, organization, and functional activities and the data quality objectives and measures necessary to achieve adequate data for use in planning and documenting the removal action.”

First, the Department of the Navy (DON) has determined that the only acceptable alternative to address potential radioactive contamination in sewer and storm drain lines is excavation, survey, and appropriate disposal. In situ survey is not possible due to the limitations of field screening devices. The DON must also address the California Department of Health Services requirements for free release, based on the intended property reuse. These requirements include scanning all overburden soil above the drain lines in addition to the lines themselves. Since the DON concluded that only one alternative is applicable to the drain lines, an equivalent cost estimate was provided in the Action Memorandum. In this sense, an EE/CA would be a redundant document.

Second, the DON has provided a Sampling and Analysis Plan to the Base Realignment and Closure (BRAC) Cleanup Team (BCT) for review. This meets the Title 40 CFR 300.415(b)(4)(ii) requirement.

**Comment 2:**

***Section II, C, 2. Potential for Continued State or Local Response, page 9:*** *DTSC does not defer to US EPA for the development of cleanup goals for radiological removal actions. The remediation of radiological contaminated sites at Hunters Point must meet the requirement of CERCLA and Chapter 6.8 of California Health and Safety Code. This includes the evaluation of risks from sites in a report such as a Remedial Investigation Report, the evaluation of remedial alternatives in a Feasibility Study and a final selection of a remedial action, or no further action in a Record of Decision. The DTSC must concur with the Record of Decision, which will include the selection of a final remedy for radiological sites. Please elaborate on DTSC extended role in remedial decisions involving radiological sites being remediated under CERCLA at Hunters Point.*

**Response 2:**

The DON concurs with DTSC’s role in approving remedial decisions involving radiological sites being remediated under CERCLA at Hunters Point Shipyard. The DON fully acknowledges the role of DTSC as a full-fledged BCT partner, as outlined in the Federal Facilities Agreement.

**Comment 3:**

**Section V.A.3, Contribution to Remedial Performance, page 12:**  
*This section states that the Navy intention is that the removal actions are the final radiological remedy for each site. Please add that the each radiological site cleanup will be later evaluated to determine if the level of cleanup achieved is appropriate for a final remedy or if additional remediation is necessary.*

**Response 3:**

The Final Action Memorandum – Revision 2006 will be edited to clarify that the removal action is an interim action and that the final action for radiological site cleanup will be selected in the Record of Decision.

**RESPONSE TO COMMENTS ON  
REVISED FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION  
ACTION MEMORANDUM  
DATED FEBRUARY 14, 2006  
HUNTERS POINT SHIPYARD  
SAN FRANCISCO, CALIFORNA**

Comments dated: March 17, 2006

Comments by: James Ricks, Project Manager, Superfund Division (SFD 8-1)  
U.S. Environmental Protection Agency (EPA), Region IX

**SPECIFIC COMMENTS**

**Comment 1:** *Section II.A.2, Physical Location, Page 2: Since the conveyance of Parcel A to the City of San Francisco, Hunters Point Shipyard (HPS) is no longer 936 acres. Please update the text to reflect the current size of HPS.*

**Response 1:** The sentence has been revised to read “HPS consists of 848 acres, 416 acres of which are on land, .....”

**Comment 2:** *Section II.A.4, Release or Threatened Release into the Environment of a Hazardous Substance or Pollutant or Contaminant, Page 3: It is unclear why daughter products are no longer listed; the 2001 Action Memorandum included “cesium-137 (and daughter products)” and “uranium-235 (and daughter products).” In addition, it appears that text is missing from the first paragraph since there are two “and” statements. Please include daughter products or explain why they have been dropped from the 2006 Action Memorandum. Also, please revise the first paragraph for clarity.*

**Response 2:** The text has been revised to include the daughter products for uranium and cesium. Also, the first paragraph has been revised for clarity. In addition, the text and Table 1 have both been updated to reflect the appropriate isotopes listed in both places.

**Comment 3:** *Section II.A.5, National Priorities List Status, Page 3: The text does not reflect the most current CERCLA status of Parcel B, specifically that the Feasibility Study is being redone so that the Record of Decision can be amended. Please update the status of Parcel B.*

- Response 3:** The text has been changed to “RI/FSs have been completed for Parcels A and B, and an Addendum to the Technical Memorandum in Support of Record of Decision Amendment (TMSRA) is being prepared for Parcel B. RI/FSs are currently being conducted for Parcels C, D, E, and E-2.”
- Comment 4:** ***Section V.A, Proposed Action, Page 10:** The last paragraph states, “Table 3 does not include those sites that were in the former Parcel A,” but it is unclear if this statement refers to the former Building 322, which was demolished, or if it refers to radiologically impacted sites for which parcel boundaries were readjusted to move them out of Parcel A. It is also possible that the community and others could read this paragraph and conclude that there are still radiologically impacted sites in Parcel A. Please revise this paragraph to clarify whether there are still radiologically impacted sites in Parcel A and to discuss the fact that the Parcel A boundary was adjusted to move radiologically impacted sites into other parcels.*
- Response 4:** The last paragraph, second sentence has been changed to: “Table 3 does not include those sites in the former Parcel A that have received regulatory release or the Formerly Used Defense Site (FUDS). The remaining impacted sites (Buildings 813 and 819) in the former Parcel A have been reassigned to Parcel D after the Parcel A boundary was adjusted.”
- Comment 5:** ***Section V.B., Estimated Costs, Page 15:** The costs are the same as those in the 2001 plan, but there has been inflation and the cost of construction materials has increased. Please update the cost estimate to reflect 2006 costs.*
- Response 5:** The costs that have been presented on Page 15 reflect changes due to inflation (a volume/cost increase) and a reduction in the volume of material remediated from 20 cubic yards to 13 cubic yards (a cost decrease). The combined effects of these changes result in the overall cost to remain about the same.
- Comment 6:** ***Table 1, Release Criteria:** During the recent Base Realignment and Closure (BRAC) Cleanup Team (BCT) meeting, the Navy agreed to update the release criteria for Cesium-137 to reflect the current preliminary remediation goal (PRG) of 0.113 picoCuries per gram (pCi/g). Please update this table with the PRG for Cesium-137.*
- Response 6:** Release Criteria for Cesium-137 for Soil for Outdoor Worker and Residential have been changed to 0.113 picoCuries per gram.

**Comment 7:**

***Figure 2, Base-Wide Impacted Buildings, Sites, Sanitary and Storm Drain Sewer Systems:*** It is unclear why the figure does not include IR-02 Northwest and Central (the Radium Dial Disposal Area) and the Metal Slag Area in the IR-01 panhandle, since radiological removal actions are still being done at these sites. Please include IR-02 Northwest and Central and the Metal Slag Area on Figure 2.

**Response 7:**

The intent of this figure is to show the impacted buildings and sites at Hunters Point Shipyard. The specific areas within the impacted sites that are currently undergoing radiological removal action, such as IR-02 Northwest and Central, Metal Slag area, PCB Hot Spot, and Metal Debris Reef, are covered by referencing Parcels E and E-2 impacted buildings and sites.

**RESPONSE TO COMMENTS ON  
REVISED FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION  
ACTION MEMORANDUM  
DATED FEBRUARY 14, 2006  
HUNTERS POINT SHIPYARD  
SAN FRANCISCO, CALIFORNIA**

Comments dated: March 24, 2006

Comments by: Department of Health Services, State of California (DHS)  
Environmental Management Branch

**GENERAL COMMENTS**

**Comment 1:** *Similar comments have been submitted previously in other reviews of the Navy's documents.*

**Response 1:** The Navy is aware of the State of California Department of Health Services previous comments on similar documents. The Navy intends to continue responding to DHS comments in an accurate and timely manner to sustain a shared vision for completing the radiological work with appropriate regulatory guidance.

**SPECIFIC COMMENTS**

**Comment 1:** *Section II.B.1.4, Phase V, Page 5: Using criteria for a "free release, for industrial use," will not guarantee a release for unrestricted use from the State of California. (See Specific Comment 2).*

**Response 1:** The Navy understands that using criteria for industrial re-use will not guarantee a free release. Appropriate release criteria for industrial and residential re-use has been established in Table 1. The Navy intends to use the release criteria as clean-up goals for the radiologically impacted sites at Hunters Point that are consistent with the planned reuse presented in the San Francisco Redevelopment Agency's (SFRA) Reuse Plan.

**Comment 2:** *Section II.B.1.5.3, NWT Interim Investigation and Removal Action, Page 6: If the Navy is requesting an unrestricted release from the State of California, the "site release criteria" will need to show that removal actions cleaned the site to as low as reasonably achievable (ALARA). Any averaged residual contamination concentrations when modeled should not exceed a dose of 25 millirem per year (mrem/year). The "Table 1, Release Criteria" will need to reflect these values.*

**Response 2:**

The Navy understands that using criteria for industrial re-use will not guarantee a free release. Appropriate release criteria for industrial and residential re-use has been established in Table 1. The Navy intends to use the release criteria as clean-up goals for the radiologically impacted sites at Hunters Point, which is ALARA.

In addition, the Navy intends to model the resulting residual radioactivity at the site to demonstrate the resulting dose is below 25 millirem per year. Table 1 will be revised to incorporate the resulting dose received at the release criteria identified. These release criteria are also consistent with the SFRA Reuse Plan.

**Comment 3:**

**Section II.C.0, STATE AND LOCAL AUTHORITIES ROLE, Page 8:** *As stated numerous times, the CDHS does not defer to the U.S. EPA with regard to unrestricted release requirements. Our dose assessment will be based on ALARA and residual contamination. The averaged residual contamination data used for your dose model should reflect representative sampling of the site.*

**Response 3:**

The Navy understands that the State of California Department of Health Services does not defer to the U.S. EPA for unrestricted release requirements. As stated in the previous response, the Navy intends to model the resulting residual contamination data, which will reflect representative sampling at the site, to demonstrate the resulting dose is below 25 millirem per year.



|    |                                                    |               |                                                                                                                                                                                                                                                                                               |
|----|----------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | Chemicals in soil that exceeded screening criteria | Section 2.3.1 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Table 2-5.<br>Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Table 4-1. |
|----|----------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table 2-5. Nature and Extent of Chemicals in Soil (0 to 10 feet bgs)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| 1997<br>Redevelopment<br>Block | 2010<br>Redevelopment<br>Block | IR Site(s)                                                                              | Triple A<br>Site(s)               | Nature and Extent Summary (with RI Report Reference Citation)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------|--------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 31A                            | MU-3                           | IR-36 North (partial)                                                                   | None                              | The screening process identified no contiguous areas that exceeded Parcel E screening criteria for soil. (Section 4.3.1.3.1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 31B/36                         | MU-2                           | IR-36 North (partial) and IR-36 South (partial)                                         | None                              | Three areas of elevated chemical concentrations were identified (Section 4.3.2.3.1): <ul style="list-style-type: none"> <li>North of Building 413: metals, SVOCs, and TPH (Figures 4.3.2-2, 4.3.2-3, and 4.3.2-4)</li> <li>South of Building 413: metals, SVOCs, and TPH (Figures 4.3.2-2, 4.3.2-3, and 4.3.2-4)</li> <li>West and Northwest of Building 406: SVOCs and VOCs (Figure 4.3.2-3)</li> </ul>                                                                                                                                                                                                                                                                                                                                               |
| 40                             | MU-2, EOS-3, and EOS-4         | IR-11/14/15 and IR-38 (partial), IR-39 (partial)                                        | 6, 7                              | The screening process identified no contiguous areas that exceeded Parcel E industrial screening criteria for soil. (Section 4.3.3.3.1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 41                             | MU-2 and EOS-4                 | IR-08 and IR-38 (partial)                                                               | None                              | The screening process identified no contiguous areas that exceeded Parcel E screening criteria for soil. (Section 4.3.4.3.1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 43                             | MU-1                           | IR-05, IR-13, IR-36 North (partial), IR-36 South (partial), IR-36 West, IR-39 (partial) | 5, 15, and unnumbered fenced area | Eight areas of elevated chemical concentrations were identified (Section 4.3.5.3.1): <ul style="list-style-type: none"> <li>Western IR-05: PCBs (Figure 4.3.5-5)</li> <li>Southeast of IR-05: PCBs (Figure 4.3.5-5)</li> <li>IR-36 North, west of Building 405: metals and SVOCs (Figures 4.3.5-2 and 4.3.5-4)</li> <li>East of Building 704: metals (Figure 4.3.5-2)</li> <li>Between Buildings 371 and 709: metals, SVOCs and TPH (Figures 4.3.5-2, 4.3.5-4, and 4.3.5-5)</li> <li>Northwest of Building 709: metals and PCBs (Figures 4.3.5-2 and 4.3.5-5)</li> <li>South of Building 709: metals, VOCs, SVOCs, and PCBs (Figures 4.3.5-2, 4.3.5-3, 4.3.5-4, and 4.3.5-5)</li> <li>IR-13: metals and SVOCs (Figures 4.3.5-2 and 4.3.5-4)</li> </ul> |

**Table 2-5. Nature and Extent of Chemicals in Soil (0 to 10 feet bgs) (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| 1997<br>Redevelopment<br>Block | 2010<br>Redevelopment<br>Block                 | IR Site(s)                                                                                                                 | Triple A<br>Site(s) | Nature and Extent Summary (with RI Report Reference Citation)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 44                             | MU-1, EOS-1,<br>EOS-2,<br>EOS-3, and<br>EOS-5A | IR-02 Northwest<br>(partial),<br>IR-02 Central<br>(partial),<br>IR-12 (partial),<br>IR-39 (partial)                        | 3, 4, 17, 19        | Three areas of elevated chemical concentrations were identified (Section 4.3.6.3.1): <ul style="list-style-type: none"> <li>▪ Northern portion of Redevelopment Block 44: metals, SVOCs, and PCBs (Figures 4.3.6-2, 4.3.6-4, and 4.3.6-5)</li> <li>▪ Central portion of Redevelopment Block 44: metals, VOCs, and TPH (Figures 4.3.6-2, 4.3.6-3, and 4.3.6-5)</li> <li>▪ Southern portion of Redevelopment Block 44: metals and SVOCs (Figures 4.3.6-2 and 4.3.6-4)</li> </ul>                                                                                                                  |
| 45                             | MU-3, EOS-<br>5B, and<br>EOS-5C                | IR-04, IR-12<br>(partial),<br>IR-56, IR-72                                                                                 | 3                   | Five areas of elevated chemical concentrations were identified (Section 4.3.7.3.1): <ul style="list-style-type: none"> <li>▪ Area northwest of Building 809: metals and SVOCs (Figures 4.3.7-2 and 4.3.7-3)</li> <li>▪ Area northwest of Building 810: metals, SVOCs and pesticides (Figures 4.3.7-2, 4.3.7-3 and 4.3.7-4)</li> <li>▪ Area south of Building 810: metals and PCBs (Figures 4.3.7-2 and 4.3.7-4)</li> <li>▪ Area northeast of Building 810: metals and SVOCs (Figures 4.3.7-2 and 4.3.7-3)</li> <li>▪ Southern border of Redevelopment Block 45: TPH (Figure 4.3.7-4)</li> </ul> |
| EMI-1                          | EOS-3 and<br>EOS-4                             | IR-02 Central<br>(partial), IR-02<br>Southeast<br>(partial),<br>IR-11/14/15,<br>IR-38 (partial),<br>IR-40, IR-54,<br>IR-73 | 6, 7, 12, 13,<br>17 | Eight areas of elevated chemical concentrations were identified (Section 4.3.8.3.1): <ul style="list-style-type: none"> <li>▪ Northwest of Building 521: metals and PCBs (Figures 4.3.8-2 and 4.3.8-4)</li> <li>▪ Northeast of Building 521: SVOCs (Figure 4.3.8-3)</li> <li>▪ West of Building 521: PCBs (Figure 4.3.8-4)</li> <li>▪ Southeast of former Building 506: PCBs (Figure 4.3.8-4)</li> <li>▪ East of former Building 510: metals (Figure 4.3.8-2)</li> <li>▪ West of former Building 514: metals (Figure 4.3.8-2)</li> </ul>                                                        |

**Table 2-5. Nature and Extent of Chemicals in Soil (0 to 10 feet bgs) (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| 1997<br>Redevelopment<br>Block | 2010<br>Redevelopment<br>Block | IR Site(s)                                                                                                                 | Triple A<br>Site(s) | Nature and Extent Summary (with RI Report Reference Citation)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EMI-1 ( <i>cont.</i> )         | EOS-3 and<br>EOS-4             | IR-02 Central<br>(partial), IR-02<br>Southeast<br>(partial),<br>IR-11/14/15,<br>IR-38 (partial),<br>IR-40, IR-54,<br>IR-73 | 6, 7, 12, 13,<br>17 | <ul style="list-style-type: none"> <li>Northern corner of IR-73: SVOCs and TPH (Figures 4.3.8-3 and 4.3.8-4)</li> <li>Southwest of former Building 518: TPH (Figure 4.3.8-4)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| EOS-1                          | EOS-1 and<br>EOS-2             | IR-02 Northwest<br>(partial) and<br>IR-02 Central<br>(partial)                                                             | 2, 14, 17, 18       | <p>Four areas of elevated chemical concentrations were identified (Section 4.3.9.3.1):</p> <ul style="list-style-type: none"> <li>Northern portion of Block EOS-1: metals, SVOCs, PCBs, and TPH (Figures 4.3.9-2, 4.3.9-3, and 4.3.9-4)</li> <li>Southwest of Building 600, former firing range and area south of firing range: metals, SVOCs, and PCBs (Figures 4.3.9-2, 4.3.9-3, and 4.3.9-4)</li> <li>South of Building 600: metals and SVOCs (Figures 4.3.9-2, 4.3.9-3)</li> <li>Southeast of Building 600 (southeastern portion of Block EOS-1): metals, SVOCs, and PCBs (Figures 4.3.9-2, 4.3.9-3, and 4.3.9-4)</li> </ul> |
| EOS-2                          | EOS-3                          | IR-02 Central<br>(partial), IR-03                                                                                          | 17                  | The screening process identified concentrations of chemicals throughout Redevelopment Block EOS-2 that exceeded Parcel E screening criteria, including metals, SVOCs, PCBs, and TPH (Section 4.3.10.3.1; Figures 4.3.10-2, 4.3.10-4, and 4.3.10-5)                                                                                                                                                                                                                                                                                                                                                                               |
| EOS-3                          | EOS-4                          | IR-02 Central<br>(partial),<br>IR-02 Southeast<br>(partial)                                                                | 13, 17              | <p>Two areas of elevated chemical concentrations were identified (Section 4.3.11.3.1):</p> <ul style="list-style-type: none"> <li>Central portion of Redevelopment Block EOS-3, in the area south of the bermed area: metals, SVOCs, and PCBs (see Figures 4.3.11-2, 4.3.11-3, and 4.3.11-5)</li> <li>Southern portion of Redevelopment Block EOS-3: metals, SVOCs, pesticides, PCBs, and dioxin/furans (see Figures 4.3.11-2, 4.3.11-3, 4.3.11-4, and 4.3.11-5)</li> </ul>                                                                                                                                                      |

**Table 2-5. Nature and Extent of Chemicals in Soil (0 to 10 feet bgs) (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| 1997<br>Redevelopment<br>Block | 2010<br>Redevelopment<br>Block | IR Site(s)                          | Triple A<br>Site(s) | Nature and Extent Summary (with RI Report Reference Citation)                                                                                                                                                                   |
|--------------------------------|--------------------------------|-------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EOS-4                          | N/A                            | IR-52 (partial),<br>IR-56 (partial) | None                | The screening process identified no areas that exceeded Parcel E screening criteria for soil. (Section 4.3.12)                                                                                                                  |
| EOS-5                          | Railroad<br>Right-of-Way       | IR-52 (partial)                     | None                | The screening process identified no contiguous areas that exceeded Parcel E screening criteria for soil. However, at one isolated boring location (IR52B009) six SVOCs exceeded industrial screening criteria. (Section 4.3.13) |

Notes: Information from Final Revised Remedial Investigation Report for Parcel E (Barajas & Associates, 2008b)

IR = Installation Restoration

PCBs = polychlorinated biphenyls

SVOCs = semivolatile organic compounds

TPH = total petroleum hydrocarbons

VOCs = volatile organic compounds

**TABLE 4-1: PARCEL E SOIL, GROUNDWATER, AND SEDIMENT SCREENING CRITERIA**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical                          | Soil Criteria                                       |                                                    |                           | Groundwater Criteria                                     |                                           |                         |                                            |                          | Sediment Criteria <sup>a</sup> |
|-----------------------------------|-----------------------------------------------------|----------------------------------------------------|---------------------------|----------------------------------------------------------|-------------------------------------------|-------------------------|--------------------------------------------|--------------------------|--------------------------------|
|                                   | Residential Screening Criteria <sup>1</sup> (mg/kg) | Industrial Screening Criteria <sup>1</sup> (mg/kg) | HPAL <sup>2</sup> (mg/kg) | Residential Vapor Intrusion Criteria <sup>3</sup> (µg/L) | Domestic Use Criteria <sup>4</sup> (µg/L) | MCL <sup>5</sup> (µg/L) | Surface Water Criteria <sup>6</sup> (µg/L) | HGAL <sup>7</sup> (µg/L) | Ambient (mg/kg) <sup>b</sup>   |
| <b>Metals</b>                     |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| Aluminum                          | 73,000                                              | 1,700,000                                          | NA                        | NA                                                       | 36,000                                    | 1,000                   | NA                                         | NA                       | NA                             |
| Antimony                          | 10                                                  | 820                                                | 9.05                      | NA                                                       | 15                                        | 6                       | NA                                         | 43.26                    | NA                             |
| Arsenic                           | 0.038                                               | 0.43                                               | 11.1                      | NA                                                       | 0.007                                     | 10                      | 36                                         | 27.34                    | 15.3                           |
| Barium                            | 7500                                                | 290,000                                            | 314.4                     | NA                                                       | 7,300                                     | 1,000                   | NA                                         | 504.2                    | NA                             |
| Beryllium                         | 140                                                 | 2200                                               | 0.71                      | NA                                                       | NA                                        | 4                       | NA                                         | 1.4                      | NA                             |
| Cadmium                           | 3.5                                                 | 980                                                | 3.14                      | NA                                                       | 18                                        | 5                       | 8.8                                        | 5.08                     | 0.33                           |
| Chromium                          | 90,000                                              | 3,100,000                                          | NA                        | NA                                                       | 55,000                                    | 50                      | 50                                         | 15.66                    | 114                            |
| Chromium VI                       | 17                                                  | 37                                                 | NA                        | NA                                                       | NA                                        | NA                      | 50                                         | NA                       | NA                             |
| Cobalt                            | 900                                                 | 1,900                                              | NA                        | NA                                                       | 730                                       | NA                      | NA                                         | 20.8                     | NA                             |
| Copper                            | 160                                                 | 76,000                                             | 124.3                     | NA                                                       | 1500                                      | 1300                    | 3.1                                        | 28.04                    | 68.1                           |
| Iron                              | 22000                                               | 610,000                                            | NA                        | NA                                                       | 11,000                                    | NA                      | NA                                         | 2,380                    | NA                             |
| Lead                              | 160                                                 | 800                                                | 8.99                      | NA                                                       | 15                                        | 15                      | 5.6                                        | 14.44                    | 43.2                           |
| Manganese                         | 840                                                 | 32,000                                             | 1,431.20                  | NA                                                       | 880                                       | NA                      | NA                                         | 8140                     | NA                             |
| Mercury                           | 1.6                                                 | 610                                                | 2.28                      | NA                                                       | NA                                        | 2                       | 0.025                                      | 0.6                      | 0.43                           |
| Molybdenum                        | 76                                                  | 10,000                                             | 2.68                      | NA                                                       | 180                                       | NA                      | NA                                         | 61.9                     | NA                             |
| Nickel                            | 300                                                 | 21,000                                             | NA                        | NA                                                       | 730                                       | 100                     | 8.2                                        | 96.48                    | 112                            |
| Selenium                          | 140                                                 | 10,000                                             | 1.95                      | NA                                                       | 180                                       | 50                      | 71                                         | 14.5                     | 0.65                           |
| Silver                            | 50                                                  | 10,000                                             | 1.43                      | NA                                                       | 180                                       | 100                     | 0.38                                       | 7.43                     | 0.58                           |
| Thallium                          | 5                                                   | 130                                                | 0.81                      | NA                                                       | 2.4                                       | 2                       | 426                                        | 12.97                    | NA                             |
| Vanadium                          | 65                                                  | 2,000                                              | 117.2                     | NA                                                       | 36                                        | NA                      | NA                                         | 26.62                    | NA                             |
| Zinc                              | 370                                                 | 610,000                                            | 109.9                     | NA                                                       | 11,000                                    | NA                      | 81                                         | 75.68                    | 158                            |
| <b>Volatile Organic Compounds</b> |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| 1,1,1-Trichloroethane             | 2,000                                               | 7,000                                              | NA                        | 3,100                                                    | NA                                        | 200                     | 6,240                                      | NA                       | ---                            |
| 1,1,2,2-Tetrachloroethane         | 0.39                                                | 0.96                                               | NA                        | NA                                                       | NA                                        | 1                       | 1,804                                      | NA                       | ---                            |
| 1,1,2-Trichloroethane             | 0.70                                                | 1.6                                                | NA                        | 4                                                        | NA                                        | 5                       | NA                                         | NA                       | ---                            |
| 1,1-Dichloroethane                | 2.8                                                 | 6                                                  | NA                        | 6.5                                                      | NA                                        | 5                       | NA                                         | NA                       | ---                            |
| 1,1-Dichloroethene                | 120                                                 | 420                                                | NA                        | 190                                                      | NA                                        | 6                       | 44,800                                     | NA                       | ---                            |
| 1,2-Dichlorobenzene               | 1,100                                               | 4,200                                              | NA                        | 2,600                                                    | 370                                       | 600                     | 129                                        | NA                       | ---                            |
| 1,2-Dichloroethane                | 0.28                                                | 0.61                                               | NA                        | 2.3                                                      | NA                                        | 0.5                     | 22,600                                     | NA                       | ---                            |
| 1,2-Dichloroethene (Total)        | 43                                                  | 150                                                | NA                        | 210                                                      | NA                                        | NA                      | 44,800                                     | NA                       | ---                            |
| 2-Butanone                        | 22,000                                              | 120,000                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | ---                            |
| 2-Hexanone                        | 22000                                               | 120,000                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | ---                            |

**TABLE 4-1: PARCEL E SOIL, GROUNDWATER, AND SEDIMENT SCREENING CRITERIA (CONTINUED)**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical                                          | Soil Criteria                                       |                                                    |                           | Groundwater Criteria                                     |                                           |                         |                                            |                          | Sediment Criteria <sup>a</sup> |
|---------------------------------------------------|-----------------------------------------------------|----------------------------------------------------|---------------------------|----------------------------------------------------------|-------------------------------------------|-------------------------|--------------------------------------------|--------------------------|--------------------------------|
|                                                   | Residential Screening Criteria <sup>1</sup> (mg/kg) | Industrial Screening Criteria <sup>1</sup> (mg/kg) | HPAL <sup>2</sup> (mg/kg) | Residential Vapor Intrusion Criteria <sup>3</sup> (µg/L) | Domestic Use Criteria <sup>4</sup> (µg/L) | MCL <sup>5</sup> (µg/L) | Surface Water Criteria <sup>6</sup> (µg/L) | HGAL <sup>7</sup> (µg/L) | Ambient (mg/kg) <sup>b</sup>   |
| <b>Volatile Organic Compounds (Continued)</b>     |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| 4-Methyl-2-Pentanone                              | 5300                                                | 66,000                                             | NA                        | 520,000                                                  | NA                                        | NA                      | NA                                         | NA                       | ---                            |
| Acetone                                           | 14,000                                              | 56,000                                             | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | ---                            |
| Benzene                                           | 0.18                                                | 0.39                                               | NA                        | 0.37                                                     | NA                                        | 1                       | 700                                        | NA                       | ---                            |
| Bromomethane                                      | 3.8                                                 | 13                                                 | NA                        | 19                                                       | NA                                        | NA                      | 6400                                       | NA                       | ---                            |
| Carbon Disulfide                                  | 360                                                 | 1,200                                              | NA                        | 560                                                      | 1,000                                     | NA                      | NA                                         | NA                       | ---                            |
| Carbon Tetrachloride                              | 0.091                                               | 0.2                                                | NA                        | 0.046                                                    | NA                                        | 0.5                     | 6,400                                      | NA                       | ---                            |
| Chlorobenzene                                     | 150                                                 | 540                                                | NA                        | 390                                                      | NA                                        | 70                      | 129                                        | NA                       | ---                            |
| Chloroform                                        | 0.22                                                | 0.47                                               | NA                        | 0.7                                                      | NA                                        | 100                     | 6,400                                      | NA                       | ---                            |
| Chloromethane                                     | 47                                                  | 160                                                | NA                        | 92                                                       | NA                                        | NA                      | 6,400                                      | NA                       | ---                            |
| cis-1,2-Dichloroethene                            | 43                                                  | 150                                                | NA                        | 210                                                      | 61                                        | 6                       | 44,800                                     | NA                       | ---                            |
| Ethylbenzene                                      | 1,900                                               | 7,700                                              | NA                        | 3,100                                                    | 1,300                                     | 700                     | 86                                         | NA                       | ---                            |
| Methylene Chloride                                | 4.3                                                 | 9.9                                                | NA                        | NA                                                       | NA                                        | 5                       | 6,400                                      | NA                       | ---                            |
| para-Isopropyl Toluene                            | 630                                                 | 2,200                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | ---                            |
| Styrene                                           | 4,400                                               | 19,000                                             | NA                        | 9,000                                                    | NA                                        | 100                     | NA                                         | NA                       | ---                            |
| Tetrachloroethene                                 | 0.48                                                | 1.5                                                | NA                        | 0.54                                                     | 0.1                                       | 5                       | 450                                        | NA                       | ---                            |
| Toluene                                           | 660                                                 | 2,200                                              | NA                        | 1,400                                                    | 720                                       | 150                     | 5,000                                      | NA                       | ---                            |
| Trichloroethene                                   | 2.9                                                 | 6.6                                                | NA                        | 2.9                                                      | 1.4                                       | 5                       | 400                                        | NA                       | ---                            |
| Vinyl Chloride                                    | 0.024                                               | 0.055                                              | NA                        | 0.028                                                    | 0.032                                     | 0.5                     | NA                                         | NA                       | ---                            |
| m,p-Xylenes                                       | 270                                                 | 900                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | ---                            |
| o-Xylene                                          | 270                                                 | 900                                                | NA                        | 340                                                      | NA                                        | NA                      | NA                                         | NA                       | ---                            |
| Xylene (Total)                                    | 270                                                 | 900                                                | NA                        | 340                                                      | 210                                       | 1750                    | NA                                         | NA                       | ---                            |
| <b>Semivolatile Organic Compounds<sup>8</sup></b> |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| 1-Methylnaphthalene                               | 150                                                 | 800                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3-Trichlorobenzene                            | 68                                                  | 240                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,4-Trichlorobenzene                            | 68                                                  | 240                                                | NA                        | 66                                                       | 7.2                                       | 70                      | 129                                        | NA                       | NA                             |
| 1,2,4-Trimethylbenzene                            | 52                                                  | 170                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,3,5-Trimethylbenzene                            | 21                                                  | 70                                                 | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,3-Dichlorobenzene                               | 530                                                 | 2,200                                              | NA                        | 1,300                                                    | 180                                       | NA                      | 129                                        | NA                       | NA                             |
| 1,4-Dichlorobenzene                               | 2                                                   | 4.5                                                | NA                        | 2.1                                                      | 0.3                                       | 5                       | 129                                        | NA                       | NA                             |
| 2,4-Dimethylphenol                                | 29                                                  | 18,000                                             | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 2-Chloronaphthalene                               | 3,900                                               | 27,000                                             | NA                        | NA                                                       | NA                                        | NA                      | 1.5                                        | NA                       | NA                             |
| 2-Methylnaphthalene                               | 150                                                 | 800                                                | NA                        | 710                                                      | NA                                        | NA                      | NA                                         | NA                       | 0.0194                         |

**TABLE 4-1: PARCEL E SOIL, GROUNDWATER, AND SEDIMENT SCREENING CRITERIA (CONTINUED)**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical                                                      | Soil Criteria                                       |                                                    |                           | Groundwater Criteria                                     |                                           |                         |                                            |                          | Sediment Criteria <sup>a</sup> |
|---------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------|---------------------------|----------------------------------------------------------|-------------------------------------------|-------------------------|--------------------------------------------|--------------------------|--------------------------------|
|                                                               | Residential Screening Criteria <sup>1</sup> (mg/kg) | Industrial Screening Criteria <sup>1</sup> (mg/kg) | HPAL <sup>2</sup> (mg/kg) | Residential Vapor Intrusion Criteria <sup>3</sup> (µg/L) | Domestic Use Criteria <sup>4</sup> (µg/L) | MCL <sup>5</sup> (µg/L) | Surface Water Criteria <sup>6</sup> (µg/L) | HGAL <sup>7</sup> (µg/L) | Ambient (mg/kg) <sup>b</sup>   |
| <b>Semivolatile Organic Compounds<sup>8</sup> (Continued)</b> |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| 2-Nitroaniline                                                | 1.5                                                 | 2,600                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 3,3'-Dichlorobenzidine                                        | 0.008                                               | 2.1                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 4-Chloro-3-Methylphenol                                       | 9.2                                                 | 4,400                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 4-Methylphenol                                                | 3                                                   | 4,400                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 4-Nitrophenol                                                 | 0.29                                                | 440                                                | NA                        | NA                                                       | NA                                        | NA                      | 970                                        | NA                       | NA                             |
| Acenaphthene                                                  | 3,700                                               | 38,000                                             | NA                        | 33,000                                                   | NA                                        | NA                      | 710                                        | NA                       | 0.0266                         |
| Acenaphthylene                                                | 3,700                                               | 38,000                                             | NA                        | NA                                                       | NA                                        | NA                      | 60                                         | NA                       | 0.0317                         |
| Anthracene                                                    | 22,000                                              | 390,000                                            | NA                        | 390,000                                                  | NA                                        | NA                      | 60                                         | NA                       | 0.088                          |
| Benzo(a)anthracene                                            | 0.37                                                | 1.8                                                | NA                        | NA                                                       | NA                                        | NA                      | 60                                         | NA                       | 0.244                          |
| Benzo(a)pyrene                                                | 0.037                                               | 0.18                                               | NA                        | NA                                                       | NA                                        | 0.2                     | 60                                         | NA                       | 0.371                          |
| Benzo(b)fluoranthene                                          | 0.34                                                | 1.8                                                | NA                        | NA                                                       | NA                                        | NA                      | 60                                         | NA                       | NA                             |
| Benzo(e)pyrene                                                | 1700                                                | 23,000                                             | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | 0.412                          |
| Benzo(g,h,i)perylene                                          | 1600                                                | 23,000                                             | NA                        | NA                                                       | NA                                        | NA                      | 60                                         | NA                       | 0.31                           |
| Benzo(k)fluoranthene                                          | 0.34                                                | 1.8                                                | NA                        | NA                                                       | NA                                        | NA                      | 60                                         | NA                       | 0.258                          |
| Benzoic acid                                                  | 2200                                                | 3,500,000                                          | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Biphenyl                                                      | 3000                                                | 30,000                                             | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Bis(2-ethylhexyl)phthalate                                    | 1.1                                                 | 180                                                | NA                        | NA                                                       | NA                                        | 4                       | NA                                         | NA                       | NA                             |
| Butylbenzylphthalate                                          | 11,000                                              | 180,000                                            | NA                        | NA                                                       | NA                                        | NA                      | 588.8                                      | NA                       | NA                             |
| Carbazole                                                     | 2.2                                                 | 120                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Chrysene                                                      | 3.3                                                 | 18                                                 | NA                        | NA                                                       | NA                                        | NA                      | 60                                         | NA                       | 0.289                          |
| Dibenz(a,h)anthracene                                         | 0.058                                               | 0.29                                               | NA                        | NA                                                       | NA                                        | NA                      | 60                                         | NA                       | 0.327                          |
| Dibenzofuran                                                  | 150                                                 | 2500                                               | NA                        | 13,000                                                   | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Dibenzothiophene                                              | 150                                                 | 2500                                               | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Diethylphthalate                                              | 660                                                 | 700,000                                            | NA                        | NA                                                       | NA                                        | NA                      | 588.8                                      | NA                       | NA                             |
| di-N-Butylphthalate                                           | 5500                                                | 88,000                                             | NA                        | NA                                                       | NA                                        | NA                      | 588.8                                      | NA                       | NA                             |
| di-N-Octylphthalate                                           | 2200                                                | 35,000                                             | NA                        | NA                                                       | NA                                        | NA                      | 588.8                                      | NA                       | NA                             |
| Fluoranthene                                                  | 2,000                                               | 30,000                                             | NA                        | NA                                                       | NA                                        | NA                      | 16                                         | NA                       | 0.514                          |
| Fluorene                                                      | 2,700                                               | 39,000                                             | NA                        | 44,000                                                   | NA                                        | NA                      | 60                                         | NA                       | 0.0253                         |
| Indeno(1,2,3-cd)pyrene                                        | 0.35                                                | 1.8                                                | NA                        | NA                                                       | NA                                        | NA                      | 60                                         | NA                       | 0.382                          |
| Isophorone                                                    | 2.2                                                 | 2,600                                              | NA                        | NA                                                       | NA                                        | NA                      | 2,580                                      | NA                       | NA                             |
| Isopropylbenzene                                              | 160                                                 | 520                                                | NA                        | 7.8                                                      | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Naphthalene                                                   | 1.7                                                 | 4.7                                                | NA                        | 3.6                                                      | NA                                        | NA                      | 470                                        | NA                       | 0.0558                         |

**TABLE 4-1: PARCEL E SOIL, GROUNDWATER, AND SEDIMENT SCREENING CRITERIA (CONTINUED)**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical                                                      | Soil Criteria                                       |                                                    |                           | Groundwater Criteria                                     |                                           |                         |                                            |                          | Sediment Criteria <sup>a</sup> |
|---------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------|---------------------------|----------------------------------------------------------|-------------------------------------------|-------------------------|--------------------------------------------|--------------------------|--------------------------------|
|                                                               | Residential Screening Criteria <sup>1</sup> (mg/kg) | Industrial Screening Criteria <sup>1</sup> (mg/kg) | HPAL <sup>2</sup> (mg/kg) | Residential Vapor Intrusion Criteria <sup>3</sup> (µg/L) | Domestic Use Criteria <sup>4</sup> (µg/L) | MCL <sup>5</sup> (µg/L) | Surface Water Criteria <sup>6</sup> (µg/L) | HGAL <sup>7</sup> (µg/L) | Ambient (mg/kg) <sup>b</sup>   |
| <b>Semivolatile Organic Compounds<sup>8</sup> (Continued)</b> |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| Naphthalene, 1,6,7-Trimethyl-                                 | 150                                                 | 800                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Naphthalene, 2,6-Dimethyl-                                    | 150                                                 | 800                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| n-Butylbenzene                                                | 580                                                 | 2,300                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| n-Nitroso-di-n-propylamine                                    | 0.00017                                             | 0.35                                               | NA                        | NA                                                       | NA                                        | NA                      | 660,000                                    | NA                       | NA                             |
| n-Nitrosodiphenylamine                                        | 0.68                                                | 270                                                | NA                        | NA                                                       | NA                                        | NA                      | 660,000                                    | NA                       | NA                             |
| Pentachlorophenol                                             | 2.6                                                 | 11                                                 | NA                        | NA                                                       | NA                                        | 1                       | 7.9                                        | NA                       | NA                             |
| Perylene                                                      | 1,600                                               | 23,000                                             | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Phenanthrene                                                  | 22,000                                              | 390,000                                            | NA                        | 190,000                                                  | NA                                        | NA                      | 60                                         | NA                       | 0.237                          |
| Phenanthrene, 1-Methyl-                                       | 22,000                                              | 390,000                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Phenol                                                        | 69                                                  | 260,000                                            | NA                        | NA                                                       | NA                                        | NA                      | 1,160                                      | NA                       | NA                             |
| Propylbenzene                                                 | 580                                                 | 2,300                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Pyrene                                                        | 2,300                                               | 55,000                                             | NA                        | 230,000                                                  | NA                                        | NA                      | 60                                         | NA                       | NA                             |
| sec-Butylbenzene                                              | 450                                                 | 1,700                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| tert-Butylbenzene                                             | 530                                                 | 2,000                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Trichlorofluoromethane                                        | 390                                                 | 1,300                                              | NA                        | 180                                                      | 1,300                                     | 150                     | NA                                         | NA                       | NA                             |
| <b>Pesticides and Polychlorinated Biphenyl Congeners</b>      |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| 2,4'-DDD                                                      | 2.1                                                 | 17                                                 | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 2,4'-DDE                                                      | 1.6                                                 | 12                                                 | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 2,4'-DDT                                                      | 1.2                                                 | 12                                                 | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 4,4'-DDD                                                      | 2.1                                                 | 17                                                 | NA                        | NA                                                       | NA                                        | NA                      | 0.72                                       | NA                       | NA                             |
| 4,4'-DDE                                                      | 1.6                                                 | 12                                                 | NA                        | NA                                                       | NA                                        | NA                      | 2.8                                        | NA                       | NA                             |
| 4,4'-DDT                                                      | 1.2                                                 | 12                                                 | NA                        | NA                                                       | NA                                        | NA                      | 0.001                                      | NA                       | NA                             |
| Aldrin                                                        | 0.024                                               | 0.15                                               | NA                        | NA                                                       | NA                                        | NA                      | 0.26                                       | NA                       | NA                             |
| alpha-BHC                                                     | 0.0019                                              | 0.59                                               | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| alpha-Chlordane                                               | 0.3                                                 | 2.9                                                | NA                        | NA                                                       | NA                                        | NA                      | 0.004                                      | NA                       | NA                             |
| Aroclor-1016                                                  | 3.5                                                 | 29                                                 | NA                        | NA                                                       | NA                                        | 0.5                     | 0.03                                       | NA                       | 0.0148                         |
| Aroclor-1242                                                  | 0.18                                                | 1                                                  | NA                        | NA                                                       | NA                                        | 0.5                     | 0.03                                       | NA                       | 0.0148                         |
| Aroclor-1248                                                  | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | 0.5                     | 0.03                                       | NA                       | 0.0148                         |
| Aroclor-1254                                                  | 0.093                                               | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | 0.03                                       | NA                       | 0.0148                         |
| Aroclor-1260                                                  | 0.21                                                | 1                                                  | NA                        | NA                                                       | NA                                        | 0.5                     | 0.03                                       | NA                       | 0.0148                         |
| beta-BHC                                                      | 0.0066                                              | 2.1                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| cis-Nonachlor                                                 | 0.3                                                 | 2.9                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |



**TABLE 4-1: PARCEL E SOIL, GROUNDWATER, AND SEDIMENT SCREENING CRITERIA (CONTINUED)**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical                                                              | Soil Criteria                                       |                                                    |                           | Groundwater Criteria                                     |                                           |                         |                                            |                          | Sediment Criteria <sup>a</sup> |
|-----------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------|---------------------------|----------------------------------------------------------|-------------------------------------------|-------------------------|--------------------------------------------|--------------------------|--------------------------------|
|                                                                       | Residential Screening Criteria <sup>1</sup> (mg/kg) | Industrial Screening Criteria <sup>1</sup> (mg/kg) | HPAL <sup>2</sup> (mg/kg) | Residential Vapor Intrusion Criteria <sup>3</sup> (µg/L) | Domestic Use Criteria <sup>4</sup> (µg/L) | MCL <sup>5</sup> (µg/L) | Surface Water Criteria <sup>6</sup> (µg/L) | HGAL <sup>7</sup> (µg/L) | Ambient (mg/kg) <sup>b</sup>   |
| <b>Pesticides and Polychlorinated Biphenyls Congeners (Continued)</b> |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| delta-BHC                                                             | 11                                                  | 270                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Dieldrin                                                              | 0.00066                                             | 0.15                                               | NA                        | NA                                                       | NA                                        | NA                      | 0.142                                      | NA                       | 0.00044                        |
| Endosulfan I                                                          | 15                                                  | 5,300                                              | NA                        | NA                                                       | NA                                        | NA                      | 0.0087                                     | NA                       | NA                             |
| Endosulfan II                                                         | 15                                                  | 5,300                                              | NA                        | NA                                                       | NA                                        | NA                      | 0.0087                                     | NA                       | NA                             |
| Endosulfan Sulfate                                                    | 16                                                  | 5,300                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Endrin                                                                | 17                                                  | 260                                                | NA                        | NA                                                       | NA                                        | 2                       | 0.0023                                     | NA                       | NA                             |
| Endrin Aldehyde                                                       | 17                                                  | 260                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Endrin Ketone                                                         | 17                                                  | 260                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| gamma-BHC (Lindane)                                                   | 0.0026                                              | 2.9                                                | NA                        | NA                                                       | NA                                        | 0.2                     | 0.032                                      | NA                       | NA                             |
| gamma-Chlordane                                                       | 0.3                                                 | 2.9                                                | NA                        | NA                                                       | NA                                        | NA                      | 0.004                                      | NA                       | NA                             |
| Heptachlor                                                            | 0.083                                               | 0.55                                               | NA                        | NA                                                       | NA                                        | 0.01                    | 0.0036                                     | NA                       | NA                             |
| Heptachlor Epoxide                                                    | 0.00054                                             | 0.27                                               | NA                        | NA                                                       | NA                                        | 0.01                    | 0.0036                                     | NA                       | NA                             |
| Hexachlorobenzene                                                     | 0.054                                               | 1.4                                                | NA                        | NA                                                       | NA                                        | 1                       | 129                                        | NA                       | NA                             |
| Methoxychlor                                                          | 290                                                 | 4,400                                              | NA                        | NA                                                       | NA                                        | 40                      | 0.003                                      | NA                       | NA                             |
| Oxychlordane                                                          | 0.3                                                 | 2.9                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-018                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-028                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-044                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-052                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-066                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-077                                                               | 0.027                                               | 0.13                                               | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-101                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-105                                                               | 0.027                                               | 0.13                                               | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-114                                                               | 0.0053                                              | 0.027                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-118                                                               | 0.027                                               | 0.13                                               | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-123                                                               | 0.027                                               | 0.13                                               | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-128                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-138                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-153                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-156                                                               | 0.0053                                              | 0.027                                              | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-167                                                               | 0.27                                                | 1.3                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-170                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |

**TABLE 4-1: PARCEL E SOIL, GROUNDWATER, AND SEDIMENT SCREENING CRITERIA (CONTINUED)**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical                                                              | Soil Criteria                                       |                                                    |                           | Groundwater Criteria                                     |                                           |                         |                                            |                          | Sediment Criteria <sup>a</sup> |
|-----------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------|---------------------------|----------------------------------------------------------|-------------------------------------------|-------------------------|--------------------------------------------|--------------------------|--------------------------------|
|                                                                       | Residential Screening Criteria <sup>1</sup> (mg/kg) | Industrial Screening Criteria <sup>1</sup> (mg/kg) | HPAL <sup>2</sup> (mg/kg) | Residential Vapor Intrusion Criteria <sup>3</sup> (µg/L) | Domestic Use Criteria <sup>4</sup> (µg/L) | MCL <sup>5</sup> (µg/L) | Surface Water Criteria <sup>6</sup> (µg/L) | HGAL <sup>7</sup> (µg/L) | Ambient (mg/kg) <sup>b</sup>   |
| <b>Pesticides and Polychlorinated Biphenyls Congeners (Continued)</b> |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| PCB-180                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-187                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-189                                                               | 0.027                                               | 0.13                                               | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-195                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-206                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| PCB-209                                                               | 0.2                                                 | 1                                                  | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| trans-Nonachlor                                                       | 0.3                                                 | 2.9                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| <b>Total Petroleum Hydrocarbons</b>                                   |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| TTPH <sup>9,10,11</sup>                                               | NA                                                  | NA                                                 | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| <b>Dioxins</b>                                                        |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| 1,2,3,4,6,7,8,9-OCDD                                                  | 0.036                                               | 0.27                                               | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,4,6,7,8,9-OCDF                                                  | 0.036                                               | 0.27                                               | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,4,6,7,8-HPCDD                                                   | 0.00036                                             | 0.0027                                             | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,4,6,7,8-HPCDF                                                   | 0.00036                                             | 0.0027                                             | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,4,7,8,9-HPCDF                                                   | 0.00036                                             | 0.0027                                             | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,4,7,8-HXCDD                                                     | 0.000036                                            | 0.00027                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,4,7,8-HXCDF                                                     | 0.000036                                            | 0.00027                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,6,7,8-HXCDD                                                     | 0.000036                                            | 0.00027                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,6,7,8-HXCDF                                                     | 0.000036                                            | 0.00027                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,7,8,9-HXCDD                                                     | 0.000036                                            | 0.00027                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,7,8,9-HXCDF                                                     | 0.000036                                            | 0.00027                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,7,8-PECDD                                                       | 0.0000036                                           | 0.000027                                           | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 1,2,3,7,8-PECDF                                                       | 0.000072                                            | 0.00055                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 2,3,4,6,7,8-HXCDF                                                     | 0.000036                                            | 0.00027                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 2,3,4,7,8-PECDF                                                       | 0.0000072                                           | 0.000055                                           | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| 2,3,7,8-TCDD                                                          | 0.0000036                                           | 0.000027                                           | NA                        | NA                                                       | NA                                        | 0.00003                 | NA                                         | NA                       | NA                             |
| 2,3,7,8-TCDF                                                          | 0.000036                                            | 0.00027                                            | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| <b>Organotins</b>                                                     |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| Dibutyltin                                                            | 14                                                  | 260                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Monobutyltin                                                          | 14                                                  | 260                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |
| Tributyltin                                                           | 14                                                  | 260                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |

**TABLE 4-1: PARCEL E SOIL, GROUNDWATER, AND SEDIMENT SCREENING CRITERIA (CONTINUED)**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical               | Soil Criteria                                       |                                                    |                           | Groundwater Criteria                                     |                                           |                         |                                            |                          | Sediment Criteria <sup>a</sup> |
|------------------------|-----------------------------------------------------|----------------------------------------------------|---------------------------|----------------------------------------------------------|-------------------------------------------|-------------------------|--------------------------------------------|--------------------------|--------------------------------|
|                        | Residential Screening Criteria <sup>1</sup> (mg/kg) | Industrial Screening Criteria <sup>1</sup> (mg/kg) | HPAL <sup>2</sup> (mg/kg) | Residential Vapor Intrusion Criteria <sup>3</sup> (µg/L) | Domestic Use Criteria <sup>4</sup> (µg/L) | MCL <sup>5</sup> (µg/L) | Surface Water Criteria <sup>6</sup> (µg/L) | HGAL <sup>7</sup> (µg/L) | Ambient (mg/kg) <sup>b</sup>   |
| <b>Other Chemicals</b> |                                                     |                                                    |                           |                                                          |                                           |                         |                                            |                          |                                |
| Cyanide                | 1,200                                               | 18,000                                             | NA                        | NA                                                       | NA                                        | 200                     | 1                                          | NA                       | NA                             |
| MCPA                   | 1                                                   | 440                                                | NA                        | NA                                                       | NA                                        | NA                      | NA                                         | NA                       | NA                             |

## Notes:

- 1 Residential and industrial screening criteria for soil are risk-based concentrations calculated based on the human health exposure pathways, exposure assumptions, and toxicity values identified in the HHRA (see [Appendix I](#)).
- 2 HPALs were derived by calculating the 95 percent UCL on the 95th percentile of a data set that included metals results for soil samples collected at Parcels B, C, D, and E in uncontaminated areas. HPALs are site-specific ambient concentrations for metals, representing a concentration that about 5 percent of all ambient results would exceed (PRC 1995).
- 3 Applies to data from A-aquifer (exposure to groundwater from inhalation of VOCs migrating through the subsurface to indoor air [vapor intrusion]) (see [Appendix I](#)).
- 4 Applies to data from B-aquifer (exposure to groundwater through domestic use, including ingestion and dermal contact).
- 5 Applies to data from B-aquifer: MCLs are drinking water standards published by EPA (2003) and by the California State Department of Health Services in Title 22 of the *California Code of Regulations* Sections 64431-64444.
- 6 The surface water screening criteria selection rationale is presented in [Table 4-2](#).
- 7 HGALs were derived by calculating the 95 percent UCL on the 95th percentile value for each metal data set based on analytical results for groundwater samples collected at Parcels B, C, D, and E. HGALs are site-specific ambient concentrations for metals, representing a concentration that about 5 percent of all ambient results would exceed (PRC 1996).
- 8 PQLs (0.33 mg/kg) for several PAHs in soil and groundwater are greater than residential soil screening criteria and appropriate groundwater criteria. The screening criterion for these PAHs is the greater of the appropriate screening criterion or the PQL. PQL are considered the lowest concentrations that can be accurately measured and are used as screening criteria when greater than the risk-based criteria. Qualified data below the PQL are reported and mapped as detected concentrations.
- 9 TTPH soil criterion include: [Soil Source Criteria](#), applicable to all reuse zones at Parcel E, TTPH concentration of 3,500 mg/kg in soil at depths ranging from 0 to 10 feet bgs; and the presence of measurable free product (greater than 0.01 feet) in groundwater or soil (either as LNAPLs or DNAPLs). (Shaw Environmental, Inc. 2007).
- 10 TTPH groundwater criteria in µg/L are based on distance from the shoreline in feet and range from 1,400 µg/L (from 0 to 50 feet) to 20,000 µg/L (for greater than 250 feet) (Shaw Environmental, Inc. 2007).
- 11 TTPH is the sum of the concentrations of TPH as gasoline, TPH as diesel, and TPH as motor oil; or is the sum of TPH as unknown purgeables and TPH as unknown extractables, whichever is greater.
- a The primary objective of the screening criteria developed for shoreline sediments was to delineate the release of copper, lead, and PCBs resulting from site activities that could be a source of contamination to sediments in adjacent Parcel F (offshore). Only selected sediment screening criteria are listed in the table. See [Appendix G](#) for details regarding the sediment screening process.
- b Ambient concentration based on an 85th percentile of 100 percent fines.
- c Values based on Long and Morgan (1991).
- d Values based on Long and others (1995).
- e Screening value from EPA (1996).

**TABLE 4-1: PARCEL E SOIL, GROUNDWATER, AND SEDIMENT SCREENING CRITERIA (CONTINUED)**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

Notes (Continued):

|       |                                         |       |                                      |
|-------|-----------------------------------------|-------|--------------------------------------|
| ---   | Samples were not analyzed for VOCs      | MCL   | Maximum contaminant level            |
| µg/L  | Micrograms per liter                    | MCPA  | 2-methyl-4-chlorophenoxy-acetic acid |
| bgs   | Below ground surface                    | mg/kg | Milligram per kilogram               |
| BHC   | Benzene hexachloride                    | NA    | Not applicable                       |
| DDD   | Dichlorodiphenyldichloroethane          | OCDD  | Octachlorodibenzo-p-dioxin           |
| DDE   | Dichlorodiphenyldichloroethene          | OCDF  | Octachlorodibenzofuran               |
| DDT   | Dichlorodiphenyltrichloroethane         | PAH   | Polynuclear aromatic hydrocarbon     |
| DNAPL | Dense nonaqueous-phase liquid           | PCB   | Polychlorinated biphenyl             |
| EPA   | U.S. Environmental Protection Agency    | PECDD | Pentachlorodibenzo-p-dioxin          |
| ER-L  | Effects range-low                       | PECDF | Pentachlorodibenzofuran              |
| ER-M  | Effects range-median                    | PQL   | Practical quantitation limit         |
| HGAL  | Hunters Point groundwater ambient level | TCDD  | Tetrachlorodibenzo-p-dioxin          |
| HPAL  | Hunters Point ambient level (soil)      | TCDF  | Tetrachlorodibenzofuran              |
| HPCDD | Heptachlorodibenzo-p-dioxin             | TTPH  | Total total petroleum hydrocarbons   |
| HPCDF | Heptachlorodibenzofuran                 | UCL   | Upper confidence limit               |
| HXCDF | Hexachlorodibenzofuran                  | VOC   | Volatile organic compound            |
| LNAPL | Light nonaqueous-phase liquid           |       |                                      |

Sources:

- EPA. 1996. "Recommendations for Screening Values for Tributyltin in Sediments at Superfund Sites in Puget Sound, Washington." EPA 910/R/96/014. October.
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- Long, E.R., and L.G. Morgan. 1991. "The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status Administration and Trends Program." National Oceanic and Atmospheric Administration Technical Memorandum NOS OMA 52. Seattle, Washington.
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- Shaw Environmental, Inc. 2007. "New Preliminary Screening Criteria and Petroleum Programs Strategy, Final, Hunters Point Shipyard, San Francisco, California." December 21.

|    |                                               |               |                                                                                                                                                                                                                                                                                                             |
|----|-----------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | Potential source of contamination to Parcel F | Section 2.3.1 | Draft Parcels E and E-2 Shoreline Characterization Technical Memorandum, Hunters Point Shipyard, San Francisco, California. SulTech. June 2007. Pages 24 and 25. (note: this document was accepted as final and was provided as Appendix G to the Final Revised Remedial Investigation Report for Parcel E) |
|----|-----------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

The purpose of the shoreline investigation was to evaluate if contamination along the Parcels E and E-2 shoreline has migrated (or has the potential to migrate) to sediments in adjacent Parcel F (offshore) and to identify areas within the shoreline that pose an unacceptable ecological risk.

Concentrations of copper and lead in sediments along the Parcels E and E-2 shoreline are a potential source of contamination to Parcel F in all areas except the Panhandle Area and IR-02 Southeast. Aroclors should be evaluated as a potential source of contamination in the Landfill Area and IR-02-Northwest, where the average concentrations of Aroclors exceeded the ambient concentration for nearshore sediment in San Francisco Bay ([Water Board 2003](#)).

Evaluation of PCB data showed that a definitive connection between onshore sources and offshore sediments could not be established, even though the congener patterns in onshore and offshore sediments were consistent. The geochemical assessment to evaluate the inter-element correlations between metals located in sediments of the shoreline and offshore area was not particularly diagnostic for linking contaminant sources and sinks, although contaminant distribution patterns in Parcel F are highly suggestive of contaminants originating from the shoreline along Area X of the South Basin. Additionally, although erosion and overland transport of contaminants from Parcels E and E-2 may be minor compared with the sediment load from San Francisco Bay, some influx of metals from the Parcels E and E-2 shoreline to Parcel F is likely.

Groundwater discharge was evaluated as a potential pathway for migration of metals and PCBs from Parcels E and E-2 to Parcel F. However, groundwater in contact with contaminated soils at depth in Parcels E and E-2 is unlikely to contribute to metals contamination in offshore sediments because of the limited solubility of metals in site groundwater. Review of metals data for groundwater samples collected from nearshore wells confirmed the low concentrations (10 micrograms per liter) of dissolved metals in site groundwater. Likewise, transport of PCBs by the groundwater pathway is severely limited by their chemical and physical properties.

Benthic invertebrates, birds, and mammals are at risk from exposure to PCBs in surface and subsurface sediment along the Parcels E and E-2 shoreline. Benthic invertebrates in surface and subsurface sediment may be adversely affected by exposure to copper, lead, zinc, and DDTs. In subsurface sediment, mercury may pose an additional risk to benthic invertebrates. Ingestion of sediment and prey that contain cadmium, copper, molybdenum, zinc, and PCBs may pose a risk to the house mouse.

Based on the results of the technical memorandum, the following recommendations are made for the Parcels E and E-2 shoreline:

- Source control measures are warranted along the Parcels E and E-2 shoreline, particularly in the metal slag area of the Panhandle Area, the Landfill Area, and IR-02 Northwest.
- Ecological risk to invertebrates, birds, and mammals in the shoreline warrants the evaluation of remedial alternatives for the intertidal sediments along the entire Parcels E and E-2 shoreline.

chemical sampling results are evaluated in conjunction with the development of the soil alternatives (Section 4). Sample locations with chemical concentrations exceeding the risk-based criteria, consistent with the amended redevelopment plan, are identified on Figure 4-2. These data are used to identify areas requiring further remedial action, which are discussed in Sections 4.2.3.1 and 4.2.4.1.

Additional post-excavation soil samples were collected and analyzed for cesium-137, radium-226, and strontium-90 (the radionuclides of concern identified in the HRA [NAVSEA, 2004]). Analytical results for all post-excavation soil samples met the specified RROs.

### 2.3.3. Groundwater Plume Delineation Update

The Revised RI Report used data collected through December 2004 to delineate A-aquifer groundwater plumes for metals, VOCs, PCBs, and TPH (see Figures 4-3 through 4-6 and Figure 6-2 in the Revised RI Report [Barajas & Associates, Inc., 2008b]). Since that time, groundwater data have been collected on a quarterly basis as part of the BGMP. The BGMP includes wells located within and in the vicinity of some of the RI plumes. Where available, these data were evaluated to determine if the plume delineations established in the Revised RI Report have significantly changed since 2004. In addition, as discussed in Section 2.1.3.4.2, additional groundwater data were collected as part of a GWTS conducted at several of the VOC plumes at Parcel E. The data used for this evaluation are summarized in Tables 2-9 through 2-12. Where appropriate, the plume delineations presented in the Revised RI Report were adjusted using updated data from the BGMP (from March 2005 to October 2009) and Phase I of the GWTS (April and November 2009). The following sections summarize the results of this evaluation for each of the aforementioned analytical groups. A complete list of all groundwater plumes and their associated redevelopment block, identifying wells, and plume constituents is shown in Table 2-13. The Revised RI Report did not identify any B-aquifer plumes at Parcel E, and data collected during the ongoing BGMP have confirmed that B-aquifer plumes are not present at Parcel E.

#### 2.3.3.1. Metals

During the RI, plumes were delineated for the following metals detected in A-aquifer groundwater above screening criteria: copper, lead, nickel, and zinc. In total, two plumes and three composite plumes (i.e., plumes comprising more than one chemical) were presented in the Revised RI Report. The evaluation of the updated BGMP data (from March 2005 to October 2009) at the metals plumes in Parcel E is summarized below and shown on Figure 2-5.

- **IR-02 Northwest Metals Plume** – Samples were collected recently from wells IR02MW373A and IR02MW126A during the BGMP. In January 2006, copper concentrations in well IR02MW126A increased to nearly 36 times the Hunters Point groundwater ambient level (HGAL) and then gradually decreased to below the HGAL by late 2007. Copper was not detected at concentrations exceeding laboratory reporting limits during the most recent three sampling events (May 2009 through October 2009). However, it is assumed that the composite plume (copper, lead, nickel, and zinc) has not changed since the RI plume delineation.
- **IR-05 Metals Plume** – No wells within or near this plume were sampled recently during the BGMP. Because no additional groundwater data exist, the composite (copper and zinc) RI plume delineation was not changed.
- **IR-12 Nickel Plume** – No wells within or near this plume were sampled recently during the BGMP. Because no additional groundwater data exist, the RI plume delineation was not changed.
- **IR-02 Central Nickel Plume** – Samples were collected recently from well IR02MWB-2 during the BGMP. In September 2008, nickel concentrations in well IR02MWB-2 increased to nearly twice the HGAL, and increased to nearly three times the HGAL in March 2009. However, because these concentrations are within the range of concentrations used in the RI plume delineation, the RI plume delineation was not changed.
- **IR-02 Southeast Metals Plume** – Samples were collected recently from wells IR02MW300A, IR02MW175A, and IR02MW179A during the BGMP. Copper and zinc concentrations detected in IR02MW300A remained consistent between 2004 and 2005, and were greater than the corresponding RI screening criteria. This well was decommissioned in 2005 prior to the Metal Debris Reef removal action and was replaced in 2007 with well IR02MW301A. Copper and zinc concentrations in well IR02MW301A from May 2007 to March 2009 were less than the corresponding RI screening criteria. Concentrations in IR01MW175A and IR02MW179A showed no expansion or migration of the composite plume delineation in the northeast and northwest directions, respectively. Therefore, it is assumed that the Metal Debris Reef removal action was successful in removing the contaminant source and the composite RI plume has been attenuated below the RI screening criteria. Lead was detected at wells IR02MW175A, IR02MW179A, and IR02MW301A in July 2008 at concentrations ranging from 14.7 to 18.4 micrograms per liter (µg/L). These lead concentrations are not attributed to site contamination because (1) they do not significantly exceed the HGAL (14.4 µg/L) and are generally consistent with variations in naturally occurring concentrations identified at other HPS sites; (2) the low lead concentrations were reported at wells located hydraulically upgradient and downgradient of the primary contaminant source (i.e., the Metal Debris Reef), which was previously removed; and (3) the lead concentrations in July 2008 represent a temporal anomaly because lead has not exceeded the HGAL at any of these wells (as well as former well IR02MW300A) during numerous sampling events performed since 1992 (see [Appendix A](#)).

As summarized above, it is assumed that for the purposes of the FS evaluation, none of the composite RI plume delineations for metals have changed, except for the IR-02 Southeast Metals Plume, since the RI was performed. The metals plume delineations considered in the FS evaluation are shown on [Figure 2-5](#).



### 2.3.3.2. VOCs

During the RI, plumes were delineated for the following VOCs detected in A-aquifer groundwater at concentrations above screening criteria: benzene, chloroform, 1,1-DCE, PCE, and TCE. In total, seven plumes and one composite plume (i.e., plumes comprising more than one chemical) were presented in the Revised RI Report. The effects of the BGMP and GWTS data evaluation on the VOC plume delineations in the Revised RI Report is summarized below and shown on [Figure 2-6](#).

- **IR-02 Northwest Benzene Plume** – Samples were collected recently from well IR02MW126A during the BGMP. Benzene concentrations in IR02MW126A were consistent between 2004 and 2008. Therefore, it is assumed that the RI plume delineation has not changed.
- **IR-03 Benzene Plume** – Samples were collected from well IR03MW342A during the BGMP through the second quarter of 2008. Benzene concentrations in IR03MW342A were consistent between 2004 and the second quarter of 2008. Otherwise, no recent data since 2004 are available in and around this plume. Therefore, it is assumed that the RI plume delineation has not changed.
- **IR-12 Benzene Plume** – Samples were collected in 2009 from wells IR12MW13A, IR12MW18A, and IR12MW19A and in 2005 from well IR12MW17A during the BGMP. In addition, samples were collected from 11 direct-push sampling locations to evaluate baseline conditions during the GWTS. Concentrations in the center of the plume (IR12MW17A) decreased to less than reporting limits in 2005; however, the reporting limits for benzene exceeded the PRG for this location. Based on 2009 data from the GWTS, the plume appears to have migrated to the north and south. Because of the lack of recent data in the center of the plume, the RI plume delineation was expanded in the north and south directions to reflect the baseline data collected during the GWTS.
- **IR-39 Benzene Plume** – Samples were collected recently from well IR39MW21A, in the northeastern portion of the plume, and from well IR39MW36A, located northeast of the plume, during the BGMP. Data from well IR39MW21A are within the range of historical concentrations used to delineate the plume, and data from IR39MW36A reveal that the plume has not expanded in the northeast direction. Otherwise, no recent data since 2004 are available in and around this plume. Therefore, it is assumed the RI plume delineation has not changed.
- **Building 406 TCE Plume** – Samples were collected recently from wells IR36MW125A, IR36MW126A, IR36MW127A, IR36MW128A, PA36MW04A, IR36MW122A, and IR36MW121A during the BGMP. In addition, samples were collected from 23 direct-push sampling locations and 13 newly-installed monitoring wells to evaluate baseline conditions during the GWTS (prior to injection of ZVI). TCE concentrations at all wells sampled after 2004 generally remained consistent except at IR36MW125A, where TCE concentrations rose from 110 µg/L in late 2004 to between 500 µg/L and 7,600 µg/L in 2005 and 2006, and declined to 1,300 µg/L in April 2009. The RI plume delineation was adjusted to reflect the southwestern expansion of the plume, as refined with data collected prior to the ZVI injection. The pre-injection data serve as a conservative basis for the plume delineation used in this FS Report. The post-injection groundwater data show that ZVI has reduced TCE concentrations, and additional post-injection data are being collected during the BGMP.

- **IR-04 TCE Plume** – Samples were collected recently from well IR04MW37A during the BGMP. TCE concentrations in IR04MW37A were consistent between 2004 and 2009. In addition, samples were collected from seven direct-push sampling locations to evaluate baseline conditions during the GWTS. The RI plume delineation was adjusted to the south, as refined with data collected during the GWTS.
- **IR-56 TCE Plume** – Samples were collected recently from well IR74MW01A, located south of IR-74 boundary within IR-56, during the BGMP. In addition, samples were collected from five direct-push sampling locations to evaluate baseline conditions during the GWTS. Data from well IR74MW01A and the GWTS indicate that the RI plume delineation has not changed.
- **IR-12 PCE Plume** – Samples were collected recently from wells IR04MW13A (located within Parcel E-2), IR12MW14A, and IR12MW19A during the BGMP. In addition, samples were collected from 19 direct-push sampling locations and four newly-installed monitoring wells to evaluate baseline conditions during the GWTS (prior to injection of ZVI). The RI plume delineation was adjusted to the north and west to reflect the additional data collected prior to the ZVI injection, including the upgradient extent within Parcel E-2. The pre-injection data serve as a conservative basis for the plume delineation used in this FS Report. The post-injection groundwater data show that the ZVI has reduced PCE concentrations, and additional post-injection data are being collected during the BGMP.

Of the eight VOC plume delineations presented in the Revised RI Report, three (IR-12 Benzene Plume, IR-12 PCE Plume, and Building 406 TCE Plume) were adjusted for purposes of the FS evaluation based on data collected since 2004. The adjusted plume delineations are shown on [Figure 2-6](#).

Risks from exposure to groundwater in the A-aquifer from vapor intrusion (for residential and industrial receptors) and from trenching (for the construction worker receptor) were evaluated in the Revised RI Report for eight VOC risk plume-based areas. As discussed in Section 5.1.1.2 of the Revised RI Report, the risk plumes were delineated using a different methodology than that used to delineate the plumes as presented on [Figure 2-5 \(Barajas & Associates, Inc., 2008b\)](#). The risk assessment results for the vapor intrusion pathway indicated that risk from exposure to VOCs in the A-aquifer exceeded the excess lifetime cancer risk threshold of 1E-06 and noncancer HI threshold of 1.0 in several redevelopment blocks at Parcel E. The groundwater vapor intrusion risks are presented on Figure 5-8 of the Revised RI Report.

Since the time the HHRA was conducted for Parcel E, more recent guidance documents for the assessment of health risks from vapor intrusion have become available ([California Environmental Protection Agency, 2005](#); [Navy, 2008](#); [U.S. Department of Defense \[DoD\], 2009](#)). The new guidance documents specify a preference for the use of soil gas data over groundwater data in evaluating the vapor intrusion pathway because soil gas data represent a direct measurement of the contaminant that will migrate to indoor air and reduces the uncertainty related to partitioning of the contaminant to the vapor phase. The preference for soil gas data over groundwater data is also reflected in EPA's vapor intrusion guidance, which was used as a basis to conduct the inhalation risk assessment at Parcel E ([EPA, 2002](#)).

To comply with the new guidance and to identify exposure areas that indicate a risk associated with soil vapor intrusion, the Navy initiated a basewide soil gas investigation in 2010. The investigation includes collection and analysis of soil vapor samples from locations at Parcel E that have identified soil or groundwater subsurface impacts. Soil vapor samples will be collected over 100-by-100 foot grids over Parcel E, with one soil vapor sample collected from every grid that has potential subsurface impacts. Data collected during the investigation will be compared with soil gas action levels currently being developed by the Navy ([Chadux et al., 2010](#)). The action levels will be used to evaluate potential risk from vapor intrusion, as well as identify areas where institutional controls or additional action may be required. The soil gas investigation is being performed in two phases, with the work in Parcel E slated for implementation during the second phase in 2014.

It should be noted that the benzene plumes in IR-02 Northwest and IR-03 are located in open space redevelopment blocks. These plumes were conservatively delineated in the Revised RI Report based on screening criteria (based on the vapor intrusion pathway for future industrial users); however, the human health risk assessment (HHRA) in the Revised RI Report clarified that the vapor intrusion exposure scenario was incomplete for the planned open space reuse in these redevelopment blocks ([Barajas & Associates, Inc., 2008b](#)). Based on this conclusion, as well as the fact that VOC concentrations do not exceed aquatic evaluation criteria (see [Appendix A](#)), this FS Report does not further evaluate these VOC plumes beyond evaluating ARARs and institutional controls for groundwater within the open space redevelopment blocks in this FS Report.

It should also be noted that evaluation of the IR-39 Benzene Plume is deferred to the TPH corrective action program because the former USTs at Building 709 (former Navy exchange gas station) are the source of this contamination.

#### **2.3.3.3. PCBs**

During the RI, one plume in A-aquifer groundwater was delineated for the PCB Aroclor-1254 (IR-02 Northwest PCB Plume). No wells within or near this plume were sampled during the BGMP. It is assumed that the RI plume delineation has not changed. The Aroclor-1254 plume delineation considered in the FS evaluation is shown on [Figure 2-7](#). PCBs have also been detected in groundwater within the IR-03 TPH plume at concentrations warranting further evaluation in the FS. PCBs were detected in samples collected from well IR03MW218A2 between 2004 and the second quarter of 2008; samples were not collected from this well following the second quarter 2008. [Appendix A](#) identifies the PCBs and other non-petroleum chemicals detected in IR-03 groundwater at concentrations that may pose a risk to aquatic wildlife in the bay.

#### 2.3.3.4. TPH

During the RI, one plume in A-aquifer groundwater was delineated for TPH (IR-03 TPH Plume). Samples were collected from well IR03MW218A2, located in the center of the plume, during the BGMP. TPH concentrations in IR03MW218A2 increased by nearly 50 percent between 2004 and 2008. Otherwise, no post-2004 data are available in and around this plume. Considering the lack of recent data along the plume's perimeter, it is assumed that the RI plume delineation has not changed. The TPH plume delineation considered in the FS evaluation is shown on [Figure 2-7](#). It should be noted that the lack of BGMP data from IR-03 is associated with the fact that many of the wells located within the IR-03 plume contain free product and are not available for sampling.

### 2.4. CONCEPTUAL SITE MODEL

This section summarizes the CSM developed for Parcel E in the Revised RI Report ([Barajas & Associates, Inc., 2008b](#)). The purpose of the CSM is to illustrate and describe a basic understanding of potential sources of contamination and media pathways and to identify possible receptors based on available site information. The CSM is not intended to provide details or quantification of these potential sources and pathways. However, it is intended to provide the framework for characterizing site contamination and assessing risks. More detailed information about the CSM is presented in the Revised RI Report ([Barajas & Associates, Inc., 2008b](#)). Figure 3-18 in the Revised RI Report presents the CSM of the release mechanisms, affected media, and exposure pathways associated with Parcel E. The CSM developed for Parcel E includes the following:

- Generalized subsurface conditions
- Potential sources of contamination
- Potentially affected media
- Migration and exposure pathways
- Receptors (humans and wildlife)

#### 2.4.1. Generalized Subsurface Conditions

The subsurface geology and hydrogeology at Parcel E are discussed in [Sections 2.2.6 and 2.2.7](#), respectively. The aquifer system beneath Parcel E consists of A- and B-aquifers that are separated by the Bay Mud aquitard except for in the northernmost portion of Parcel E, where the aquitard is not present. The aquifer system at Parcel E is underlain by bedrock that slopes from former Parcel A toward San Francisco Bay. Bedrock depth ranges from less than 5 feet at the northwestern border of Parcel E (in gas monitoring probes installed along Crisp Avenue) to about 280 feet at the south-central portion of Parcel E, along the bay shoreline. Two exceptions are the Building 406 area and Building 521 area, where bedrock can be as shallow as 9 feet bgs and 15 feet bgs, respectively. The slopes of elevated

|    |                  |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----|------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13 | VOCs in soil gas | Section 2.3.2 | <p>Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.1.3.4.2, pages 2-8 through 2-9.</p> <p>Final Parcel E Groundwater Treatability Study Technical Report, Hunters Point Shipyard, San Francisco, California. Shaw. May 2011. Figures 31, 32, 35 and 36.</p> <p>Final Parcel E Groundwater Treatability Study Technical Report Addendum, Hunters Point Naval Shipyard, San Francisco, California. Shaw. March 2013. Figures 4 through 7.</p> |
|----|------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

of 3 SVE wells and 15 vapor monitoring wells, operated for 3 months beginning in May 2001 (IT Corporation, 2002). Trichloroethene (TCE) was found to be the predominant volatile organic compound (VOC) in vadose zone soil. The cumulative VOC mass removed during the test performance period was estimated at 7 pounds, with over 90 percent of the VOC mass attributed to TCE (IT Corporation, 2002). This estimate was substantially higher than the initial amount of TCE assumed to be present in soil within the study area, indicating the potential presence of more extensive TCE contamination in the vadose zone. No soil samples were collected after operation of the SVE system; however, based on comparison of the estimated mass of TCE removed with original estimates of TCE in soil, additional investigation was recommended to further characterize the extent of VOCs in the vadose zone beyond the treatability study area (IT Corporation, 2002). Based on the results of the study, SVE appeared to be an effective remedial technology to remove VOCs from vadose zone soil.

#### 2.1.3.4.2. 2009 and 2010 Zero Valent Iron Groundwater Treatability Study

In 2009 and 2010, the Navy performed a groundwater treatability study (GWTS) to evaluate the effectiveness of zero-valent iron (ZVI) injection in treating groundwater contamination at Parcel E. The GWTS was implemented in two phases: (1) a plume characterization phase, during which groundwater and soil vapor samples were collected to better delineate the groundwater plumes identified in the Revised RI Report (Phase I), and (2) treatment of select plumes using ZVI (Phase II) (Shaw, 2011).

Phase I of the study was conducted between April and November 2009 and consisted of initial characterization of the following plumes identified in the Revised RI Report: IR-04, IR-12 tetrachloroethene (PCE) plume, IR-12 benzene plume, Building 406 TCE plume (at IR-36 South), and IR-56 TCE plume (Shaw, 2011). Phase I included collection and analysis of (1) baseline groundwater samples from existing monitoring wells, (2) groundwater samples from direct-push borings and new wells installed for the GWTS, (3) soil vapor samples from soil vapor points installed for the GWTS, and (4) soil samples collected from direct-push borings. Based upon the Phase I characterization, ZVI injections were not recommended for the IR-04 TCE plume, IR-56 TCE plume, and the IR-12 benzene plume because concentrations of COCs did not significantly exceed their respective project-specific goals. In addition, the IR-12 benzene plume was not a candidate for ZVI injection because the plume is composed mainly of fuel-related hydrocarbons that would not be effectively treated by ZVI. Also, soil vapor data identified elevated concentrations of VOCs at several locations under Building 406 (Shaw, 2011). ZVI injections were recommended for two plumes (IR-12 PCE plume and Building 406 TCE plume) based on the Phase I characterization results.

For the two plumes, areas where VOCs were detected at concentrations greater than 10 times their respective project-specific goals were targeted for ZVI injections. At the Building 406 TCE plume (between January and March 2010), a total of 104,461 pounds of microscale ZVI was injected through 91 injection points and 400 gallons of nanoscale ZVI (approximately 5,440 pounds of ZVI) was injected through 4 injection points. At the IR-12 PCE plume, approximately 20,205 pounds of microscale ZVI were injected through 17 injection points in December 2009. Groundwater and soil vapor samples were collected at 2 weeks, 6 weeks, and 12 weeks after ZVI injections were completed at both plumes. The post-injection monitoring data indicated that, at several injection areas, ZVI was capable of reducing VOC concentrations to meet the project-specific goals; however, the study concluded that additional monitoring was needed at the plume areas to better assess post-injection groundwater conditions (Shaw, 2011). The Navy continues to collect groundwater data at the IR-12 PCE plume and Building 406 TCE Plume under the Basewide Groundwater Monitoring Program (BGMP). In addition, the Navy has initiated a follow-on study to collect additional soil and soil vapor data in high-concentration VOC areas at the Building 406 TCE Plume; the study is planned for implementation in 2012.

#### 2.1.3.5. Radiological Program

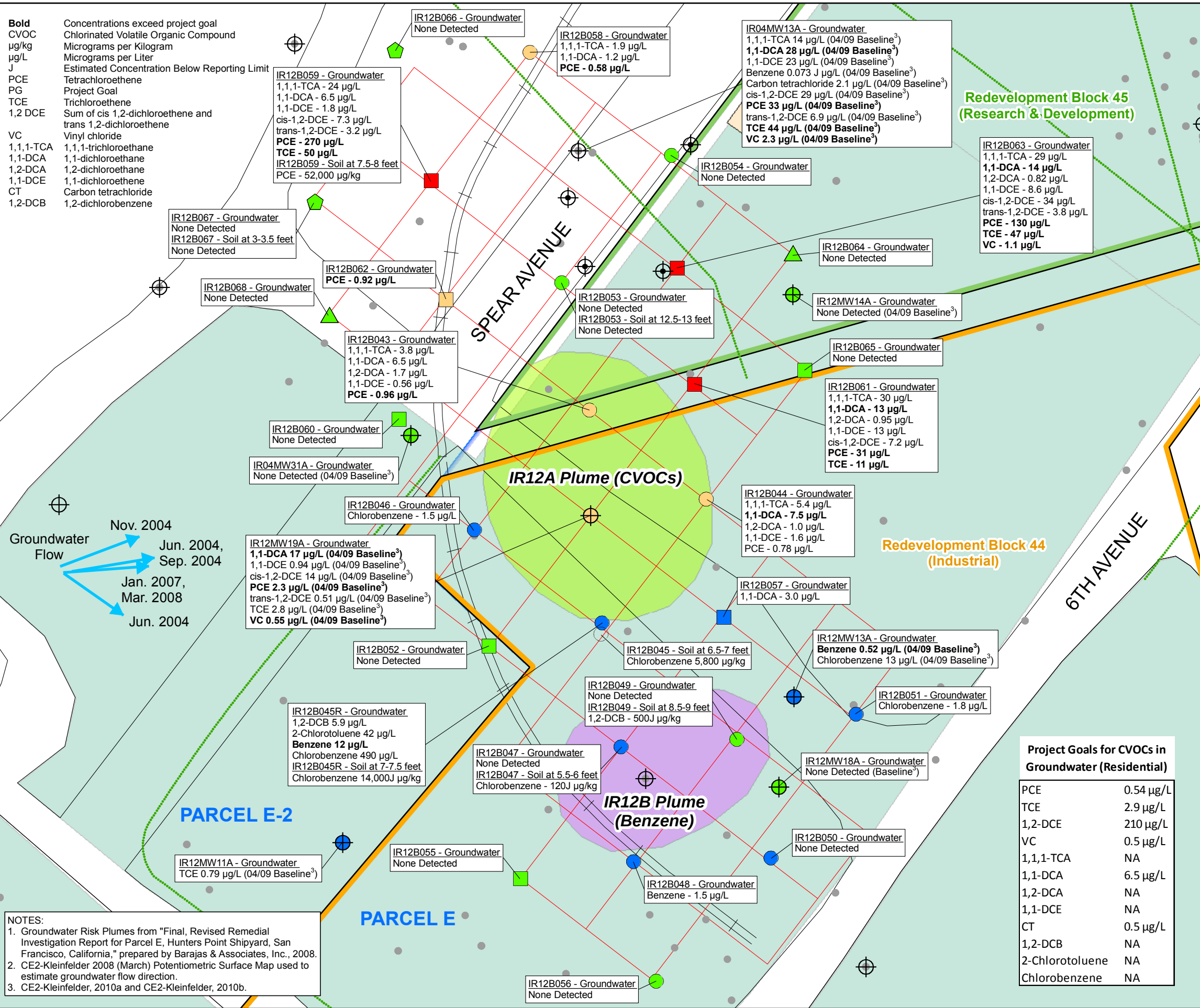
Radioactive materials are present at HPS from past shipyard and NRDL operations and decontamination of ships that participated in atomic weapons testing (NAVSEA, 2004). These radioactive materials are defined as CERCLA hazardous substances and therefore must be addressed under the IR Program. To do so, the Navy established a basewide radiological program for HPS under the authority of the “Final Action Memorandum for Time-Critical Removal Action of Radiological Materials in Soils, Debris, or Structures at Hunters Point Shipyard, San Francisco, California” (Navy, 2006a). The goal of the action memorandum is to eliminate substantially identified pathways of exposure to radioactive contamination for surrounding populations and nearby ecosystems. This goal will be accomplished through site investigations and removal actions. “Mixed-waste” sites where chemicals and radioactive materials are both present will be addressed as part of the radiological actions to the extent practical, thereby simplifying the remedy evaluation and selection and accelerating the cleanup and transfer of HPS.

Remedial action may be required at mixed-waste sites, where it is not practical to eliminate pathways of exposure to radioactive contamination during removal actions. This FS Report evaluates potential remedies for mixed-waste sites to limit or eliminate potential exposures to COCs and COECs in soil, shoreline sediment, and groundwater. Potential remedies for mixed-waste sites will be refined as appropriate in a radiological addendum to this FS Report to ensure their protectiveness of humans and wildlife from exposure to radioactive contamination. In addition, potential remedies for areas affected by only radioactive materials will be evaluated in the radiological addendum to this FS Report. The radiological addendum and ROD for Parcel E will select remedies that address radiological and mixed waste issues.



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**Bold** Concentrations exceed project goal  
**CVOC** Chlorinated Volatile Organic Compound  
**µg/kg** Micrograms per Kilogram  
**µg/L** Micrograms per Liter  
**J** Estimated Concentration Below Reporting Limit  
**PCE** Tetrachloroethene  
**PG** Project Goal  
**TCE** Trichloroethene  
**1,2 DCE** Sum of cis 1,2-dichloroethene and trans 1,2-dichloroethene  
**VC** Vinyl chloride  
**1,1,1-TCA** 1,1,1-trichloroethane  
**1,1-DCA** 1,1-dichloroethane  
**1,2-DCA** 1,2-dichloroethane  
**1,1-DCE** 1,1-dichloroethene  
**CT** Carbon tetrachloride  
**1,2-DCB** 1,2-dichlorobenzene



**NOTES:**

- Groundwater Risk Plumes from "Final, Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California," prepared by Barajas & Associates, Inc., 2008.
- CE2-Kleinfelder 2008 (March) Potentiometric Surface Map used to estimate groundwater flow direction.
- CE2-Kleinfelder, 2010a and CE2-Kleinfelder, 2010b.





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PCE Tetrachloroethene  
TCE Trichloroethene  
1,2-DCE Sum of cis 1,2-dichloroethene and trans 1,2-dichloroethene  
VC Vinyl chloride  
1,1-DCA 1,1-dichloroethane

#### IR12MW43A

| µg/L    | 11/09 | 01/10 | 02/10 | 03/10 |
|---------|-------|-------|-------|-------|
| PCE     | 0.36J | U 0.5 | U 0.5 | U 0.5 |
| TCE     | 1.4   | U 0.5 | 0.45J | 0.24J |
| 1,2-DCE | 1.6   | U 0.5 | 1     | 0.41J |
| VC      | U 0.5 | U 0.5 | U 0.5 | U 0.5 |
| 1,1-DCA | 1.6   | U 0.5 | 1.2   | 0.61  |

IR12B067  
09/09

#### IR12B062

| µg/L    | 09/09 |
|---------|-------|
| PCE     | 0.92  |
| TCE     | U 0.5 |
| 1,2-DCE | U 0.5 |
| VC      | U 0.5 |
| 1,1-DCA | U 0.5 |

#### IR12B059

| µg/L    | 08/09 |
|---------|-------|
| PCE     | 270   |
| TCE     | 50    |
| 1,2-DCE | 10.5  |
| VC      | U 0.5 |
| 1,1-DCA | 6.5   |

#### IR12MW44A

| µg/L | 11/09 | 01/10 | 02/10 | 03/10 |
|------|-------|-------|-------|-------|
| PCE  | U 0.5 | U 0.5 | U 0.5 | U 0.5 |
| VC   | U 0.5 | U 0.5 | U 0.5 | U 0.5 |

IR12B053  
08/09

#### IR12MW45A

| µg/L    | 11/09 | 01/10 | 02/10 | 03/10 |
|---------|-------|-------|-------|-------|
| PCE     | 18    | 13    | 24    | 14    |
| TCE     | 8.1   | 1.9   | 12    | 7.7   |
| 1,2-DCE | 5.0   | 0.67  | 9.4   | 4.0   |
| VC      | U 0.5 | U 0.5 | U 0.5 | U 0.5 |
| 1,1-DCA | 3.6   | 2.9   | 5.7   | 2.9   |

IR12B060  
09/09

IR04MW31A  
04/09

#### IR12B069

| µg/L    | 12/09 |
|---------|-------|
| PCE     | 41    |
| TCE     | 19    |
| 1,2-DCE | 17.3  |
| VC      | 0.86  |
| 1,1-DCA | 22    |

IR12B052  
08/09

#### IR12B058

| µg/L    | 08/09 |
|---------|-------|
| PCE     | 0.58  |
| TCE     | U 0.5 |
| 1,2-DCE | U 0.5 |
| VC      | U 0.5 |
| 1,1-DCA | 1.2   |

#### IR04MW13A

| µg/L    | 04/09 |
|---------|-------|
| PCE     | 33    |
| TCE     | 44    |
| 1,2-DCE | 35.9  |
| VC      | 2.3   |
| 1,1-DCA | 28    |

#### IR12MW46A

| µg/L | 11/09 | 01/10 | 02/10 | 03/10 |
|------|-------|-------|-------|-------|
| PCE  | U 0.5 | U 0.5 | U 0.5 | U 0.5 |
| VC   | U 0.5 | U 0.5 | U 0.5 | U 0.5 |

#### IR12B063

| µg/L    | 09/09 | 03/10 |
|---------|-------|-------|
| PCE     | 130   | 14    |
| TCE     | 47    | 9     |
| 1,2-DCE | 37.8  | 8.0   |
| VC      | 1.1   | U 0.5 |
| 1,1-DCA | 14    | 4     |

#### IR12MW14A

| µg/L | 04/09 | 01/10 | 02/10 | 03/10 |
|------|-------|-------|-------|-------|
| PCE  | U 0.5 | U 0.5 | U 0.5 | U 0.5 |
| VC   | U 0.5 | U 0.5 | U 0.5 | U 0.5 |

#### IR12B061

| µg/L    | 08/09 | 03/10 |
|---------|-------|-------|
| PCE     | 31    | 6.1   |
| TCE     | 11    | 18    |
| 1,2-DCE | 7.2   | 27    |
| VC      | U 0.5 | 0.4J  |
| 1,1-DCA | 13    | 15    |

#### IR12B044

| µg/L    | 09/09 |
|---------|-------|
| PCE     | 0.78  |
| TCE     | U 0.5 |
| 1,2-DCE | U 0.5 |
| VC      | U 0.5 |
| 1,1-DCA | 7.5   |

#### IR12B043

| µg/L    | 08/09 | 03/10 |
|---------|-------|-------|
| PCE     | 0.96  | 9.6   |
| TCE     | U 0.5 | 2.4   |
| 1,2-DCE | U 0.5 | 0.57  |
| VC      | U 0.5 | U 0.5 |
| 1,1-DCA | 6.5   | 6.1   |

#### IR12MW19A

| µg/L    | 04/09 |
|---------|-------|
| PCE     | 2.3   |
| TCE     | 2.8   |
| 1,2-DCE | 14.51 |
| VC      | 0.55  |
| 1,1-DCA | 17    |

#### IR12B057

| µg/L    | 08/09 |
|---------|-------|
| PCE     | U 0.5 |
| TCE     | U 0.5 |
| 1,2-DCE | U 0.5 |
| VC      | U 0.5 |
| 1,1-DCA | 3.0   |

#### References:

- CE<sup>2</sup>Kleinfelder, 2010, Semiannual Groundwater Monitoring Report (October 2009-March 2010), June.
- CE<sup>2</sup>Kleinfelder, 2010, Semiannual Groundwater Monitoring Report (April 2009-September 2009), February.

## Legend

- ⊗ Grab Sample by Battelle (12/8/09)
- Battelle Injection Point (12/10/09 to 12/17/09)
- Design 7.5-foot Radius Around Injection Point
- ⊕ Existing Monitoring Well Location
- ⊕ Temporary Monitoring Well (sampled 11/11/09 to 11/12/09)
- Grab Sample Location - Pre- and Post-Injection
- Grab Sample Location - Pre-Injection Only

### Sampling Results

Color represents highest CVOC concentration relative to PG, based on most recent sample date

- > 10 x PG
- U (Undetected)
- PG - 10 x PG
- Refusal
- U - PG

CVOC Concentration in Groundwater (µg/L)

| Pre-Injection Characterization |       | Post-Injection Sampling |       |       | Sample Date |
|--------------------------------|-------|-------------------------|-------|-------|-------------|
| µg/L                           | 11/09 | 01/10                   | 02/10 | 03/10 |             |
| analyte                        | PCE   | 0.36J                   | U 0.5 | U 0.5 | U 0.5       |

The ZVI-injection period was from 12/10/09 through 12/17/09

- ..... Storm Drain Line
- Radiologically-Impacted Site
- Parcel E Boundary
- Building (Existing)
- Proposed Reuse
  - Industrial
  - Research & Development

CVOC Chlorinated Volatile Organic Compound  
J Estimated Concentration Below Reporting Limit  
µg/L Micrograms per Liter  
PG Project Goal  
PQL Practical Quantitation Limit  
U Undetected

0 40 80 Feet

**Shaw** Shaw Environmental, Inc.

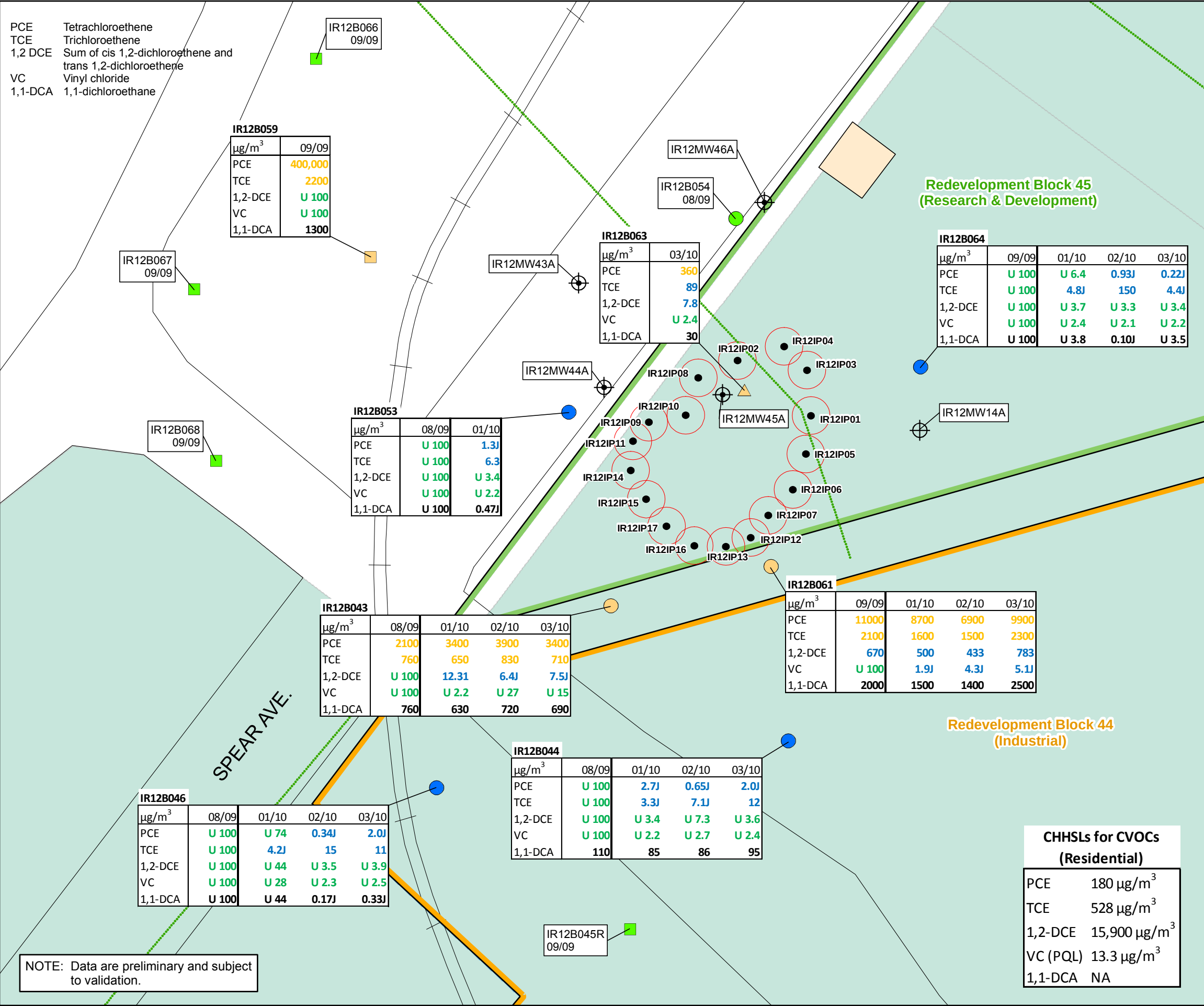
**Hunters Point Shipyard, San Francisco, California**  
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 35  
IR12A PLUME AREA PRE- AND POST-INJECTION  
CVOCs DETECTED ABOVE PGs  
IN GROUNDWATER AND  
ZVI INJECTION LOCATIONS  
DRAFT REPORT

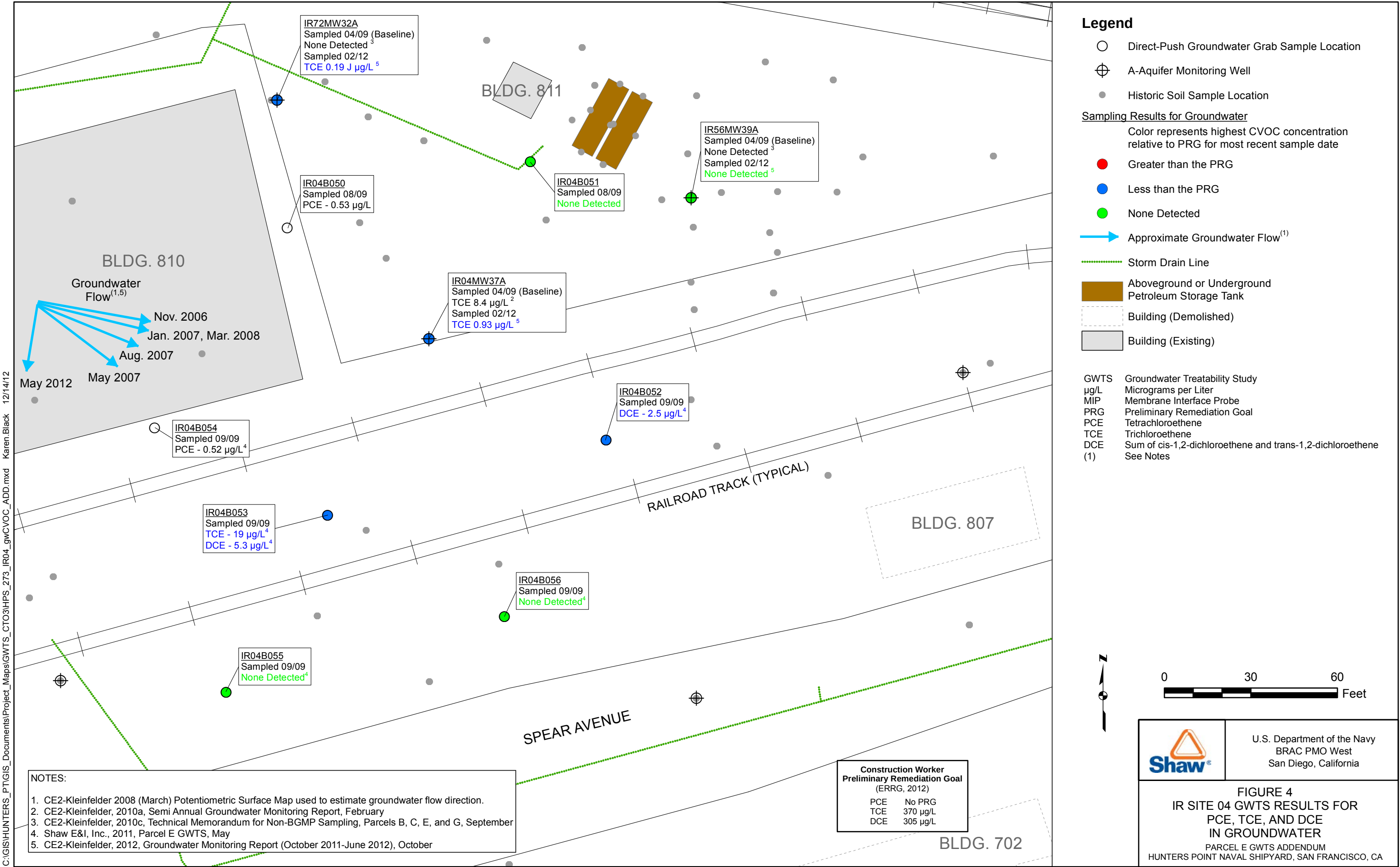
### Project Goals for CVOCs (Residential)

|          |           |
|----------|-----------|
| PCE      | 0.54 µg/L |
| TCE      | 2.9 µg/L  |
| 1,2-DCE  | 210 µg/L  |
| VC (PQL) | 0.5 µg/L  |
| 1,1-DCA  | 6.5 µg/L  |

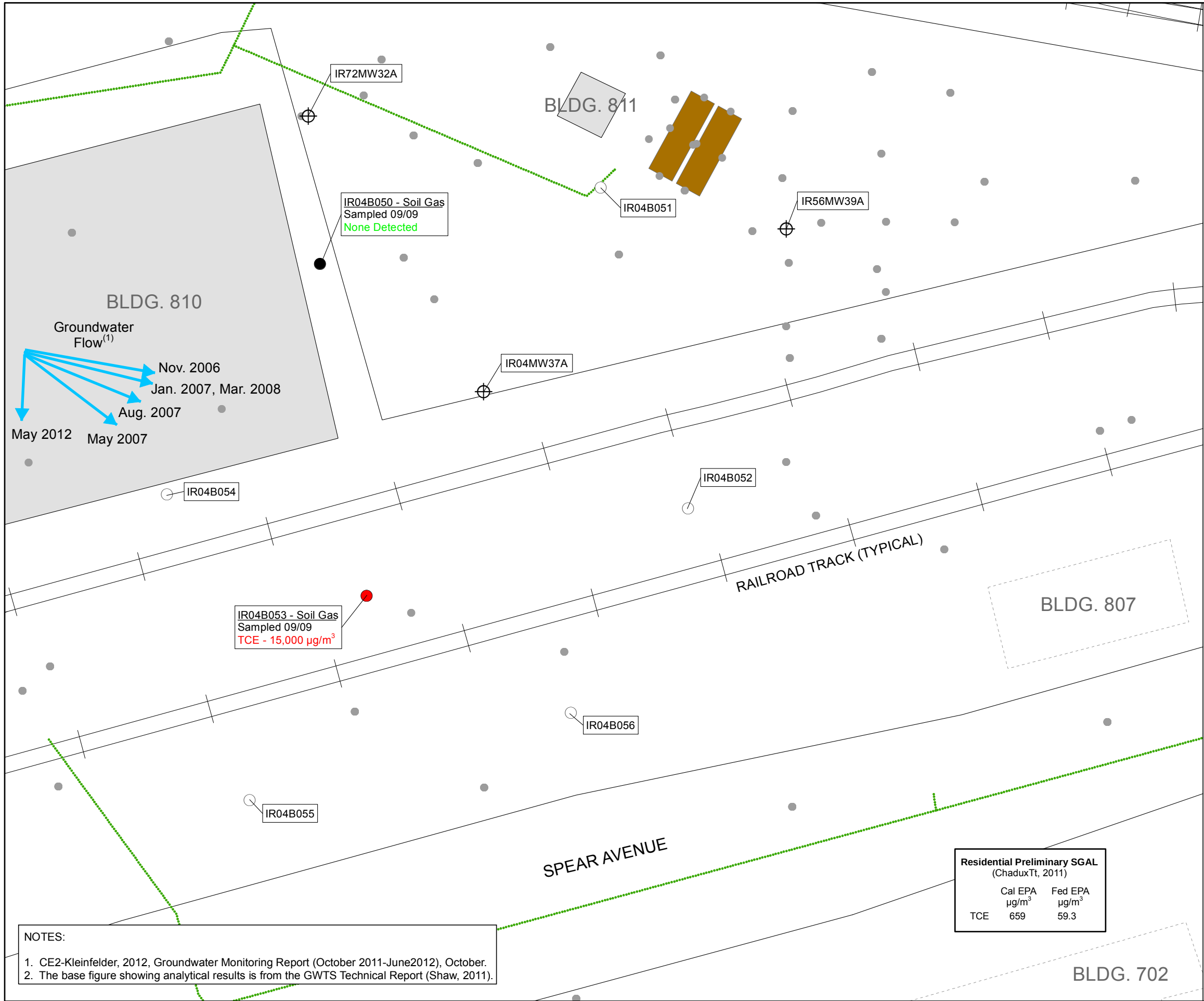
C:\GIS\HUNTERS\_PTVGIS\_Documents\Project\_Maps\GWTS\_CTO3HPS\_217\_IR12\_post\_injectionSV.mxd Drawn By: Karen.Black 01/12/11



C:\GIS\HUNTERS\_PTGIS\_Documents\Project\_Maps\GWTS\_GTO3\HPS\_273\_IR04\_gwCVOC\_ADD.mxd Karen.Black 12/14/12



C:\GIS\HUNTERS\_PT\GIS\_Documents\Project\_Maps\GWTS\_CTO3HPS\_274\_IR04\_soilCVOC\_ADD.mxd Karen.Black 12/14/12



### Legend

- Direct-Push Soil Vapor Sample Location
- ⊕ A-Aquifer Monitoring Well
- Historic Soil Sample Location

### Sampling Results for Soil Gas

Color represents highest CVOC concentration relative to SGAL

- Greater than the CAL EPA SGAL
- Greater than the EPA SCAL and less than the CAL EPA SGAL
- Less than the EPA SGAL
- U (Undetected)
- No Available SGAL
- No Vapor Point Set

→ Approximate Groundwater Flow<sup>(1)</sup>

--- Storm Drain Line

■ Aboveground or Underground Petroleum Storage Tank

--- Building (Demolished)

■ Building (Existing)

CVOC Chlorinated Volatile Organic Compound  
GWTS Groundwater Treatability Study  
µg/m<sup>3</sup> Micrograms per cubic meter  
SGAL Soil Gas Action Level (Preliminary)  
TCE Trichloroethene  
> Greater than  
(1) See Notes



0 30 60 Feet

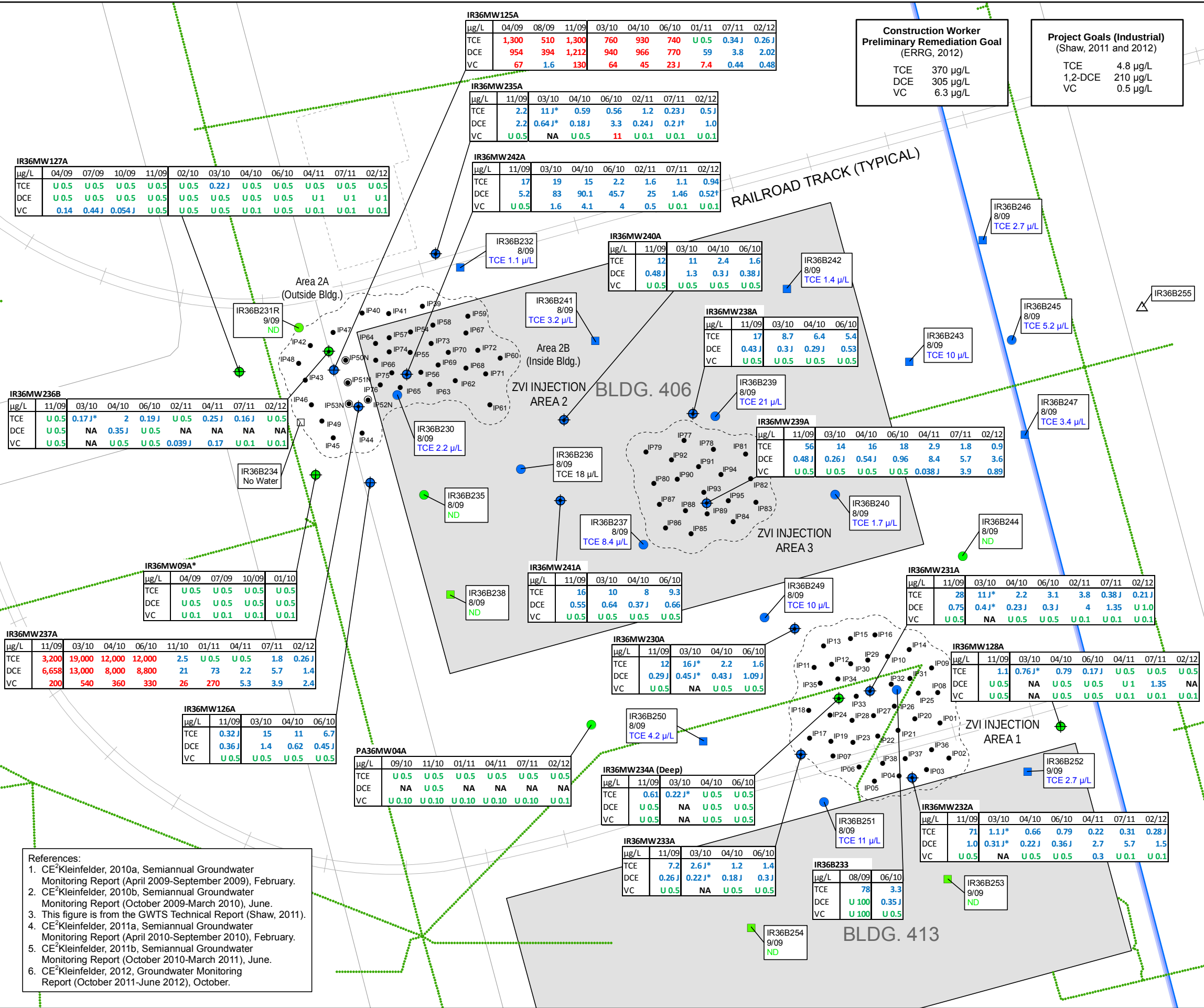


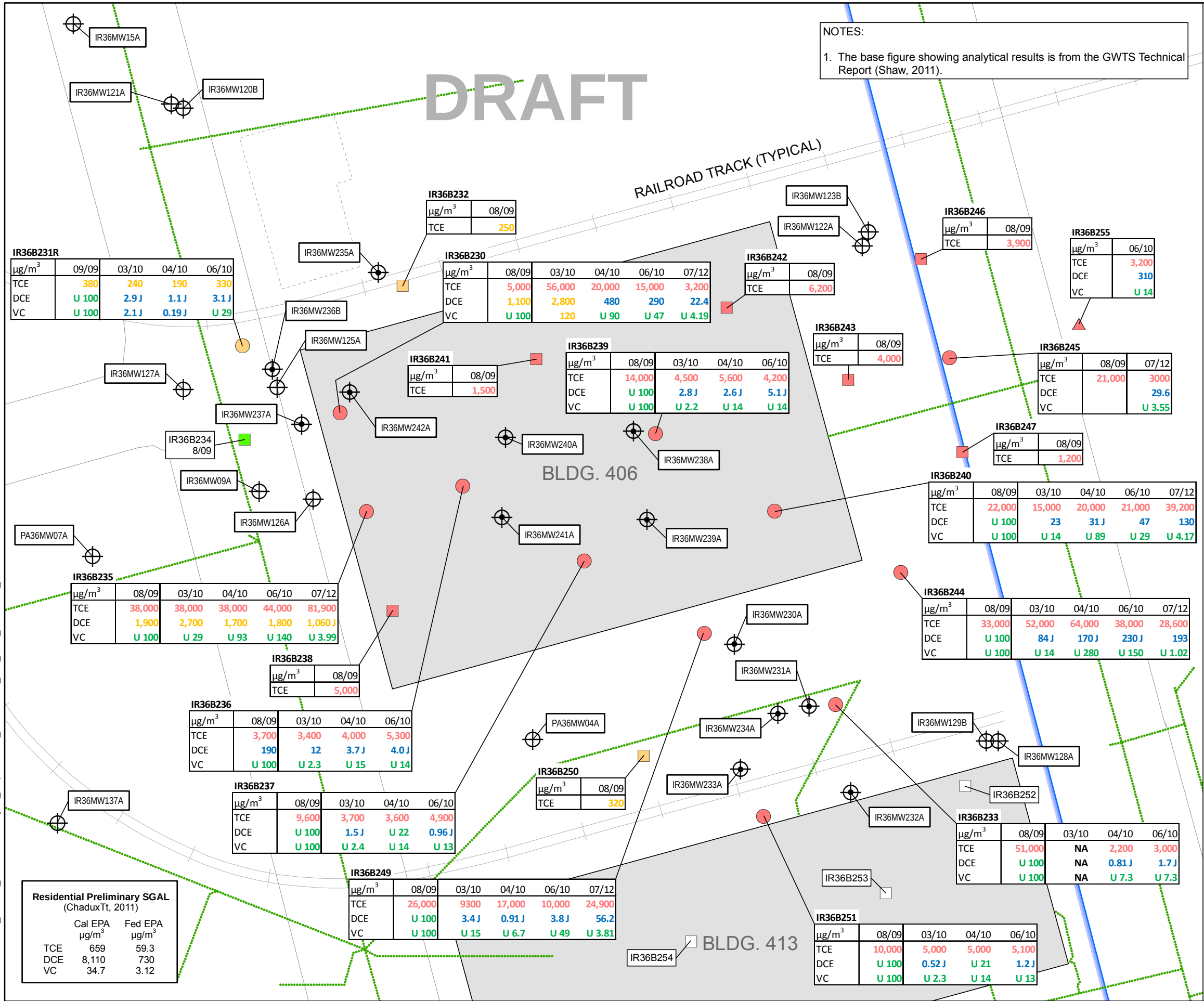
U.S. Department of the Navy  
BRAC PMO West  
San Diego, California

FIGURE 5  
IR SITE 04 GWTS RESULTS FOR  
TCE IN SOIL GAS

PARCEL E GWTS ADDENDUM  
HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CA







## Legend

- Existing Monitoring Well
- Temporary Monitoring Well
- Sample Location - Pre-ZVI and Post-ZVI Injection
- Sample Location - Pre-ZVI Injection Only
- Sample Location - Post-ZVI Injection Only

## Sampling Results

Color represents highest CVOC concentration relative to SGAL, based on most recent sample date

- Greater than the CAL EPA SGAL
- Greater than the EPA SGAL and less than the CAL EPA SGAL
- Less than the EPA SGAL
- U (Undetected)

## Analyte Concentration in Soil Vapor (µg/m<sup>3</sup>)

Pre-Injection Characterization | Post-Injection Sampling

| Units   | µg/m <sup>3</sup> | 09/09 | 03/10 | 04/10 | 06/10 | Sample Date |
|---------|-------------------|-------|-------|-------|-------|-------------|
| Analyte | TCE               | 380   | 240   | 190   | 330   | Results     |

The ZVI-injection period was from 12/10/09 through 12/17/09

- Storm Drain Line
- Parcel E Boundary
- Building (Demolished)
- Building (Existing)

CVOC Chlorinated Volatile Organic Compound  
GWTS Groundwater Treatability Study  
µg/m<sup>3</sup> Micrograms per cubic meter  
NA Not Analyzed  
SGAL Soil Gas Action Limit (Preliminary)  
TCE Trichloroethene  
DCE cis 1,2-dichloroethene  
VC Vinyl chloride  
J Estimated concentration below the practical quantitation limit  
U Undetected

0 50 100 Feet



U.S. Department of the Navy  
BRAC PMO West  
San Diego, California

**FIGURE 7**  
**IR SITE 36 GWTS RESULTS FOR**  
**TCE, DCE, AND VC**  
**IN SOIL GAS**

PARCEL E GWTS ADDENDUM  
HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CA

|    |                                                                  |               |                                                                                                                                              |
|----|------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 14 | <b>NAPL across large portions of the Former Oily Waste Ponds</b> | Section 2.3.3 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.3.1, page 2-22. |
|----|------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------|

**Nonaqueous-phase liquids (NAPL).** The nature and extent evaluation identified extensive NAPL at IR-03, the former oil reclamation ponds located within Redevelopment Block EOS-3 (formerly Redevelopment Block EOS-2 in the Revised RI Report and Draft FS Report). Characterization work performed in 1996, prior to the IR-03 removal action involving construction of a sheet-pile wall and low-permeability cap (see [Section 2.1.3](#) and [Table 2-4](#)), reported free-phase petroleum as deep as 25 feet bgs ([IT Corporation, 1997a](#)). From January through April 1991, NAPL was measured on seven separate occasions in four wells (IR03MW218A1, IR03MWO-1, IR03MWO-2, and IR03MWO-3) at IR-03. Product thickness ranged from a minimum of 0.07 feet in well IR03MW218A1 to a maximum of 6.93 feet in well IR03MWO-2 ([Barajas & Associates, Inc., 2008b](#)). In 1991, approximately 25 gallons of floating product and 70 gallons of waste oil were recovered from the four wells ([Barajas & Associates, Inc., 2008b](#)).

In 2002, the extent of NAPL was further evaluated at IR-03 during the Phase III groundwater data gaps investigation ([Barajas & Associates, Inc., 2008b](#)). NAPL was found in nine IR-03 wells IR-03, at thicknesses ranging from less than 0.01 feet (in well IR03MWO-1) to 10.85 feet (in well IR03MW370A). The NAPL was described as highly viscous and consisted of a 2:1 ratio of diesel- to motor oil-range TPH ([Barajas & Associates, Inc., 2008b](#)). Under the current BGMP, NAPL measurements are taken annually (generally during the 3rd or 4th quarter) at a select group of wells where NAPL has been present historically. During the most recent monitoring and sampling event for which NAPL measurements were taken (September 2009), NAPL measurements in the IR-03 area ranged from 0.16 feet (in well IR03MW226A) to 4.62 feet (in well IR03WMO-3) ([CE2-Kleinfelder Joint Venture, 2010b](#)). A conceptual cross section depicting the location and occurrence of NAPL at IR-03 is presented as [Figure 2-8](#).

During 2004, the Navy conducted a focused investigation and cleanup action along the Parcel E shoreline, and no discharge of NAPL was observed. In addition, riprap along the IR-03 shoreline is covered in concrete, which prevents direct contact with NAPL and contaminated soil. The available information is adequate to document the general nature of NAPL at IR-03 (such as the range of thicknesses and viscosities) and provide a preliminary indication of the extent of NAPL. The Navy performed additional characterization of NAPL at IR-03 in September and October 2011 in accordance with a work plan that was approved by the regulatory agencies ([ITSI, 2011](#)). The Navy is preparing a report, concurrent with the final version of this FS Report, summarizing the results of the additional characterization and the bench-scale treatability study that was performed under the same project. The Navy expects that the additional characterization will refine the nature and extent of NAPL at IR-03; however, once the findings of the study are reviewed, the Navy will consult with the regulatory agencies to determine whether additional characterization is required prior to the remedial design (RD).

In addition to IR-03, light NAPL has been identified at four other wells in Parcel E (IR12MW21A, IR14MW13A, PA36MW08A, and IR39MW21A), each of which contain only TPH and thus are being addressed by the TPH corrective action program.



|    |                                                    |               |                                                                                                                                                                                                                                                                                                         |
|----|----------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15 | Approach for testing thermally-enhanced extraction | Section 2.3.3 | Final In Situ Thermal Remediation Design NAPL Treatment Pilot Study, Installation Restoration Program Site 03 Former Oily Waste Ponds, Hunters Point Naval Shipyard, San Francisco, California. TPS Tech. November 2013. Executive Summary, pages vii through ix. Responses to Comments, pages 1 and 2. |
|----|----------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## EXECUTIVE SUMMARY

An In-Situ Thermal Remediation (ISTR) using Thermal Conduction Heating (TCH) pilot study is planned at Hunters Point Naval Shipyard Installation Restoration (IR) Site 03 (IR-03) to aggressively remove mobile Non Aqueous Phase Liquid (NAPL) that potentially may threaten San Francisco Bay. ISTR is used to alter subsurface conditions to mobilize and extract NAPL from the subsurface, therefore the technology performance objectives are based on achieving mass removal assessed as reductions in NAPL saturation. The objective of this pilot study is to examine the effectiveness of ISTR using TCH to extract and treat all mobile NAPL within the target treatment zone (TTZ). This goal will be measured as a reduction in average total NAPL saturation in soil to levels below residual saturation.

TCH is a technology that relies on heater wells to generate heat, which propagates into the surrounding formation by thermal conduction to soil, groundwater, and NAPL matrices. Heat transfer through the TTZ volume is driven by temperature gradients. Steam agitation (steam stripping) and a reduction of NAPL viscosity are the primary drivers of NAPL mobilization and removal, especially in the saturated zone, where NAPL will become buoyant and rise to the top of the water table to be extracted via multi-phase extraction (MPE). Additionally, extracted and treated water will be reinjected around the perimeter of the TTZ as a hydraulic control, to limit the flux of groundwater into the TTZ and prevent the lateral migration of heated NAPL outside of the TTZ.

The pilot study treatment area encompasses approximately 1,900 square feet (sq ft) of the former oily waste pond, with the west end of the treatment area bounded by an existing sheet pile wall, which was found to provide good hydraulic control during the pre-design characterization. Active heating will be performed from ground surface to approximately 25 feet below ground surface (ft bgs). Below is a summary of the Pilot study dimensions:

- Treatment area - 1,900 square feet (sq ft)
- Upper depth of treatment - 5 ft bgs
- Lower depth of treatment - 20 ft bgs
- Treatment volume – 1,056 cubic yards (cu yd)
- Upper depth of heating - 0 ft bgs
- Lower depth of heating - 25 ft bgs
- Heated volume - 1,760 cu yd.

The pilot study well field will be composed of:

- TCH heater wells (vertical): 46 TCH heater wells supply heat by thermal conduction from just below the ground surface to a depth of 25 ft bgs (5 feet below target treatment depth)
- MPE wells (vertical): 14 MPE wells will be located throughout the TTZ, and will act as the primary NAPL extraction points
- Co-Located Vacuum Extraction wells (vertical): 46 Vacuum extraction wells are co-located with all of the TCH heater wells. These vacuum extraction points provide



- pneumatic control during subsurface heating, and their operation may be adjusted at any time in the project to provide precise pneumatic control of the subsurface
- Horizontal Vacuum Extraction wells: Horizontal vacuum extraction wells will be laid atop the ground surface, in gravel, to provide pneumatic control of the upper most heated zone, just below the insulating surface cover. These vacuum extraction points are designed to provide pneumatic control during subsurface heating, but their operation may be adjusted at any time in the project to provide precise pneumatic control of the subsurface
- Reinjection wells: 7 reinjection wells will be located around the north, east, and south boundaries of the ISTR TTZ. Extracted water will be treated (details on treatment method provided in Section 4) and reinjected to provide hydraulic control
- Temperature and Pressure Monitoring Points: 10 points are used to document heating and pressure effectiveness. Thermocouples are placed at 5 ft intervals from 5 ft bgs to 25 ft bgs within the TTZ.
- Pressure Monitoring Points: An additional 4 points (installed 0 ft bgs to 1 ft bgs) are used to measure vadose zone pressures on the boundary of the TTZ.

The target thermal heating operating temperature is 212 degrees Fahrenheit (°F) (100°C). This temperature will result in contaminants being mobilized, dissolved, desorbed and/or volatilized. NAPL viscosity will decrease as subsurface temperature increases, and steam agitation (steam stripping) will assist in NAPL mobilization. The more mobile NAPL will slowly rise to the top of the water table, where it will be extracted via the MPE wells. The extracted liquid will be run through a LNAPL/DNAPL/water phase separator to separate any free-phase liquid from the water. The remaining water stream will be treated with a liquid granular activated carbon (LGAC) system, then re-heated (using a heat exchanger) before it is re-injected into the reinjection wells.

Some of the volatile organic chemicals (e.g. lighter chain hydrocarbons, chlorobenzene) may volatilize into vapor phase during heating. The resultant contaminant-laden vapors will be recovered via the network of vapor extraction and MPE wells, and subsequently treated with an off-gas treatment system. The vapor extraction wells are connected via a manifold piping network, and a vacuum is applied to the manifold system to ensure vapor capture and control. Extracted off-gas will then be directed through a vapor liquid separator / knock out tank, to begin the separation of off-gas into condensable and non-condensable fractions. The off-gas will continue through the vapor treatment system, passing through a large air-to-air heat exchanger to further reduce its temperature. The resultant off-gas will travel through a positive displacement blower system with an aftercooler, and then, finally, the contaminated vapors will pass through three vapor phase granular activated carbon (VGAC) vessels, capturing the contaminants. The presence of NAPL with a neutral density (1 gram per milliliter [g/mL]) collected from within the ISTR TTZ was comprised of a mixture of primarily diesel-range hydrocarbons (C9-C16) at 39.6%, motor oil-range hydrocarbons (C28-C40) at 11.9%, mixed aryl phosphates at 48.2% with lower amounts (<0.1%) of entrained polychlorinated biphenyls (PCBs), naphthalene and dichlorobenzene compounds was observed during the pre-design characterization testing. The relatively high fraction of mixed aryl phosphates may be one reason the NAPL was “heavy” as the density of these compounds is typically reported between 1.185-1.202 at 25°C. One potential issue with neutrally buoyant NAPL is that it can be more difficult to separate from the aqueous phase resulting in lower removal efficiencies during the NAPL separation portion of the above

ground treatment system. Therefore, more LGAC may be required to treat the system effluent.

The mix of naphthalene with more volatile petroleum hydrocarbon fractions in the off-gas stream may also lower the overall effectiveness of the VGAC due to competitive absorbency of these compounds. Because of these concerns, the final design included the following modifications (1) an additional (third) VGAC vessel, and (2) increased capacity of the VGAC vessels. Off-gas sampling from the vapor treatment system will ensure that the substantive requirements of a Bay Area Air Quality Management District (BAAQMD) compliance per applicable or relevant and appropriate requirement (ARAR) guidelines.

During the active heating period (estimated at 120 days), a minimum of 4,529 million British thermal units (MMBTUs) of propane and 249,000 kilowatt hours (kWh) of electricity will be delivered to the treatment system. Electricity will be generated onsite by temporary generators. The effluent treatment system is expected to treat up to  $3.68\text{E}+07$  cubic feet of extracted off-gas, and treat up to  $4.76\text{E}+05$  gallons of extracted liquid during the course of the project. Up to 31,000 pounds (lbs) of GAC, including both VGAC and LGAC, are projected to be used for contaminant removal in the effluent treatment system.

**Response to U.S. EPA Comments on  
Draft-Final In Situ Thermal Remediation Design, NAPL Treatment Pilot Study  
Installation Restoration Program Site 03, Former Oily Waste Ponds, Parcel E  
Hunters Point Naval Shipyard, San Francisco, California**

*The following comments were submitted by Ms. Yvonne Fong (U.S. Environmental Protection Agency, Region IX) on 25 October 2013.*

| Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General Comments</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p>1. During the September 30, 2013 meeting, it was stated that the NAPL recovered from this site “sometimes separates into LNAPL and DNAPL fractions” (see slide 26). This suggests that during heating of the NAPL in the subsurface, DNAPL is likely to form. It is not likely that DNAPLs composed of some of the constituents found in this NAPL, which includes PCBs and chlorobenzenes, would become an LNAPL again at temperatures up to 100oC. This has important implications for the project since the pilot system is currently designed to collect LNAPL and cannot recover significant quantities of DNAPL.</p> <p>NAPL recovered from different portions of the ISTR pilot study treatment area could be measured for density as a function of temperature. If significant DNAPL formation is shown within the target treatment zone as a result, the pilot study system should be re-designed to recover DNAPL, as well as LNAPL. The Bay Mud below the fill material at this site will likely stop downward migration of DNAPL. However, under this scenario of significant DNAPL formation, the multiphase extraction (MPE) wells and heater wells must be extended in order to heat and recover the DNAPL. The MPE wells must have a sump that extends into the Bay Mud and a bottom loading pump to collect and recover the DNAPL.</p> | <p><i>The design and operation of the multiphase extraction (MPE) wells allows for recovery of nonaqueous phase liquid (NAPL), (including dense nonaqueous phase liquid (DNAPL), by controlling the pumping rates and the subsequent dewatering within the well. Over the course of operations, if DNAPL comes into the wells it would be recovered by increasing the pumping rates and lowering the stinger to the bottom of the MPE well as the well is dewatered. As provided in the data package submitted with the final design, the composition of the NAPL was determined to be primarily diesel, motor oil and aryl phosphates. Therefore, the aryl phosphates are believed to be the primary component of the DNAPL within the system. Concentrations of chlorobenzenes and PCBs were detected in the NAPL samples, but at concentrations well below percent levels and at levels unlikely to form separate DNAPLs.</i></p> <p><i>The system operation will be modified to include sampling of the DNAPL for density within different parts of the treatment area. The MPE wells will be extended down to approximately 23 feet and a 1 foot sump will be added at the bottom of the wells for collection of any DNAPL. However, the current plan is to heat the treatment volume down to 25 feet. It is believed that this is a sufficient depth to recover the NAPL within the treatment zone due to:</i></p> <ol style="list-style-type: none"> <li><i>1. Hydraulic profile tooling (HPT) data illustrate that the hydraulic conductivity transitions 1-3 orders of magnitude between 23 and 25 feet below ground surface (bgs) within the highly saturated NAPL zone (at HPT-02 and HPT-03). In fact, at HPT-02, the HPT could not inject any water below 25 feet bgs and at HPT-03 could not inject any water below 22 feet bgs. This suggests this depth is the transition to the Bay Mud. See attached figure illustrating the HPT results and the revised conceptual screened interval for the MPE wells. A more detailed revision of the MPE well construction diagrams will be provided in the Final ISTR Design and is attached as Figure 12. This permeability contrast is believed sufficient to prevent further downward vertical migration of any DNAPL.</i></li> </ol> |

**Response to U.S. EPA Comments on  
Draft-Final In Situ Thermal Remediation Design, NAPL Treatment Pilot Study  
Installation Restoration Program Site 03, Former Oily Waste Ponds, Parcel E  
Hunters Point Naval Shipyard, San Francisco, California**

| Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>2. <i>The soil boring screening and sampling indicate that contaminant levels decline dramatically below 20 feet bgs as indicated by soil staining, PID screening and soil sampling. The borehole logs have been attached for reference and soil sample results were submitted with the Draft ISTR Design.</i></p> <p>3. <i>Completing a significant proportion of the MPE well screens and extracting from the low conductivity silty clay and clay is better avoided, if possible, to prevent significant silt and clay from entering the above ground treatment system, which fouls up the system and makes operations more difficult. Therefore, the MPE well screens will be completed to the transition zone to the low permeability silt and clay sediment but will not extend into the clay.</i></p> |
| <p>2. During the September 30, 2013 meeting, it was stated that understanding the site hydrogeology and the nature and extent of the contamination is critical to a successful treatability evaluation (Slide 4). Slide 6 lists the site characterization and data gap activities taken in 2013; however, much of the data collected was not presented during the September 30, 2012 meeting or in the ISTR Design. Data that was to have been collected, but was not presented, includes the results from three HPT/CPT borings in the ISTR area, groundwater hydraulic heads from which groundwater flow direction and rate can be determined, and site stratigraphy and heterogeneity information. This information is critical to the design and evaluation of the ISTR pilot study. All of the characterization data pertinent to the ISTR treatment area should be included in this document, and the conceptual site model (CSM) for the treatment zone should be updated to incorporate this data.</p> | <p><i>Attached is a data package that includes the cone penetrometer (CPT) and HPT data, a figure illustrating the boring locations (Figure A-1), and the borehole logs of the borings advanced within the ISTR treatment zone. The revised final design will be updated to include a discussion of these data, including hydraulic gradients.</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>3. Additional information on the evaluation of the ISTR pilot system and on adjustments to the operational timeframe is found in the Final Response to BCT Comments sent out June 5, 2013, but is not contained in either the ISTR Design or the Final NAPL Treatment Pilot Study Workplan (see comment #5 below). For example, Section 4.3.4 gives a schedule for operation of the ISTR pilot study that does not allow for longer operating times if NAPL is still being recovered, while page 28 of the Final Response to BCT Comments sent out June 5, 2013 allows for adjustments to the operational time frame. It is recommended that the ISTR Design contain all of the critical design information including operation</p>                                                                                                                                                                                                                                                                         | <p><i>The Final Design was intended to describe how the physical components of the ISTR system changed based on new information obtained during pre-design characterization. The intent of the document is not to discuss operational timeframes. The thermal treatment system operational approach discussed in the <b>Final NAPL Treatment Pilot Study Work Plan (June 2013)</b> and the response to comments will be adhered to and nothing in the Final Design submittal changes the planned operational timeframe nor decisions for shutting down operations described in that document.</i></p>                                                                                                                                                                                                           |

|    |                                     |               |                                                                                                                                                                                                                 |
|----|-------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 | Several radiological investigations | Section 2.3.4 | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Sections 2.3.1.1 and 2.3.1.2, pages 2-29 through 2-43. |
|----|-------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Approximately 44,500 cubic yards of soil and debris was removed and disposed of off site as part of this removal action. Out of this total volume, 533 cubic yards of soil and fire brick was segregated as radiologically impacted. Also, 40 radiological devices, 78 cubic yards of metal debris, and 19 pieces of other radioactively contaminated debris were identified within the removal area (TtECI, 2007b). In addition to this radiologically impacted debris, 110 drums and 537 assorted waste containers were recovered from the central portion of the removal area and were characterized prior to off-site disposal. The drums, which were discovered in varying degrees of decay, contained grease, oil, soil, asphalt, and tar substances. Waste characterization data indicated that the drums contained various chemicals, including PCBs. Two of the drums contained mixed waste with radiological contamination. The small containers contained various laboratory chemicals, ranging from strong acids and bases to solvents, alcohols, and inorganic salts (TtECI, 2007b).

Post-excavation soil samples were collected and analyzed for  $^{137}\text{Cs}$ ,  $^{226}\text{Ra}$ , and  $^{90}\text{Sr}$  (the ROCs for IR-01/21 and IR-02). Analytical results for all post-excavation soil samples met the specified RROs. Post-excavation soil data are presented in the “Final Removal Action Completion Report, PCB Hot Spot Soil Excavation Site” (TtECI, 2007b). Radiological analytical results are provided in Appendix M of the RACR, with sampling locations depicted on Figures 4-10 through 4-11 of the RACR.

## 2.3. NATURE AND EXTENT OF RADIONUCLIDES IN SOIL AND GROUNDWATER

The soil and groundwater data derived from the various radiological investigations, as discussed in Section 2.2, were used to evaluate the nature and extent of ROCs in soil and groundwater at Parcel E. The nature and extent evaluation presented in this section documents that an adequate amount of data exist to support a screening-level human health risk assessment (HHRA) based on the planned reuse of Parcel E and to evaluate remedial alternatives for Parcel E. As identified in the HRA (NAVSEA, 2004), shoreline sediment (within the intertidal shoreline zone) and structures at Parcel E are also considered radiologically impacted; however, data are inadequate to support a detailed evaluation of the nature and extent of radionuclides in shoreline sediment and structures. In the absence of such data, this radiological addendum assumes that the radiologically impacted shoreline sediment and structures, as identified in the HRA, will require remedial option analysis (in Sections 3, 4, and 5).

### 2.3.1. Nature and Extent of Radionuclides in Soil (and associated structures)

#### 2.3.1.1. Potential Sources of Radioactive Contamination and Impacted Media

Table 1 identifies each of the radiologically impacted areas at Parcel E and the ROCs at each area. Section 2.1.2 discussed the radiological operations at each impacted area and identified the potential sources of radioactive contamination. Two general sources of potential radioactive contamination exist at Parcel E: NRDL activities at the former 500 series buildings, Building 707 Triangle Area, and other buildings formerly occupied by NRDL; and historic waste disposal activities that occurred mainly along the shoreline, primarily IR-02. Additional radiological activities at Parcel E include:

- Practical and applied research on radiation decontamination methods and on the effects of radiation on living organisms and natural and synthetic materials, primarily conducted within the former 500 series buildings and within the Building 707 Triangle Area
- Disposal of radioluminescent commodity items (such as dials, gauges, and deck markers) within IR-02 and IR-03
- Disposal of industrial debris and metal slag with radioactive anomalies at the Metal Debris Reef
- Potential discharge of small amounts of low-level radioactive liquids into drains at NRDL buildings (potentially leading to sanitary sewer, storm drain, and septic sewer lines)

The HRA evaluated the potential for residual radioactive contamination at each impacted site based on historical information, previous radiological survey results, and site reconnaissance (NAVSEA, 2004). Table 2, as excerpted from the HRA, identifies the potential for various media (for example, surface soil, subsurface soil, groundwater, etc.) to contain radioactive contamination. As shown in Table 2, surface and subsurface soil are the most likely media to contain radioactive contamination at Parcel E.

#### 2.3.1.2. Radionuclides Detected in Soil

The following paragraphs briefly discuss the detections of radionuclides in soil at Parcel E. The following discussion is focused on the results from the Phase V investigation, which evaluated whether residual radioactivity on the surface met the predetermined release criterion as summarized below.

- $^{226}\text{Ra}$ : 1 pCi/g greater than background, not to exceed 2 pCi/g<sup>3</sup>
- $^{90}\text{Sr}$ : 10.8 pCi/g
- $^{137}\text{Cs}$ : 0.13 pCi/g<sup>4</sup>
- $^{241}\text{Am}$ : 5.67 pCi/g
- $^{239}\text{Pu}$ : 14.0 pCi/g
- $^{235}\text{U}$ : 0.398 pCi/g
- $^{60}\text{Co}$ : 0.060 pCi/g

These release criteria were considered equivalent to EPA preliminary remediation goals (PRGs) for outdoor worker exposure to soil, based on agreements with EPA. For  $^{226}\text{Ra}$  and  $^{137}\text{Cs}$ , the outdoor worker release criteria are identical to the release criteria for future residents. The outdoor worker release criteria for  $^{90}\text{Sr}$ ,  $^{241}\text{Am}$ ,  $^{239}\text{Pu}$ ,  $^{235}\text{U}$ , and  $^{60}\text{Co}$  are greater than the residential release criteria; however, these differences were accounted for in this radiological addendum because (1) no radiologically impacted sites were eliminated from further evaluation (as part of the remedial option analysis in Sections 3, 4, and 5)

<sup>3</sup> The  $^{226}\text{Ra}$  release criterion was 5 pCi/g when the Phase V investigation was started but was subsequently reduced to 1 pCi/g above background; the uncertainty related to this change in criterion is discussed in Section 2.5.4.

<sup>4</sup> The  $^{137}\text{Cs}$  release criterion applied to this survey when conducted in 2002 is slightly higher than the one used today (0.113 pCi/g); however, this change does not directly impact the results of this survey.



based on the results from the Phase V data, and (2) the remedial option analysis considered both the outdoor worker and residential release criteria in developing remediation goals.

The discussion of radionuclide data presented in the following paragraphs is limited to the sites for which radiological data are available; to date, radiological data have not been collected at each radiologically impacted site discussed in [Section 2.1.2](#) and identified in [Table 2](#). In the absence of such data, this radiological addendum assumes that radiologically impacted subsurface soil, as identified in the HRA (NAVSEA, 2004), will require remedial option analysis (in [Sections 3, 4, and 5](#)).

### ***Redevelopment Block MU-1***

#### **Building 707 and 707 Triangle Area**

In 1969, NRDL conducted a radiological survey at Building 707; the building was decontaminated to background levels and released by NRDL for unrestricted reuse (TtEMI, LFR, and U&A, 1997). In January 1970, Building 707 was inspected and cleared by AEC for unrestricted reuse (TtEMI, LFR, and U&A, 1997).

In 1978, RASO conducted a survey consisting of alpha and beta-gamma scans and wipe sampling for alpha and beta-gamma activity. No areas of elevated radioactivity were identified in the building.

In 1997, the concrete pad adjacent to Building 707 was surveyed during the Phase III investigation (TtEMI, LFR, and U&A, 1997). The investigation consisted of a surface gamma walkover survey of the pad and surrounding area, collection and analysis of concrete and asphalt samples from 27 locations surrounding the pad, and collection and analysis of 52 wipe samples from the concrete pad. Thirteen (B707SS04 through B707SS16) of the 27 surface sampling locations were located on the asphalt. Soil samples were collected under two asphalt sampling locations (B707SS04 and B707SS14).

Two areas on the pad and two areas on the asphalt near the pad exhibited elevated gamma readings exceeding background. The two anomalous areas on the pad were located approximately 10 feet apart and had gamma count readings of 18,640 and 21,115 cpm, above the average background rate of 5,800 cpm for concrete. The two anomalous areas off the pad were located to the southeast of the pad on the asphalt near “J” Street. Gamma count readings (32,300 and 17,300 cpm) at these anomalies exceeded the background activity of 7,600 cpm for asphalt cover.

To further evaluate the anomalies, asphalt and concrete samples were collected from these areas. Three of the four anomalies were sampled; only one sample was collected from the pad because of the proximity of the two anomalies. The laboratory results indicated elevated activities of  $^{137}\text{Cs}$ ,  $^{226}\text{Ra}$ , thorium-228, and thorium-232 exceeding their respective screening criteria (TtEMI, LFR, and U&A, 1997). The activities of  $^{137}\text{Cs}$  ranged from 4,300 pCi/g to 7,000 pCi/g, exceeding the Navy’s  $^{137}\text{Cs}$

criterion for hot spots of 100 pCi/g.  $^{226}\text{Ra}$  activities ranged from 51 to 61 pCi/g, exceeding the Navy's criterion of 5 pCi/g at the surface.

No radioisotopes were reported in the soil samples at activities exceeding background, except for one sample analyzed for  $^{40}\text{K}$ , which was reported at an activity of 16 pCi/g, exceeding the background activity of 10 pCi/g. Gross alpha and gross beta measurements from the wipe samples did not exceed the acceptable contamination criteria for maximum activity, average activity, or removable acceptable surface activity. Based on the results of the Phase III investigation, additional investigation was recommended in the area of the concrete pad to address the anomalies.

In 1999, the Building 707 concrete pad was further investigated as part of the Phase IV investigation. The investigation included collection and analysis of 28 asphalt and concrete samples and 28 soil samples from areas near the anomalies identified in the Phase III investigation (TtEMI, 2000). At each of the anomalous locations, one sample was collected from the "hottest" area (as determined by 2-inch sodium iodide detector), three samples were detected in a 1-meter concentric ring from the central sampling location, and five samples were collected in a 4-meter ring from the central sampling location. At each sampling location, the concrete or asphalt was cored and sampled and underlying soil or soil aggregate was sampled. In addition, 10 asphalt and concrete samples and 10 soil samples were collected as background samples.

Results of the sampling indicated several radionuclides of concern ( $^{241}\text{Am}$ ,  $^{137}\text{Cs}$ ,  $^{60}\text{Co}$ , europium-152 [ $^{152}\text{Eu}$ ], europium-154 [ $^{154}\text{Eu}$ ], and  $^{235}\text{U}$ ) were present exceeding background by more than three standard deviations. To evaluate whether the Building 707 concrete pad area would require remediation, radionuclide activities were compared against site-specific derived concentration guideline levels (DCGLs) and decay-corrected PRGs. DCGLs were calculated for the ROCs exceeding background using RESRAD.  $^{137}\text{Cs}$  was the only radionuclide that exceeded the site-specific DCGL of 13.1 pCi/g; the highest reported activity of  $^{137}\text{Cs}$  was 84.2 pCi/g in sample location 707A1. The average activity of  $^{137}\text{Cs}$  exceeded the PRG of 0.13 pCi/g. The maximum reported activities of  $^{241}\text{Am}$ ,  $^{152}\text{Eu}$ ,  $^{154}\text{Eu}$ , and  $^{235}\text{U}$  exceeded their respective PRGs; however, the average activities did not exceed the PRGs. The human health risk, calculated using RESRAD, posed by radioactive isotopes at the Building 707 concrete pad site ranged from 9E-06 to 1E-05 and is within the acceptable risk range (TtEMI, 2000).

In 2002, a MARSSIM scoping survey was conducted at the location of the Building 707 concrete pad area during the Phase V investigation. The designed surveillance area for the concrete pad was organized into 12 survey units, with each unit designated as a Class I area with a surface area not more than 100 square meters ( $\text{m}^2$ ). Survey methods included static and scan measurements for gamma radiation, static and scan measurements for alpha and beta radiation, exposure rate measurements, and analysis of solid samples. Two solid samples were collected from each of the 12 survey units.  $^{137}\text{Cs}$  exceeded the release criterion in 4 of the 12 survey units, with a maximum reported activity of 0.277 pCi/g in survey unit G.  $^{226}\text{Ra}$



exceeded the release criterion in 7 of the 12 survey units, with a maximum reported activity of 3.892 pCi/g in survey unit D. Based on the results of the Phase V investigation, a characterization survey and subsequent remedial action were recommended for the site.

The MARSSIM scoping survey also included the location of the Triangle Area during the Phase V investigation. The designed surveillance area for the Triangle Area was organized into seven survey units, with each unit designated as a Class I area with a surface area not more than 2,000 m<sup>2</sup>. Survey methods included static and scan measurements for gamma radiation, static and scan measurements for alpha and beta radiation, exposure rate measurements, and analysis of solid samples. Sixteen solid samples were collected from each survey unit except for grid ATI, from which two samples were collected. <sup>137</sup>Cs and <sup>226</sup>Ra exceeded the release criteria in each of the seven survey units. The maximum reported activities were 113.960 pCi/g for <sup>137</sup>Cs and 6.640 pCi/g for <sup>226</sup>Ra, both located in survey unit ATI. <sup>235</sup>U was also reported in each of the survey units at activities ranging from 0.519 pCi/g (survey unit API) to 1.615 pCi/g (survey unit ATI). Based on the results of the Phase V investigation, characterization surveys and subsequent remedial action were recommended for the site.

A final status survey was conducted in Building 707 during the Phase V survey. The survey consisted of collecting 16 static readings from each of 17 survey units within the building, with each survey unit not more than 100 m<sup>2</sup>. The mean net alpha static measurements ranged from -9 to 4 dpm/100 cm<sup>2</sup> within the survey units, with maximum net alpha measurements ranging from -6 to 19 dpm/100 cm<sup>2</sup>. Mean net beta static measurements ranged from -352 to 314 dpm/100 cm<sup>2</sup> within the survey units, with maximum net beta measurements ranging from 68 to 779 dpm/100 cm<sup>2</sup>. In addition, 16 static readings were collected from each of 10 survey units in the kennels, with each survey unit not more than 100 m<sup>2</sup>. The mean net alpha static measurements ranged from -4 to 24 dpm/100 cm<sup>2</sup> within the survey units, with maximum net alpha measurements ranging from 14 to 109 dpm/100 cm<sup>2</sup>. Mean net beta static measurements ranged from 215 to 582 dpm/100 cm<sup>2</sup> within the survey units, with maximum net beta measurements ranging from 479 to 1,294 dpm/100 cm<sup>2</sup>.

### ***Redevelopment Block MU-2***

#### **Building 406**

In 2002, a MARSSIM scoping survey was conducted in Building 406 during the Phase V investigation. The survey consisted of collecting 16 alpha and beta static readings from each of 57 survey units within the building. The mean net alpha static measurements ranged from -9 to 16 dpm/100 cm<sup>2</sup> within the survey units, with maximum net alpha measurements ranging from 3 to 57 dpm/100 cm<sup>2</sup>. Mean net beta static measurements ranged from -839 to 1,625 dpm/100 cm<sup>2</sup> within the survey units, with maximum net beta measurements ranging from -442 to 2,656 dpm/100 cm<sup>2</sup>. Areas containing <sup>226</sup>Ra exceeding release criteria were identified, remediated, and the building was resurveyed.

### Building 414

In 2002, a MARSSIM scoping survey was conducted at the location of Building 414 during the Phase V investigation. The investigation consisted of collection and analysis of two surface soil samples near the building for  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$ .  $^{137}\text{Cs}$  did not exceed the release criterion, with a maximum activity of 0.043 pCi/g.  $^{226}\text{Ra}$  exceeded the release criterion in one of the two samples, with a maximum activity of 1.822 pCi/g.

### Building 506 Site

Building 506 was first surveyed in 1955 as part of the NRDL decommissioning survey (NAVSEA, 2004). The NRDL release letter indicates the building was released for unrestricted reuse, with the caveat that a radiation monitor must accompany working parties on the sewer systems for monitoring until the drain lines are replaced. No other information is available regarding the 1955 NRDL survey at Building 506.

In 1969, NRDL conducted a radiological survey at Building 506 (TtEMI, LFR, and U&A, 1997). Results of wipe samples collected in rooms 35 and 35A indicated the presence of  $^3\text{H}$  contamination, and several other areas and pieces of equipment were also contaminated with  $^3\text{H}$ . Detectable contamination was removed by washing the affected areas and dismantling contaminated equipment, and contaminated areas were steam cleaned following decontamination. All radioactive waste and dismantled equipment was packaged and disposed of off site. Following completion of decontamination, Building 506 was resurveyed by NRDL personnel, and wipe samples indicated the site was decontaminated to background levels. In December 1969, Building 506 was inspected and cleared by the AEC for unrestricted reuse (TtEMI, LFR, and U&A, 1997).

In 1978, RASO conducted a survey consisting of alpha and beta-gamma scans and wipe sampling for alpha and beta-gamma activity. Three isolated locations of beta-gamma activity were detected, which were less than NRC guidelines.

In 1997, the location of former Building 506 was surveyed during the Phase III investigation. The investigation consisted of a surface gamma walkover survey and collection and analysis of 15 surface soil and 3 asphalt samples near the former building. Several 1-minute gamma count measurements exceeded the background activity; however, these measurements could not be associated with an anomaly and were considered to be caused by variances in background activity. No radioisotopes were reported in soil or asphalt samples at activities exceeding background. Release of the Building 506 Area was not recommended because a potential buried point source was encountered behind Building 529, which was previously discussed above in the summary of the Building 529 Area.

In 2002, a MARSSIM scoping survey was conducted at the location of former Building 506 during the Phase V investigation. Nine surface soil samples were collected near the former building and analyzed at the on-site laboratory for  $^{241}\text{Am}$ ,  $^{137}\text{Cs}$ , and  $^{226}\text{Ra}$ .  $^{241}\text{Am}$  and  $^{137}\text{Cs}$  activities did not exceed the release

criteria, with maximum reported activities of 0.197 and 0.069 pCi/g, respectively.  $^{226}\text{Ra}$  exceeded the release criterion in two of the nine samples, with a maximum reported activity of 2.175 pCi/g.

#### Building 507 Site

Building 507 was first surveyed in 1955 as part of the NRDL decommissioning survey and was released for unrestricted reuse (NAVSEA, 2004). In December 1969, Building 507 was inspected and cleared by AEC for unrestricted reuse (TtEMI, LFR, and U&A, 1997).

In 1997, the location of former Building 507 was surveyed during the Phase III investigation. The investigation consisted of a surface gamma walkover survey and collection and analysis of six surface soil samples near the former building. Several 1-minute gamma count measurements exceeded the background activity; however, these measurements could not be associated with an anomaly and were considered to be caused by variances in background activity. No radioisotopes were reported in the surface soil samples at activities exceeding background, except for one sample analyzed for  $^{40}\text{K}$ , which was reported at an activity of 11 pCi/g, slightly exceeding the background activity of 10 pCi/g. Based on the results of the Phase III survey, the Building 507 Area was recommended to be released for unrestricted reuse.

In 2002, a MARSSIM scoping survey was conducted at the location of former Building 507 as part of the Phase V investigation. Four surface soil samples were collected from a Class 3 Survey Unit near the former building and analyzed at the on-site laboratory for  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$ ; one sample was also sent to an off-site laboratory for independent gamma quality assurance.  $^{137}\text{Cs}$  did not exceed the release criterion in any of the samples, with a maximum reported activity of 0.099 pCi/g.  $^{226}\text{Ra}$  exceeded the release criterion in one of the samples, with a reported activity of 4.402 pCi/g. Based upon the results of the scoping survey, New World Technology (NWT) concluded the original classification of the Building 507 was incorrect, and further characterization of the site should be performed to identify the extent of residual contamination, with remediation and a Class I survey to be completed after characterization is complete.

#### Building 508 Site

Building 508 was first surveyed in 1955 as part of the NRDL decommissioning survey and was released for unrestricted reuse (NAVSEA, 2004). In December 1969, Building 508 was inspected and cleared by AEC for unrestricted reuse (TtEMI, LFR, and U&A, 1997).

In 1997, the location of former Building 508 was surveyed during the Phase III investigation. The investigation consisted of a surface gamma walkover survey and collection and analysis of seven surface soil samples near the former building. Several 1-minute gamma count measurements exceeded the background activity; however, these measurements could not be associated with an anomaly and were considered to be caused by variances in background activity. No radioisotopes were reported in the

surface soil samples at activities exceeding background. Based on the results of the Phase III survey, the Building 508 Area was recommended to be released for unrestricted reuse.

In 2002, a MARSSIM scoping survey was conducted at the location of former Building 508 as part of the Phase V investigation. Four surface soil samples were collected from a Class 3 Survey Unit near the former building and analyzed at the on-site laboratory for  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$ ; one sample was also sent to an off-site laboratory for independent gamma quality assurance.  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$  activities did not exceed the release criteria in any of the samples, with maximum reported activities of 0.1267 and 1.0577 pCi/g, respectively. Statistical test applications and solid sample analysis results indicated the residual activity at the Building 508 site did not exceed the release criteria.

#### Building 520 Site

In 2002, a MARSSIM scoping survey was conducted at the location of former Building 520 during the Phase V investigation. The investigation consisted of collection and analysis of three surface soil samples near the former building. The analysis of collected field data and solid sample analysis indicated the residual activity at Building 520 exceeded the release criteria, with  $^{226}\text{Ra}$  reported at a maximum activity of 1.978 pCi/g at sample location S-1. According to the HRA, the radium contamination was found near the foundation of Building 520, indicating contamination was likely present in the drain system (NAVSEA, 2004). NWT recommended that sample location S-1 should be remediated, and new systematic samples should be collected in the area. NWT further recommended the area should be reclassified as a Class 1 or Class 2 area for survey purposes.

#### Building 529 Site

In 1969, NRDL conducted a radiological survey at Building 529; radiation was not detected in the building (TtEMI, LFR, and U&A, 1997). The stainless steel holding tank was decontaminated, and results from wipe samples following decontamination indicated the tank was decontaminated to background levels. Following decontamination, the tank was moved from the vicinity of Building 529. In December 1969, Building 529 was inspected and cleared by the AEC for unrestricted reuse (TtEMI, LFR, and U&A, 1997).

In 1978, RASO conducted a survey consisting of alpha and beta-gamma scans and wipe sampling for alpha and beta-gamma activity. No areas of elevated radioactivity were identified in the building (TtEMI, LFR, and U&A, 1997).

In 1997, the location of former Building 529 was surveyed during the Phase III investigation (TtEMI, LFR, and U&A, 1997). The investigation consisted of a surface gamma walkover survey and collection and analysis of four surface soil samples near the former building. One elevated gamma radiation reading was observed to the southwest of the former building, between former Buildings 529 and 520 near the foundation of former Building 520. The location of the elevated gamma reading was excavated to a depth of 12 inches bgs and gamma activity increased with depth, although no source was

found. At the surface, the gamma count reading was 11,205 cpm; at 4 inches, the count was 13,130 cpm; and at 12 inches, the count was 18,394 cpm, nearly three times background. Although the gamma anomaly was located near the foundation of former Building 520, it was associated in the Phase III investigation with former Building 529, since former Building 520 was not included in the Phase III investigation. Additional investigation was recommended to evaluate the area for the potential presence of a buried radium-containing device.

No radioisotopes were reported in the soil samples at activities exceeding background, except for one sample analyzed for potassium-40 ( $^{40}\text{K}$ ), which was reported at an activity of 13 pCi/g, slightly exceeding the background activity of 10 pCi/g.

In 2002, a MARSSIM scoping survey at the location of former Building 529 during the Phase V investigation; contaminated underground piping was found in the area. Three surface soil samples were collected and analyzed at the on-site laboratory for  $^{241}\text{Am}$ ,  $^{137}\text{Cs}$ , and  $^{226}\text{Ra}$ ; one sample was also analyzed for  $^{90}\text{Sr}$ . Radionuclide activities did not exceed the release criteria in any of the three soil samples.

#### Shack 79 Site

In 2002, a MARSSIM Class 3 scoping survey was conducted at the Shack 79 Site during the Phase V investigation. Two surface soil samples were collected near the former building and analyzed at the on-site laboratory for  $^{241}\text{Am}$ ,  $^{137}\text{Cs}$ , and  $^{226}\text{Ra}$ .  $^{241}\text{Am}$  and  $^{137}\text{Cs}$  activities did not exceed the residential release criteria, with maximum reported activities of 0.236 and 0.137 pCi/g, respectively.  $^{226}\text{Ra}$  exceeded the release criterion in one of the two samples, with a maximum reported activity of 2.007 pCi/g.

#### Shack 80 Site

In 2002, a MARSSIM scoping survey was conducted at the Shack 80 Site during the Phase V investigation. Two surface soil samples were collected from a Class 3 survey unit near the former building and analyzed at the on-site laboratory for  $^{241}\text{Am}$ ,  $^{137}\text{Cs}$ , and  $^{226}\text{Ra}$ .  $^{241}\text{Am}$  activities did not exceed the residential release criterion, with a maximum reported activity of 0.269 pCi/g.  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$  exceeded the release criteria in both samples, with maximum reported activities of 39.682 and 6.156 pCi/g, respectively. Based on the results of the scoping survey, remedial actions were performed at the site.

Following remedial actions, 16 soil samples were collected from a Class 1 survey unit at the Shack 80 site.  $^{137}\text{Cs}$  exceeded the release criterion in five samples, with a maximum reported activity of 2.4293 pCi/g.  $^{226}\text{Ra}$  exceeded the release criterion in six samples, with maximum reported activity of 2.953 pCi/g. Based on the results of the Class 1 survey, additional remedial actions were performed at the site, and 16 additional samples were collected from a Class 2 survey unit to identify any potential contamination beyond the building footprint boundary.  $^{137}\text{Cs}$  exceeded the release criteria in 11 samples, with a maximum reported activity of 7.7129 pCi/g.  $^{226}\text{Ra}$  exceeded the release criteria in 12 samples, with maximum reported activity of 4.467 pCi/g.

***Redevelopment Block MU-3******Building 701 Site***

In 1991, the location of former Building 701 was surveyed during the Phase I investigation (TtEMI, LFR, and U&A, 1997). No radiological anomalies were found in the area.

In 2002, a MARSSIM scoping survey was conducted at the Building 701 Site during the Phase V investigation. Six surface soil samples were collected near the former building, and six subsurface soil samples were collected from a depth of 12 inches. Soil samples were analyzed at the on-site laboratory for  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$ .  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$  activities did not exceed the release criteria, with maximum reported activities of 0.039 and 1.206 pCi/g, respectively.

***IR-04***

In 2002, a MARSSIM scoping survey was conducted at IR-04 during the Phase V investigation. The area was divided into five survey units: three designated as a Class 1 area, encompassing up to 2,000 m<sup>2</sup> each, and two designated as a Class 2 buffer area surrounding the Class 1 areas. Sixteen soil samples were collected from each survey unit, for a total of 80 samples, and were analyzed at the on-site laboratory for  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$ .  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$  activities exceeded the release criteria in all survey units, with maximum reported activities of 1.039 pCi/g (in survey grid C) and 4.205 pCi/g (in survey grid D), respectively. Based on the results of the scoping survey, additional characterization and remedial action was recommended for the site.

***Redevelopment Blocks EOS-1 through EOS-4******Building 509 Site***

In 1997, the location of former Building 509 was surveyed during the Phase III investigation. The investigation consisted of a surface gamma walkover survey and collection and analysis of five surface soil samples and one asphalt sample near the former building. Several 1-minute gamma count measurements exceeded the background activity; however, these measurements could not be associated with an anomaly and were considered to be caused by variances in background activity. No radioisotopes were reported in the surface soil or asphalt samples at activities exceeding background, except for one sample analyzed for  $^{40}\text{K}$ , which was reported at an activity of 15 pCi/g, exceeding the background activity of 10 pCi/g. Release of the Building 509 Site was not recommended because elevated gamma readings were measured between former Buildings 509 and Building 517, which is discussed further below.

In 2002, a MARSSIM scoping survey was conducted at the location of former Building 509 as part of the Phase V investigation. Six surface soil samples were collected from a Class 3 Survey Unit near the former building and analyzed at the on-site laboratory for  $^{137}\text{Cs}$ .  $^{137}\text{Cs}$  activities did not exceed the release criterion in any of the samples, with a maximum reported activity of 0.0632 pCi/g. Statistical test applications and solid sample analysis results indicated the residual activity at the Building 509 Site met the release criteria.



### Building 510 and 510A Sites

Building 510 was first surveyed in 1955 as part of the NRDL decommissioning survey, and was released for unrestricted reuse ([NAVSEA, 2004](#)).

In 1997, the location of former Building 510 was surveyed during the Phase III investigation. The investigation consisted of a surface gamma walkover survey and collection and analysis of six surface soil samples near the former building. Several 1-minute gamma count measurements exceeded the background activity; however, these measurements could not be associated with an anomaly and were considered to be caused by variances in background activity. No radioisotopes were reported in the surface soil samples at activities exceeding background, except for one sample analyzed for  $^{40}\text{K}$ , which was reported at an activity of 11 pCi/g, slightly exceeding the background activity of 10 pCi/g. Based on the results of the Phase III investigation, the Building 510 Site was recommended to be released for unrestricted reuse.

In 1997, the location of former Building 510A was surveyed during the Phase III investigation. The investigation consisted of a surface gamma walkover survey and collection and analysis of two surface soil samples near the former building. Several 1-minute gamma count measurements exceeded the background activity; however, these measurements could not be associated with an anomaly and were considered to be caused by variances in background activity. No radioisotopes were reported in the surface soil samples at activities exceeding background. Based on the results of the Phase III investigation, the Building 510A Site was recommended to be released for unrestricted reuse.

In 2002, a MARSSIM scoping survey was conducted at the location of former Buildings 510 and 510A as part of the Phase V investigation. Five surface soil samples were collected from a Class 3 survey unit near the former buildings and analyzed at the on-site laboratory for  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$ .  $^{137}\text{Cs}$  and  $^{226}\text{Ra}$  activities did not exceed the release criteria in any of the samples, with maximum reported activities of 0.0406 and 1.644 pCi/g, respectively. Statistical test applications and solid sample analysis results indicated the residual activity at the Building 510 and 510A site met the release criteria.

### Building 517 Site

In January 1970, Building 517 was inspected and cleared by AEC for unrestricted reuse ([TtEMI, LFR, and U&A, 1997](#)).

In 1978, RASO conducted a survey consisting of alpha and beta-gamma scans and wipe sampling for alpha and beta-gamma activity. No areas of elevated radioactivity levels were identified in the building.

In 1997, the location of former Building 517 was surveyed during the Phase III investigation. The investigation consisted of a surface gamma walkover survey and collection and analysis of three surface soil samples near the former building. One gamma count measurement (9,000 cpm) slightly above background (6,500 cpm) was observed near the northeast corner of the former building. No radioisotopes

were reported in the surface soil samples at activities exceeding background, except for one sample analyzed for  $^{232}\text{thorium}$ , which was reported at an activity of 0.96 pCi/g, slightly exceeding the background activity of 0.87 pCi/g. Based on the results of the Phase III investigation, the area around the elevated gamma count reading at Building 517 was recommended to be further assessed.

In 2002, a MARSSIM scoping survey was conducted at the location of former Building 517 during the Phase V investigation. Two surface soil samples were collected near the former building and analyzed for  $^{137}\text{Cs}$  and  $^{60}\text{Co}$ . The analysis of collected field data and solid sample analysis indicated the residual activity at the Building 517 met the release criteria; however, additional soil samples were recommended because the scan minimum detectable concentration for one of the isotopes of concern could not be achieved.

#### IR-02

In 1988, Harding Lawson Associates conducted a preliminary surface radiation survey to determine if radioactivity levels at HPS posed unacceptable exposure risks to RI fieldworkers. Project activities included a surface gamma survey for radiation at surface locations at Parcel E. The surface gamma survey was conducted at predetermined on- and off-site locations to obtain background measurements, and at the nodal points of a 50- by 50-foot grid over the entire IR-02 area. Gamma readings were measured at the ground surface and at 1 meter above ground surface at each grid node and along grid lines.

An area of five anomalous gamma readings in IR-02 was also surveyed in more detail using a 10- by 10-foot grid spacing, as well as a ground scanning method (NAVSEA, 2004). Twenty-four elevated readings were detected using the 10-by-10 foot grid spacing, and 8 more were identified using the ground scanning method. Anomalies detected between grid nodes were recorded, mapped, and included in a database. Anomalously high gamma radiation readings were only observed within a portion of IR-02 Northwest, which was characterized by surface debris and machinery parts. These anomalies were observed at small, isolated locations, suggesting the presence of discrete point sources of radioactivity such as buried  $^{226}\text{Ra}$ -containing devices (Harding Lawson Associates, 1990).

In 1991, the Phase I radiological investigation was initiated to confirm the nature and extent of  $^{226}\text{Ra}$ -containing devices in the disposal area at IR-02 Northwest. The Phase I investigation consisted of the following tasks: (1) a surface gamma walkover survey to establish the extent and locations of an anomalously high gamma readings found in the survey performed by Harding Lawson Associates; (2) collection of soil samples to establish whether radioisotopes other than  $^{226}\text{Ra}$  were present at Parcel E; (3) collection of radon flux canister samples to assess the potential presence of radon gas that may be associated with  $^{226}\text{Ra}$ -containing devices; and (4) air sampling to determine whether airborne radioactive contaminants posed a health risk to workers at HPS or the surrounding community.



To conduct the surface gamma walkover survey, a local grid coordinate system was developed to map and relocate radioactive material detected during the surface walkover survey. Each grid section was 300-feet by 300-feet square, with each section further subdivided into 30-foot by 30-foot subgrids. During the Phase I SCRS, gamma readings exceeding two times the background level were considered potential radioactive point source anomalies associated with buried radium-containing devices (PRC, 1992). When elevated gamma readings were observed, the location, gamma measurements, and exposure measurements were recorded and a biased soil sample was collected to identify the radioisotopes. To provide additional characterization information, systematic soil samples were also collected at random locations throughout Parcel E at a sampling frequency of one sample per 2 acres.

During the surface walkover survey, over 300  $^{226}\text{Ra}$ -containing point sources were observed in a centralized area at IR-02 Northwest that extended approximately 50 feet across the site boundary into IR-02 Central. The anomalous area was approximately 600 feet by 600 feet in size, and was centered approximately 500 feet west of Building 600. Various  $^{226}\text{Ra}$ -containing devices were observed on the ground surface at IR-02 Northwest and were removed prior to soil sample collection. A few anomalously high gamma readings were also recorded in the intertidal area at IR-02 Northwest (PRC, 1992). Radioactive point source anomalies were not found at IR-03 or IR-11/14/15; a combination safe found at IR-11/14/15 had an anomalously high gamma activity associated with a dial on the door (PRC, 1992).

In total, 76 soil samples were collected from IR-02 within the current Parcel E boundary, and 3 soil samples were collected from IR-11/14/15. Thirteen soil samples collected from the disposal dump area at IR-02 Northwest exhibited  $^{226}\text{Ra}$  activities above background, ranging from 4 to 3,900 pCi/g.

In addition to the soil sampling, 158 radon flux canister samples were collected at ground surface locations at or near selected radioactive anomalies and other areas with elevated gamma activity. Ten of the samples were collected at IR-14, and 148 samples were collected at IR-02. Flux canister samples were analyzed for radon gas, a radioactive gas emitted into soil from the decay of  $^{226}\text{Ra}$ . The analytical results were quantified as a radon flux rate value in pCi/m<sup>2</sup>-s. Analytical results for the 158 radon flux canister samples collected at Parcel E are summarized below.

- Twenty-one samples had no detectable levels of radon gas, with radon flux rates quantified as 0 pCi/m<sup>2</sup>-s
- Seventy-eight samples exhibited very low levels of radon gas at or below the average background radon flux rate (0.17 pCi/m<sup>2</sup>-s)
- Nineteen samples exhibited low levels of radon gas within twice the average background flux rate, with radon flux rates ranging from 0.18 to 0.34 pCi/m<sup>2</sup>-s

- Five samples exhibited slightly elevated levels of radon gas within three times the average background flux rate, with radon flux rates ranging from 0.35 to 0.45 pCi/m<sup>2</sup>-s
- Thirty-five samples exhibited elevated levels of radon gas greater than three times the average background flux rate, with radon flux rates ranging from 0.47 to 74.96 pCi/m<sup>2</sup>-s

The 35 samples with elevated levels of radon gas were collected directly above areas with elevated gamma activity and were surrounded by nearby canister samples with very low or low levels of radon gas. The average radon flux rate (2.07 pCi/m<sup>2</sup>-s) measured at Parcel E during the Phase I investigation is well below the average radon emission rate (20 pCi/m<sup>2</sup>-s) specified in the Uranium Mill Tailings Radiation Control Act (40 CFR § 192.02[b][1]).

In 1991, Phase I particulate air monitoring was conducted to evaluate the background airborne particulate alpha and beta radioactivity levels at several locations, including Parcel E. Particulate air samples were collected from 35 locations at HPS, including Parcel E. The gross alpha and gross beta airborne particulate concentrations were well within safety standards for airborne concentrations of general radioactive materials in outdoor air (PRC, 1992).

In 1993, the Phase II radiological investigation was initiated at IR-02 to further investigate the distribution of <sup>226</sup>Ra-containing devices identified during the Phase I investigation. Thirty-four 15-foot-deep test pits and 3 100-foot-long trenches were excavated at IR-02. Twelve test pits and 2 trenches were found to contain a total of 111 gamma-emitting point source anomalies. In total, 96 point sources, or approximately 90 percent, of the <sup>226</sup>Ra-containing devices were found between the surface and 6.5 feet bgs. The remainder of the point sources was found distributed between 6.5 feet bgs and until Bay Mud was encountered; no point sources or elevated gamma count rates were found after Bay Mud was encountered.

Anomalous gamma count readings as high as 988,000 cpm were recorded during the investigation. Thirteen soil samples were collected from the trenches and test pits; <sup>226</sup>Ra activity in soil samples collected from the trenches and test pits ranged from 46.28 pCi/g in the sample collected from test pit IR02TP17 to 20,949 pCi/g in the sample collected from test pit IR02TP23. A total volume of approximately 6,080 cubic feet of soil and debris was excavated from the test pits and trenches during the Phase II investigation and disposed of off-site at a licensed facility. The subsurface distribution of <sup>226</sup>Ra-containing devices associated with the point sources was confined to an area approximately 400 feet by 250 feet in size, to a maximum depth of 9 feet bgs. Based on the results of the Phase II investigation, approximately 148,000 cubic feet of soil was estimated to contain radioactive sources.

Gross alpha or gross beta radioactivity was not reported above background levels during low-, medium-, and high-volume air sampling conducted during the Phase II investigation (PRC, 1996).

In 1993, EPA's National Air and Radiation Environmental Laboratory analyzed 13 soil samples from IR-02 Northwest to determine particle size, radionuclide distribution, and radionuclide content (EPA, 1994). Three of the samples exhibited elevated levels of  $^{226}\text{Ra}$ , with a maximum activity of 318 pCi/g reported in sample A, which was collected from the disposal area. The remainder of the samples exhibited  $^{226}\text{Ra}$  at activities comparable with background.  $^{226}\text{Ra}$  was found to be approximately equal between particle size fractions in some of the samples, and sometimes preferring smaller fractions, indicating contamination by oxidation or fragmentation. The study concluded that based on background activities in 10 of the samples, a significant volume of soil at IR-02 Northwest may contain background levels of  $^{226}\text{Ra}$ . The study further concluded that particle size separation could be accomplished by hydro-classification or a similar technology to remove radium sources, with removal of soil in the immediate vicinity of the radium sources.

### 2.3.1.3. Fate and Transport of Radioactive Chemicals in Soil

Radioactive chemicals, also referred to as radionuclides, are unstable and undergo spontaneous transformations at a constant rate by releasing energy until a stable state is reached. This transformation process is known as radioactive decay and is accompanied by the emission of at least one or more charged particles (for example, alpha and beta particles) or gamma rays. Alpha particles can travel only short distances and cannot penetrate human skin; the risks from alpha particles are from internal exposure of the particle from either inhalation or ingestion. Beta particles are generally absorbed in the skin and do not pass through the entire body, but in high enough quantities can cause cataracts to the lens of the eye. Gamma ray radiation can penetrate the human body with enough energy for the photon to interact with the body's cells. The table below lists the ROCs, their half-lives, and major radiations emitted when decaying (NAVSEA 2004). The radionuclides potentially present in Parcel E were either (1) buried along with excavated fill materials while increasing the footprint of HPS; (2) residue from decontamination of ships or workers; (3) residual contamination as a result of NRDL experiments or tests in structures or land areas; (4) residual contamination from shipyard operations; or (5) released into the sanitary sewers and storm drains.

| Radionuclide  | Half-Life        | Radiation Emitted During Decay           |
|---------------|------------------|------------------------------------------|
| Americium-241 | 7,370 years      | Alpha and beta particles                 |
| Cesium-137    | 30 years         | Beta particles, gamma rays               |
| Cobalt-60     | 5.3 years        | Beta particles, gamma rays               |
| Hydrogen-3    | 12.35 years      | Beta particles                           |
| Plutonium-239 | 24,100 years     | Alpha particles, x-rays                  |
| Radium-226    | 1,600 years      | Alpha and beta particles, and gamma rays |
| Strontium-90  | 29.1 years       | Beta particles                           |
| Uranium-235   | 70,400,000 years | Alpha particles, x-rays                  |

|    |                                                |                      |                                                                                                                                                                                                  |
|----|------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17 | <b>Radiological groundwater investigations</b> | <b>Section 2.3.5</b> | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Section 2.3.2, pages 2-44 through 2-48. |
|----|------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Each potential ROC is transported through the environment differently. Residual radioactivity, resulting from the disposal or discharge of radioactive material, may be present at Parcel E in soil. Residual radioactivity from soil may be transported to other secondary media; the degree of this potential transport is governed by the properties of each ROC, which are summarized briefly in [Table 4](#).

## **2.3.2. Nature and Extent of Radionuclides in Groundwater**

The groundwater data derived from the 2001/2002 and 2007 to 2009 radiological investigations, as discussed in [Section 2.2](#), were used to evaluate the nature and extent of ROCs in groundwater at Parcel E. The nature and extent evaluation presented in this section documents that an adequate amount of data exist to determine whether or not groundwater contains radionuclides at concentrations that warrant further analysis in this radiological addendum. Additional information on the nature and extent of nonradioactive chemicals in groundwater at Parcel E is presented in the Final Revised RI Report ([Barajas & Associates, 2008](#)).

### **2.3.2.1. Summary of 2001/2002 Groundwater Investigation**

The radiological groundwater investigation performed in 2001 and 2002 as part of the Phase III GDGI collected isotope-specific data from 24 A-aquifer monitoring wells within Parcel E. The investigation was intended to supplement data collected during previous investigations for radiological indicator parameters (gross alpha and gross beta) because the nonspecific results for gross alpha and gross beta did not allow the Navy to distinguish between natural and potentially site-related components of radioactivity in shallow groundwater (within what is referred to as the “A-aquifer”). [Figure 6](#) identifies the monitoring wells sampled during the 2001 and 2002 groundwater investigation.

The analytical data were evaluated by simple (nonstatistical) threshold comparisons to a fixed standard and by statistical tests comparing the site data with background data (two-sample statistical tests) and with fixed standards<sup>5</sup> (one-sample statistical tests) ([TtEMI, 2004](#)). To conduct the statistical analysis, the analytical data were compiled by study area. The data set used for IR-02 consisted of 18 wells, for a total of 36 samples, and the data set used for IR-03 consisted of 2 wells, for a total of 4 samples. The data from IR-14 were grouped with the data from IR-34 and IR-71, located in Parcel D, for a total of 6 wells and 12 samples. The statistical test results are summarized by data set as follows:

<sup>5</sup> Maximum contaminant levels (MCL) as outlined in Title 40 Code of Federal Regulations Part 141 were used as drinking water standards in the evaluation. For radionuclides other than radium and uranium, the drinking water comparison standard was calculated from the 4 mrem/year dose standard.

**IR-02**

- A simple threshold comparison of groundwater data from IR-02 for radionuclides with drinking water or other standards indicated the sum of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  activities from one well (IR02MW101A2) exceeded the drinking water standard of 5 picocuries per liter (pCi/L). Thirty samples from a total of 16 wells exhibited activities of  $^{40}\text{K}$  greater than 50 pCi/L, which is the standard for gross beta.
- Statistical testing comparing groundwater data from IR-02 and background areas indicated that the sum of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  activities statistically exceeded the background data sets using a parametric statistical test (two-sample t-test), but did not statistically exceed the drinking water standard using a one-sample t-test.
- Statistical testing comparing groundwater data from IR-02 indicated that  $^{40}\text{K}$  activities statistically exceeded the background data sets using the two-sample t-test, both including and excluding bay water samples.  $^{40}\text{K}$  activity occurs naturally in seawater at about 300 pCi/L, as beta emissions, and bay water samples collected for this investigation produced an average of 280 pCi/L for  $^{40}\text{K}$ . The arithmetic mean of  $^{40}\text{K}$  activity at IR-02 was significantly lower, at 184.2 pCi/L.
- Statistical testing comparing groundwater data from IR-02 and background areas, excluding bay samples, indicated that the site data sets for  $^{228}\text{Ac}$ ,  $^{40}\text{K}$ , and for the sum of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  activities, statistically exceeded the background data sets using a nonparametric statistical test (Wilcoxon rank sum test).

**IR-03**

- A simple threshold comparison of groundwater data from IR-03 for radionuclides with drinking water or other standards indicated the sum of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  activities from two wells (IR03MW218A2 and IR03MW218A3) exceeded the drinking water standard of 5 pCi/L. Four samples from a total of two wells exhibited activities of  $^{40}\text{K}$  greater than 50 pCi/L.
- Statistical testing comparing groundwater data from IR-03 and background areas indicated that the sum of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  activities statistically exceeded the background data sets using a two-sample t-test, but did not statistically exceed the drinking water standard using a one-sample t-test.
- Statistical testing comparing groundwater data from IR-03 indicated that  $^{40}\text{K}$  activities statistically exceeded the background data sets using the two-sample t-test, both including and excluding bay water samples.  $^{212}\text{Pb}$  activities significantly exceeded background levels, both including and excluding bay water samples.
- Statistical testing comparing groundwater data from IR-03 and background areas, excluding bay samples, indicated that the site data sets for  $^{228}\text{Ac}$ ,  $^{40}\text{K}$ ,  $^{212}\text{Pb}$ , and the sum of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  activities statistically exceeded the background data sets using the Wilcoxon rank sum test.

### Other Areas

- A simple threshold comparison of groundwater data from other areas, including IR-14, IR-34, and IR-71, for radionuclides with drinking water or other standards indicated the sum of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  activities did not exceed the drinking water standard of 5 pCi/L. Five samples from a total of four wells exhibited activities of  $^{40}\text{K}$  greater than 50 pCi/L.
- Statistical testing comparing groundwater data from other areas indicated that 125-antimony ( $^{125}\text{Sb}$ ) and thallium-208 ( $^{208}\text{Th}$ ) activities statistically exceeded the background data sets using a parametric statistical test (two-sample t-test).
- Statistical testing comparing groundwater data from other areas and background areas, including bay samples, indicated that the site data sets for the sum of  $^{125}\text{Sb}$  statistically exceeded the background data sets using the Wilcoxon rank sum test. When bay samples were excluded,  $^{125}\text{Sb}$ ,  $^{40}\text{K}$ , and  $^{208}\text{Th}$  statistically exceeded background.

The results indicated the sum of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  activities exceeded the drinking water standard at select wells in IR-02 and IR-03; however, based on the results of the one-sample statistical tests, the mean activities of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  at both IR-02 and IR-03 did not statistically exceed the drinking water standard. The investigation also concluded that naturally occurring  $^{40}\text{K}$  in seawater is the main contributor to beta emissions measured in groundwater samples from nearshore monitoring wells within Parcel E. The gross beta values historically reported for samples collected from nearshore wells were dominated by beta emissions from natural  $^{40}\text{K}$  in seawater, not beta emissions from radium isotopes. Background seawater contains the highest average activity of  $^{40}\text{K}$  (280 pCi/L, beta) of all data groups, followed by nearshore IR sites, where saltwater intrusion has resulted in brackish groundwater conditions. This intrusion has altered the composition of nearshore groundwater, with corresponding changes in the radiological quality (especially gross beta emissions). The results of the radiological groundwater investigation are detailed in the Parcel E Groundwater Summary Report ([TtEMI, 2004](#)).

#### 2.3.2.2. Summary of 2007 to 2009 Groundwater Investigation

Beginning in the first quarter 2007, groundwater samples from six A-aquifer wells in Parcel E were collected and analyzed for radionuclides as part of the BGMP. Groundwater samples were collected and analyzed on a quarterly basis through the first quarter 2009. In addition, a supplemental data collection event was conducted at Parcel E in 2008 to further evaluate the nature and extent of radionuclides in groundwater. In June and July 2008, groundwater samples were collected from an additional eight monitoring wells (seven in the A-aquifer and one in the deeper B-aquifer) and submitted to an off-site laboratory for radionuclide analyses of  $^{137}\text{Cs}$ ,  $^{226}\text{Ra}$ , and  $^{90}\text{Sr}$ . In addition, samples collected from monitoring well IR12MW14A were evaluated for  $^{239}\text{Pu}$ . In the first quarter 2009, samples were collected from 12 A-aquifer wells and analyzed for  $^{137}\text{Cs}$ ,  $^{226}\text{Ra}$ , and  $^{90}\text{Sr}$ . An additional sample was collected from monitoring well IR12MW14A for analysis of  $^{239}\text{Pu}$ . Samples from A-aquifer monitoring well IR36MW09A and B-aquifer monitoring well IR36MW123B were analyzed exclusively for  $^{226}\text{Ra}$ . No

additional radionuclide data were collected through the first quarter 2010, the most recent quarter for which data is available.

The radionuclide groundwater data collected in 2007 through 2009 were compiled as part of this radiological addendum and were evaluated, similar to the 2002 investigation, by simple (non-statistical) threshold comparisons to a fixed standard (such as drinking water standards) and by statistical tests comparing the site data to fixed standards (one-sample statistical tests), if necessary. To evaluate whether radionuclide activities exceeded drinking water standards, a tiered approach was used. Initially, the data were compiled and compared against drinking water standards using a simple threshold comparison. If the maximum activity in any of the samples exceeded the drinking water standard, a one-sample statistical test (t-test) was conducted to evaluate if the mean radionuclide activities statistically exceeded the drinking water standard.

The simple threshold comparison with drinking water standards revealed the following:

- $^{137}\text{Cs}$  was reported in 11 of the 87 samples in the data set, at activities ranging from 0.451 to 3.83 pCi/L. All reported activities were below the drinking water standard of 80 pCi/L.
- $^{239}\text{Pu}$  was not reported in any of the three samples in the data set.
- $^{226}\text{Ra}$  was reported in 15 of the 88 samples in the data set, at activities ranging from 0.482 to 1.27 pCi/L. All reported activities were below the drinking water standard of 5 pCi/L.
- $^{90}\text{Sr}$  was reported in 7 of the 37 samples in the data set, at activities ranging from 0.672 to 2.22 pCi/L. All reported activities were below the drinking water standard of 8 pCi/L.

Based on the results of the comparison, radionuclide activities in groundwater at Parcel E do not exceed drinking water standards. Since drinking water standards were not exceeded in any of the samples, the one-sample statistical test was not conducted.

### 2.3.2.3. Conclusions from Groundwater Investigations

The reported activities for radionuclides using current data, collected from 2007 to 2009, do not exceed drinking water standards. The results from the 2001/2002 investigation indicated the sum of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  activities exceeded the drinking water standard at select wells in IR-02 and IR-03; however, based on the results of the one-sample statistical tests, the mean activities of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  at both IR-02 and IR-03 did not exceed the drinking water standard. In addition, the comparison of radionuclide data from A-aquifer groundwater with drinking water standards is a conservative evaluation performed because of the lack of alternative comparison criteria. This conservative evaluation is not representative of potential exposures to future site users because, as documented in Section 2 and Appendix F of the Revised RI Report ([Barajas & Associates, Inc., 2008](#)), A-aquifer groundwater is not a potential source of drinking water. Based on the results of the comparison of radionuclide groundwater data with drinking water



standards, groundwater does not appear to have been impacted by radionuclides at concentrations that warrant further evaluation in the FS.

These findings are consistent with the HRA that, as summarized in [Table 2](#), determined that a low potential existed for radioactive contamination in Parcel E groundwater based on historical information ([NAVSEA, 2004](#)). However, the Revised RI Report concluded that nonradioactive chemicals in groundwater required remedial option analysis ([Barajas & Associates, Inc., 2008](#)). The FS Report evaluates remedial alternatives for groundwater that include monitoring, institutional controls, source removal, and containment ([ERRG, 2012](#)). As a conservative measure, future monitoring will include analysis for radionuclides in groundwater to verify the conclusions of this radiological addendum.

## 2.4. CONCEPTUAL SITE MODEL

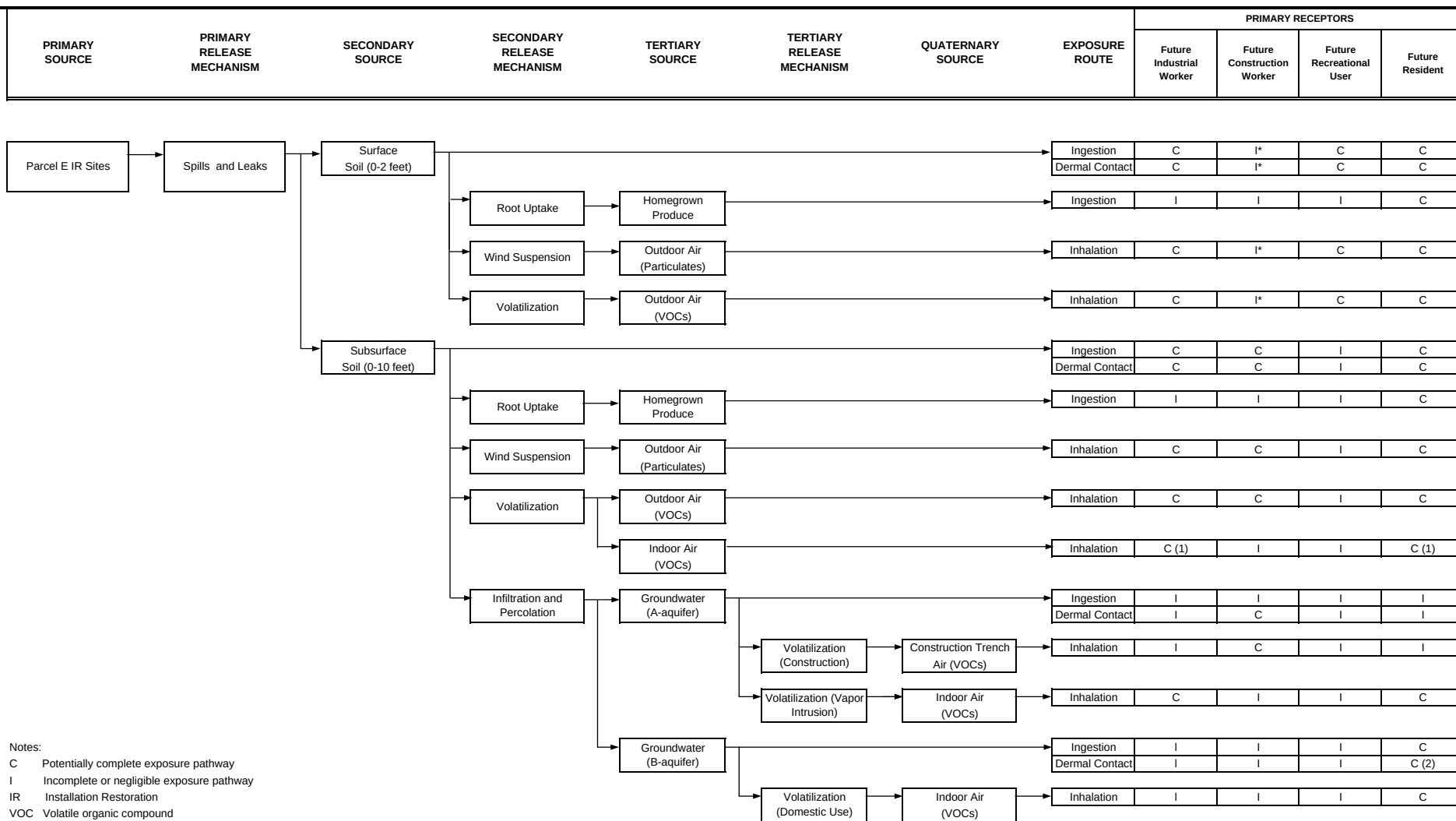
The CSM is an understanding of the dynamics of the site's environmental concerns and serves as a basis of the development of the RAO. The CSM is used to understand potential sources of contamination, migration pathways, and human receptors that the RAOs are intended to address. The conceptual site model for the nonradiological risk assessment is described in Section 2.4 of the Final Parcel E FS Report ([ERRG, 2012](#)). This section summarizes the CSM specific to the radiological risk assessment, and is discussed in detail in Section B3 of [Appendix B](#). The radiological CSM summarizes the sources of radioactive chemicals on site and presents the affected environmental media, the potential receptors, and potential exposure pathways through which receptors may receive radiological doses.

The computer code RESRAD Model Version 6.5 (Argonne National Laboratory [[ANL](#)], 2009) was used to perform dose and risk modeling of radiologically impacted sites at Parcel E. RESRAD was used to model the risk associated with radiologically impacted soil areas. RESRAD uses the isotopes specified as ROCs and automatically includes the long-lived daughter products of these isotopes. RESRAD incorporates various exposure pathways, and the user has the option of selecting or excluding specific pathways based upon the anticipated receptors, activities, and land use patterns. The radiological CSM for Parcel E is presented on Figure B-1 of [Appendix B](#) and indicates which pathways were considered active in the radiological risk assessment. Radiological pathways that are not active for this analysis are excluded from the CSM.

### 2.4.1. Sources of Site Contaminants

Details on the historical activities at Parcel E that contributed to the existing radiological contamination are presented in [Section 2.1](#) of this addendum. The primary potential sources of radiological contamination at Parcel E are past shipyard and NRDL operations, decontamination of ships that participated in atomic weapons testing, and the disposal of radioluminescent devices.





- Notes:
- C Potentially complete exposure pathway
  - I Incomplete or negligible exposure pathway
  - IR Installation Restoration
  - VOC Volatile organic compound
  - \* See subsurface soil exposure pathways
  - (1) Complete exposure pathway, but not evaluated in the HHRA. The Navy plans to complete a focused soil gas survey to address this pathway prior to finalizing the Feasibility Study for Parcel E, as necessary.
  - (2) Addressed in Uncertainty Analysis (see Section 19.0)



Hunters Point Shipyard, San Francisco, California  
U.S. Department of the Navy, BRAC PMO West, San Diego, California

### FIGURE I-1 CONCEPTUAL SITE MODEL

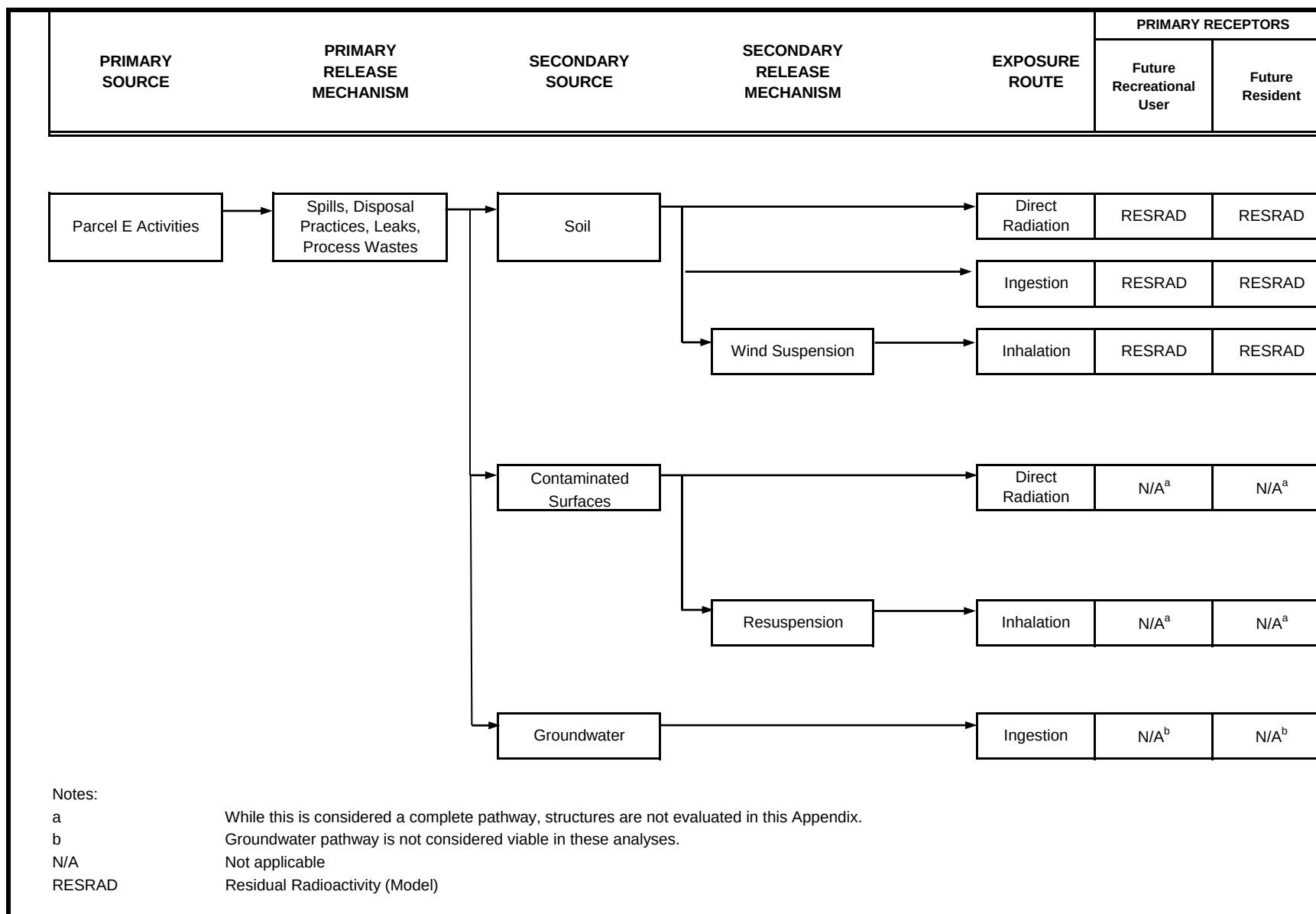
Revised Remedial Investigation Report for Parcel E

**18 CSM for human health Section 2.5.1**

Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Appendix I, Figure I-1.

Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix B, Figure B-1.

**Figure B-1. Conceptual Site Model**



|    |                   |               |                                                                                                                                                                                                                                                                                                                                                                                         |
|----|-------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19 | Quantitative HHRA | Section 2.5.1 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Appendix I, pages I-15 through I-22.<br><br>Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix B, pages B-11 and B-12. |
|----|-------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Tables I1-1, I1-2, I1-3, and I1-4 of [Attachment I1](#) present analytical data summary statistics for each total risk COPC. Tables I2-1, I2-2, I2-3, and I2-4 of [Attachment I2](#) present analytical data summary statistics for each incremental risk COPC. Tables I3-1 through I3-8 of [Attachment I3](#) list the COPCs for groundwater and present analytical data summary statistics for each groundwater COPC. In these tables, statistics are developed separately for each grid with analytical data.

## 15.0 EXPOSURE ASSESSMENT

An exposure assessment identifies potential human receptors that could be exposed to site-related chemicals, as well as the routes, magnitude, frequency, and duration of the potential exposures. The principal objective of this evaluation is to identify reasonable maximum exposures (RME). As defined by [EPA \(1989\)](#), the RME is the maximum exposure that is reasonably expected to occur at a site. The potential human receptors and potentially complete exposure pathways for the identified receptors were presented in [Section I3.0](#), Conceptual Site Model. The remainder of this section describes the process used to estimate EPCs and to quantify pathway-specific RME chemical intakes for each receptor. Central tendency exposures were not evaluated in this revised baseline HHRA.

### 15.1 EXPOSURE POINTS AND EXPOSURE POINT CONCENTRATIONS

Potential exposure points are identified based on anticipated population activity patterns and the relationship of the activities to the presence of contaminated media. A location is identified as an exposure point if a human might contact (for example, ingest) a contaminated medium (for example, soil) at that location. For evaluation of exposures to soil and exposure to groundwater not associated with risk plumes, each residential and industrial grid was considered a separate exposure point for this HHRA. For each of the groundwater risk plumes, the area encompassed by each risk plume (see [Attachment I3](#) to this appendix) was considered a separate groundwater exposure point. Potential exposure to COPCs is assumed to occur uniformly throughout each exposure point.

The concentration in the medium (for example, subsurface soil) that a receptor may be exposed to is called the EPC. EPCs were calculated for all COPCs in all media sampled: surface soils (0 to 2 feet bgs), subsurface soils (0 to 10 feet bgs), A-aquifer groundwater, and B-aquifer groundwater. The methods used to calculate EPCs for soil and groundwater are described below in [Sections I5.1.1 and I5.1.2](#), respectively.

As shown in the conceptual site model (see [Figure I-1](#)), chemicals in soil may be transferred to outdoor air from wind erosion or volatilization, or to vegetation from root uptake. Chemicals in groundwater may be transferred to outdoor air in a construction trench from volatilization, indoor air from vapor intrusion, and indoor air from volatilization of groundwater during

domestic use. Sample data for outdoor and indoor air, and vegetation were not available for Parcel E. EPCs in outdoor air (from particulate and volatile chemicals in soil), indoor air (from groundwater vapor intrusion and volatilization), outdoor air in a construction trench (from volatile chemicals in groundwater), and homegrown produce (from root uptake of chemicals in soil) were estimated using the methods described in [Section I5.1.3](#).

#### **I5.1.1 EPCs for Soil**

The 95 percent upper confidence limit (95 UCL) of the arithmetic mean was used as the EPC for each soil COPC, unless the maximum value was less than the 95 UCL, in which case, the maximum concentration was used as the EPC. The 95 UCL for each soil COPC in each grid was calculated using the following methodology. This methodology is consistent with the approach used for the soil HHRA in the Draft Final RI Report for Parcel E ([PRC, LFR, and U&A 1997](#)), and follows the methodology recently re-established for soil HHRAs for HPS ([Tetra Tech 2003; Navy 2004](#)):

- Statistical testing was conducted to determine data distribution for sample sizes with a minimum of four samples and four detections. For samples sizes less than 50 with at least four detections, the Shapiro-Wilk W-test was used to determine the distribution of the data. For sample sizes greater than or equal to 50 with at least four detections, the D'Agostino test was used to determine the distribution of the data.
- For data found to be normally or lognormally distributed, 95 UCLs were calculated using [EPA \(1992\)](#) guidance.
- If distribution testing showed that data follow a non-parametric distribution, then a 95 UCL was calculated for both a normal and lognormal distribution following EPA guidance ([EPA 1992](#)) and the higher of the two 95 UCL values was selected as the representative 95 UCL.
- For samples sizes with less than four samples, distribution testing was not conducted and the maximum concentration was used as the EPC.

In accordance with EPA guidance, one-half of the reporting limit was used as a proxy value for nondetectable (below the reporting limit) results in calculating the 95 UCL concentration ([EPA 1989](#)). EPCs for each total risk assessment COPC in surface soil and subsurface soil are shown in [Tables I1-1, I1-2, I1-3, and I1-4](#) of [Attachment I1](#). EPCs for each incremental risk assessment COPC in surface soil and subsurface soil are shown in [Tables I2-1, I2-2, I2-3, and I2-4](#) of [Attachment I2](#). These tables also present the results of the distribution testing for each COPC and the calculated 95 UCLs.

Although more recent guidance regarding calculation of EPCs is available (see [Section I5.1.2](#)), the previous guidance provided by [EPA \(1992\)](#) was used to calculate EPCs for soil in this revised HHRA in accordance with the recent methodology established for soil HHRAs for HPS ([Tetra Tech 2003; Navy 2004](#)). In many cases, because of the relatively few sample points and

detections for each grid (that is, less than four samples and four detected results), the maximum concentration is used as the EPC, resulting in a conservative estimate of potential risks.

### **I5.1.2 EPCs for Groundwater**

Separate EPCs for groundwater were developed to evaluate exposure areas associated with risk plumes and exposure areas not associated with risk plumes (see [Section I4.3.2](#)). To evaluate exposures associated with the groundwater risk plumes, the lesser of the 95 UCL or maximum concentration was used as the EPC for each COPC present in each risk plume. The methods used to calculate 95 UCLs for each risk plume are described below. [Tables I3-1 through I3-8 of Attachment I3](#) present analytical data summary statistics for each risk plume-based exposure area.

For exposure areas not associated with risk plumes (that is, for areas with monitoring wells that do not fall within the risk plume boundaries delineated in [Attachment I3](#)), the maximum detected concentration was used as the EPC. [Tables I3-9, I3-10, and I3-14 of Attachment I3](#) present analytical data summary statistics, including maximum concentrations (EPCs), for exposure areas not associated with risk plumes.

The methods used to calculate EPCs for groundwater associated with risk plumes is based on “Calculating Exposure Point Concentrations at Hazardous Waste Sites” ([EPA 2002b](#)) and *ProUCL Version 3.0 User Guide* ([Singh, Singh, and Maichle 2004](#)). Because the groundwater data set for the HHRA consisted of samples collected over a number of years (that is, the last 12 rounds of sampling), to reduce the influence of historical nondetected results on the EPCs, only detected results were used for calculation of the EPCs for groundwater. Nondetected results (that is, U-qualified data), were not included in the EPC calculation. For data sets with fewer than six samples, statistical estimations lack statistical power and cannot be confidently estimated ([EPA 2000](#)). Therefore, the maximum detected concentration was used as the EPC for data sets with fewer than six detections, rather than six samples. A 95 UCL was used as the EPC for COPCs in groundwater associated with risk plumes for data sets consisting of six or more detections. The following methods were used to calculate the underlying distribution for each chemical, population summary statistics, and EPCs.

**Distribution tests:** Distribution testing was conducted for all samples with at least six measurements. Formal tests were conducted using well-established goodness-of-fit tests. The Shapiro-Wilk W-Test ( $n \leq 50$ ) and Lilliefors Test ( $n > 50$ ) were used to evaluate normal and lognormal distributions. The Anderson-Darling and Kolmogorov-Smirnov Test were used to evaluate gamma distributions ([Singh, Singh, and Maichle 2004](#); [EPA 2002b](#)). A Type I error rate ( $\alpha$ ) of 0.05 (equivalent to 5 percent) was used to interpret the significance of each test. A Type I error rate of 0.05 means that there is a 5 percent chance that the null hypothesis will be rejected when it is true, thus leading to the false conclusion.

Chemical data confirmed as following a normal, lognormal, or gamma distribution based on the outcome of the two goodness-of-fit tests are listed as “normal (N)”, “lognormal (L),” or “gamma (G)” in the summary tables (see [Tables I3-1 through I3-8 and I3-11 through I3-13 of Attachment I3](#)). Chemical data that were not confirmed as following one of these three distributions are listed as “nonparametric (NP)” in the summary tables.

**Calculation of Population Parameters and Selection of the EPC:** The one-sided UCLs on the mean were calculated for chemicals with at least six samples. Recommendations in [Singh, Singh, and Maichle \(2004\)](#) are based on three properties measured for individual samples: (1) best-fit distribution, (2) relative degree of skewness, and (3) relative sample size. The recommendations for calculating an EPC for normal, gamma, lognormal, and nonparametric distributions are provided by the ProUCL software ([EPA 2004b](#)). EPCs for data that follow a normal distribution or that exhibit low skewness (standard deviation of the natural logarithms of the data less than 0.50) are based on calculation of a UCL using the Student’s t- statistic. After a sample-by-sample evaluation of the three properties described above, a UCL is calculated based on one of the parametric or nonparametric methods listed below.

| Parametric Methods                                       | Nonparametric Methods    |                                |
|----------------------------------------------------------|--------------------------|--------------------------------|
| Student's t UCL                                          | Chebyshev inequality UCL | Central Limit Theorem          |
| Approximate gamma UCL                                    | Bootstrap t UCL          | Modified-t statistic           |
| Adjusted gamma UCL                                       | Hall's bootstrap UCL     | Adjusted-Central Limit Theorem |
| Land's H-UCL                                             | Modified-t UCL           | Percentile bootstrap           |
| Minimum Variance                                         | Standard Bootstrap UCL   | Jackknife UCL                  |
| Unbiased Estimator (Minimum Variance Unbiased Estimator) |                          |                                |
| Chebyshev UCL                                            |                          |                                |

The UCL calculated using the Minimum Variance Unbiased Estimator Chebyshev or nonparametric Chebyshev method can be based on a 95, 97.5, or 99 percent one-sided UCL. The 95 UCLs calculated for groundwater are shown in [Tables I3-1 through I3-8 and I3-11 through I3-13 of Attachment I3](#). These tables also present the results of the distribution testing for each chemical. If the calculated 95 UCL was greater than the maximum concentration, then the maximum concentration was used as the EPC.

### I5.1.3 Exposure Point Concentrations for Media Not Sampled

As discussed in [Sections I3.0 and I5.1](#), COPCs in soil and groundwater may be transferred to outdoor air, indoor air, and vegetation (homegrown produce) from the following transfer mechanisms:

- Wind erosion of particulate chemicals from soil to outdoor air
- Volatilization from soil to outdoor air

- Vapor intrusion from groundwater to indoor air
- Volatilization from groundwater to indoor air during domestic use
- Volatilization from groundwater to outdoor air in a construction trench
- Uptake of chemicals in soil through plant roots into homegrown produce

Samples were not collected for outdoor air, indoor air, or vegetation at Parcel E. In the absence of direct measurements of chemical concentrations in air and vegetation, models were used to estimate EPCs in outdoor air, indoor air, and homegrown produce as a result of the above transfer mechanisms. These models are discussed below. EPCs for indoor air as a result of vapor intrusion of groundwater and volatilization from domestic use of groundwater were not calculated because a risk-based screening assessment was used to quantify risks from exposure to COPCs in groundwater (see [Section I7.2](#)).

#### **15.1.3.1 Outdoor Air – Particulate COPCs Released from Soil**

EPCs of particulates released from soil to outdoor air were estimated using soil EPCs as the source term and the methodology provided by EPA Region 9 in its memorandum describing the derivation of PRGs ([EPA 2004a](#)). To derive the EPCs in outdoor air, the EPC for soil was multiplied by the reciprocal of the [EPA \(2004a\)](#) default particulate emission factor of 1.316E+09 cubic meters per kilogram, which is a non-chemical-specific value that relates chemical concentrations in soil to airborne concentrations that may be inhaled.

#### **15.1.3.2 Outdoor Air – Volatile COPCs Released from Soil**

Chemical-specific volatilization factors, which relate concentrations of volatile chemicals in soil to airborne concentrations that may be inhaled, were used to estimate concentrations in outdoor air from volatile COPCs in soil. Volatilization factors were taken from the EPA Region 9 guidance ([EPA 2004a](#)) and are summarized in [Table I-2](#). To estimate EPCs in outdoor air, the soil EPC was multiplied by the reciprocal of the volatilization factor.

#### **15.1.3.3 Indoor Air – Vapor Intrusion of Volatile COPCs in Groundwater**

Subsurface vapor intrusion of volatile COPCs in groundwater into a hypothetical residential or standard industrial building was evaluated for the industrial and residential exposure scenarios. A risk-based screening assessment was used to calculate risks from groundwater vapor intrusion, based on groundwater EPCs developed for each A-aquifer risk plume and non-plume exposure area, and risk-based screening levels (RBSL) for groundwater vapor intrusion provided in [EPA \(2002a\)](#) guidance. [Section I7.2](#) provides further details on this approach. Because a risk-based screening assessment approach was used to evaluate groundwater vapor intrusion, EPCs were not modeled for indoor air from EPCs in groundwater.

#### **15.1.3.4 Indoor Air – Volatilization of COPCs in Groundwater during Domestic Use**

Volatilization of volatile COPCs in groundwater into household air during domestic use of groundwater was evaluated for the residential exposure scenario, based on groundwater EPCs developed for the B-aquifer. A risk-based screening assessment was used to calculate risks from domestic use of groundwater, based on groundwater EPCs and PRGs for tap water developed by EPA Region 9 ([EPA 2004a](#)). [Section 17.2](#) provides further details on this approach. Because a risk-based screening assessment approach was used to evaluate risks from domestic use of groundwater, EPCs were not developed for indoor air based on volatilization of COPCs in groundwater during domestic use.

#### **15.1.3.5 Outdoor Air – Volatile COPCs Released from Groundwater in a Construction Trench**

Chemical-specific volatilization factors that relate concentrations of volatile chemicals in groundwater accumulated in a construction trench to airborne concentrations that may be inhaled by construction workers were used to estimate EPCs from volatile COPCs in groundwater. Calculation of the volatilization factors for this scenario were based on guidance from [Virginia Department of Environmental Quality \(2005\)](#), which provides a combination of a vadose zone model to estimate volatilization of gaseous COPCs from groundwater into a trench, and a box model to estimate dispersion of the COPCs from the air inside the trench into aboveground air. A full description of the models used to estimate volatilization into a construction trench is provided in [Attachment I5](#) to this appendix.

#### **15.1.3.6 Homegrown Produce – Uptake of COPCs in Soil through Plant Roots**

Ingestion of COPCs that are transferred from soil to homegrown produce via uptake through plant roots was evaluated for the residential exposure scenario. Direct measurements of chemical concentrations in homegrown produce are not available for Parcel E because homegrown produce is not currently grown at Parcel E. EPCs for homegrown produce were calculated based on EPCs for COPCs in soil and soil-to-plant uptake factors (UF) that estimate the root uptake of inorganic and organic chemicals in soil and translocation of chemicals to edible plant parts ([U.S. Department of Energy 1984](#)). [Table I-3](#) lists the UFs for each COPC in soil.

For inorganic COPCs, UFs were obtained from [U.S. Department of Energy \(1984\)](#). To estimate EPCs in homegrown produce from inorganic COPCs, the soil EPC was multiplied by the UF.

For nonvolatile organic COPCs, equations from Cal/EPA were used to derive the UFs ([Cal/EPA 2003](#)). These equations relate the octanol-water partition coefficient ( $K_{ow}$ ) and the organic carbon-water partition coefficient ( $K_{oc}$ ) of the contaminant and the fraction of organic carbon ( $F_{oc}$ ) in the soil to calculate the UF. The equation used to calculate the UF is as follows:



$$UF = \frac{(0.03 \times K_{ow}^{0.77}) + 0.82}{(K_{oc})(F_{oc})} \quad (I-1)$$

where

|          |   |                                                                         |
|----------|---|-------------------------------------------------------------------------|
| $UF$     | = | Soil-to-plant uptake factor                                             |
| $K_{ow}$ | = | Octanol-water partition coefficient (cubic centimeters per gram)        |
| $K_{oc}$ | = | Organic carbon-water partition coefficient (cubic centimeters per gram) |
| $F_{oc}$ | = | Fraction organic carbon in soil (unitless)                              |

$F_{oc}$  was assumed to be 0.1, a value appropriate to soil used for the production of food crops (Cal/EPA 2003). If  $K_{oc}$  values are unavailable, they were estimated based on chemical-specific  $K_{ow}$  values using the following equation (Lyman and others 1990):

$$\text{Log } K_{oc} = \text{log } K_{ow} - 0.21 \quad (I-2)$$

Consistent with EPA guidance, a correction factor was applied to lipophilic COPCs (EPA 1998). For this HHRA, lipophilic chemicals were defined as PCBs, PAHs, pesticides, and semivolatile organic compounds. EPA (1998) recommends a correction factor of 0.01 for lipophilic COPCs (log  $K_{ow}$  greater than 4); that is, for lipophilic COPCs, the UF calculated using Equation I-1 should be multiplied by the correction factor of 0.01 to calculate a corrected UF. For COPCs with a log  $K_{ow}$  less than 4, EPA does not recommend use of a correction factor. Table I-3 lists the UFs for nonvolatile organic COPCs derived using the above equations and the values and sources of the chemical data used to derive the UFs.

Risks associated with VOCs were not evaluated in the homegrown produce pathway. VOCs are typically low-molecular-weight chemicals that do not persist or bioaccumulate in the environment (EPA 1994b). In addition, VOCs are expected to be lost during soil tilling, planting, and food preparation activities such as peeling, cooking, and cleaning.

## **I5.2 CHEMICAL INTAKE ESTIMATES**

Estimates of exposure are based on the EPCs (as described in Section I5.1) and scenario-specific assumptions and intake parameters. Consistent with EPA guidance (EPA 1995), exposure estimates (intakes) were calculated for an RME scenario for each receptor and exposure pathway and are expressed in terms of milligrams of chemical per kilogram body weight per day (mg/kg-day). The RME represents the highest exposure reasonably expected to occur and is calculated using the 95 UCL and the RME exposure parameters.

EPA-derived exposure algorithms were used to estimate the chemical intakes for each route of exposure. Equation I-3 is a generic equation for calculating chemical intake as follows (EPA 1989):

$$I = \frac{C \times CR \times EF \times ED}{BW \times AT} \quad (I-3)$$

where

|    |   |                                                                                                                                                                                                                                                                                                                                     |
|----|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I  | = | Intake: the amount of chemical at the exchange boundary (mg/kg-day)                                                                                                                                                                                                                                                                 |
| C  | = | Chemical concentration: the EPC (for example, mg/kg for soil)                                                                                                                                                                                                                                                                       |
| CR | = | Contact rate: the amount of contaminated medium contacted per unit of time or event; may be the ingestion rate, inhalation rate, or dermal contact rate (for example, milligram per day for the ingestion rate of soil)                                                                                                             |
| EF | = | Exposure frequency: how often the exposure occurs (days per year)                                                                                                                                                                                                                                                                   |
| ED | = | Exposure duration: the number of years in which a receptor comes in contact with the contaminated medium (years)                                                                                                                                                                                                                    |
| BW | = | Body weight: the average body weight of the receptor over the exposure period (kilograms)                                                                                                                                                                                                                                           |
| AT | = | Averaging time: the period over which exposure is averaged (days); for carcinogens, the averaging time is 25,550 days on the basis of a lifetime exposure of 70 years (average life expectancy), and for noncarcinogens, the averaging time is equal to the exposure duration multiplied by the number of days in a year (365 days) |

Pathway-specific variations of Equation I-3 were used to calculate intakes of COPCs in soil for residential, industrial, recreational, and construction worker receptors, and COPCs in groundwater for construction worker receptors. [Tables I-4 through I-9](#) present the pathway-specific equations and receptor-specific exposure assumptions used to calculate intakes. The calculation of chemical intake for the dermal contact with soil exposure pathway (all receptors) requires chemical-specific dermal absorption factors; these factors are shown in [Table I-2](#). The calculation of chemical intake for the dermal contact with groundwater exposure pathway (construction worker) requires chemical-specific permeability constants; these factors are shown in [Table I-10](#).

Chemical intakes from groundwater exposure pathways for residential receptors (ingestion, inhalation during household use, and vapor intrusion) and industrial receptors (vapor intrusion) were not calculated because a risk-based screening assessment was used to quantify risks from exposure to COPCs in groundwater for these receptors (see [Section I7.2](#)).

## Section B5. Exposure Assessment

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An exposure assessment identified potential human receptors that could come into contact with radiologically impacted areas, as well as the exposure routes, magnitude, frequency, and duration of the potential exposures. The principal objective of this evaluation is to identify reasonable maximum exposures (RMEs). As defined by [EPA \(1989\)](#), the RME is the maximum exposure that is reasonably expected to occur at a site. The potential human receptors and potentially complete exposure pathways for the identified receptors were presented in [Section B3](#), Conceptual Site Model. The remainder of this section describes the process used to estimate exposure point concentrations (EPCs) and to quantify pathway-specific RME radiological exposures for each receptor.

The nonradiological HHRA in the Revised Final Parcel E RI Report provides both total and incremental risk associated with chemical constituents ([Barajas & Associates, Inc., 2008](#)). To combine nonradiological risk and radiological risk, the same approach used in the RI Report to calculate chemical risk must be taken; namely, calculating total risk from ROCs inclusive of background and calculating incremental risk from the ROCs present at levels that do not include background. Consistent with EPA and Navy guidance, both total and incremental risk were evaluated.

### B5.1. EXPOSURE POINTS AND EXPOSURE POINT CONCENTRATIONS

Similar to the nonradiological HHRA, exposure points are identified based on anticipated population activity patterns and the relationship of the activities to the presence of contaminated media. For this radiological risk evaluation, each of the individual radiologically impacted sites for which data are available was considered a separate exposure point. Soil radiological data from each of the survey units collected during the Phase V investigation, along with data collected during the Phase I investigation, were grouped into individual data sets. The summary statistics for each radiologically impacted site for which data are available are presented in [Table B-4](#).

Sample locations that have been physically removed during the time-critical removal actions at IR-02 Northwest and Central, the IR-02 Southeast Metal Debris Reef Area, and the Polychlorinated Biphenyl Hot Spot Area were removed from each data set.

**B5.2. RESRAD**

Radiological dose and risk were estimated for each of the radiologically impacted sites for which data are available. Individual RESRAD runs were conducted for each site, using the maximum reported activity of each ROC evaluated during the Phase V and Phase I investigations. [Table B-5](#) presents the modeled dose and risk estimates for the receptors for each site, based upon anticipated reuse. For residential and recreational receptors, the risk values presented in [Table B-5](#) are the sum of the risk for the adult and child receptors, as carcinogenic risk is cumulative. The dose values presented are the higher of the adult and child receptors. The RESRAD modeling runs are presented in [Attachment B1](#). [Table B-6](#) presents the modeled dose and risk estimates for each site, based on residential reuse.

To estimate the incremental risk from impacted soil areas, background concentrations of the ROCs were subtracted from the maximum activity values. As indicated in [Section B4](#), sample results from the reference areas indicated mean background levels of 0.049 pCi/g for  $^{137}\text{Cs}$ , 0.818 pCi/g for  $^{226}\text{Ra}$ , and 0.18 pCi/g for  $^{90}\text{Sr}$ . To estimate the total radiological risk, the maximum activity values were used as the EPC, without subtracting the background values.

The current methodology for assessing risks from exposure to dioxins, furans, and dioxin-like PCBs involves application of TEFs to measured concentrations to calculate a toxicity equivalency quotient (TEQ), rather than use of TEFs to calculate adjusted cancer SFs. The uncertainties associated with the TEF methods applied in this HHRA on the risk results are discussed in [Section I9.6](#).

## **I6.5 LEAD**

No RfD or SF is currently available for evaluating health risks from exposure to lead. Therefore, the HHRA evaluated the potential for human health effects from exposure to lead by comparing EPCs for lead with (1) a HPS-specific risk-based concentration for lead for residential and recreational receptors and (2) the EPA Region 9 industrial PRG for lead for industrial and construction worker receptors. [Section I7.4](#) and [Attachment I6](#) detail the methodology used to evaluate lead.

## **I7.0 RISK CHARACTERIZATION METHODS**

The final step in this revised baseline HHRA is the characterization of the potential risks associated with exposure to COPCs. Risks from exposure to soil for all receptors and from construction worker exposure to groundwater were characterized using the methodology provided in [EPA \(1989\)](#) risk assessment guidance for Superfund sites; [Section I7.1](#) details this methodology. Risks from industrial and residential exposure to groundwater were characterized using a risk-based screening assessment approach; [Section I7.2](#) presents this methodology. [Section I7.3](#) discusses interpretation of hazard and risk levels. [Section I7.4](#) discusses the risk characterization approach for lead. The results of the risk characterization for Parcel E are presented in [Section I8.0](#).

### **I7.1 RISK CHARACTERIZATION FOR SOIL EXPOSURES AND CONSTRUCTION WORKER EXPOSURE TO GROUNDWATER**

The general methodology for estimating cancer risks and HIs for soil exposures for all receptors and construction worker exposure to groundwater follows the methodology provided in [EPA \(1989\)](#) guidance and is presented in [Section I7.1.1](#) for cancer risks and in [Section I7.1.2](#) for noncancer health hazards.

#### **I7.1.1 Characterization of Cancer Risks**

Risks associated with exposure to chemicals classified as carcinogens are estimated as the incremental probability that an individual will develop cancer over a lifetime as a direct result of an exposure ([EPA 1989](#)). The estimated risk is expressed as a unitless probability.

Three steps are used in estimating cancer risks for chemicals classified as carcinogens. First, the chemical intake is multiplied by the chemical-specific SF to derive a cancer risk estimate for a single chemical and pathway. The calculation is based on the following relationship:

$$\text{Chemical-Specific Cancer Risk} = \text{Intake (mg/kg-day)} \times \text{SF (mg/kg-day)}^{-1} \quad (\text{I-4})$$

Second, the individual chemical cancer risks are assumed to be additive to estimate the cancer risk associated with exposure to multiple carcinogens for a single exposure pathway, as follows:

$$\text{Pathway-Specific Cancer Risk} = \sum \text{Chemical-Specific Cancer Risk} \quad (\text{I-5})$$

Third, pathway-specific risks are summed for each receptor to estimate the total cancer risk. For exposures scenarios for which both an adult and child receptor are evaluated (that is, residential and recreational), the estimated cancer risk is based on the sum of the risk estimated for the adult receptor plus the child receptor. Hence, for the residential receptor, the estimated cancer risk is based on the sum of the risk estimated for the adult resident and the child resident. Likewise, for the recreational receptor, the estimated cancer risk is based on the sum of the risk estimated for the adult recreational user and the child recreational user.

### 17.1.2 Characterization of Noncancer Hazards

The potential for exposure that may result in adverse health effects other than cancer is evaluated by comparing the intake with an RfD for chemicals that are not classified as carcinogens and for those carcinogens known to cause adverse health effects other than cancer. A three-step approach is used as described below:

Calculate a chemical-specific hazard quotient (HQ) based on the following equation:

$$\text{Hazard Quotient} = \frac{\text{Intake (mg/kg-day)}}{\text{RfD (mg/kg-day)}} \quad (\text{I-6})$$

Next, sum the HQs for all chemicals to evaluate the potential for noncancer health effects from simultaneous exposure to multiple chemicals, yielding an HI as follows:

$$\text{Hazard Index} = \sum \text{HQ} \quad (\text{I-7})$$

Third, sum pathway-specific HIs to estimate a total HI for each receptor.

The total noncancer HI for the residential and recreational receptors is based on the total HI estimated for the child receptor because the intake for children of soil, groundwater, and air per unit body mass is higher (hence, noncancer HIs for a child receptor are always higher than noncancer HIs for an adult receptor for similar exposures).

## 17.2

### RISK CHARACTERIZATION FOR RESIDENTIAL AND INDUSTRIAL EXPOSURE TO GROUNDWATER

Residential and industrial receptors were evaluated for exposure to groundwater from vapor intrusion. Residential receptors were also evaluated for exposure to groundwater from domestic use. Based on agreement between the EPA, DTSC, and [Navy \(2004\)](#), the assessment of risks from these exposure pathways is based on a risk-based screening assessment.

The risk-based screening assessment is a streamlined approach that uses the ratio of EPCs to RBSLs. For this HHRA, the EPA Region 9 PRGs for tap water were used as RBSLs to calculate cancer risks and noncancer HIs from residential exposure to B-aquifer groundwater from domestic use ([EPA 2004a](#)). Screening levels for groundwater vapor intrusion were used to estimate cancer risks and HIs from residential and industrial exposure to A-aquifer groundwater ([EPA 2002a](#)). Both the EPA tap water PRGs and screening levels for groundwater vapor intrusion are risk-based concentrations that correspond to a cancer risk of 1E-06 or an HI of 1 based on standardized equations that combine standard exposure assumptions and EPA toxicity values.

The risk estimates developed using the risk-based screening approach represent the risk for all exposure pathways evaluated by the RBSLs (that is, the tap water PRGs and groundwater screening levels for groundwater vapor intrusion). These risk estimates are numerically equivalent to risk estimates obtained using the [EPA \(1989\)](#) “forward calculation methodology,” which involves calculating risks using contaminant concentrations, exposure assumptions, and toxicity values (see [Section I6.0](#)), if the exposure pathways and assumptions used to derive the RBSLs are the same as those used in the forward calculations.

The EPA tap water PRGs were used as RBSLs in this HHRA to evaluate domestic use of groundwater for the residential receptor ([EPA 2004a](#)). The tap water PRGs are used to evaluate residential exposure to groundwater from ingestion and from inhalation of VOCs released from groundwater to indoor air during household use. The PRGs do not account for exposure from dermal contact with groundwater; [Section I9.4](#) addresses the uncertainties associated with exclusion of this exposure pathway on the risk results.

Screening levels for groundwater vapor intrusion provided in Table 2c of EPA’s “Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)” ([EPA 2002a](#)) were used to evaluate cancer risks and noncancer hazards from groundwater vapor intrusion. The following factors were considered in the use of the [EPA \(2002a\)](#) screening levels for groundwater vapor intrusion in the risk-based screening assessment for groundwater:

- The screening levels provided in Table 2c of [EPA \(2002a\)](#) risk assessment guidance for Superfund sites are based on generic attenuation factors that assume minimum reduction of contaminant concentrations due to diffusive, advective, and other attenuating mechanisms. These conditions are similar to groundwater and soil conditions at HPS, where groundwater is relatively shallow and vadose zone soils are fairly coarse (see [Section 3.0](#) of the Revised Parcel E RI Report).
- The screening levels provided in Table 2c of [EPA \(2002a\)](#) risk assessment guidance for Superfund sites for some chemicals are based on federal maximum contaminant levels; for these chemicals, an RBSL was calculated following the methodology provided in [EPA \(2002a\)](#) guidance for deriving screening levels for vapor intrusion, and the calculated screening level was used in lieu of the maximum contaminant level.
- The screening levels provided in Table 2c of [EPA \(2002a\)](#) risk assessment guidance for Superfund sites are considered protective of residential exposure. For evaluation of industrial exposures, vapor intrusion screening levels were calculated using the methodology provided in [EPA \(2002a\)](#) guidance and the assumptions provided in [Table I-6](#) of this appendix for industrial worker exposure to air.

[Section I6.0](#) discusses the hierarchy toxicity criteria used in the HHRA; [Tables I-11 and I-12](#) list the toxicity criteria for each COPC. The [EPA \(2004a\)](#) Region 9 PRGs for tap water and [EPA \(2002a\)](#) screening levels for groundwater vapor intrusion were recalculated for this HHRA to be based on the same toxicity criteria listed in these tables; methodologies provided by [EPA \(2004a, 2002a\)](#) directives were used for the calculations. [Table I-13](#) lists the groundwater RBSLs used for this HHRA.

Cancer risks and noncancer hazards were calculated by comparing site EPCs of each COPC to the corresponding RBSL, as detailed in the following text.

### **I7.2.1 Characterization of Cancer Risks**

For COPCs that are carcinogens, the cancer risk associated with exposure to a single chemical is calculated as follows:

$$\text{Cancer risk} = (\text{EPC}/\text{RBSL}) \times 10^{-6} \quad (\text{I-8})$$

where:

|      |   |                                                           |
|------|---|-----------------------------------------------------------|
| EPC  | = | Exposure point concentration (microgram per liter [µg/L]) |
| RBSL | = | Risk-based screening level (µg/L)                         |



At a given exposure area, individuals may be exposed to more than one chemical. The total risk from exposure to multiple chemicals is calculated using the following equation:

$$\text{Total risk} = 10^{-6} \times \{EPC_1/RBSL_1 + EPC_2/RBSL_2 + \dots EPC_n/RBSL_n\} \quad (\text{I-9})$$

where:

Total risk = Total carcinogenic risk from exposure to all chemicals (unitless)

$EPC_n$  = Exposure point concentration of chemical  $n$  ( $\mu\text{g/L}$ )

$RBSL_n$  = RBSL for chemical  $n$  ( $\mu\text{g/L}$ )

### 17.2.2 Characterization of Noncancer Hazards

For COPCs not classified as carcinogens and for carcinogens known to cause adverse health effects other than cancer, the potential for receptors to develop adverse health effects is evaluated by comparing EPCs with noncancer RBSLs as follows:

$$\text{Hazard quotient} = EPC/RBSL \quad (\text{I-10})$$

where

EPC = Exposure point concentration ( $\mu\text{g/L}$ )

RBSL = Risk-based screening level ( $\mu\text{g/L}$ )

To evaluate the potential for noncancer effects from exposure to multiple chemicals, the HQs for all chemicals are summed, yielding an HI as follows:

$$\text{Hazard index} = EPC_1/RBSL_1 + EPC_2/RBSL_2 + \dots + EPC_n/RBSL_n \quad (\text{I-11})$$

where:

$EPC_n$  = Exposure point concentration of chemical  $n$  ( $\mu\text{g/L}$ )

$RBSL_n$  = RBSL for chemical  $n$  ( $\mu\text{g/L}$ )

## 17.3 INTERPRETATION OF HAZARD AND RISK LEVELS

EPA guidance on exposure levels considered protective of human health is presented to aid in the interpretation of the results of the risk assessment. In the National Oil and Hazardous Substances Pollution Contingency Plan, EPA defined general remedial action goals for sites on the National Priorities List (Title 40 of the *Code of Federal Regulations* Part 300.430). The goals include a range for residual cancer risk, which is “an excess upper-bound lifetime cancer risk to an individual of between  $10^{-4}$  and  $10^{-6}$ ,” or 1 in 10,000 to 1 in 1,000,000. The goals set

out in the National Oil and Hazardous Substances Pollution Contingency Plan are applied once a decision to remediate a site has been made. A more recent EPA directive provides additional guidance on the role of the HHRA in supporting risk management decisions, and in particular, determining if remedial action is necessary (EPA 1991). Specifically, the guidance states, “Where cumulative carcinogenic risk to an individual based on reasonable maximum exposure for both current and future land use is less than  $10^{-4}$ , and the noncancer HQ is less than 1, action generally is not warranted unless there are adverse environmental impacts.” EPA Region 9 has stated, however, that action may be taken to address risks between  $10^{-4}$  and  $10^{-6}$ . In addition, DTSC has stated that it considers  $1E-06$  as the point of departure for risk management decisions. To be protective of human health, the BCT has chosen to use  $10^{-6}$ , the lower end of the residual  $10^{-4}$  to  $10^{-6}$  risk range set out in the National Oil and Hazardous Substances Pollution Contingency Plan, as a threshold level for cancer risks for HPS.

An HI of less than 1.0 indicates that adverse noncancer health effects are not expected. In accordance with EPA guidance (EPA 1989), the HHRA further evaluated exposure areas with total HIs that exceeded 1. Noncancer health effects associated with exposure to multiple COPCs may not be cumulative if the COPCs affect different target organs or systems within the body. Therefore, for exposure areas with HI values that exceeded 1 based on the summed HIs from multiple COPCs, the HHRA segregates the HI by target organ or system and assumes that the potential for noncancer health effects exists only if the highest total segregated HI for a target organ or system exceeded 1. Table I-14 identifies the target organs affected by each COPC for Parcel E; this information was used, as necessary, to segregate HIs by target organ. Information on target organs was obtained from Integrated Risk Information System (EPA 2005), Health Effects Assessment Summary Tables (EPA 1997), Provisional Peer-Reviewed Toxicity Values database (EPA 2004c), and the Agency for Toxic Substances and Disease Registry (2005).

#### **17.4 EVALUATION OF LEAD**

The HHRA evaluated the potential for human health effects from exposure to lead by comparing EPCs for lead with an HPS-specific risk-based concentration for lead (155 mg/kg) for residential and recreational receptors and the EPA (2004a) Region 9 industrial PRG for lead (800 mg/kg) for industrial and construction worker receptors. The HPS risk-based concentration for lead was developed using the Cal/EPA (1999b) LeadSpread model and EPA’s Integrated Exposure Uptake Biokinetic model. The methodology for development of the HPS risk-based concentration for lead is presented in Attachment I6 to this appendix. The Region 9 industrial PRG for lead was developed by EPA using EPA’s adult lead model (EPA 1996). These models are designed to predict the soil lead concentration associated with a target blood lead level of 10 micrograms per deciliter, the EPA threshold level of concern (EPA 1994a). Adverse health effects are not expected to occur from exposure to lead below the risk-based concentration or PRG.

|    |                               |               |                                                                                                                                                                                                                                                                                                                                                                                  |
|----|-------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21 | Assumptions and uncertainties | Section 2.5.1 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. Appendix I, pages I-40 through I-44.<br><br>Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Section 2.5.2, pages 2-52 and 2-53. |
|----|-------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## I9.0 UNCERTAINTY ANALYSIS

Varying degrees of uncertainty at each stage of the HHRA arise from assumptions made in the risk assessment and the limitations of the data used to calculate risks. Uncertainty and variability are also inherent in the exposure assessment, toxicity values, and risk characterization. [Table I-25](#) lists both general and site-specific uncertainties associated with this HHRA.

The effect of uncertainties is overestimation or underestimation of the actual cancer risk or HI. In general, the risk assessment process is based on use of conservative (health-protective) assumptions that when combined, are intended to overestimate the actual risk. However, a small possibility exists that risks were underestimated.

The remainder of this discussion focuses on the following uncertainties specific to this HHRA:

- The influence of metals in soil at or below ambient levels on this HHRA
- Use of a SF for TCE developed by Cal/EPA, rather than the EPA provisional SF for TCE
- Assumption that the exposure area for groundwater vapor intrusion risks is consistent with the risk plume boundaries delineated for groundwater COPCs
- Dermal contact with groundwater for the residential exposure scenario
- Use of generic, non-site-specific RBSLs to calculate risks from groundwater vapor intrusion
- Risk estimates for exposure to dioxins, furans, and dioxin-like PCBs

### I9.1 METALS IN SOIL BELOW AMBIENT LEVELS

To account for the contribution of naturally occurring concentrations of metals at HPS, both total risks and incremental risks were assessed for exposure to soil. The total risk evaluation for soil included all chemicals regardless of concentration, except for the essential nutrients calcium, magnesium, potassium, and sodium. For the incremental risk evaluation, the above essential nutrients and metals with maximum measured concentrations below HPALs were excluded as COPCs.

The differences in risk and hazard results between the total risk evaluation and the incremental risk evaluation are attributed to the risks and hazards associated with ambient levels of metals at HPS. At ambient concentrations (that is, HPALs), some metals at HPS are associated with cancer risks exceeding 1E-06 and noncancer hazards exceeding 1.0. [Table I-26](#) presents the cancer risks and noncancer hazards associated with exposure to metals at concentrations equal to

HPALs; risks and hazards are presented in this table for each of the exposure scenarios associated with planned reuse (residential, industrial, recreational). As shown in [Table I-26](#), the contribution of ambient levels of metals to cancer risk and HI estimates is significant. For example, the cancer risk associated with residential exposure to arsenic at a concentration equal to the HPAL for arsenic (11.1 mg/kg) is 2.9E-04. The HI associated with residential exposure to manganese at a concentration equal to the HPAL for manganese (1,431 mg/kg) is 1.7. Collectively, all metals at ambient levels contribute to a cancer risk of 3E-04 for a residential receptor, and 3E-05 for industrial and recreational receptors. For noncancer hazards, metals at ambient levels collectively contribute to an HI of 11 for residential receptors, 0.2 for industrial receptors, and 0.7 for recreational receptors.

This evaluation of risks and hazards associated with metals at concentrations equivalent to HPALs shows that the total risk evaluation, which includes metals present at concentrations at or below HPALs, likely overestimates risks and hazards associated with Navy releases of chemicals. This is because of the presence of these metals at concentrations at or below HPALs in many exposure areas at Parcel E. While the incremental risk evaluation excludes risks and hazards from metals for which maximum concentrations do not exceed HPALs, the results of the incremental evaluation should be considered with the information contained in [Table I-26](#), as the contribution of ambient levels to risks and hazards at HPS is significant for some metals.

## **I9.2 SLOPE FACTOR FOR TRICHLOROETHENE**

As discussed in [Section I6.0](#), the provisional cancer SFs derived by EPA (2001) for TCE, although more conservative than the SFs derived by Cal/EPA, were not used in the HHRA. The draft risk assessment that is the basis for the provisional EPA SFs for TCE is being reviewed currently by the National Academy of Sciences, and as such, does not represent EPA policy. For this HHRA, the SFs developed by Cal/EPA were used to evaluate cancer risks from exposure to TCE. Uncertainties specific to the provisional cancer SFs for TCE were analyzed in this HHRA because the difference between the provisional SFs for TCE and the Cal/EPA SFs for TCE is significant, and can affect the risk results. [Attachment I7](#) contains a detailed discussion of the uncertainties associated with the SFs for TCE.

## **I9.3 BOUNDARIES FOR VAPOR INTRUSION RISKS**

As discussed in [Section I4.3.2](#), risk plume boundaries for evaluation of groundwater vapor intrusion were established based on delineation of volatile COPCs in the A-aquifer to nondetectable (below reporting limit) levels, and vapor intrusion risks were applied to each residential and industrial grid encompassed by the boundaries of the risk plumes. This approach assumes that the exposure area for groundwater vapor intrusion risks is consistent with the risk plume boundaries; however, EPA states that it is reasonable to assume that subsurface vapors may migrate laterally up to 100 feet ([EPA 2002a](#)). [Figure I-8](#) portrays the potential lateral extent, or 100-foot “inhalation risk buffer zone” to which the groundwater vapor intrusion risks calculated for Parcel E may extend. In this figure, the risk plume boundaries delineated in [Section I4.3.2](#) were expanded laterally in each direction by 100 feet to account for the distance

that vapors may travel laterally from a groundwater source. This inhalation risk buffer zone was also applied to non-plume well locations with volatile COPCs (see [Figure I-8](#)).

Preferential pathways, which consist of utility conduits, subsurface drains, and buried pipelines that intersect vapor sources or vapor migration pathways, may allow subsurface vapors to migrate more than 100 feet laterally ([EPA 2002a](#)). These preferential pathways are considered significant if they are associated with a high gas permeability and are of sufficient volume and proximity to a building such that the pathways may influence vapor intrusion into the building ([EPA 2002a](#)). [Figure I-9](#) shows the subsurface utilities at Parcel E; these utilities may influence the extent to which subsurface vapors may migrate beyond the 100-foot inhalation risk buffer zone depicted in [Figure I-8](#).

#### **I9.4 DERMAL CONTACT WITH GROUNDWATER FOR RESIDENTIAL SCENARIO**

As discussed in [Section I7.2](#), tap water PRGs were used in this HHRA to evaluate domestic use of groundwater for the residential receptor. The tap water PRGs are used to evaluate residential exposure to groundwater from ingestion and from inhalation of VOCs released from groundwater to indoor air during household use. The tap water PRGs are limited to an assessment of exposure to groundwater from the oral and inhalation exposure pathways, and do not account for exposure from the dermal exposure pathway.

To address the uncertainties associated with exclusion of the dermal exposure pathway on the risk results for residential domestic use of groundwater, the potential for intake of COPCs from the dermal exposure pathway relative to intake of COPCs from the oral exposure pathway was evaluated using information provided in [EPA \(2004d\)](#) guidance on the relative percentage of dermal exposure compared to oral exposures for non-volatile COPCs. This information is presented in the table below for the non-volatile COPCs identified for the B-aquifer. In this table, exposure from the oral route is represented by ingestion of two liters of water per day ([EPA 2004d](#)). Although several volatile COPCs were identified for the B-aquifer, partitioning risks between oral and dermal exposures for volatile COPCs is not necessary because the tap water PRGs account for the inhalation route of exposure. Non-volatile COPCs for the B-aquifer were limited to metals. Information was not available for several metals identified as COPCs for the B-aquifer (aluminum, cobalt, iron, molybdenum, and zinc).

| Chemical of Potential Concern | Dermal/Oral (%)* | Chemical of Potential Concern | Dermal/Oral (%)* |
|-------------------------------|------------------|-------------------------------|------------------|
| Antimony                      | 3.5              | Manganese                     | 8.8              |
| Arsenic                       | 0.55             | Nickel                        | 2.6              |
| Barium                        | 7.5              | Selenium                      | 1.8              |
| Cadmium                       | 10.5             | Thallium                      | 0.52             |
| Chromium                      | 40               | Vanadium                      | 20               |
| Copper                        | 0.92             |                               |                  |

Source: [EPA \(2004d\)](#)

This evaluation above shows that risks from exposure to groundwater in the B-aquifer, which were calculated using a risk-based screening assessment and EPA Region 9 tap water PRGs, may be slightly to moderately underestimated for some metals in the B-aquifer (from 0.52 for thallium to 40 percent for chromium). However, the effect of this underestimate is not significant because the overall cancer risk and noncancer HI for domestic use of groundwater in the B-aquifer were found to exceed the risk and hazards thresholds of 1E-06 and 1.0, respectively, for each of the three B-aquifer groundwater plumes and the three nonplume exposure areas.

## **19.5 SCREENING LEVELS FOR GROUNDWATER VAPOR INTRUSION**

Based on agreements between the EPA, DTSC, and [Navy \(2004\)](#), the generic RBSLs provided in Table 2c of [EPA \(2002a\)](#) guidance for evaluating vapor intrusion were used in this HHRA to calculate risks for the groundwater vapor intrusion exposure pathway. This approach was used in lieu of site-specific modeling with the [Johnson-Ettinger \(1991\)](#) vapor model because the [EPA \(2002a\)](#) model assumptions (such as depth to groundwater and soil physical properties) used to calculate the generic screening criteria are similar to the properties of soil and groundwater at HPS. Site conditions at HPS (shallow depth to groundwater and coarse soils; see [Section 2.0](#) of the Revised Parcel E RI Report) do not differ significantly enough from conditions assumed for the generic screening values to warrant detailed modeling using the Johnson-Ettinger model.

To evaluate whether use of the generic values would represent conditions at HPS and would not result in a significant overestimate of potential risks, the Navy evaluated risks from vapor intrusion for selected groundwater risk plumes at HPS using both generic [EPA \(2002a\)](#) risk-based screening values for vapor intrusion and site-specific modeling. The results of this evaluation showed that risks calculated ratiometrically using generic EPA risk-based vapor intrusion screening values are comparable to site-specific risks calculated using the Johnson-Ettinger model adjusted for HPS-specific values for depth to groundwater and physical properties of the soil. Risks calculated using the generic EPA screening values were higher than modeled results by approximately a factor of two. The difference results from an assumed basement exposure scenario in the generic EPA screening values, whereas the modeled results were based on a slab-on-grade exposure scenario because of the shallow depth to groundwater at HPS (roughly 7 to 8 feet bgs). This difference is not considered significant for risk results, which are represented by order-of-magnitude estimates.

## **19.6 RISK ESTIMATES FOR EXPOSURE TO DIOXINS, FURANS, AND DIOXIN-LIKE POLYCHLORINATED BIPHENYLS**

The HHRA for Parcel E used TEFs for 2,3,7,8-TCDD to calculate adjusted cancer SFs for each dioxin-like compound identified as a COPC for Parcel E. Risks were estimated separately for each dioxin-like COPC, using the TEF-adjusted cancer SFs. Additionally, dioxin-like COCs were identified separately, based on the individual risk results for dioxin-like COPCs. As discussed in [Section I6.4](#), the current method for assessing risks from exposure to dioxin mixtures involves calculating a TEQ-based EPC by multiplying measured concentrations for

individual dioxin-like compounds with respective TEFs that relate the toxicity of the individual dioxin-like compound to 2,3,7,8-TCDD. The TEF-adjusted concentrations are then summed to calculate a TEQ for 2,3,7,8-TCDD, which is evaluated in risk calculations as a single dioxin compound. The primary difference between the method used in the HHRA for Parcel E and the current method for assessing exposure to dioxin-like compounds is that the HHRA method evaluated dioxin-like COPCs as individual compounds, while the current method evaluates dioxin-like COPCs as a single compound.

To address the uncertainties associated with the TEF method used in the HHRA for Parcel E, the Navy further evaluated risk results for exposure areas with dioxin-like COPCs. Detections of dioxin-like COPCs were confined to the soil exposure medium; 31 exposure areas (grids) for soil were associated with dioxin-like COPCs. Dioxin-like COCs were identified for two of these exposure areas (grid AN38 and grid BG36); remedial alternatives for dioxin-like compounds detected in these grids will be addressed in the feasibility study for Parcel E. For the remaining 29 grids with dioxin-like COPCs, it is possible that risks for dioxin-like compounds (that is, 2,3,7,8-TCDD) may have been underestimated by assessing risks for each compound individually. As part of this analysis of uncertainties, risk results for all of the dioxin-like COPCs in each the 29 remaining grids were summed to calculate a summed dioxin risk for each grid. None of the summed dioxin risks for the 29 grids exceeds  $1\text{E-}06$ , the cancer risk level at which a COPC is identified as a COC (that is, a chemical that is targeted for evaluation of remediation alternatives in the feasibility study). Therefore, although the method used to evaluate dioxin-like COPCs for Parcel E may have resulted in an overall underestimate of risk for dioxin-like compounds, the underestimate is not considered significant, relative to the identification of COCs for Parcel E.



## Section B7. Uncertainty Analysis

Any comprehensive risk analysis must also consider the effects of uncertainty on input parameters. This analysis is no different; however, rather than perform explicit uncertainty analyses, which would have required countless additional RESRAD runs, an approach was taken that minimized the need for additional modeling computations. Nuclear Regulatory Commission Regulation (NUREG)-6697 ([NRC, 2000](#)) was used as the basis for the uncertainty analysis.

One of the primary purposes of NUREG-6697 was to study the effect of various parameter distributions on the final results of RESRAD analyses. RESRAD is a mathematical model that simplifies complex physical, ecological, dosimetric, and human processes. RESRAD requires finite input parameters that represent current and future site conditions. However, most site characteristics (such as hydrogeological and geochemical properties) are not accurately represented by a single input value; most physical characteristics vary across a site. In addition, it is difficult to obtain sufficient data to completely characterize site-specific radionuclide transport and exposure processes and to predict future site conditions and human occupancy factors. Therefore, many of the RESRAD input parameters selected during the modeling process are averages, estimates, or default values.

Because the accuracy of modeled results depends upon the accuracy of the input parameters, risk results derived from RESRAD will contain inherent uncertainties based on the assumptions used in choosing the input parameters. Where default or estimated values are used, the modeled results may not accurately represent the actual physical conditions of the site or the future land use scenarios. To limit this uncertainty and ensure health protective results for the Parcel E radiological risk assessment, input parameters for physical processes and occupancy were chosen based on conservative assumptions; these parameters are discussed in [Section B2.1](#). The uncertainty associated with some of the significant inputs to RESRAD is discussed below.

The RESRAD modeling is based on the radiological data collected during the Phase I and Phase V investigations. The data collected during those investigations were analyzed to meet acceptance criteria (such as minimum detectable activities) that were based on the release criteria current at the time the investigations were performed; however, the current release criteria for certain ROCs are more conservative. The most notable example is  $^{226}\text{Ra}$ , for which the release criterion at the time of the Phase V investigation was 5 pCi/g. The current release criterion for  $^{226}\text{Ra}$  is 1 pCi/g above background



(the background  $^{226}\text{Ra}$  level for the Phase V investigation was 0.82 pCi/g). Because of the differences in release criteria, the accuracy of the data for certain ROCs may not meet current acceptance criteria and results in some degree of uncertainty for the risk screening analysis. However, the degree of uncertainty is acceptable for the risk screening analysis because the analysis was only intended to provide a general estimate of radiological risks for ROCs that, in the case of  $^{226}\text{Ra}$ , were known to consistently exceed current release criteria and warrant analysis of remedial alternatives in the FS.

The RESRAD default cover material density was used for all analyses performed. The default was designed to be representative of the body of soil types. In reality, existing asphalt and concrete covers would have a greater density than the default soil value. The specific density is dependent upon the asphalt-laying process. By underestimating the density of asphalt, a certain measure of conservatism has been built into the results presented in this appendix. It is therefore reasonable to assume that any uncertainty associated with the cover material density is minimal and a full uncertainty analysis for a range of cover material densities is not necessary.

|    |                                           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----|-------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22 | Total excess and incremental excess risks | Section 2.5.1.1 | <p>Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas &amp; Associates, Inc. May 2008. Sections 5.1.2 and 5.1.3, pages 5-5 through 5-10.</p> <p>Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix B, pages B-16 and B-17.</p> |
|----|-------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Construction worker exposure to the A-aquifer includes exposure to both volatile and nonvolatile chemicals. Although the risk plumes delineated in the A-aquifer were based on volatile chemicals, all detected chemicals (volatile and nonvolatile) within the delineated boundaries of the risk plume were included for evaluation of construction worker exposure. Chemical concentrations detected at some groundwater sampling locations at Parcel E were not associated with risk plumes; as a result, these nonplume-based locations were evaluated on a grid-basis, using the same grid system that was used in the HHRA to evaluate soil exposures as an efficient mechanism to locate each nonplume exposure area for the HHRA.

Chemical plumes are not present in the B-aquifer at Parcel E; however, risk plume boundaries delineated for the A-aquifer were extrapolated vertically and applied to the B-aquifer as part of this HHRA. Since the delineated A-aquifer risk plumes represent worst-case scenarios of groundwater contamination, and since contaminant plumes have not been identified in the B-aquifer at Parcel E, the extrapolated boundaries of the B-aquifer are conservative and likely represent larger areas than present-day conditions warrant. Extrapolation of the boundaries of the A-aquifer risk plumes to the B-aquifer was based on meetings between with EPA, DTSC, and the Navy in 2003 and 2004. The extrapolated plume boundaries were used to represent exposure areas for the B-aquifer for the residential domestic use evaluation. Of the eight risk plumes delineated for the A-aquifer, boundaries for three of the risk plumes (IR-02, IR-03, and Building 406) were extrapolated to the B-aquifer. The boundaries for the remaining risk plumes in the A-aquifer were not extrapolated to the B-aquifer because the B-aquifer is not present in those risk plume areas. Similar to the approach used for the A-aquifer, chemical concentrations detected at groundwater sampling locations in the B-aquifer at Parcel E that fell outside of the extrapolated plume boundaries were evaluated as non-plume exposure areas, using the exposure area grids established for soil.

The risk plumes reflect a worst-case scenario of groundwater contamination because the methodology used to delineate risk plumes includes historical data over 10 years old. [Figures 4-3 through 4-6](#) show the 2004 plume boundaries for metals, VOCs, pesticides, and PCBs and TPH. The lateral extent of 2004 plumes at Parcel E is smaller than the extent of the risk plumes evaluated in the HHRA; likewise, concentrations of volatile chemicals are less than the concentrations evaluated in the HHRA (see [Section 4.1.2.3](#)).

### 5.1.2 Total and Incremental Risks for Soil Exposure

Both total and incremental risks were evaluated for exposure to soil at Parcel E. For the total risk evaluation, all detected chemicals were included as COPCs regardless of concentration, except for the essential nutrients calcium, magnesium, potassium, and sodium. The total risk evaluation provides an estimate of the risks posed by all chemicals at Parcel E, including those present at concentrations at or below ambient levels. For the incremental risk evaluation, the above essential nutrients and metals with maximum detected concentrations below HPALs were excluded as COPCs. The incremental risk evaluation provides an estimate of risks posed by all chemicals at Parcel E, except those that do not exceed ambient levels.

No toxicity criteria are currently available for evaluating health risks from exposure to lead. Therefore, specific cancer risk or noncancer hazard results for lead were assessed by comparing exposure point concentrations (EPC) for lead with (1) a HPS-specific risk-based concentration for lead (155 mg/kg) for residential and recreational receptors and (2) the EPA Region 9 industrial preliminary remediation goal for lead (800 mg/kg) for industrial and construction worker receptors.

### **5.1.3 Soil Risk Summary**

This section summarizes the results of the total and incremental risk evaluations for soil based on planned reuse.

#### **5.1.3.1 Total Risk Evaluation**

For the total risk evaluation, risks from residential and industrial exposure to COPCs in soil were assessed for both surface soil (0 to 2 feet bgs) and subsurface soil (0 to 10 feet bgs). The evaluation of recreational and construction worker exposures to COPCs in soil were limited to surface and subsurface soil, respectively. [Figures 5-2 and 5-3](#) summarize the total risk results for surface and subsurface soil, respectively, at each risk grid based on the planned reuse of the redevelopment block associated with each grid. [Figure 5-4](#) summarizes the total risk results for construction worker exposure to soil at each risk grid. Results for each grid are shown relative to the cancer risk threshold of 1E-06, the highest segregated noncancer hazard index (HI) of 1.0, and the HPS risk-based concentration for lead (155 mg/kg for residential and recreational receptors, and 800 mg/kg for industrial and construction worker receptors). [Tables 5-2, 5-3, and 5-4](#) present the specific calculated total cancer risk and noncancer HI results for each grid.

The risk results shown in the above-referenced figures and tables represent total risk; that is, all detected chemicals not considered to be essential human nutrients were included in the total risk evaluation. Risks were assessed for 141 grids in the industrial reuse areas, 103 grids in the residential reuse areas, and 46 grids in the open space reuse areas. Results of the total risk evaluation showed that of these grids, 134 grids in the industrial reuse areas, 99 grids in the residential reuse areas, and 44 grids in the open space reuse areas exceeded the cancer risk threshold of 1E-06 or the noncancer threshold HI of 1.0. For the construction worker exposure scenario, risks were assessed for 227 grids; 207 of these grids exceeded the cancer risk threshold of 1E-06 or the noncancer threshold HI of 1.0.

[Tables 5-5, 5-6, and 5-7](#) present a risk characterization analysis for each grid for which the total cancer risk or segregated noncancer HI exceeds thresholds. For each of these grids, the tables identify the COCs (that is, the chemicals for which the chemical-specific cancer risk exceeds 1E-06 or the highest segregated HI exceeds 1.0) and show the percent contribution of the COCs to the calculated total risks and hazards for each exposure pathway evaluated.

The following chemicals are identified as COCs in at least one grid based on planned reuse and results of the total risk evaluation for soil.

| Exposure Scenario         | Chemicals of Concern in Surface Soil (0 to 2 feet bgs), Total Risk                                                                                                                                       |                                                                                                                                           | Chemicals of Concern in Subsurface Soil (0 to 10 feet bgs), Total Risk                                                                                                                                                                                                    |                                                                                                                                                                                                                        |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Industrial <sup>a</sup>   | Aroclor-1254<br>Aroclor-1260<br>Arsenic<br>Benzo(a)anthracene<br>Benzo(a)pyrene                                                                                                                          | Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Dibenzo(a,h)anthracene<br>Indeno(1,2,3-cd)pyrene<br>Lead<br>Naphthalene                   | 1,2,4-Trimethylbenzene<br>1,3,5-Trimethylbenzene<br>Aldrin<br>Aroclor-1248<br>Aroclor-1254<br>Aroclor-1260<br>Arsenic<br>Benzene                                                                                                                                          | Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Dibenzo(a,h)anthracene<br>Indeno(1,2,3-cd)pyrene<br>Lead<br>Naphthalene                                                        |
| Recreational <sup>a</sup> | 1,2,3,4,6,7,8-HPCDD<br>1,2,3,7,8-PECDD<br>2,3,4,7,8-PECDF<br>Aroclor-1254<br>Aroclor-1260<br>Arsenic                                                                                                     | Benzo(k)fluoranthene<br>Chrysene<br>Dibenzo(a,h)anthracene<br>Dieldrin<br>Indeno(1,2,3-cd)pyrene<br>Lead                                  | Not applicable                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                        |
| Recreational <sup>a</sup> | Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene                                                                                                                                             | PCB-105<br>PCB-118<br>PCB-187<br>PCB-206                                                                                                  | Not Applicable                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                        |
| Residential <sup>a</sup>  | Antimony<br>Aroclor-1260<br>Arsenic<br>Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Bis(2-Ethylhexyl)phthalate<br>Dibenzo(a,h)anthracene<br>Cadmium<br>Copper | Dieldrin<br>Indeno(1,2,3-cd)pyrene<br>Iron<br>Lead<br>Manganese<br>Mercury<br>Nickel<br>Pentachlorophenol<br>Thallium<br>Vanadium<br>Zinc | Antimony<br>Aroclor-1254<br>Aroclor-1260<br>Arsenic<br>Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Bis(2-Ethylhexyl)phthalate<br>Cadmium<br>Copper<br>Dibenzo(a,h)anthracene                                                  | Dieldrin<br>Indeno(1,2,3-cd)pyrene<br>Iron<br>Lead<br>Manganese<br>Mercury<br>Nickel<br>Pentachlorophenol<br>Silver<br>Thallium<br>Vanadium<br>Zinc                                                                    |
| Construction <sup>b</sup> | Not applicable                                                                                                                                                                                           |                                                                                                                                           | 1,2,3,7,8-PECDD<br>2,3,4,7,8-PECDD<br>1,2,4-Trichlorobenzene<br>1,2,4-Trimethylbenzene<br>1,3,5-Trimethylbenzene<br>2,3,4,6,7,8-HXCDF<br>Aldrin<br>Antimony<br>Aroclor-1248<br>Aroclor-1254<br>Aroclor-1260<br>Arsenic<br>Benzene<br>Benzo(a)anthracene<br>Benzo(a)pyrene | Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Copper<br>Dibenzo(a,h)anthracene,<br>Indeno(1,2,3-cd)pyrene<br>Iron<br>Lead<br>Manganese<br>Mercury<br>Naphthalene<br>Nickel<br>n-Nitroso-di-n-propylamine<br>Vanadium |

Notes:

a COCs identified for this exposure scenario are based on the planned reuse for Parcel E.

b The construction worker exposure scenario is not associated with a specific planned reuse for Parcel E. Based on agreement with the BCT, evaluation of construction worker exposure to soil was based on subsurface soil from 0 to 10 feet bgs; this depth range includes surface soil (0 to 2 feet bgs) exposure.

HPCDD Heptachlorodibenzo-p-dioxin

HXCDF Hexachlorodibenzofuran

PECDD Pentachlorodibenzo-p-dioxin

Of these chemicals, the following most frequently occur as COCs for each exposure scenario for the total risk evaluation:

- For industrial exposure (industrial and maritime industrial reuse areas), arsenic and PAHs (primarily benzo[a]pyrene) were the most frequently occurring COCs. Arsenic was a COC in 93 percent of the grids evaluated, and the PAH benzo(a)pyrene was a COC in 33 percent the grids evaluated.
- For residential exposure (mixed-use and research and development reuse areas), metals (arsenic, iron, manganese, nickel, and vanadium) were identified as COCs in most of the grids evaluated. Arsenic was identified as a COC in 73 percent of the grids evaluated, iron in 93 percent, manganese in 63 percent, nickel in 86 percent, and vanadium in 58 percent.
- For recreational exposure (open space reuse areas), arsenic, benzo(a)pyrene, lead, and Aroclor-1260 were COCs in over 40 percent of the grids evaluated.
- For construction worker exposure (evaluated parcel-wide), arsenic was identified as a COC in 93 percent of the grids evaluated. Lead, PAHs, and PCBs were also identified as COCs in approximately 10 to 15 percent of the grids evaluated.

#### **5.1.3.2 Incremental Risk Evaluation**

For the incremental risk evaluation, risks from residential and industrial exposure to COCs in soil were assessed for both surface soil (0 to 2 feet bgs) and subsurface soil (0 to 10 feet bgs). The evaluation of recreational and construction worker exposures to COCs in soil was limited to surface and subsurface soil, respectively. [Figures 5-5 and 5-6](#) summarize the incremental risk results for surface and subsurface soil, respectively, at each grid based on the planned reuse of the redevelopment block associated with each grid. [Figure 5-7](#) summarizes the incremental risk results for construction worker exposure to soil at each grid. [Tables 5-8, 5-9, and 5-10](#) list the incremental cancer risk and noncancer HI results calculated for each grid.

The risk results shown in the above-referenced figures and tables represent incremental risk; that is, all detected chemicals except essential human nutrients and metals below HPALs were included in the risk evaluation. Risks were assessed for 141 grids in the industrial reuse areas, 103 grids in the residential reuse areas, and 46 grids in the open space reuse areas. Results of the incremental risk evaluation showed that of these grids, 71 grids in the industrial reuse areas, 53 grids in the residential reuse areas, and 37 grids in the open space reuse areas exceeded the cancer risk threshold of 1E-06 or the noncancer threshold HI of 1.0. For the construction worker exposure scenario, risks were assessed for 227 grids; of these grids, 108 exceeded the cancer risk threshold of 1E-06 or the noncancer threshold HI of 1.0. Compared to the total risk evaluation for soil, under the incremental risk evaluation, there is on average a 43 percent reduction in the number of exposure areas at Parcel E that exceed the cancer risk threshold of 1E-06 or the noncancer threshold HI of 1.0 (based on highest segregated HI) for the planned reuses of Parcel E.

Tables 5-11, 5-12, and 5-13 present a risk characterization analysis for those grids for which the total cancer risk or segregated noncancer HI exceeded thresholds. For each of these grids, the tables identify the COCs and present their contribution to the calculated incremental risks and hazards for each potentially complete exposure pathway.

The following chemicals were identified as COCs in at least one grid based on planned reuse and results of the incremental risk evaluation for soil.

| Exposure Scenario         | Chemicals of Concern in Surface Soil (0 to 2 feet bgs), Incremental Risk                                                                                                                       |                                                                                                                                           | Chemicals of Concern in Subsurface Soil (0 to 10 feet bgs), Incremental Risk                                                                                                                                                                            |                                                                                                                                                                                                                                        |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Industrial <sup>a</sup>   | Aroclor-1254<br>Aroclor-1260<br>Arsenic<br>Benzo(a)anthracene<br>Benzo(a)pyrene                                                                                                                | Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Dibenzo(a,h)anthracene<br>Indeno(1,2,3-cd)pyrene<br>Lead<br>Naphthalene                   | 1,2,4-Trimethylbenzene<br>1,3,5-Trimethylbenzene<br>Aldrin<br>Aroclor-1248<br>Aroclor-1254<br>Aroclor-1260<br>Arsenic<br>Benzene                                                                                                                        | Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Dibenzo(a,h)anthracene<br>Lead<br>Naphthalene                                                                                                  |
| Recreational <sup>a</sup> | 1,2,3,4,6,7,8-HPCDD<br>1,2,3,7,8-PECDD<br>2,3,4,7,8-PECDF<br>Aroclor-1254<br>Aroclor-1260<br>Arsenic<br>Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Benzo(k)fluoranthene   | Chrysene<br>Dibenzo(a,h)anthracene<br>Dieldrin<br>Indeno(1,2,3-cd)pyrene<br>Lead<br>PCB-105<br>PCB-118<br>PCB-187<br>PCB-206              | Not applicable                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                        |
| Residential <sup>a</sup>  | Antimony<br>Aroclor-1260<br>Arsenic<br>Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Bis(2-Ethylhexyl)phthalate<br>Dibenzo(a,h)anthracene<br>Cadmium | Copper<br>Dieldrin<br>Indeno(1,2,3-cd)pyrene<br>Iron<br>Lead<br>Manganese<br>Mercury<br>Pentachlorophenol<br>Thallium<br>Vanadium<br>Zinc | Antimony<br>Aroclor-1254<br>Aroclor-1260<br>Arsenic<br>Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(k)fluoranthene<br>Bis(2-Ethylhexyl)phthalate<br>Cadmium<br>Copper                                                                                  | Dibenzo(a,h)anthracene<br>Dieldrin<br>Indeno(1,2,3-cd)pyrene<br>Iron<br>Lead<br>Manganese<br>Mercury<br>Pentachlorophenol<br>Silver<br>Thallium<br>Vanadium<br>Zinc                                                                    |
| Construction <sup>b</sup> | Not applicable                                                                                                                                                                                 |                                                                                                                                           | 1,2,3,7,8-PECDD<br>2,3,4,7,8-PECDD<br>1,2,4-Trichlorobenzene<br>1,2,4-Trimethylbenzene<br>1,3,5-Trimethylbenzene<br>2,3,4,6,7,8-HXCDF<br>Aldrin<br>Antimony<br>Aroclor-1248<br>Aroclor-1254<br>Aroclor-1260<br>Arsenic<br>Benzene<br>Benzo(a)anthracene | Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Copper<br>Dibenzo(a,h)anthracene<br>Indeno(1,2,3-cd)pyrene<br>Iron<br>Lead<br>Manganese<br>Mercury<br>Naphthalene<br>Nickel<br>n-Nitrosodi-n-propylamine<br>Vanadium |

Notes:

a COCs identified for this exposure scenario are based on the planned reuse for Parcel E.

b The construction worker exposure scenario is not associated with a specific planned reuse for Parcel E. Based on discussion with the BCT, evaluation of construction worker exposure to soil was based on subsurface soil from 0 to 10 feet bgs; this depth range includes surface soil (0 to 2 feet bgs) exposure.

Of these chemicals, the following most frequently occur as COCs for each exposure scenario for the incremental risk evaluation:

- For industrial exposure (industrial and maritime industrial reuse areas), arsenic and PAHs (primarily benzo[a]pyrene) occur as COCs in approximately 33 percent of the grids evaluated.
- For residential exposure (mixed-use and research and development reuse areas), arsenic is a COC in 15 percent of the grids evaluated and manganese is a COC in 29 percent of the grids evaluated.
- For recreational exposure (open space reuse areas), arsenic, lead, and benzo(a)pyrene, were COCs in over 30 percent of the grids evaluated.
- For construction worker exposure (evaluated parcel-wide), arsenic was identified as a COC in 40 percent of the grids evaluated. Lead, PAHs, and PCBs were also identified as COCs in approximately 10 to 15 percent of the grids evaluated.

#### 5.1.4 Groundwater Risk Summary

Risks from exposure to COPCs in groundwater were assessed for the A- and B-aquifers. [Figure 5-8](#) summarizes the risk results for industrial and residential exposure to the A-aquifer from vapor intrusion for each of the identified risk plumes and nonplume exposure, based on the planned reuse for each redevelopment block. [Figure 5-9](#) summarizes the risk results for residential domestic use of groundwater in the B-aquifer. [Figure 5-10](#) summarizes the risk results for construction worker exposure to groundwater in the A-aquifer. Results in these figures are shown relative to the cancer risk threshold of 1E-06 and highest segregated noncancer HI of 1.0.

[Tables 5-14 and 5-15](#) present a risk characterization analysis for those exposure areas in the A-aquifer for which the cancer risk exceeded 1E-06 or the highest segregated HI exceeded 1.0 for the exposure scenarios associated with planned reuse and the construction worker scenario, respectively. These tables identify the groundwater COCs associated with each Parcel E risk plume and the percent contribution of each COC to the total cancer risk and HI calculated for each plume. Exposure areas in the A-aquifer not associated with risk plumes with COCs are shown in [Tables 5-14 and 5-15](#). The following chemicals were identified as COCs in groundwater in the A-aquifer based on planned reuse.

| Exposure Scenario         | Chemicals of Concern in A-Aquifer Groundwater                                                                  |                                                                                   |
|---------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Industrial <sup>a</sup>   | 1,1-DCA<br>1,2-DCE (total)<br>1,4-DCB<br>Benzene<br>Bromodichloromethane<br>Carbon tetrachloride<br>Chloroform | Isopropylbenzene<br>Naphthalene<br>PCE<br>TCE<br>Vinyl chloride<br>Xylene (total) |
| Recreational <sup>a</sup> | Not applicable                                                                                                 |                                                                                   |
| Residential <sup>a</sup>  | 1,1-DCA<br>1,4-DCB<br>Benzene<br>Chloroform                                                                    | Isopropylbenzene<br>Naphthalene<br>PCE<br>TCE                                     |



planned for mixed use, which may include residential reuse; and the recreational receptor is evaluated for redevelopment blocks planned for open space reuse. These receptors are consistent with the 2010 redevelopment plan (SFRA, 2010b). In addition, a residential scenario was also evaluated for the entire parcel. While residential reuse of the entire parcel is not planned, the residential exposure scenario presents an upper-bound risk estimation from exposure to ROCs at the parcel.

Both direct exposure pathways (external radiation) and indirect exposure pathways (inhalation and soil ingestion) are evaluated.

The goal of the RESRAD risk modeling approach was to be as consistent as possible with assumptions and inputs used in the nonradiological HHRA in the Revised RI Report. To achieve this goal, development of representative parameters for receptor scenarios other than the RESRAD default was required. This development was achieved by following guidance from EPA; specifically, “Exposure Factors Handbook” and the “Risk Assessment Guidance for Superfund (RAGS)” (EPA, 1989 and 1997b). The guidance was also used to develop input parameters for the nonradiological HHRA in the Revised RI Report. Receptor-specific RESRAD values were selected from the guidance for industrial workers, residents, and recreational users. To achieve the best correlation with site-specific agreements, it was necessary to adjust each of the parameters based on receptor-specific information. The parameters used in the RESRAD modeling, along with the basis for each, are discussed in detail in [Appendix B](#).

### 2.5.2. Total and Incremental Dose and Risk Calculation Methodology and Results

Radiological dose and risk were estimated for each of the radiologically impacted areas for which data are available. For each area, RESRAD modeling was conducted based upon the maximum reported activity for each ROC. To estimate the incremental risk from impacted areas, background concentrations of the ROCs were subtracted from the maximum reported activity levels. If the background activity exceeded the maximum reported activity for a given ROC, the ROC was not modeled in the incremental risk calculations. To estimate the total radiological risk, the maximum activity values were used as the exposure point concentration, without subtracting the background values. The exposure point concentrations used to calculate the radiological risk are presented in [Table 5](#), along with the minimum, maximum, and mean activities for each ROC within each radiologically impacted area.

Total and incremental risk results are presented in [Table 6](#). The total and incremental risk results presented in [Table 6](#) are provided for both (1) planned reuse and (2) residential reuse across the entire parcel. The RESRAD incremental risk estimates for planned reuse are summarized as follows:

- For the residential exposure scenario, incremental radiological risk estimates ranged from 2E-05 (Building 529 Site) to 7E-03 (Building 707 Triangle Area)
- For the recreational user exposure scenario, incremental radiological risk estimates ranged from 5E-08 (Building 509 Site) to 7E-03 (IR-02 Southeast).



The RESRAD total risk estimates for planned reuse are summarized as follows:

- For the residential exposure scenario, total radiological risk estimates ranged from 2E-04 (Building 508 Site) to 7E-03 (Building 707 Triangle Area)
- For the recreational user exposure scenario, total radiological risk estimates ranged from 2E-07 (Building 509 Site) to 7E-03 (IR-02 Southeast).

### 2.5.3. Combined Chemical and Radiological Risk

Estimates of the lifetime risk of cancer to exposed individuals resulting from radiological and chemical risk assessments may be summed to determine the overall potential human health hazard associated with a site (EPA, 1989). To combine the chemical risk and radiological risk, the same approach used in the Parcel E Revised RI Report to calculate chemical risk must be taken; namely, calculating total risk from ROCs inclusive of background and calculating incremental risk from the ROCs present at activity levels that do not include background.

Table 6 presents the combined chemical and radiological risk at the site. To estimate the combined chemical and radiological risk, the incremental risk was derived by reviewing the RI and locating grid points close to the impacted soil areas and adding it to the estimated risk from the radiological ROCs. In some instances (such as the Building 701 Site), chemical risk is not available because no soil samples were collected in the vicinity and chemical risk was subsequently not assessed.

With some exceptions, such as the Building 707 Triangle Area and IR-02, the estimated risks are of a comparable order of magnitude to incremental risks for nonradioactive chemicals. The results indicate that concentrations of radioactive and nonradioactive chemicals in soil pose a potential unacceptable risk to future site users and remedial alternatives should be evaluated to address the potential risks. Although the extent of radioactive contamination in subsurface soil has not been defined, this radiological addendum conservatively assumes, consistent with the findings of the HRA, that potential radioactive chemicals may be present in subsurface soil at Parcel E and will therefore require remedial option analysis.

### 2.5.4. Uncertainty Analysis for Critical Assumptions

Appendix B provides a discussion of the input parameters and modeling results for the radiological dose and risk for each radiologically impacted site. The results were compared against the EPA-increased lifetime cancer risk of 1E-06 and the NRC dose limit of 25 millirems per year. EPA does not believe this NRC dose limit is protective of human health and the environment, and recommends a maximum dose limit of 15 millirems per year (EPA, 1997a). The remedial option analysis (in Sections 3, 4, and 5) will consider both risk-based RGs and the 15 millirems per year dose limit in developing remedial alternatives that are protective of human health and the environment.

|    |                                                   |                 |                                                                                                                                                                                                            |
|----|---------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23 | HHRA results for nonradioactive chemicals in soil | Section 2.5.1.1 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 5.0, Tables 5-5, 5-6, 5-7, 5-11, 5-12, and 5-13. |
|----|---------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |     |      |       |    |    | Chemicals of Concern (COC) |                        | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|------------------------------------------------------------------------------------------------|-----|------|-------|----|----|----------------------------|------------------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                                                                                                |     |      |       |    |    |                            |                        |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| 31B/36                                                                                         | IND | AR27 | 4E-06 | <1 | <1 | Metal                      | Arsenic                | C             | 1.8 - 1.8                        | 1.80E+00 | 1/1                 | 4.15E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AR28 | 1E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 1.4 - 4.9                        | 4.90E+00 | 2/5                 | 1.13E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AS27 | 4E-06 | <1 | <1 | Metal                      | Arsenic                | C             | 1.5 - 1.5                        | 1.50E+00 | 1/1                 | 3.46E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AS28 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 4.1 - 6.5                        | 6.50E+00 | 3/3                 | 1.50E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AS29 | 3E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 1.7 - 8                          | 8.00E+00 | 6/10                | 1.84E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AT27 | 1E-05 | <1 | <1 | PAH                        | Benzo(a)pyrene         | C             | 1.2 - 1.2                        | 1.20E+00 | 1/9                 | 6.83E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                                                                                                |     |      |       |    |    | Metal                      | Arsenic                | C             | 3.1 - 5.8                        | 5.80E+00 | 2/2                 | 1.34E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |    |    | Metal                      | Arsenic                | C             | 3.4 - 4.2                        | 4.20E+00 | 2/2                 | 9.68E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AT28 | 1E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 11 - 130                         | 1.30E+02 | 2/2                 | 3.00E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 31B/36                                                                                         | IND | AT29 | 3E-04 | <1 | <1 | PAH                        | Benzo(a)pyrene         | C             | 0.24 - 0.24                      | 2.40E-01 | 1/2                 | 1.37E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                                                                                                |     |      |       |    |    | Metal                      | Arsenic                | C             | 1.7 - 7.6                        | 7.60E+00 | 3/3                 | 1.75E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |    |    | VOC                        | Naphthalene            | C             | 0.058 - 5.7                      | 5.70E+00 | 3/3                 | 1.22E-06                      | 9.8                                                               | 0.0            | 90.2                                 |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 31B/36                                                                                         | IND | AU28 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 7.2 - 105                        | 7.88E+01 | 7/7                 | 1.82E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 31B/36                                                                                         | IND | AU29 | 2E-04 | <1 | <1 | PAH                        | Benzo(a)pyrene         | C             | 0.065 - 0.8                      | 8.00E-01 | 4/7                 | 4.56E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                                                                                                |     |      |       |    |    |                            | Benzo(b)fluoranthene   | C             | 0.23 - 2.1                       | 2.10E+00 | 4/6                 | 1.20E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                                                                                                |     |      |       |    |    | Metal                      | Arsenic                | C             | 2.5 - 2.5                        | 2.50E+00 | 1/1                 | 5.76E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AU31 | 6E-06 | <1 | <1 | Metal                      | Arsenic                | C             | 2.4 - 50.9                       | 5.09E+01 | 7/8                 | 1.17E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 31B/36                                                                                         | IND | AV29 | 1E-04 | <1 | <1 | VOC                        | Naphthalene            | C             | 6.6 - 6.6                        | 6.60E+00 | 1/11                | 1.42E-06                      | 9.8                                                               | 0.0            | 90.2                                 |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 31B/36                                                                                         | IND | AV30 | 5E-06 | <1 | <1 | PAH                        | Benzo(a)pyrene         | C             | 0.45 - 0.45                      | 4.50E-01 | 1/2                 | 2.56E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
| 40                                                                                             | IND | AW31 | 3E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 12.3 - 12.3                      | 1.23E+01 | 1/1                 | 2.84E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 40                                                                                             | IND | AX33 | 1E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 4.5 - 4.5                        | 4.50E+00 | 1/1                 | 1.04E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | AZ33 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 2.6 - 7.1                        | 7.10E+00 | 2/2                 | 1.64E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | AZ34 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 2.4 - 7.4                        | 7.40E+00 | 3/3                 | 1.71E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | BA33 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 2.8 - 7.8                        | 6.88E+00 | 6/7                 | 1.59E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |    |    | Pest/PCB                   | Aroclor-1254           | C             | 3.4 - 3.4                        | 3.40E+00 | 1/7                 | 3.38E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                                                                                                |     |      |       |    |    |                            | Aroclor-1260           | C             | 2.8 - 2.8                        | 2.80E+00 | 1/7                 | 2.79E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 41                                                                                             | IND | BA29 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 0.66 - 8.5                       | 6.58E+00 | 5/5                 | 1.52E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 41                                                                                             | IND | BA30 | 1E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 2 - 5.8                          | 5.41E+00 | 5/5                 | 1.25E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |    |    | PAH                        | Benzo(a)pyrene         | C             | 0.16 - 0.23                      | 2.30E-01 | 2/5                 | 1.31E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
| 41                                                                                             | IND | BA31 | 8E-06 | <1 | <1 | Metal                      | Arsenic                | C             | 3.6 - 3.6                        | 3.60E+00 | 1/1                 | 8.30E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 41                                                                                             | IND | BA32 | 7E-06 | <1 | <1 | Metal                      | Arsenic                | C             | 3.1 - 3.1                        | 3.10E+00 | 1/1                 | 7.15E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 41                                                                                             | IND | BB29 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 0.8 - 7.9                        | 7.61E+00 | 4/4                 | 1.75E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 41                                                                                             | IND | BB30 | 5E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 3.5 - 8                          | 8.00E+00 | 3/3                 | 1.84E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |    |    | PAH                        | Benzo(a)pyrene         | C             | 0.055 - 4.8                      | 2.80E+00 | 4/11                | 1.60E-05                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                                                                                                |     |      |       |    |    |                            | Benzo(b)fluoranthene   | C             | 0.023 - 9.4                      | 9.40E+00 | 6/11                | 5.35E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                                                                                                |     |      |       |    |    |                            | Benzo(k)fluoranthene   | C             | 0.023 - 2.3                      | 2.30E+00 | 2/11                | 1.31E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                                                                                                |     |      |       |    |    |                            | Dibenz(a,h)anthracene  | C             | 1 - 1                            | 1.00E+00 | 1/11                | 3.46E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                                                                                                |     |      |       |    |    |                            | Indeno(1,2,3-cd)pyrene | C             | 0.032 - 2.8                      | 2.80E+00 | 2/11                | 1.59E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
| 41                                                                                             | IND | BB31 | 1E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 5.6 - 5.6                        | 5.60E+00 | 1/1                 | 1.29E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AN30 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 0.44 - 7.2                       | 7.20E+00 | 4/4                 | 1.66E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AO29 | 4E-06 | <1 | <1 | Metal                      | Arsenic                | C             | 1.7 - 1.7                        | 1.70E+00 | 1/1                 | 3.92E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AO30 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 1.5 - 6.3                        | 4.90E+00 | 8/9                 | 1.13E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |    |    | Pest/PCB                   | Aroclor-1260           | C             | 0.77 - 6.8                       | 4.12E+00 | 5/9                 | 4.10E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 43                                                                                             | IND | AO31 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 3 - 7.8                          | 7.80E+00 | 3/3                 | 1.80E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AP29 | 2E-04 | <1 | <1 | Metal                      | Arsenic                | C             | 2.8 - 244                        | 9.09E+01 | 6/8                 | 2.10E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |     |      |       |    |    | PAH                        | Benzo(a)pyrene         | C             | 0.038 - 0.21                     | 1.89E-01 | 4/8                 | 1.08E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
| 43                                                                                             | IND | AP30 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 0.8 - 9.9                        | 9.88E+00 | 4/4                 | 2.28E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AP31 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 4.6 - 9.2                        | 9.20E+00 | 2/3                 | 2.12E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |    |    | PAH                        | Benzo(a)pyrene         | C             | 0.2 - 0.2                        | 2.00E-01 | 1/3                 | 1.14E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                                                                                                |     |      |       |    |    | Metal                      | Arsenic                | C             | 4.3 - 6                          | 6.00E+00 | 3/3                 | 1.38E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AQ30 | 3E-05 | <1 | <1 | PAH                        | Benzo(a)pyrene         | C             | 0.068 - 0.37                     | 3.70E-01 | 3/7                 | 2.11E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                                                                                                |     |      |       |    |    | Pest/PCB                   | Aroclor-1260           | C             | 0.55 - 14                        | 1.40E+01 | 6/8                 | 1.39E-05                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 43                                                                                             | IND | AQ32 | 2E-06 | <1 | <1 | Metal                      | Arsenic                | C             | 0.45 - 0.65                      | 6.50E-01 | 2/2                 | 1.50E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AR29 | 7E-06 | <1 | <1 | Metal                      | Arsenic                | C             | 1.9 - 3.1                        | 3.10E+00 | 2/2                 | 7.15E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AR30 | 1E-05 | <1 | <1 | Metal                      | Arsenic                | C             | 5.6 - 5.6                        | 5.60E+00 | 1/1                 | 1.29E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |

TABLE 5-11: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) | Basis for COC          | Range of Detected Concentrations | RME EPC      | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|------------------------|----------------------------------|--------------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                     |               |             |                       |              |                   |                            |                        |                                  |              |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| 31B/36              | IND           | AS29        | 9E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 1.2 - 1.2    | 1.20E+00            | 1/9                           | 6.83E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 31B/36              | IND           | AT29        | 3E-04                 | <1           | <1                | Metal                      | Arsenic                | C                                | 11 - 130     | 1.30E+02            | 2/2                           | 3.00E-04                                                          | 71.6           | 28.4                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
| 31B/36              | IND           | AU29        | 2E-04                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.24 - 0.24  | 2.40E-01            | 1/2                           | 1.37E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                | C                                | 7.2 - 105    | 7.88E+01            | 7/7                           | 1.82E-04                                                          | 71.6           | 28.4                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C                                | 0.065 - 0.8  | 8.00E-01            | 4/7                           | 4.56E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C                                | 0.23 - 2.1   | 2.10E+00            | 4/6                           | 1.20E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 31B/36              | IND           | AV29        | 1E-04                 | <1           | <1                | Metal                      | Arsenic                | C                                | 2.4 - 50.9   | 5.09E+01            | 7/8                           | 1.17E-04                                                          | 71.6           | 28.4                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
| 31B/36              | IND           | AV30        | 5E-06                 | <1           | <1                | VOC                        | Naphthalene            | C                                | 6.6 - 6.6    | 6.60E+00            | 1/11                          | 1.42E-06                                                          | 9.8            | 0.0                                  | 90.2                         | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C                                | 0.45 - 0.45  | 4.50E-01            | 1/2                           | 2.56E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 40                  | IND           | AW31        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C                                | 12.3 - 12.3  | 1.23E+01            | 1/1                           | 2.84E-05                                                          | 71.6           | 28.4                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
| 40                  | IND           | BA33        | 6E-06                 | <1           | <1                | Pest/PCB                   | Aroclor-1254           | C                                | 3.4 - 3.4    | 3.40E+00            | 1/7                           | 3.38E-06                                                          | 35.1           | 64.9                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Aroclor-1260           | C                                | 2.8 - 2.8    | 2.80E+00            | 1/7                           | 2.79E-06                                                          | 35.1           | 64.9                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
| 41                  | IND           | BA30        | 2E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.16 - 0.23  | 2.30E-01            | 2/5                           | 1.31E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 41                  | IND           | BB30        | 3E-05                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.055 - 4.8  | 2.80E+00            | 4/11                          | 1.60E-05                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C                                | 0.023 - 9.4  | 9.40E+00            | 6/11                          | 5.35E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C                                | 0.023 - 2.3  | 2.30E+00            | 2/11                          | 1.31E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C                                | 1 - 1        | 1.00E+00            | 1/11                          | 3.46E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C                                | 0.032 - 2.8  | 2.80E+00            | 2/11                          | 1.59E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AO30        | 5E-06                 | <1           | <1                | Pest/PCB                   | Aroclor-1260           | C                                | 0.77 - 6.8   | 4.12E+00            | 5/9                           | 4.10E-06                                                          | 35.1           | 64.9                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AP29        | 2E-04                 | <1           | <1                | Metal                      | Arsenic                | C                                | 2.8 - 244    | 9.09E+01            | 6/8                           | 2.10E-04                                                          | 71.6           | 28.4                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C                                | 0.038 - 0.21 | 1.89E-01            | 4/8                           | 1.08E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AP31        | 2E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.2 - 0.2    | 2.00E-01            | 1/3                           | 1.14E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AQ30        | 2E-05                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.068 - 0.37 | 3.70E-01            | 3/7                           | 2.11E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AR31        | 3E-05                 | <1           | <1                | Pest/PCB                   | Aroclor-1260           | C                                | 0.55 - 14    | 1.40E+01            | 6/8                           | 1.39E-05                                                          | 35.1           | 64.9                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                | C                                | 2.3 - 13     | 9.13E+00            | 10/10                         | 2.11E-05                                                          | 71.6           | 28.4                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C                                | 0.039 - 0.19 | 1.90E-01            | 2/12                          | 1.08E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C                                | 0.038 - 9    | 5.82E+00            | 7/10                          | 5.79E-06                                                          | 35.1           | 64.9                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AR32        | 3E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.21 - 0.21  | 2.10E-01            | 1/18                          | 1.20E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AS30        | 2E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.23 - 0.23  | 2.30E-01            | 1/3                           | 1.31E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AS32        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C                                | 0.81 - 27    | 1.15E+01            | 12/14                         | 2.65E-05                                                          | 71.6           | 28.4                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C                                | 0.041 - 0.38 | 3.80E-01            | 3/16                          | 2.16E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AT32        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C                                | 4.4 - 15     | 1.16E+01            | 4/5                           | 2.68E-05                                                          | 71.6           | 28.4                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AT33        | 2E-05                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.16 - 2.4   | 2.40E+00            | 3/4                           | 1.37E-05                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AU32        | 3E-06                 | <1           | <1                | Pest/PCB                   | Aroclor-1260           | C                                | 0.053 - 2.3  | 2.30E+00            | 3/5                           | 2.29E-06                                                          | 35.1           | 64.9                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AU34        | 3E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.3 - 0.3    | 3.00E-01            | 1/4                           | 1.71E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AV33        | 5E-05                 | <1           | <1                | PAH                        | Benzo(a)anthracene     | C                                | 0.13 - 8.2   | 8.20E+00            | 2/8                           | 4.67E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C                                | 0.082 - 6.4  | 6.40E+00            | 2/8                           | 3.64E-05                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C                                | 0.21 - 13    | 1.30E+01            | 3/8                           | 7.40E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C                                | 1.1 - 1.1    | 1.10E+00            | 1/8                           | 3.81E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AV34        | 4E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.32 - 0.36  | 3.60E-01            | 2/4                           | 2.05E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 43                  | IND           | AW34        | 2E-05                 | <1           | <1                | PAH                        | Benzo(a)anthracene     | C                                | 0.12 - 5.7   | 5.70E+00            | 6/9                           | 3.25E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C                                | 0.16 - 2.2   | 1.33E+00            | 6/9                           | 7.56E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C                                | 0.33 - 5.2   | 3.03E+00            | 6/9                           | 1.73E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C                                | 0.083 - 1.8  | 1.80E+00            | 3/5                           | 1.79E-06                                                          | 35.1           | 64.9                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AL32        | 7E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.036 - 0.43 | 4.30E-01            | 2/3                           | 2.45E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C                                | 0.36 - 3.6   | 3.60E+00            | 2/3                           | 3.58E-06                                                          | 35.1           | 64.9                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AM32        | 6E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.043 - 0.53 | 3.76E-01            | 4/5                           | 2.14E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AM33        | 1E-05                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C                                | 0.049 - 0.64 | 6.40E-01            | 2/3                           | 3.64E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C                                | 0.11 - 1.8   | 1.80E+00            | 3/3                           | 1.03E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C                                | 0.33 - 3.9   | 3.90E+00            | 2/3                           | 3.88E-06                                                          | 35.1           | 64.9                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |

TABLE 5-11: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                     |               |             |                       |              |                   |                            |                            |                    |                                  |               |                     |                               | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              |                      | Percent Contribution by Exposure Pathway to Total RME HI |                      |                                      |                                      |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------------------|--------------------|----------------------------------|---------------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------------|--------------------------------------|--------------------------------------|
|                     |               |             |                       |              |                   |                            |                            |                    |                                  |               |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Chemical-Specific HI                                     | Incidental Ingestion | Dermal Contact                       | Inhalation (Releases to Ambient Air) |
| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                            | Basis for COC      | Range of Detected Concentrations | RME EPC       | Detection Frequency | Chemical-Specific Cancer Risk | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | Chemical-Specific HI | Incidental Ingestion                                     | Dermal Contact       | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion         |
| 44                  | IND           | AM34        | 1E-05                 | <1           | <1                | PAH                        | Benzo(a)pyrene             | C                  | 0.75 - 0.75                      | 7.50E-01      | 1/3                 | 4.27E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254               | C                  | 1.6 - 1.6                        | 1.60E+00      | 1/3                 | 1.59E-06                      | 35.1                                                              | 64.9           | 0.0                                  | <1                           | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Aroclor-1260               | C                  | 5.3 - 5.3                        | 5.30E+00      | 1/3                 | 5.28E-06                      | 35.1                                                              | 64.9           | 0.0                                  | <1                           | --                   | --                                                       | --                   |                                      |                                      |
| 44                  | IND           | AM35        | 8E-05                 | <1           | <1                | Metal                      | Arsenic                    | C                  | 3.6 - 23                         | 2.30E+01      | 3/7                 | 5.30E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene         | C                  | 0.052 - 2.3                      | 2.30E+00      | 6/8                 | 1.31E-06                      | 36.8                                                              | 63.2           | 0.0                                  | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C                  | 0.051 - 3.5                      | 3.50E+00      | 6/8                 | 1.99E-05                      | 36.8                                                              | 63.2           | 0.0                                  | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene       | C                  | 0.1 - 6.1                        | 6.10E+00      | 6/8                 | 3.47E-06                      | 36.8                                                              | 63.2           | 0.0                                  | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene      | C                  | 0.071 - 0.81                     | 8.10E-01      | 3/8                 | 2.81E-06                      | 36.8                                                              | 63.2           | 0.0                                  | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene     | C                  | 0.23 - 2.3                       | 2.30E+00      | 4/8                 | 1.31E-06                      | 36.8                                                              | 63.2           | 0.0                                  | --                           | --                   | --                                                       |                      |                                      |                                      |
| 44                  | IND           | AN33        | 1E-05                 | <1           | <1                | PAH                        | Benzo(a)pyrene             | C                  | 0.19 - 1                         | 1.00E+00      | 2/6                 | 5.70E-06                      | 36.8                                                              | 63.2           | 0.0                                  | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C                  | 1.6 - 1.6                        | 1.60E+00      | 1/6                 | 1.59E-06                      | 35.1                                                              | 64.9           | 0.0                                  | <1                           | --                   | --                                                       | --                   |                                      |                                      |
| 44                  | IND           | AP37        | 7E-06                 | <1           | <1                | Pest/PCB                   | Aroclor-1254               | C                  | 1.3 - 1.3                        | 1.30E+00      | 1/5                 | 1.29E-06                      | 35.1                                                              | 64.9           | 0.0                                  | <1                           | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Aroclor-1260               | C                  | 0.044 - 4.3                      | 4.30E+00      | 3/5                 | 4.28E-06                      | 35.1                                                              | 64.9           | 0.0                                  | <1                           | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | PAH                        | Benzo(a)pyrene     | C                                | 0.38 - 0.38   | 3.80E-01            | 1/4                           | 2.16E-06                                                          | 36.8           | 63.2                                 | 0.0                          | --                   | --                                                       | --                   |                                      |                                      |
| 44                  | IND           | AQ35        | 4E-06                 | <1           | <1                | PAH                        | Arsenic                    | C                  | 2.6 - 16                         | 1.15E+01      | 5/7                 | 2.64E-05                      | 71.6                                                              | 28.4           | 0.0                                  | <1                           | --                   | --                                                       | --                   |                                      |                                      |
| 44                  | IND           | AQ36        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                    | C                  | 0.23 - 0.23                      | 2.30E-01      | 1/1                 | 1.31E-06                      | 36.8                                                              | 63.2           | 0.0                                  | --                           | --                   | --                                                       | --                   |                                      |                                      |
| 44                  | IND           | AR35        | 2E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene             | C                  | 0.23 - 0.23                      | 2.30E-01      | 1/1                 | 1.31E-06                      | 36.8                                                              | 63.2           | 0.0                                  | --                           | --                   | --                                                       | --                   |                                      |                                      |
| 44                  | IND           | AR36        | 3E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene             | C                  | 0.22 - 0.22                      | 2.20E-01      | 1/4                 | 1.25E-06                      | 36.8                                                              | 63.2           | 0.0                                  | --                           | --                   | --                                                       | --                   |                                      |                                      |
| 44                  | IND           | AV36        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                    | C                  | 9.2 - 15                         | 1.50E+01      | 5/5                 | 3.46E-05                      | 71.6                                                              | 28.4           | 0.0                                  | <1                           | --                   | --                                                       | --                   |                                      |                                      |
| 44                  | IND           | AW36        | 2E-06                 | <1           | <1                | --                         | No COCs Identified         | --                 | --                               | --            | --                  | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --                   |                                      |                                      |
| 44                  | IND           | AY35        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                    | C                  | 11.9 - 11.9                      | 1.19E+01      | 1/1                 | 2.74E-05                      | 71.6                                                              | 28.4           | 0.0                                  | <1                           | --                   | --                                                       | --                   |                                      |                                      |
| 45                  | RD            | 033077      | --                    | 8E+00        | 7E+00             | Metal                      | Manganese                  | NC                 | 6040 - 6040                      | 6.04E+03      | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 7.16E+00             | 44.9                                                     | 0.0                  | 2.9                                  | 52.2                                 |
| 45                  | RD            | 035079      | 4E-04                 | <1           | <1                | Metal                      | Arsenic                    | C/NC               | 16.5 - 16.5                      | 1.65E+01      | 1/1                 | 4.31E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.05E+00             | 66.8                                                     | 5.6                  | 0.1                                  | 27.5                                 |
| 45                  | RD            | 036074      | --                    | 9E+00        | 3E+00             | Metal                      | Iron                       | NC                 | 64100 - 64100                    | 6.41E+04      | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.92E+00             | 93.6                                                     | 0.0                  | 0.0                                  | 6.4                                  |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC                 | 1560 - 1560                      | 1.56E+03      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.85E+00                     | 44.9                 | 0.0                                                      | 2.9                  | 52.2                                 |                                      |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC                 | 191 - 191                        | 1.91E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 2.95E+00                     | 82.9                 | 0.0                                                      | 0.0                  | 17.1                                 |                                      |
| 45                  | RD            | 037076      | 8E-10                 | 4E+00        | 3E+00             | Metal                      | Manganese                  | NC                 | 2840 - 2840                      | 2.84E+03      | 1/1                 | --                            | --                                                                | --             | --                                   | 3.37E+00                     | 44.9                 | 0.0                                                      | 2.9                  | 52.2                                 |                                      |
| 45                  | RD            | 038074      | 2E-07                 | 4E+00        | 3E+00             | Metal                      | Iron                       | NC                 | 59200 - 59200                    | 5.92E+04      | 1/1                 | --                            | --                                                                | --             | --                                   | 2.70E+00                     | 93.6                 | 0.0                                                      | 0.0                  | 6.4                                  |                                      |
|                     |               |             |                       |              |                   |                            | Thallium                   | NC                 | 5.7 - 5.7                        | 5.70E+00      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.13E+00                     | 97.3                 | 0.0                                                      | 0.0                  | 2.7                                  |                                      |
|                     |               |             |                       |              |                   |                            | Antimony                   | NC                 | 38.4 - 38.4                      | 3.84E+01      | 1/2                 | --                            | --                                                                | --             | --                                   | 3.76E+00                     | 32.7                 | 0.0                                                      | 0.0                  | 67.3                                 |                                      |
| 45                  | RD            | 038079      | 6E-04                 | 2E+01        | 2E+01             | Metal                      | Arsenic                    | C/NC               | 10.7 - 21.8                      | 2.18E+01      | 2/2                 | 5.69E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.39E+00             | 66.8                                                     | 5.6                  | 0.1                                  | 27.5                                 |
|                     |               |             |                       |              |                   |                            | Cadmium                    | NC                 | 8.2 - 8.2                        | 8.20E+00      | 1/2                 | 1.39E-08                      | --                                                                | --             | --                                   | --                           | 2.37E+00             | 8.8                                                      | 0.0                  | 0.0                                  | 91.1                                 |
|                     |               |             |                       |              |                   |                            | Copper                     | NC                 | 33.7 - 165                       | 1.65E+02      | 2/2                 | --                            | --                                                                | --             | --                                   | 1.04E+00                     | 5.5                  | 0.0                                                      | 0.0                  | 94.5                                 |                                      |
|                     |               |             |                       |              |                   |                            | Lead                       | --                 | 142 - 504                        | 5.04E+02      | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Zinc                       | NC                 | 49.1 - 5400                      | 5.40E+03      | 2/2                 | --                            | --                                                                | --             | --                                   | 1.45E+01                     | 1.6                  | 0.0                                                      | 0.0                  | 98.4                                 |                                      |
|                     |               |             |                       |              |                   |                            | PAH                        | Benzo(a)anthracene | C                                | 0.55 - 0.55   | 5.50E-01            | 1/2                           | 1.49E-06                                                          | 69.5           | 28.5                                 | 0.0                          | 2.0                  | --                                                       | --                   | --                                   | --                                   |
|                     |               |             |                       |              |                   | Benzo(a)pyrene             | C                          | 0.76 - 0.76        | 7.60E-01                         | 1/2           | 2.04E-05            | 70.1                          | 28.8                                                              | 0.0            | 1.1                                  | --                           | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | Benzo(b)fluoranthene       | C                          | 1.2 - 1.2          | 1.20E+00                         | 1/2           | 3.55E-06            | 63.6                          | 26.1                                                              | 0.0            | 10.3                                 | --                           | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C                  | 0.58 - 0.58                      | 5.80E-01      | 1/2                 | 2.75E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --                   | --                                   | --                                   |
|                     |               |             |                       |              |                   | SVOC                       | Bis(2-ethylhexyl)phthalate | C                  | 5.4 - 5.4                        | 5.40E+00      | 1/2                 | 4.73E-06                      | 2.5                                                               | 0.8            | 0.0                                  | 96.7                         | <1                   | --                                                       | --                   | --                                   | --                                   |
|                     |               |             |                       |              |                   | 45                         | RD                         | 040075             | --                               | 5E+00         | 5E+00               | Metal                         | Manganese                                                         | NC             | 4390 - 4390                          | 4.39E+03                     | 1/1                  | --                                                       | --                   | --                                   | --                                   |
| 45                  | RD            | 041082      | 4E-05                 | <1           | <1                | PAH                        | Benzo(a)anthracene         | C                  | 0.59 - 0.59                      | 5.90E-01      | 1/1                 | 1.60E-06                      | 69.5                                                              | 28.5           | 0.0                                  | 2.0                          | --                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C                  | 0.94 - 0.94                      | 9.40E-01      | 1/1                 | 2.52E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene       | C                  | 1.2 - 1.2                        | 1.20E+00      | 1/1                 | 3.55E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene       | C                  | 0.47 - 0.47                      | 4.70E-01      | 1/1                 | 1.39E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene     | C                  | 0.6 - 0.6                        | 6.00E-01      | 1/1                 | 1.73E-06                      | 65.3                                                              | 26.8           | 0.0                                  | 8.0                          | --                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Pest/PCB                   | Dieldrin           | C                                | 0.005 - 0.005 | 5.00E-03            | 1/1                           | 7.58E-06                                                          | 1.7            | 0.5                                  | 0.0                          | 97.8                 | <1                                                       | --                   | --                                   | --                                   |
|                     |               |             |                       |              |                   | Metal                      | Manganese                  | NC                 | 843 - 2530                       | 2.53E+03      | 2/2                 | --                            | --                                                                | --             | --                                   | 3.00E+00                     | 44.9                 | 0.0                                                      | 2.9                  | 52.2                                 |                                      |
| Thallium            | NC            | 7.1 - 7.1   | 7.10E+00              | 1/2          | --                | --                         | --                         | --                 | 1.41E+00                         | 97.3          | 0.0                 | 0.0                           | 2.7                                                               |                |                                      |                              |                      |                                                          |                      |                                      |                                      |
| 45                  | RD            | 042081      | 4E-04                 | <1           | <1                | Metal                      | Arsenic                    | C/NC               | 16.3 - 16.3                      | 1.63E+01      | 1/2                 | 4.26E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.04E+00             | 66.8                                                     | 5.6                  | 0.1                                  | 27.5                                 |
| 45                  | RD            | 042082      | 4E-05                 | 9E+00        | 5E+00             | Metal                      | Antimony                   | NC                 | 11.9 - 11.9                      | 1.19E+01      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.16E+00                     | 32.7                 | 0.0                                                      | 0.0                  | 67.3                                 |                                      |
|                     |               |             |                       |              |                   |                            | Copper                     | NC                 | 771 - 771                        | 7.71E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 4.84E+00                     | 5.5                  | 0.0                                                      | 0.0                  | 94.5                                 |                                      |
|                     |               |             |                       |              |                   |                            | Lead                       | --                 | 321 - 321                        | 3.21E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Zinc                       | NC                 | 794 - 794                        | 7.94E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 2.13E+00                     | 1.6                  | 0.0                                                      | 0.0                  | 98.4                                 |                                      |

TABLE 5-11: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                            | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                     |               |             |                       |              |                   |                            |                            |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| 45                  | RD            | 042082      | 4E-05                 | 9E+00        | 5E+00             | PAH                        | Benzo(a)anthracene         | C             | 1.3 - 1.3                        | 1.30E+00 | 1/1                 | 3.51E-06                      | 69.5                                                              | 28.5           | 0.0                                  | 2.0                          | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C             | 0.79 - 0.79                      | 7.90E-01 | 1/1                 | 2.12E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene       | C             | 2.5 - 2.5                        | 2.50E+00 | 1/1                 | 7.39E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene       | C             | 0.75 - 0.75                      | 7.50E-01 | 1/1                 | 2.22E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene      | C             | 0.14 - 0.14                      | 1.40E-01 | 1/1                 | 2.42E-06                      | 66.2                                                              | 27.2           | 0.0                                  | 6.7                          | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene     | C             | 0.45 - 0.45                      | 4.50E-01 | 1/1                 | 1.30E-06                      | 65.3                                                              | 26.8           | 0.0                                  | 8.0                          | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C             | 0.82 - 0.82                      | 8.20E-01 | 1/1                 | 3.89E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 043081      | 5E-04                 | <1           | <1                | Metal                      | Arsenic                    | C/NC          | 17.9 - 17.9                      | 1.79E+01 | 1/2                 | 4.68E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.14E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         |
| 45                  | RD            | 044073      | --                    | <1           | <1                | Metal                      | Thallium                   | NC            | 5.6 - 5.6                        | 5.60E+00 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.11E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          |
| 45                  | RD            | 044079      | 4E-04                 | 4E+00        | 3E+00             | Metal                      | Arsenic                    | C             | 14.3 - 14.3                      | 1.43E+01 | 1/2                 | 3.74E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 994 - 2440                       | 2.44E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 2.89E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
| 45                  | RD            | 045074      | 1E-05                 | 4E+00        | 3E+00             | Metal                      | Manganese                  | NC            | 925 - 2630                       | 2.63E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 3.12E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C             | 0.22 - 0.22                      | 2.20E-01 | 1/2                 | 5.90E-06                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   | PAH                        | Benzo(b)fluoranthene       | C             | 0.54 - 0.54                      | 5.40E-01 | 1/2                 | 1.60E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene       | C             | 0.56 - 0.56                      | 5.60E-01 | 1/2                 | 1.66E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene     | C             | 0.41 - 0.41                      | 4.10E-01 | 1/2                 | 1.18E-06                      | 65.3                                                              | 26.8           | 0.0                                  | 8.0                          | --                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 045075      | 2E-08                 | 4E+00        | 3E+00             | Metal                      | Copper                     | NC            | 170 - 170                        | 1.70E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.07E+00             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 2500 - 2500                      | 2.50E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.97E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
| 45                  | RD            | 046072      | 4E-08                 | 2E+00        | <1                | Metal                      | Thallium                   | NC            | 7.1 - 7.1                        | 7.10E+00 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.41E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          |
| 45                  | RD            | 046074      | 3E-06                 | 2E+01        | 1E+01             | Metal                      | Copper                     | NC            | 536 - 536                        | 5.36E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 3.37E+00             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         |
|                     |               |             |                       |              |                   |                            | Mercury                    | NC            | 17.5 - 17.5                      | 1.75E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.10E+01             | 6.8                                                      | 0.0            | 0.0                                  | 93.2                         |
|                     |               |             |                       |              |                   |                            | Zinc                       | NC            | 567 - 567                        | 5.67E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.52E+00             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.04 - 0.04                      | 4.00E-02 | 1/1                 | 1.07E-06                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 046082      | 8E-06                 | 5E+01        | 3E+01             | Metal                      | Antimony                   | NC            | 22.3 - 22.3                      | 2.23E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.18E+00             | 32.7                                                     | 0.0            | 0.0                                  | 67.3                         |
|                     |               |             |                       |              |                   |                            | Copper                     | NC            | 5230 - 5230                      | 5.23E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 3.29E+01             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         |
|                     |               |             |                       |              |                   | Pest/PCB                   | Lead                       | --            | 4850 - 4850                      | 4.85E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Mercury                    | NC            | 3.7 - 3.7                        | 3.70E+00 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.33E+00             | 6.8                                                      | 0.0            | 0.0                                  | 93.2                         |
|                     |               |             |                       |              |                   |                            | Zinc                       | NC            | 2220 - 2220                      | 2.22E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 5.95E+00             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         |
|                     |               |             |                       |              |                   |                            | Aroclor-1260               | C/NC          | 1.4 - 1.4                        | 1.40E+00 | 1/1                 | 6.63E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | 1.29E+00             | 69.6                                                     | 27.3           | 0.0                                  | 3.1                          |
|                     |               |             |                       |              |                   | Metal                      | Copper                     | NC            | 188 - 188                        | 1.88E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.18E+00             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         |
| 45                  | RD            | 047089      | 4E-06                 | 3E+00        | <1                | Pest/PCB                   | Lead                       | --            | 1080 - 1080                      | 1.08E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Zinc                       | NC            | 401 - 401                        | 4.01E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.07E+00             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         |
|                     |               |             |                       |              |                   |                            | Aroclor-1260               | C             | 0.75 - 0.75                      | 7.50E-01 | 1/1                 | 3.55E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 047092      | 4E-09                 | <1           | <1                | Metal                      | Lead                       | --            | 187 - 187                        | 1.87E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 048072      | 1E-05                 | 3E+00        | 3E+00             | Metal                      | Iron                       | NC            | 12200 - 61100                    | 6.11E+04 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 2.78E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          |
| 45                  | RD            | 048080      | 7E-06                 | 7E+01        | 7E+01             | PAH                        | Benzo(a)pyrene             | C             | 0.46 - 0.46                      | 4.60E-01 | 1/2                 | 1.23E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Antimony                   | NC            | 29 - 29                          | 2.90E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.84E+00             | 32.7                                                     | 0.0            | 0.0                                  | 67.3                         |
|                     |               |             |                       |              |                   | Metal                      | Copper                     | NC            | 10400 - 10400                    | 1.04E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 6.53E+01             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         |
|                     |               |             |                       |              |                   |                            | Lead                       | --            | 1900 - 1900                      | 1.90E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Zinc                       | NC            | 784 - 784                        | 7.84E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.10E+00             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         |
| 45                  | RD            | 049079      | 2E-05                 | 9E+00        | 4E+00             | Pest/PCB                   | Aroclor-1260               | C/NC          | 1.4 - 1.4                        | 1.40E+00 | 1/1                 | 6.63E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | 1.29E+00             | 69.6                                                     | 27.3           | 0.0                                  | 3.1                          |
|                     |               |             |                       |              |                   |                            | Cadmium                    | NC            | 4 - 4                            | 4.00E+00 | 1/1                 | 6.78E-09                      | --                                                                | --             | --                                   | --                           | 1.16E+00             | 8.8                                                      | 0.0            | 0.0                                  | 91.1                         |
|                     |               |             |                       |              |                   | Metal                      | Copper                     | NC            | 619 - 619                        | 6.19E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 3.89E+00             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         |
|                     |               |             |                       |              |                   |                            | Lead                       | --            | 1070 - 1070                      | 1.07E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 050077      | 5E-06                 | 3E+00        | 2E+00             | Pest/PCB                   | Aroclor-1260               | C/NC          | 3.3 - 3.3                        | 3.30E+00 | 1/1                 | 1.56E-05                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | 3.03E+00             | 69.6                                                     | 27.3           | 0.0                                  | 3.1                          |
|                     |               |             |                       |              |                   | Metal                      | Vanadium                   | NC            | 121 - 121                        | 1.21E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.87E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC          | 1.1 - 1.1                        | 1.10E+00 | 1/1                 | 5.21E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | 1.01E+00             | 69.6                                                     | 27.3           | 0.0                                  | 3.1                          |
| 45                  | RD            | 050083      | --                    | 2E+00        | 2E+00             | Metal                      | Mercury                    | NC            | 2.3 - 2.3                        | 2.30E+00 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.45E+00             | 6.8                                                      | 0.0            | 0.0                                  | 93.2                         |
| 45                  | RD            | 050086      | 5E-06                 | <1           | <1                | SVOC                       | Pentachloropheno           | C             | 10 - 10                          | 1.00E+01 | 1/1                 | 3.85E-06                      | 48.8                                                              | 38.5           | 0.0                                  | 12.6                         | <1                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 052085      | 4E-08                 | 2E+00        | 2E+00             | Metal                      | Manganese                  | NC            | 1590 - 1590                      | 1.59E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.89E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
| 45                  | RD            | 053081      | 2E-08                 | 3E+00        | 3E+00             | Metal                      | Cadmium                    | NC            | 11.3 - 11.3                      | 1.13E+01 | 1/1                 | 1.92E-08                      | --                                                                | --             | --                                   | --                           | 3.27E+00             | 8.8                                                      | 0.0            | 0.0                                  | 91.1                         |
| 45                  | RD            | 053085      | 4E-06                 | <1           | <1                | Metal                      | Lead                       | --            | 12.5 - 169                       | 1.69E+02 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   | SVOC                       | Bis(2-ethylhexyl)phthalate | C             | 3.6 - 3.6                        | 3.60E+00 | 1/2                 | 3.15E-06                      | 2.5                                                               | 0.8            | 0.0                                  | 96.7                         | <1                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   | Metal                      | Lead                       | --            | 597 - 597                        | 5.97E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 054074      | 2E-06                 | 2E+00        | <1                | Pest/PCB                   | Aroclor-1260               | C             | 0.32 - 0.32                      | 3.20E-01 | 1/1                 | 1.52E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --             | --                                   | --                           |

TABLE 5-11: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                        | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|------------------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                     |               |             |                       |              |                   |                            |                        |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| 45                  | RD            | 054077      | --                    | 2E+00        | <1                | Metal                      | Thallium               | NC            | 6.8 - 6.8                        | 6.80E+00 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.35E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          |
| 45                  | RD            | 054081      | 8E-08                 | 2E+00        | 2E+00             | Metal                      | Manganese              | NC            | 1890 - 1890                      | 1.89E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.24E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
| EMI-1               | MI            | BA34        | 4E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.052 - 0.46                     | 4.60E-01 | 3/10                | 2.62E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BB32        | 6E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.043 - 0.6                      | 6.00E-01 | 2/6                 | 3.42E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BB33        | 1E-05                 | <1           | <1                | Pest/PCB                   | Aroclor-1260           | C             | 0.019 - 1.5                      | 1.50E+00 | 3/6                 | 1.49E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.13 - 0.38                      | 3.80E-01 | 2/11                | 2.16E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BB34        | 3E-05                 | <1           | <1                | Pest/PCB                   | Aroclor-1254           | C             | 6.9 - 6.9                        | 6.90E+00 | 1/11                | 6.87E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                | C             | 3.4 - 14.5                       | 8.89E+00 | 6/14                | 2.05E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.014 - 0.31                     | 3.10E-01 | 8/16                | 1.77E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C             | 0.02 - 1.6                       | 1.60E+00 | 3/9                 | 1.59E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BC33        | 2E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.068 - 0.29                     | 2.90E-01 | 2/14                | 1.65E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BD32        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 3.5 - 12                         | 1.20E+01 | 3/5                 | 2.77E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BD33        | 6E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 3.5 - 62                         | 2.54E+01 | 12/12               | 5.87E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                        | --            | 5.5 - 1420                       | 1.42E+03 | 11/13               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BD34        | 2E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 0.84 - 14.5                      | 8.32E+00 | 7/9                 | 1.92E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254           | C             | 0.46 - 3.3                       | 3.30E+00 | 2/6                 | 3.28E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BE31        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 7.9 - 12                         | 1.20E+01 | 2/2                 | 2.77E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BE32        | 7E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.096 - 0.85                     | 8.50E-01 | 2/6                 | 4.84E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BE34        | 5E-05                 | 3E+00        | 3E+00             | Metal                      | Arsenic                | C             | 2.5 - 11.8                       | 6.93E+00 | 7/11                | 1.60E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254           | C/NC          | 30 - 38                          | 3.80E+01 | 2/11                | 3.78E-05                      | 35.1                                                              | 64.9           | 0.0                                  |                              | 2.65E+00             | 35.1                                                     | 64.9           | 0.0                                  |                              |
| EMI-1               | MI            | BF31        | 1E-04                 | <1           | <1                | Metal                      | Arsenic                | C             | 4.4 - 45                         | 4.50E+01 | 3/3                 | 1.04E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                        | --            | 35.6 - 4300                      | 4.30E+03 | 3/3                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BG32        | 6E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.27 - 0.7                       | 7.00E-01 | 2/4                 | 3.99E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BG33        | 8E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.45 - 0.99                      | 9.90E-01 | 3/20                | 5.64E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BG34        | 4E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.066 - 0.4                      | 4.00E-01 | 2/4                 | 2.28E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BI34        | 2E-04                 | <1           | <1                | Metal                      | Arsenic                | C             | 3.6 - 99.5                       | 9.95E+01 | 2/5                 | 2.29E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                        | --            | 8.7 - 1340                       | 1.34E+03 | 3/5                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.21 - 0.21                      | 2.10E-01 | 1/4                 | 1.20E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                | C             | 12.1 - 12.1                      | 1.21E+01 | 1/1                 | 2.79E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BJ33        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 6.9 - 12                         | 1.20E+01 | 2/2                 | 3.23E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EOS-1               | OS            | AL35        | 3E-05                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.17 - 0.17                      | 1.70E-01 | 1/2                 | 1.30E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-1               | OS            | AL36        | 1E-04                 | 3E+00        | <1                | Metal                      | Arsenic                | C             | 2.9 - 31                         | 3.10E+01 | 2/5                 | 8.34E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                        | --            | 28 - 470                         | 4.13E+02 | 5/5                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 2.7 - 2.7                        | 2.70E+00 | 1/5                 | 2.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.25 - 2.5                       | 2.50E+00 | 2/5                 | 1.91E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.085 - 3.5                      | 3.50E+00 | 2/5                 | 2.68E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C             | 1.7 - 1.7                        | 1.70E+00 | 1/5                 | 1.30E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C             | 0.17 - 1.4                       | 1.40E+00 | 2/5                 | 1.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.13 - 5.5                       | 5.50E+00 | 4/5                 | 7.40E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 1.39E+00             | 29.0                                                     | 71.0           | 0.0                                  |                              |
| EOS-1               | OS            | AM36        | 1E-04                 | 1E+01        | 1E+01             | Metal                      | Arsenic                | C             | 8.4 - 18                         | 1.80E+01 | 3/6                 | 4.85E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                        | --            | 38 - 700                         | 5.72E+02 | 5/6                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.045 - 0.15                     | 1.50E-01 | 2/6                 | 1.15E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.15 - 40                        | 4.00E+01 | 3/6                 | 5.39E-05                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 1.01E+01             | 29.0                                                     | 71.0           | 0.0                                  |                              |
| EOS-1               | OS            | AM37        | 1E-04                 | 5E+00        | 3E+00             | Metal                      | Arsenic                | C             | 6.2 - 12                         | 1.20E+01 | 3/4                 | 3.23E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                        | --            | 270 - 871                        | 8.65E+02 | 4/4                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 0.52 - 20                        | 2.00E+01 | 3/4                 | 1.53E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.1 - 3.5                        | 3.50E+00 | 3/4                 | 2.68E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.15 - 6.5                       | 6.50E+00 | 3/4                 | 4.98E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Chrysene               | C             | 0.58 - 20                        | 2.00E+01 | 3/4                 | 1.53E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C             | 0.61 - 0.61                      | 6.10E-01 | 1/4                 | 2.84E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C             | 0.38 - 2.3                       | 2.30E+00 | 2/4                 | 1.76E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.074 - 12                       | 1.20E+01 | 4/4                 | 1.62E-05                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 3.02E+00             | 29.0                                                     | 71.0           | 0.0                                  |                              |



TABLE 5-11: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block    | Planned Reuse          | Grid Number  | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                       | Basis for COC  | Range of Detected Concentrations | RME EPC     | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|------------------------|------------------------|--------------|-----------------------|--------------|-------------------|----------------------------|-----------------------|----------------|----------------------------------|-------------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                        |                        |              |                       |              |                   |                            |                       |                |                                  |             |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| EOS-1                  | OS                     | AM38         | 6E-05                 | 2E+00        | <1                | Metal                      | Arsenic               | C              | 5.2 - 19.2                       | 1.92E+01    | 2/3                 | 5.17E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                        |                        |              |                       |              |                   |                            | Lead                  | --             | 19.2 - 1180                      | 1.18E+03    | 3/3                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                        |                        |              |                       |              |                   | PAH                        | Benzo(a)pyrene        | C              | 0.33 - 0.33                      | 3.30E-01    | 1/3                 | 2.53E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      |                              |
| EOS-1                  | OS                     | AN37         | 2E-05                 | 2E+00        | 2E+00             | Pest/PCB                   | Aroclor-1260          | C              | 0.5 - 1.3                        | 1.30E+00    | 2/3                 | 1.75E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                        |                        |              |                       |              |                   | Metal                      | Lead                  | --             | 509 - 4810                       | 4.81E+03    | 3/3                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                        |                        |              |                       |              |                   |                            | PAH                   | Benzo(a)pyrene | C                                | 0.17 - 0.86 | 8.60E-01            | 3/4                           | 6.58E-06                                                          | 28.0           | 71.9                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              |
| EOS-1                  | OS                     | AN38         | 1E-04                 | 4E+00        | 3E+00             |                            | Benzo(b)fluoranthene  | C              | 0.41 - 1.5                       | 1.50E+00    | 3/4                 | 1.15E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      |                              |
|                        |                        |              |                       |              |                   | Pest/PCB                   | Aroclor-1260          | C/NC           | 0.7 - 6.4                        | 5.61E+00    | 4/4                 | 7.56E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 1.41E+00             | 29.0                                                     | 71.0           | 0.0                                  |                              |
|                        |                        |              |                       |              |                   | Metal                      | Arsenic               | C              | 2 - 29.5                         | 2.08E+01    | 11/11               | 5.61E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| Lead                   | --                     | 740 - 4130   | 2.71E+03              | 11/11        | --                |                            | --                    | --             | --                               |             | --                  | --                            | --                                                                |                |                                      |                              |                      |                                                          |                |                                      |                              |
| PAH                    | Benzo(a)anthracene     | C            | 0.079 - 11            | 6.74E+00     | 7/11              |                            | 5.16E-06              | 28.0           | 71.9                             | 0.0         |                     | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |
|                        | Benzo(a)pyrene         | C            | 0.064 - 6.5           | 4.15E+00     | 8/11              |                            | 3.18E-05              | 28.0           | 71.9                             | 0.0         |                     | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |
|                        | Benzo(b)fluoranthene   | C            | 0.13 - 21             | 8.36E+00     | 9/11              |                            | 6.40E-06              | 28.0           | 71.9                             | 0.0         |                     | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |
|                        | Benzo(k)fluoranthene   | C            | 0.045 - 20            | 1.47E+01     | 8/11              |                            | 1.12E-05              | 28.0           | 71.9                             | 0.0         |                     | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |
|                        | Chrysene               | C            | 0.081 - 19            | 1.33E+01     | 8/11              |                            | 1.02E-06              | 28.0           | 71.9                             | 0.0         |                     | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |
|                        | Dibenz(a,h)anthracene  | C            | 0.049 - 1.7           | 1.70E+00     | 6/11              |                            | 7.92E-06              | 28.0           | 71.9                             | 0.0         |                     | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |
|                        | Indeno(1,2,3-cd)pyrene | C            | 0.045 - 3.3           | 3.13E+00     | 8/11              |                            | 2.40E-06              | 28.0           | 71.9                             | 0.0         |                     | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |
| Pest/PCB               | Aroclor-1260           | C/NC         | 0.44 - 4.8            | 4.07E+00     | 5/5               | 5.47E-06                   | 26.6                  | 73.4           | 0.0                              |             | 1.02E+00            | 29.0                          | 71.0                                                              | 0.0            |                                      |                              |                      |                                                          |                |                                      |                              |
|                        | PCB-105                | C            | 0.015 - 0.12          | 1.20E-01     | 2/6               | 1.21E-06                   | 26.6                  | 73.4           | 0.0                              |             | --                  | --                            | --                                                                |                |                                      |                              |                      |                                                          |                |                                      |                              |
|                        | PCB-118                | C            | 0.012 - 0.22          | 2.20E-01     | 5/6               | 2.22E-06                   | 26.6                  | 73.4           | 0.0                              |             | --                  | --                            | --                                                                |                |                                      |                              |                      |                                                          |                |                                      |                              |
|                        | PCB-187                | C            | 0.024 - 1             | 1.00E+00     | 6/6               | 1.35E-06                   | 26.6                  | 73.4           | 0.0                              |             | <1                  | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |
|                        | PCB-206                | C            | 0.004 - 1.2           | 1.20E+00     | 5/6               | 1.62E-06                   | 26.6                  | 73.4           | 0.0                              |             | <1                  | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |
| EOS-1                  | OS                     | AN39         | 3E-06                 | <1           | <1                | Metal                      | Lead                  | --             | 275 - 875                        | 8.75E+02    | 2/2                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                        |                        |              |                       |              |                   | Pest/PCB                   | Aroclor-1260          | C              | 1.5 - 1.8                        | 1.80E+00    | 2/2                 | 2.42E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EOS-1                  | OS                     | AO37         | 7E-10                 | <1           | <1                | Metal                      | Lead                  | --             | 618 - 618                        | 6.18E+02    | 1/1                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
| EOS-1                  | OS                     | AO39         | 2E-06                 | <1           | <1                | Metal                      | Lead                  | --             | 12.6 - 232                       | 2.32E+02    | 2/2                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
| EOS-1                  | OS                     | AQ40         | 7E-06                 | <1           | <1                | Pest/PCB                   | Aroclor-1260          | C              | 0.055 - 1.3                      | 1.30E+00    | 2/2                 | 1.75E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                        |                        |              |                       |              |                   | Metal                      | Lead                  | --             | 92 - 200                         | 2.00E+02    | 2/2                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                        |                        |              |                       |              |                   |                            | PAH                   | Benzo(a)pyrene | C                                | 0.33 - 0.33 | 3.30E-01            | 1/1                           | 2.53E-06                                                          | 28.0           | 71.9                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              |
| EOS-1                  | OS                     | AR39         | 2E-06                 | <1           | <1                |                            | Dibenz(a,h)anthracene | C              | 0.22 - 0.22                      | 2.20E-01    | 1/1                 | 1.02E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      |                              |
|                        |                        |              |                       |              |                   | Pest/PCB                   | Aroclor-1260          | C              | 0.25 - 1.7                       | 1.70E+00    | 2/2                 | 2.29E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                        |                        |              |                       |              |                   | Metal                      | Lead                  | --             | 17 - 260                         | 2.60E+02    | 5/8                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
| PAH                    | Benzo(a)pyrene         | C            | 0.035 - 0.21          | 2.10E-01     | 3/12              |                            | 1.61E-06              | 28.0           | 71.9                             | 0.0         |                     | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |
| EOS-1                  | OS                     | AR40         | 2E-04                 | 1E+01        | 1E+01             | Metal                      | Arsenic               | C              | 2 - 85.3                         | 3.20E+01    | 10/11               | 8.61E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                        |                        |              |                       |              |                   |                            | Lead                  | --             | 7 - 968                          | 9.68E+02    | 10/11               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                        |                        |              |                       |              |                   | PAH                        | Benzo(a)pyrene        | C              | 0.1 - 3.1                        | 3.10E+00    | 3/10                | 2.37E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      |                              |
| Benzo(b)fluoranthene   | C                      | 0.042 - 7.7  | 4.86E+00              | 5/10         | 3.72E-06          |                            | 28.0                  | 71.9           | 0.0                              |             | --                  | --                            | --                                                                |                |                                      |                              |                      |                                                          |                |                                      |                              |
| Benzo(k)fluoranthene   | C                      | 0.034 - 2    | 2.00E+00              | 3/10         | 1.53E-06          |                            | 28.0                  | 71.9           | 0.0                              |             | --                  | --                            | --                                                                |                |                                      |                              |                      |                                                          |                |                                      |                              |
| Dibenz(a,h)anthracene  | C                      | 0.069 - 0.57 | 5.70E-01              | 2/10         | 2.65E-06          |                            | 28.0                  | 71.9           | 0.0                              |             | --                  | --                            | --                                                                |                |                                      |                              |                      |                                                          |                |                                      |                              |
| Indeno(1,2,3-cd)pyrene | C                      | 0.048 - 2.5  | 2.50E+00              | 3/10         | 1.91E-06          |                            | 28.0                  | 71.9           | 0.0                              |             | --                  | --                            | --                                                                |                |                                      |                              |                      |                                                          |                |                                      |                              |
| Pest/PCB               | Aroclor-1260           | C/NC         | 0.038 - 45            | 4.50E+01     | 8/11              |                            | 6.06E-05              | 26.6           | 73.4                             | 0.0         |                     | 1.13E+01                      | 29.0                                                              | 71.0           | 0.0                                  |                              |                      |                                                          |                |                                      |                              |
| EOS-1                  | OS                     | AS38         | 2E-04                 | <1           | <1                | Metal                      | Arsenic               | C              | 11 - 56.1                        | 5.18E+01    | 4/4                 | 1.39E-04                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                        |                        |              |                       |              |                   |                            | Lead                  | --             | 1440 - 1440                      | 1.44E+03    | 1/4                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                        |                        |              |                       |              |                   | PAH                        | Benzo(a)anthracene    | C              | 0.1 - 1.4                        | 1.40E+00    | 3/4                 | 1.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      |                              |
| Benzo(a)pyrene         | C                      | 0.13 - 2     | 2.00E+00              | 4/4          | 1.53E-05          |                            | 28.0                  | 71.9           | 0.0                              |             | --                  | --                            | --                                                                |                |                                      |                              |                      |                                                          |                |                                      |                              |
| Benzo(b)fluoranthene   | C                      | 0.26 - 3.7   | 3.70E+00              | 3/4          | 2.83E-06          |                            | 28.0                  | 71.9           | 0.0                              |             | --                  | --                            | --                                                                |                |                                      |                              |                      |                                                          |                |                                      |                              |
| Dibenz(a,h)anthracene  | C                      | 0.44 - 0.44  | 4.40E-01              | 1/4          | 2.05E-06          |                            | 28.0                  | 71.9           | 0.0                              |             | --                  | --                            | --                                                                |                |                                      |                              |                      |                                                          |                |                                      |                              |
| EOS-1                  | OS                     | AT38         | 6E-06                 | <1           | <1                | Metal                      | Lead                  | --             | 26 - 230                         | 1.93E+02    | 5/6                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                        |                        |              |                       |              |                   | PAH                        | Benzo(a)pyrene        | C              | 0.084 - 0.52                     | 4.66E-01    | 4/6                 | 3.57E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      |                              |
| EOS-1                  | OS                     | AT39         | 3E-05                 | <1           | <1                | Metal                      | Arsenic               | C              | 12 - 12                          | 1.20E+01    | 1/1                 | 3.23E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EOS-1                  | OS                     | AU37         | 9E-03                 | 2E+03        | 2E+03             | PAH                        | Benzo(b)fluoranthene  | C              | 0.2 - 1.4                        | 1.40E+00    | 2/4                 | 1.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      |                              |
|                        |                        |              |                       |              |                   | Pest/PCB                   | Aroclor-1260          | C/NC           | 0.16 - 6600                      | 6.60E+03    | 3/4                 | 8.89E-03                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 1.66E+03             | 29.0                                                     | 71.0           | 0.0                                  |                              |

TABLE 5-11: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                     |               |             |                       |              |                   |                            |                        |                |                                  |             |                     |                               | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              |                      | Percent Contribution by Exposure Pathway to Total RME HI |                      |                                      |                                      |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|------------------------|----------------|----------------------------------|-------------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------------|--------------------------------------|--------------------------------------|
|                     |               |             |                       |              |                   |                            |                        |                |                                  |             |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Chemical-Specific HI                                     | Incidental Ingestion | Dermal Contact                       | Inhalation (Releases to Ambient Air) |
| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                        | Basis for COC  | Range of Detected Concentrations | RME EPC     | Detection Frequency | Chemical-Specific Cancer Risk | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | Chemical-Specific HI | Incidental Ingestion                                     | Dermal Contact       | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion         |
| EOS-1               | OS            | AV37        | 5E-03                 | 9E+02        | 9E+02             | Metal                      | Arsenic                | C              | 3.3 - 24                         | 1.38E+01    | 9/9                 | 3.72E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Lead                   | --             | 23 - 487                         | 2.82E+02    | 8/9                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C              | 0.038 - 0.52                     | 5.20E-01    | 5/9                 | 3.98E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Pest/PCB               | Aroclor-1260   | C/NC                             | 0.24 - 3700 | 3.70E+03            | 7/9                           | 4.98E-03                                                          | 26.6           | 73.4                                 | 0.0                          |                      | 9.33E+02                                                 | 29.0                 | 71.0                                 | 0.0                                  |
| EOS-1               | OS            | AW37        | 2E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C              | 0.18 - 0.18                      | 1.80E-01    | 1/1                 | 1.38E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
| EOS-2               | OS            | AX36        | 2E-04                 | 2E+00        | <1                | Metal                      | Arsenic                | C              | 3 - 95.5                         | 8.17E+01    | 4/8                 | 2.20E-04                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Lead                   | --             | 5.5 - 660                        | 6.60E+02    | 5/8                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C              | 0.27 - 0.27                      | 2.70E-01    | 1/8                 | 2.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Pest/PCB               | Aroclor-1254   | C                                | 0.89 - 0.89 | 8.90E-01            | 1/8                           | 1.20E-06                                                          | 26.6           | 73.4                                 | 0.0                          |                      | <1                                                       | --                   | --                                   | --                                   |
| EOS-2               | OS            | AX37        | 2E-05                 | <1           | <1                | PAH                        | Aroclor-1260           | C              | 0.016 - 0.81                     | 8.10E-01    | 2/8                 | 1.09E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(a)anthracene     | C              | 1.7 - 1.7                        | 1.70E+00    | 1/1                 | 1.30E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | Benzo(a)pyrene             | C                      | 2.1 - 2.1      | 2.10E+00                         | 1/1         | 1.61E-05            | 28.0                          | 71.9                                                              | 0.0            |                                      | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C              | 3 - 3                            | 3.00E+00    | 1/1                 | 2.30E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
| EOS-2               | OS            | AY36        | 1E-04                 | <1           | <1                | Metal                      | Benzo(k)fluoranthene   | C              | 1.4 - 1.4                        | 1.40E+00    | 1/1                 | 1.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Arsenic                | C              | 2.2 - 50                         | 5.00E+01    | 6/6                 | 1.35E-04                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C              | 0.67 - 0.67                      | 6.70E-01    | 1/4                 | 5.13E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Pest/PCB               | Aroclor-1260   | C                                | 0.027 - 1.7 | 1.70E+00            | 4/6                           | 2.29E-06                                                          | 26.6           | 73.4                                 | 0.0                          |                      | <1                                                       | --                   | --                                   | --                                   |
| EOS-2               | OS            | AY37        | 7E-05                 | 4E+00        | 3E+00             | Metal                      | Arsenic                | C              | 3.1 - 19.7                       | 1.97E+01    | 3/3                 | 5.30E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | PAH                    | Benzo(a)pyrene | C                                | 0.39 - 0.39 | 3.90E-01            | 1/4                           | 2.99E-06                                                          | 28.0           | 71.9                                 | 0.0                          |                      | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC           | 0.19 - 12                        | 1.20E+01    | 2/4                 | 1.62E-05                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 3.02E+00             | 29.0                                                     | 71.0                 | 0.0                                  |                                      |
|                     |               |             |                       |              |                   |                            | Metal                  | Arsenic        | C                                | 0.72 - 63   | 6.30E+01            | 10/10                         | 1.70E-04                                                          | 62.8           | 37.2                                 | 0.0                          |                      | <1                                                       | --                   | --                                   | --                                   |
| EOS-2               | OS            | AZ36        | 3E-04                 | 3E+00        | <1                | PAH                        |                        | Lead           | --                               | 1.5 - 453   | 4.53E+02            | 10/10                         | --                                                                | --             | --                                   |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(a)anthracene     | C              | 0.087 - 14                       | 1.40E+01    | 4/5                 | 1.07E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | Benzo(a)pyrene             | C                      | 0.053 - 11     | 1.10E+01                         | 3/5         | 8.42E-05            | 28.0                          | 71.9                                                              | 0.0            |                                      | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C              | 0.19 - 30                        | 3.00E+01    | 4/5                 | 2.30E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
| EOS-2               | OS            | AZ37        | 7E-05                 | <1           | <1                | Pest/PCB                   | Benzo(k)fluoranthene   | C              | 0.11 - 6.9                       | 6.90E+00    | 3/5                 | 5.28E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Chrysene               | C              | 0.26 - 19                        | 1.90E+01    | 4/5                 | 1.45E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | Dibenz(a,h)anthracene      | C                      | 2.1 - 2.1      | 2.10E+00                         | 1/5         | 9.78E-06            | 28.0                          | 71.9                                                              | 0.0            |                                      | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C              | 0.04 - 9.8                       | 9.80E+00    | 3/5                 | 7.50E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
| EOS-2               | OS            | BA36        | 1E-03                 | 5E+00        | 3E+00             | Metal                      | Aroclor-1260           | C              | 0.016 - 3.9                      | 3.90E+00    | 5/10                | 5.25E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   |                            | Arsenic                | C              | 16.1 - 18.2                      | 1.82E+01    | 2/2                 | 4.90E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   | PAH                        | Lead                   | --             | 118 - 163                        | 1.63E+02    | 2/2                 | --                            | --                                                                | --             |                                      | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(a)anthracene     | C              | 0.15 - 1.6                       | 1.60E+00    | 2/3                 | 1.22E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
| EOS-2               | OS            | BA37        | 4E-06                 | <1           | <1                | Pest/PCB                   | Benzo(a)pyrene         | C              | 0.21 - 1.5                       | 1.50E+00    | 2/3                 | 1.15E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C              | 0.3 - 2                          | 2.00E+00    | 2/3                 | 1.53E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | Aroclor-1260               | C                      | 0.59 - 1.4     | 1.40E+00                         | 2/3         | 1.88E-06            | 26.6                          | 73.4                                                              | 0.0            |                                      | <1                           | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Arsenic                | C/NC           | 2.7 - 641                        | 4.30E+02    | 12/12               | 1.16E-03                      | 62.8                                                              | 37.2           | 0.0                                  |                              | 3.20E+00             | 65.5                                                     | 34.4                 | 0.1                                  |                                      |
| EOS-2               | OS            | BB36        | 3E-05                 | <1           | <1                | PAH                        | Lead                   | --             | 7.6 - 1080                       | 1.08E+03    | 12/12               | --                            | --                                                                | --             |                                      | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(a)anthracene     | C              | 0.84 - 4                         | 4.00E+00    | 2/7                 | 3.06E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | Benzo(a)pyrene             | C                      | 0.9 - 3.1      | 3.10E+00                         | 2/7         | 2.37E-05            | 28.0                          | 71.9                                                              | 0.0            |                                      | --                           | --                   | --                                                       |                      |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C              | 0.098 - 2.9                      | 2.90E+00    | 4/7                 | 2.22E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
| EOS-3               | OS            | BE35        | 2E-05                 | <1           | <1                | Pest/PCB                   | Benzo(k)fluoranthene   | C              | 0.83 - 3.1                       | 3.10E+00    | 2/7                 | 2.37E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Aroclor-1260           | C              | 0.014 - 1.5                      | 1.50E+00    | 6/12                | 2.02E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C              | 0.36 - 0.36                      | 3.60E-01    | 1/1                 | 2.76E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Arsenic                | C              | 3.8 - 11.2                       | 1.05E+01    | 5/5                 | 2.84E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      |
| EOS-3               | OS            | BC36        | 6E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C              | 0.061 - 0.39                     | 3.90E-01    | 2/4                 | 2.99E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
| EOS-3               | OS            | BE35        | 2E-05                 | <1           | <1                | Metal                      | Arsenic                | C              | 0.073 - 0.46                     | 4.60E-01    | 2/2                 | 3.52E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Lead                   | --             | 3.8 - 6130                       | 6.13E+03    | 10/10               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C              | 0.39 - 1.7                       | 1.70E+00    | 2/7                 | 1.30E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C              | 0.52 - 1.4                       | 1.40E+00    | 2/7                 | 1.07E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
| EOS-3               | OS            | BE35        | 2E-05                 | <1           | <1                | Pest/PCB                   | Benzo(b)fluoranthene   | C              | 0.79 - 4.4                       | 4.40E+00    | 2/7                 | 3.37E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C              | 0.4 - 0.4                        | 4.00E-01    | 1/6                 | 1.86E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   | Aroclor-1260               | C                      | 0.094 - 1.1    | 1.10E+00                         | 3/10        | 1.48E-06            | 26.6                          | 73.4                                                              | 0.0            |                                      | <1                           | --                   | --                                                       | --                   |                                      |                                      |
|                     |               |             |                       |              |                   |                            |                        |                |                                  |             |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                      |                                      |                                      |



TABLE 5-11: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |    |      |       |    |    | Chemicals of Concern (COC) |                        | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |                    |          |       | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|------------------------------------------------------------------------------------------------|----|------|-------|----|----|----------------------------|------------------------|------------------------------------------------------------------------------------------------------|--------------------|----------|-------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                                                                                                |    |      |       |    |    |                            |                        |                                                                                                      |                    |          |       | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| EOS-3                                                                                          | OS | BE36 | 4E-06 | <1 | <1 | Metal                      | Lead                   | --                                                                                                   | 49.9 - 200         | 2.00E+02 | 4/4   | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.17 - 0.31        | 3.10E-01 | 3/4   | 2.37E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
| EOS-3                                                                                          | OS | BF35 | 2E-06 | <1 | <1 | Metal                      | Lead                   | --                                                                                                   | 4.9 - 310          | 3.10E+02 | 6/7   | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.047 - 0.21       | 2.10E-01 | 2/7   | 1.61E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
| EOS-3                                                                                          | OS | BF36 | 1E-04 | <1 | <1 | PAH                        | Benzo(a)anthracene     | C                                                                                                    | 0.36 - 18          | 1.80E+01 | 3/4   | 1.38E-05                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    |                            | Benzo(a)pyrene         | C                                                                                                    | 0.25 - 15          | 1.29E+01 | 4/4   | 9.89E-05                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    |                            | Benzo(b)fluoranthene   | C                                                                                                    | 0.33 - 12          | 1.10E+01 | 4/4   | 8.42E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    |                            | Benzo(k)fluoranthene   | C                                                                                                    | 14 - 14            | 1.40E+01 | 1/4   | 1.07E-05                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    |                            | Chrysene               | C                                                                                                    | 0.66 - 19          | 1.90E+01 | 4/4   | 1.45E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    |                            | Dibenz(a,h)anthracene  | C                                                                                                    | 0.53 - 0.78        | 7.80E-01 | 2/4   | 3.63E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    |                            | Indeno(1,2,3-cd)pyrene | C                                                                                                    | 0.33 - 5.8         | 5.80E+00 | 3/4   | 4.44E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
| EOS-3                                                                                          | OS | BG35 | 6E-06 | <1 | <1 | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.58 - 0.58        | 5.80E-01 | 1/1   | 4.44E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
| EOS-3                                                                                          | OS | BG36 | 5E-05 | <1 | <1 | Metal                      | Arsenic                | C                                                                                                    | 6.1 - 19.3         | 1.28E+01 | 5/7   | 3.43E-05                                                          | 62.8           | 37.2                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                                |    |      |       |    |    |                            | Lead                   | --                                                                                                   | 25.9 - 460         | 4.60E+02 | 5/7   | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.1 - 0.2          | 2.00E-01 | 5/7   | 1.53E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    | Pest/PCB                   | Dieldrin               | C                                                                                                    | 0.14 - 0.14        | 1.40E-01 | 1/7   | 1.19E-06                                                          | 33.6           | 66.4                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                                |    |      |       |    |    | Dioxin                     | 1,2,3,4,6,7,8-HPCDD    | C                                                                                                    | 0.00353 - 0.00353  | 3.53E-03 | 1/1   | 1.51E-06                                                          | 62.8           | 37.2                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    |                            | 1,2,3,7,8-PECDD        | C                                                                                                    | 0.000606 - 0.00006 | 6.06E-05 | 1/1   | 2.59E-06                                                          | 62.8           | 37.2                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    |                            | 2,3,4,7,8-PECDF        | C                                                                                                    | 0.000235 - 0.00023 | 2.35E-04 | 1/1   | 5.02E-06                                                          | 62.8           | 37.2                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
| EOS-3                                                                                          | OS | BH36 | 1E-05 | <1 | <1 | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.074 - 0.82       | 8.20E-01 | 3/5   | 6.28E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
| EOS-3                                                                                          | OS | BI35 | 4E-08 | <1 | <1 | Metal                      | Lead                   | --                                                                                                   | 155 - 155          | 1.55E+02 | 1/2   | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
| EOS-3                                                                                          | OS | BI36 | 2E-04 | <1 | <1 | Metal                      | Arsenic                | C                                                                                                    | 5.1 - 73           | 7.30E+01 | 5/8   | 1.96E-04                                                          | 62.8           | 37.2                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                                |    |      |       |    |    |                            | Lead                   | --                                                                                                   | 36.8 - 370         | 2.01E+02 | 6/8   | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.038 - 0.69       | 6.90E-01 | 4/7   | 5.28E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    |                            | Benzo(b)fluoranthene   | C                                                                                                    | 0.087 - 1.4        | 1.40E+00 | 5/8   | 1.07E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |
| EOS-5                                                                                          | OS | ZZ01 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C                                                                                                    | 2 - 12.8           | 7.08E+00 | 11/13 | 1.91E-05                                                          | 62.8           | 37.2                                 | 0.0                          | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                                |    |      |       |    |    |                            | Lead                   | --                                                                                                   | 6.1 - 1280         | 1.28E+03 | 13/13 | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |    |      |       |    |    | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.18 - 0.18        | 1.80E-01 | 1/13  | 1.38E-06                                                          | 28.0           | 71.9                                 | 0.0                          | --                   | --                                                       | --             |                                      |                              |

Notes: All concentrations shown in milligrams per kilogram (mg/kg).

|          |                                                           |
|----------|-----------------------------------------------------------|
| <1       | Less than 1                                               |
| --       | Not applicable or chemical is not a COC for this endpoint |
| %        | Percent                                                   |
| bgs      | Below ground surface                                      |
| C        | Cancer effect                                             |
| COC      | Chemical of concern                                       |
| EPC      | Exposure point concentration                              |
| HI       | Hazard index                                              |
| HPCDD    | Heptachlorodibenzo-p-dioxin                               |
| HHRA     | Human health risk assessment                              |
| IND      | Industrial (industrial exposure scenario)                 |
| MI       | Maritime industrial (industrial exposure scenario)        |
| NC       | Noncancer effect                                          |
| OS       | Open space (recreational exposure scenario)               |
| PAH      | Polynuclear aromatic hydrocarbon                          |
| PECDD    | Pentachlorodibenzo-p-dioxin                               |
| PECDF    | Pentachlorodibenzofuran                                   |
| Pest/PCB | Pesticide/polychlorinated biphenyl                        |
| RD       | Research and development (residential exposure scenario)  |
| RME      | Reasonable maximum exposure                               |
| SVOC     | Semivolatile organic compound                             |
| VOC      | Volatile organic compound                                 |

TABLE 5-12: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HIRME Segregated HI |     |        |       |       |       | Chemicals of Concern (COC) |                            | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|-----------------------------------------------------------------------------------------------|-----|--------|-------|-------|-------|----------------------------|----------------------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                                                                                               |     |        |       |       |       |                            |                            |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| 31A                                                                                           | MU  | 058073 | 3E-06 | <1    | <1    | SVOC                       | Bis(2-ethylhexyl)phthalate | C             | 2.9 - 2.9                        | 2.90E+00 | 1/4                 | 2.54E-06                      | 2.5                                                               | 0.8            | 0.0                                  | 96.7                         | <1                   | --                                                       | --             | --                                   | --                           |
| 31A                                                                                           | MU  | 060074 | --    | 1E+01 | 6E+00 | Metal                      | Iron                       | NC            | 43200 - 60500                    | 6.05E+04 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 2.75E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          |
|                                                                                               |     |        |       |       |       |                            | Manganese                  | NC            | 2970 - 5050                      | 5.05E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 5.99E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
|                                                                                               |     |        |       |       |       |                            | Vanadium                   | NC            | 132 - 209                        | 2.09E+02 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 3.22E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         |
| 31B/36                                                                                        | IND | AR28   | 2E-05 | <1    | <1    | Metal                      | Arsenic                    | C             | 0.44 - 32.3                      | 9.89E+00 | 9/14                | 2.28E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 31B/36                                                                                        | IND | AS28   | 2E-06 | <1    | <1    |                            | No COCs Identified         | --            | --                               | --       | --                  | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   |                              |
| 31B/36                                                                                        | IND | AS29   | 3E-05 | <1    | <1    | Metal                      | Arsenic                    | C             | 0.77 - 15.7                      | 9.29E+00 | 14/23               | 2.14E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Benzo(a)pyrene             | C             | 1.2 - 1.2                        | 1.20E+00 | 1/21                | 6.83E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 31B/36                                                                                        | IND | AT29   | 1E-04 | <1    | <1    | Metal                      | Arsenic                    | C             | 0.83 - 130                       | 4.94E+01 | 11/14               | 1.14E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Benzo(a)pyrene             | C             | 0.24 - 0.24                      | 2.40E-01 | 1/13                | 1.37E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 31B/36                                                                                        | IND | AU29   | 2E-04 | <1    | <1    | Metal                      | Arsenic                    | C             | 4.4 - 105                        | 1.05E+02 | 13/14               | 2.42E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Lead                       | --            | 8.2 - 980                        | 9.80E+02 | 11/14               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       | PAH                        | Benzo(a)pyrene             | C             | 0.065 - 0.8                      | 4.25E-01 | 5/14                | 2.42E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 31B/36                                                                                        | IND | AU31   | 2E-06 | <1    | <1    | --                         | No COCs Identified         | --            | --                               | --       | --                  | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   |                              |
| 31B/36                                                                                        | IND | AV29   | 9E-05 | <1    | <1    | Metal                      | Arsenic                    | C             | 2.4 - 50.9                       | 4.01E+01 | 18/23               | 9.24E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | VOC                        | C             | 0.039 - 6.6                      | 6.60E+00 | 2/28                | 1.42E-06                      | 9.8                                                               | 0.0            | 90.2                                 |                              | <1                   | --                                                       | --             | --                                   |                              |
| 31B/36                                                                                        | IND | AV30   | 5E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C             | 0.45 - 0.45                      | 4.50E-01 | 1/7                 | 2.56E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 40                                                                                            | IND | AW31   | 3E-05 | <1    | <1    | Metal                      | Arsenic                    | C             | 1.9 - 12.3                       | 1.17E+01 | 4/4                 | 2.70E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 40                                                                                            | IND | BA33   | 4E-05 | <1    | <1    |                            | Arsenic                    | C             | 0.7 - 21                         | 1.39E+01 | 16/18               | 3.21E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Aroclor-1254               | C             | 3.4 - 3.4                        | 3.40E+00 | 1/18                | 3.38E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Aroclor-1260               | C             | 2.8 - 2.8                        | 2.80E+00 | 1/18                | 2.79E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 41                                                                                            | IND | AX30   | 3E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C             | 0.33 - 0.33                      | 3.30E-01 | 1/1                 | 1.88E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 41                                                                                            | IND | BA29   | 1E-05 | <1    | <1    |                            | Arsenic                    | C             | 0.64 - 12.9                      | 4.38E+00 | 35/43               | 1.01E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 41                                                                                            | IND | BA30   | 1E-05 | <1    | <1    |                            | Arsenic                    | C             | 0.77 - 11.6                      | 3.47E+00 | 36/58               | 8.01E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Benzo(a)pyrene             | C             | 0.023 - 0.23                     | 2.30E-01 | 3/39                | 1.31E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 41                                                                                            | IND | BB30   | 1E-05 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C             | 0.014 - 4.8                      | 6.59E-01 | 7/29                | 3.75E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Benzo(k)fluoranthene       | C             | 0.021 - 2.3                      | 2.30E+00 | 3/27                | 1.31E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Dibenz(a,h)anthracene      | C             | 1 - 1                            | 1.00E+00 | 1/27                | 3.46E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AO30   | 3E-06 | <1    | <1    | Pest/PCB                   | Aroclor-1260               | C             | 0.3 - 6.8                        | 1.91E+00 | 7/23                | 1.90E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AP29   | 2E-04 | <1    | <1    |                            | Arsenic                    | C             | 0.59 - 244                       | 9.97E+01 | 12/19               | 2.30E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Benzo(a)pyrene             | C             | 0.038 - 0.31                     | 2.08E-01 | 5/19                | 1.18E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AP31   | 2E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C             | 0.2 - 0.2                        | 2.00E-01 | 1/9                 | 1.14E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AQ30   | 3E-05 | <1    | <1    |                            | Arsenic                    | C             | 0.31 - 12                        | 6.87E+00 | 9/9                 | 1.58E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Benzo(a)pyrene             | C             | 0.068 - 0.37                     | 2.61E-01 | 9/26                | 1.49E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       | Pest/PCB                   | Aroclor-1260               | C             | 0.04 - 16                        | 9.56E+00 | 12/19               | 9.52E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AR31   | 2E-05 | <1    | <1    |                            | Arsenic                    | C             | 1.8 - 13                         | 7.07E+00 | 25/29               | 1.63E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       | PAH                        | Benzo(a)pyrene             | C             | 0.039 - 0.2                      | 2.00E-01 | 3/32                | 1.14E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AR32   | 3E-05 | <1    | <1    | Metal                      | Arsenic                    | C             | 0.39 - 12.6                      | 1.13E+01 | 43/49               | 2.61E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Benzo(a)pyrene             | C             | 0.21 - 0.21                      | 2.10E-01 | 1/57                | 1.20E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AS30   | 2E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C             | 0.23 - 0.23                      | 2.30E-01 | 1/6                 | 1.31E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AS32   | 6E-05 | <1    | <1    | Metal                      | Arsenic                    | C             | 0.81 - 27                        | 2.30E+01 | 24/34               | 5.31E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Benzo(a)pyrene             | C             | 0.031 - 0.38                     | 3.49E-01 | 5/45                | 1.99E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AS33   | 1E-05 | <1    | <1    | Metal                      | Arsenic                    | C             | 1.8 - 15                         | 4.30E+00 | 12/22               | 9.91E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AT31   | 3E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C             | 0.52 - 0.52                      | 5.20E-01 | 1/26                | 2.96E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AT32   | 3E-04 | <1    | <1    | Metal                      | Arsenic                    | C             | 4.4 - 168                        | 1.48E+02 | 9/10                | 3.42E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       |                            | Benzo(a)pyrene             | C             | 0.027 - 0.76                     | 2.35E-01 | 4/26                | 1.34E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       | PAH                        | Benzo(a)pyrene             | C             | 0.084 - 2.4                      | 1.27E+00 | 5/9                 | 7.25E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AU32   | 2E-05 | <1    | <1    | Metal                      | Arsenic                    | C             | 0.97 - 12                        | 7.97E+00 | 12/13               | 1.84E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |        |       |       |       | Pest/PCB                   | Aroclor-1260               | C             | 0.053 - 2.3                      | 1.87E+00 | 5/13                | 1.86E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |

TABLE 5-12: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HIRME Segregated HI |     |      |       |       |       | Chemicals of Concern (COC) |                        | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |              |          |       |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|-----------------------------------------------------------------------------------------------|-----|------|-------|-------|-------|----------------------------|------------------------|------------------------------------------------------------------------------------------------------|--------------|----------|-------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                                                                                               |     |      |       |       |       |                            |                        |                                                                                                      |              |          |       |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| 43                                                                                            | IND | AU33 | 3E-05 | <1    | <1    | PAH                        | Benzo(a)anthracene     | C                                                                                                    | 0.086 - 6.5  | 6.50E+00 | 8/16  | 3.70E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(a)pyrene         | C                                                                                                    | 0.061 - 3.5  | 3.50E+00 | 8/16  | 1.99E-05 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(k)fluoranthene   | C                                                                                                    | 0.0455 - 6.4 | 6.40E+00 | 9/16  | 3.64E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(k)fluoranthene   | C                                                                                                    | 0.062 - 4.1  | 4.10E+00 | 8/16  | 2.33E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AU34 | 3E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.3 - 0.3    | 3.00E-01 | 1/10  | 1.71E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AV32 | 8E-05 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 3.3 - 14     | 7.41E+00 | 13/16 | 1.71E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(a)anthracene     | C                                                                                                    | 0.19 - 4.7   | 4.70E+00 | 3/21  | 2.68E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.19 - 2.1   | 2.10E+00 | 3/21  | 1.20E-05 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(k)fluoranthene   | C                                                                                                    | 2.3 - 2.3    | 2.30E+00 | 1/20  | 1.31E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(k)fluoranthene   | C                                                                                                    | 0.00038 - 19 | 1.90E+01 | 7/16  | 4.89E-05 | 0.7                                                               | 0.0            | 99.3                                 |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       | VOC                        | Benzene                | C                                                                                                    | 0.048 - 42   | 6.54E+00 | 5/25  | 1.40E-06 | 9.8                                                               | 0.0            | 90.2                                 |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Naphthalene            | C                                                                                                    | 0.044 - 6.4  | 6.36E-01 | 11/54 | 3.62E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AV33 | 1E-05 | <1    | <1    | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 1.1 - 1.1    | 1.10E+00 | 1/54  | 3.81E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Dibenz(a,h)anthracene  | C                                                                                                    | 0.4 - 0.68   | 6.80E-01 | 2/37  | 1.75E-06 | 0.7                                                               | 0.0            | 99.3                                 |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       | VOC                        | Benzene                | C                                                                                                    | 1.1 - 11.2   | 6.89E+00 | 8/12  | 1.59E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AV34 | 2E-05 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 0.19 - 0.36  | 3.60E-01 | 3/12  | 2.05E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(a)pyrene         | C                                                                                                    | 4.8 - 20     | 1.59E+01 | 6/6   | 3.67E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 43                                                                                            | IND | AW33 | 4E-05 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.4 - 11.2   | 5.33E+00 | 12/22 | 1.23E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(a)pyrene         | C                                                                                                    | 0.099 - 2.2  | 8.88E-01 | 7/30  | 5.06E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 44                                                                                            | IND | AL32 | 7E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.036 - 0.43 | 4.30E-01 | 2/6   | 2.45E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Aroclor-1260           | C                                                                                                    | 0.36 - 3.6   | 3.60E+00 | 2/6   | 3.58E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 44                                                                                            | IND | AM32 | 4E-05 | 3E+00 | 3E+00 | Metal                      | Lead                   | --                                                                                                   | 1.7 - 6570   | 5.13E+03 | 14/14 | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(a)pyrene         | C                                                                                                    | 0.043 - 0.53 | 3.26E-01 | 5/14  | 1.86E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       | Pest/PCB                   | Aroclor-1254           | C/NC                                                                                                 | 0.57 - 33    | 2.69E+01 | 4/14  | 2.67E-05 | 35.1                                                              | 64.9           | 0.0                                  |                              | 1.87E+00             | 35.1                                                     | 64.9           | 0.0                                  |                              |
|                                                                                               |     |      |       |       |       |                            | Aroclor-1260           | C                                                                                                    | 0.086 - 10   | 9.48E+00 | 6/14  | 9.44E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       | VOC                        | Naphthalene            | C                                                                                                    | 0.038 - 5.3  | 5.30E+00 | 3/14  | 1.14E-06 | 9.8                                                               | 0.0            | 90.2                                 |                              | <1                   | --                                                       | --             | --                                   |                              |
| 44                                                                                            | IND | AM33 | 3E-05 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.2 - 14.1   | 8.03E+00 | 10/10 | 1.85E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(a)pyrene         | C                                                                                                    | 0.049 - 0.64 | 6.40E-01 | 4/10  | 3.64E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       | PAH                        | Benzo(k)fluoranthene   | C                                                                                                    | 0.079 - 1.8  | 1.80E+00 | 6/10  | 1.03E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Aroclor-1260           | C                                                                                                    | 0.1 - 3.9    | 3.90E+00 | 7/10  | 3.88E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 44                                                                                            | IND | AM34 | 3E-05 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 0.64 - 13    | 6.99E+00 | 13/16 | 1.61E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(a)pyrene         | C                                                                                                    | 0.092 - 0.75 | 7.50E-01 | 2/16  | 4.27E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       | Pest/PCB                   | Aroclor-1254           | C                                                                                                    | 1.6 - 1.6    | 1.60E+00 | 1/16  | 1.59E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Aroclor-1260           | C                                                                                                    | 0.39 - 5.3   | 5.30E+00 | 3/16  | 5.28E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 44                                                                                            | IND | AM35 | 8E-05 | 7E+00 | 6E+00 | Metal                      | Arsenic                | C                                                                                                    | 3.5 - 32     | 1.73E+01 | 6/15  | 3.99E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(a)anthracene     | C                                                                                                    | 0.052 - 2.3  | 2.30E+00 | 11/17 | 1.31E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.051 - 3.6  | 3.60E+00 | 11/17 | 2.05E-05 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(k)fluoranthene   | C                                                                                                    | 0.1 - 6.4    | 6.40E+00 | 11/17 | 3.64E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Dibenz(a,h)anthracene  | C                                                                                                    | 0.071 - 0.81 | 8.10E-01 | 5/17  | 2.81E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Indeno(1,2,3-cd)pyrene | C                                                                                                    | 0.1 - 2.3    | 2.30E+00 | 9/17  | 1.31E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Aroclor-1248           | C                                                                                                    | 7.1 - 7.1    | 7.10E+00 | 1/15  | 7.07E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       | VOC                        | 1,2,4-Trimethylbenzene | NC                                                                                                   | 440 - 440    | 4.40E+02 | 1/1   | --       | --                                                                | --             | --                                   |                              | 2.58E+00             | 0.2                                                      | 0.0            | 99.8                                 |                              |
|                                                                                               |     |      |       |       |       |                            | 1,3,5-Trimethylbenzene | NC                                                                                                   | 200 - 200    | 2.00E+02 | 1/1   | --       | --                                                                | --             | --                                   |                              | 2.87E+00             | 0.1                                                      | 0.0            | 99.9                                 |                              |
| 44                                                                                            | IND | AN33 | 6E-06 | <1    | <1    | PAH                        | Naphthalene            | C                                                                                                    | 6.9 - 6.9    | 6.90E+00 | 1/18  | 1.48E-06 | 9.8                                                               | 0.0            | 90.2                                 |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(a)pyrene         | C                                                                                                    | 0.06 - 1     | 5.30E-01 | 4/11  | 3.02E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 44                                                                                            | IND | AP32 | 2E-05 | <1    | <1    | Pest/PCB                   | Aroclor-1260           | C                                                                                                    | 1.6 - 1.6    | 1.60E+00 | 1/11  | 1.59E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Arsenic                | C                                                                                                    | 3.9 - 11.2   | 1.06E+01 | 4/4   | 2.44E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 44                                                                                            | IND | AP37 | 6E-06 | <1    | <1    | Pest/PCB                   | Aroclor-1254           | C                                                                                                    | 1.3 - 1.3    | 1.30E+00 | 1/12  | 1.29E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Aroclor-1260           | C                                                                                                    | 0.019 - 4.3  | 3.31E+00 | 4/12  | 3.30E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 44                                                                                            | IND | AQ35 | 5E-05 | 1E+01 | 1E+01 | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.053 - 0.38 | 2.81E-01 | 4/9   | 1.60E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       |                            | Benzo(a)pyrene         | C                                                                                                    | 0.053 - 0.38 | 2.81E-01 | 4/9   | 1.60E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                                                                                               |     |      |       |       |       | VOC                        | 1,2,4-Trimethylbenzene | NC                                                                                                   | 1400 - 1400  | 1.40E+03 | 1/1   | --       | --                                                                | --             | --                                   |                              | 8.21E+00             | 0.2                                                      | 0.0            | 99.8                                 |                              |
|                                                                                               |     |      |       |       |       |                            | 1,3,5-Trimethylbenzene | NC                                                                                                   | 290 - 290    | 2.90E+02 | 1/1   | --       | --                                                                | --             | --                                   |                              | 4.16E+00             | 0.1                                                      | 0.0            | 99.9                                 |                              |
| 44                                                                                            | IND | AQ35 | 5E-05 | 1E+01 | 1E+01 | VOC                        | Naphthalene            | C/NC                                                                                                 | 0.17 - 210   | 2.10E+02 | 2/10  | 4.51E-05 | 9.8                                                               | 0.0            | 90.2                                 |                              | 1.11E+00             | 0.5                                                      | 0.0            | 99.5                                 |                              |
|                                                                                               |     |      |       |       |       |                            | Naphthalene            | C/NC                                                                                                 | 0.17 - 210   | 2.10E+02 | 2/10  | 4.51E-05 | 9.8                                                               | 0.0            | 90.2                                 |                              | 1.11E+00             | 0.5                                                      | 0.0            | 99.5                                 |                              |

TABLE 5-12: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                            | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                     |               |             |                       |              |                   |                            |                            |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| 44                  | IND           | AQ36        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                    | C             | 2.6 - 17.6                       | 9.36E+00 | 11/16               | 2.16E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Lead                       | --            | 7.6 - 1150                       | 1.15E+03 | 14/16               | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.004 - 0.28                     | 2.80E-01 | 7/16                | 1.59E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AR35        | 1E-05                 | <1           | <1                | Pest/PCB                   | Aldrin                     | C             | 0.21 - 0.21                      | 2.10E-01 | 1/16                | 1.45E-06                      | 43.1                                                              | 56.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene         | C             | 0.24 - 1.9                       | 1.90E+00 | 2/2                 | 1.08E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C             | 0.23 - 1.2                       | 1.20E+00 | 2/2                 | 6.83E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AR36        | 4E-05                 | <1           | <1                |                            | Benzo(k)fluoranthene       | C             | 0.47 - 2.6                       | 2.60E+00 | 2/2                 | 1.48E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                    | C             | 2 - 42.9                         | 1.41E+01 | 7/11                | 3.25E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.22 - 0.22                      | 2.20E-01 | 1/8                 | 1.25E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AR37        | 2E-06                 | <1           | <1                | VOC                        | Naphthalene                | C             | 12 - 15                          | 1.50E+01 | 2/10                | 3.22E-06                      | 9.8                                                               | 0.0            | 90.2                                 |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | --                         | No COCs Identified         | --            | --                               | --       | --                  | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                    | C             | 2.8 - 15                         | 1.22E+01 | 13/13               | 2.82E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AV36        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                    | C             | 2.1 - 13                         | 7.14E+00 | 12/12               | 1.65E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.059 - 1.3                      | 4.38E-01 | 6/12                | 2.49E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AY35        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                    | C             | 4.3 - 11.9                       | 1.19E+01 | 3/3                 | 2.74E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | 033077      | --                    | 8E+00        | 7E+00             | Metal                      | Manganese                  | NC            | 700 - 6040                       | 6.04E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 7.16E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
| 45                  | RD            | 034074      | --                    | <1           | <1                | Metal                      | Thallium                   | NC            | 6.8 - 6.8                        | 6.80E+00 | 1/2                 | --                            | --                                                                | --             | --                                   | --                           | 1.35E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          |
| 45                  | RD            | 035079      | 4E-04                 | <1           | <1                | Metal                      | Arsenic                    | C/NC          | 0.72 - 16.5                      | 1.65E+01 | 2/3                 | 4.31E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.05E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         |
| 45                  | RD            | 036074      | --                    | 9E+00        | 3E+00             | Metal                      | Iron                       | NC            | 56500 - 64100                    | 6.41E+04 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 2.92E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 1560 - 1580                      | 1.58E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 1.87E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 42.9 - 191                       | 1.91E+02 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 2.95E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         |
| 45                  | RD            | 037076      | 8E-10                 | 4E+00        | 3E+00             | Metal                      | Manganese                  | NC            | 878 - 2840                       | 2.84E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 3.37E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
| 45                  | RD            | 038074      | 7E-08                 | 4E+00        | 2E+00             | Metal                      | Iron                       | NC            | 32200 - 59200                    | 5.47E+04 | 5/5                 | --                            | --                                                                | --             | --                                   | --                           | 2.49E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          |
|                     |               |             |                       |              |                   |                            | Thallium                   | NC            | 5.7 - 5.7                        | 5.70E+00 | 1/5                 | --                            | --                                                                | --             | --                                   | --                           | 1.13E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          |
| 45                  | RD            | 038077      | --                    | <1           | <1                | Metal                      | Lead                       | --            | 2.8 - 161                        | 1.61E+02 | 3/3                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 038079      | 6E-04                 | 2E+01        | 2E+01             | Metal                      | Antimony                   | NC            | 38.4 - 38.4                      | 3.84E+01 | 1/3                 | --                            | --                                                                | --             | --                                   | --                           | 3.76E+00             | 32.7                                                     | 0.0            | 0.0                                  | 67.3                         |
|                     |               |             |                       |              |                   |                            | Arsenic                    | C/NC          | 10.7 - 21.8                      | 2.18E+01 | 2/3                 | 5.69E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.39E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         |
|                     |               |             |                       |              |                   |                            | Cadmium                    | NC            | 8.2 - 8.2                        | 8.20E+00 | 1/3                 | 1.39E-08                      | --                                                                | --             | --                                   | --                           | 2.37E+00             | 8.8                                                      | 0.0            | 0.0                                  | 91.1                         |
|                     |               |             |                       |              |                   |                            | Copper                     | NC            | 15.4 - 165                       | 1.65E+02 | 3/3                 | --                            | --                                                                | --             | --                                   | --                           | 1.04E+00             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         |
|                     |               |             |                       |              |                   |                            | Lead                       | --            | 1.9 - 504                        | 5.04E+02 | 3/3                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Zinc                       | NC            | 40.4 - 5400                      | 5.40E+03 | 3/3                 | --                            | --                                                                | --             | --                                   | --                           | 1.45E+01             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene         | C             | 0.55 - 0.55                      | 5.50E-01 | 1/3                 | 1.49E-06                      | 69.5                                                              | 28.5           | 0.0                                  | 2.0                          | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C             | 0.76 - 0.76                      | 7.60E-01 | 1/3                 | 2.04E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene       | C             | 1.2 - 1.2                        | 1.20E+00 | 1/3                 | 3.55E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C             | 0.58 - 0.58                      | 5.80E-01 | 1/3                 | 2.75E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 039075      | 6E-09                 | 3E+00        | 3E+00             | SVOC                       | Bis(2-ethylhexyl)phthalate | C             | 5.4 - 5.4                        | 5.40E+00 | 1/3                 | 4.73E-06                      | 2.5                                                               | 0.8            | 0.0                                  | 96.7                         | <1                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   | Metal                      | Manganese                  | NC            | 830 - 2600                       | 2.60E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 3.08E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
|                     |               |             |                       |              |                   | Metal                      | Manganese                  | NC            | 837 - 1580                       | 1.58E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 1.87E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
| 45                  | RD            | 040075      | 4E-09                 | 5E+00        | 5E+00             | Metal                      | Manganese                  | NC            | 386 - 4390                       | 4.39E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 5.21E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
| 45                  | RD            | 040082      | 3E-05                 | <1           | <1                | PAH                        | Benzo(a)anthracene         | C             | 1 - 1                            | 1.00E+00 | 1/3                 | 2.70E-06                      | 69.5                                                              | 28.5           | 0.0                                  | 2.0                          | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C             | 0.67 - 0.67                      | 6.70E-01 | 1/3                 | 1.80E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene       | C             | 1 - 1                            | 1.00E+00 | 1/3                 | 2.96E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene       | C             | 0.4 - 0.4                        | 4.00E-01 | 1/3                 | 1.18E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           |
| 45                  | RD            | 041075      | 2E-07                 | 4E+00        | 3E+00             | Metal                      | Manganese                  | NC            | 936 - 2550                       | 2.55E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 3.02E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
| 45                  | RD            | 041079      | --                    | 6E+00        | 4E+00             | Metal                      | Manganese                  | NC            | 2950 - 2950                      | 2.95E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 3.50E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 134 - 134                        | 1.34E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.07E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         |
|                     |               |             |                       |              |                   |                            |                            |               |                                  |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |
| 45                  | RD            | 041082      | 3E-04                 | 1E+01        | 6E+00             | Metal                      | Arsenic                    | C             | 0.81 - 11.8                      | 9.23E+00 | 6/6                 | 2.41E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           |
|                     |               |             |                       |              |                   |                            | Cadmium                    | NC            | 3 - 6.8                          | 6.80E+00 | 2/6                 | 1.15E-08                      | --                                                                | --             | --                                   | --                           | 1.97E+00             | 8.8                                                      | 0.0            | 0.0                                  | 91.1                         |
|                     |               |             |                       |              |                   |                            | Iron                       | NC            | 28900 - 75700                    | 5.95E+04 | 6/6                 | --                            | --                                                                | --             | --                                   | --                           | 2.71E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 642 - 2070                       | 1.54E+03 | 6/6                 | --                            | --                                                                | --             | --                                   | --                           | 1.82E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |
|                     |               |             |                       |              |                   |                            | Mercury                    | NC            | 0.26 - 5.6                       | 5.60E+00 | 5/6                 | --                            | --                                                                | --             | --                                   | --                           | 3.52E+00             | 6.8                                                      | 0.0            | 0.0                                  | 93.2                         |
|                     |               |             |                       |              |                   |                            | Silver                     | NC            | 5 - 59.9                         | 5.99E+01 | 2/6                 | --                            | --                                                                | --             | --                                   | --                           | 1.21E+00             | 12.7                                                     | 0.0            | 0.0                                  | 87.3                         |
|                     |               |             |                       |              |                   |                            | Zinc                       | NC            | 98.7 - 650                       | 6.38E+02 | 6/6                 | --                            | --                                                                | --             | --                                   | --                           | 1.71E+00             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         |

TABLE 5-12: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block    | Planned Reuse  | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) | Basis for COC          | Range of Detected Concentrations | RME EPC       | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |      |      |
|------------------------|----------------|-------------|-----------------------|--------------|-------------------|----------------------------|------------------------|----------------------------------|---------------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|------|------|
|                        |                |             |                       |              |                   |                            |                        |                                  |               |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |      |      |
| 45                     | RD             | 041082      | 3E-04                 | 1E+01        | 6E+00             | PAH                        | Benzo(a)anthracene     | C                                | 0.59 - 0.59   | 5.90E-01            | 1/6                           | 1.60E-06                                                          | 69.5           | 28.5                                 | 0.0                          | 2.0                  | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Benzo(a)pyrene         | C                                | 0.94 - 0.94   | 9.40E-01            | 1/6                           | 2.52E-05                                                          | 70.1           | 28.8                                 | 0.0                          | 1.1                  | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C                                | 0.2 - 1.2     | 1.20E+00            | 2/6                           | 3.55E-06                                                          | 63.6           | 26.1                                 | 0.0                          | 10.3                 | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C                                | 0.47 - 0.47   | 4.70E-01            | 1/6                           | 1.39E-06                                                          | 63.6           | 26.1                                 | 0.0                          | 10.3                 | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C                                | 0.6 - 0.6     | 6.00E-01            | 1/6                           | 1.73E-06                                                          | 65.3           | 26.8                                 | 0.0                          | 8.0                  | --                                                       | --             | --                                   | --                           |      |      |
| 45                     | RD             | 042073      | 3E-04                 | 1E+01        | 4E+00             | Pest/PCB                   | Dieldrin               | C                                | 0.005 - 0.005 | 5.00E-03            | 1/6                           | 7.58E-06                                                          | 1.7            | 0.5                                  | 0.0                          | 97.8                 | <1                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Metal                  | Arsenic                          | C             | 3.2 - 11.6          | 1.07E+01                      | 4/4                                                               | 2.80E-04       | 56.6                                 | 5.4                          | 0.0                  | 38.0                                                     | <1             | --                                   | --                           | --   | --   |
|                        |                |             |                       |              |                   |                            |                        | Iron                             | NC            | 23400 - 61200       | 6.03E+04                      | 4/4                                                               | --             | --                                   | --                           | --                   | --                                                       | 2.74E+00       | 93.6                                 | 0.0                          | 0.0  | 6.4  |
|                        |                |             |                       |              |                   |                            |                        | Manganese                        | NC            | 843 - 3200          | 3.20E+03                      | 4/4                                                               | --             | --                                   | --                           | --                   | --                                                       | 3.80E+00       | 44.9                                 | 0.0                          | 2.9  | 52.2 |
|                        |                |             |                       |              |                   |                            |                        | Thallium                         | NC            | 7.1 - 7.1           | 7.10E+00                      | 1/4                                                               | --             | --                                   | --                           | --                   | --                                                       | 1.41E+00       | 97.3                                 | 0.0                          | 0.0  | 2.7  |
| 45                     | RD             | 042074      | --                    | 5E+00        | 3E+00             | Metal                      |                        | Vanadium                         | NC            | 62 - 134            | 1.26E+02                      | 4/4                                                               | --             | --                                   | --                           | --                   | 1.95E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1 |      |
|                        |                |             |                       |              |                   |                            | Manganese              | NC                               | 1520 - 1520   | 1.52E+03            | 1/1                           | --                                                                | --             | --                                   | --                           | --                   | 1.80E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
|                        |                |             |                       |              |                   |                            | Vanadium               | NC                               | 202 - 202     | 2.02E+02            | 1/1                           | --                                                                | --             | --                                   | --                           | --                   | 3.12E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1 |      |
| 45                     | RD             | 042081      | 3E-04                 | 3E+00        | 2E+00             | Metal                      | Arsenic                | C                                | 4.8 - 16.3    | 1.06E+01            | 4/6                           | 2.77E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Manganese              | NC                               | 584 - 2350    | 1.74E+03            | 6/6                           | --                                                                | --             | --                                   | --                           | --                   | 2.06E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
|                        |                |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C                                | 0.2 - 0.2     | 2.00E-01            | 1/6                           | 5.36E-06                                                          | 70.1           | 28.8                                 | 0.0                          | 1.1                  | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C                                | 0.34 - 0.34   | 3.40E-01            | 1/6                           | 1.00E-06                                                          | 63.6           | 26.1                                 | 0.0                          | 10.3                 | --                                                       | --             | --                                   | --                           |      |      |
| 45                     | RD             | 042082      | 4E-05                 | 9E+00        | 5E+00             | Metal                      | Antimony               | NC                               | 11.9 - 11.9   | 1.19E+01            | 1/1                           | --                                                                | --             | --                                   | --                           | --                   | 1.16E+00                                                 | 32.7           | 0.0                                  | 0.0                          | 67.3 |      |
|                        |                |             |                       |              |                   |                            | Copper                 | NC                               | 771 - 771     | 7.71E+02            | 1/1                           | --                                                                | --             | --                                   | --                           | --                   | 4.84E+00                                                 | 5.5            | 0.0                                  | 0.0                          | 94.5 |      |
|                        |                |             |                       |              |                   |                            | Lead                   | --                               | 321 - 321     | 3.21E+02            | 1/1                           | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Zinc                   | NC                               | 794 - 794     | 7.94E+02            | 1/1                           | --                                                                | --             | --                                   | --                           | --                   | 2.13E+00                                                 | 1.6            | 0.0                                  | 0.0                          | 98.4 |      |
|                        |                |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C                                | 1.3 - 1.3     | 1.30E+00            | 1/1                           | 3.51E-06                                                          | 69.5           | 28.5                                 | 0.0                          | 2.0                  | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Benzo(a)pyrene         | C                                | 0.79 - 0.79   | 7.90E-01            | 1/1                           | 2.12E-05                                                          | 70.1           | 28.8                                 | 0.0                          | 1.1                  | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C                                | 2.5 - 2.5     | 2.50E+00            | 1/1                           | 7.39E-06                                                          | 63.6           | 26.1                                 | 0.0                          | 10.3                 | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C                                | 0.75 - 0.75   | 7.50E-01            | 1/1                           | 2.22E-06                                                          | 63.6           | 26.1                                 | 0.0                          | 10.3                 | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C                                | 0.14 - 0.14   | 1.40E-01            | 1/1                           | 2.42E-06                                                          | 66.2           | 27.2                                 | 0.0                          | 6.7                  | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C                                | 0.45 - 0.45   | 4.50E-01            | 1/1                           | 1.30E-06                                                          | 65.3           | 26.8                                 | 0.0                          | 8.0                  | --                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Pest/PCB               | Aroclor-1260                     | C             | 0.82 - 0.82         | 8.20E-01                      | 1/1                                                               | 3.89E-06       | 66.1                                 | 29.2                         | 0.0                  | 4.7                                                      | <1             | --                                   | --                           | --   |      |
|                        |                |             |                       |              |                   | 45                         | RD                     | 043081                           | 5E-04         | 5E+00               | 3E+00                         | Metal                                                             | Arsenic        | C/NC                                 | 4.6 - 17.9                   | 1.79E+01             | 2/5                                                      | 4.68E-04       | 56.6                                 | 5.4                          | 0.0  | 38.0 |
| Manganese              | NC             | 824 - 3360  | 2.55E+03              | 5/5          | --                |                            |                        |                                  |               |                     |                               |                                                                   | --             | --                                   | --                           | --                   | 3.02E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
| PAH                    | Benzo(a)pyrene | C           | 0.073 - 0.073         | 7.30E-02     | 1/5               |                            |                        |                                  |               |                     |                               | 1.96E-06                                                          | 70.1           | 28.8                                 | 0.0                          | 1.1                  | --                                                       | --             | --                                   | --                           |      |      |
| 45                     | RD             | 043082      | 2E-06                 | 5E+00        | 5E+00             | Metal                      | Antimony               | NC                               | 7.3 - 43.5    | 4.35E+01            | 2/3                           | --                                                                | --             | --                                   | --                           | 4.26E+00             | 32.7                                                     | 0.0            | 0.0                                  | 67.3                         |      |      |
|                        |                |             |                       |              |                   | Pest/PCB                   | Aroclor-1254           | C                                | 0.18 - 0.18   | 1.80E-01            | 1/3                           | 1.94E-06                                                          | 29.1           | 12.9                                 | 0.0                          | 58.0                 | <1                                                       | --             | --                                   | --                           |      |      |
| 45                     | RD             | 044073      | --                    | <1           | <1                | Metal                      | Thallium               | NC                               | 5.6 - 5.8     | 5.80E+00            | 2/2                           | --                                                                | --             | --                                   | --                           | 1.15E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          |      |      |
| 45                     | RD             | 044079      | 4E-04                 | 4E+00        | 3E+00             | Metal                      | Arsenic                | C                                | 14.3 - 14.3   | 1.43E+01            | 1/3                           | 3.74E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           |      |      |
|                        |                |             |                       |              |                   |                            | Manganese              | NC                               | 600 - 2440    | 2.44E+03            | 3/3                           | --                                                                | --             | --                                   | --                           | --                   | 2.89E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
| 45                     | RD             | 045074      | 1E-05                 | 8E+00        | 3E+00             | Metal                      | Iron                   | NC                               | 14600 - 64100 | 4.82E+04            | 8/8                           | --                                                                | --             | --                                   | --                           | 2.19E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          |      |      |
| 45                     | RD             | 045074      | 1E-05                 | 8E+00        | 3E+00             | Metal                      | Manganese              | NC                               | 546 - 3430    | 2.37E+03            | 8/8                           | --                                                                | --             | --                                   | --                           | --                   | 2.82E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
|                        |                |             |                       |              |                   |                            | Vanadium               | NC                               | 15.1 - 181    | 1.03E+02            | 8/8                           | --                                                                | --             | --                                   | --                           | --                   | 1.59E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1 |      |
|                        |                |             |                       |              |                   |                            | PAH                    | Benzo(a)pyrene                   | C             | 0.22 - 0.22         | 2.20E-01                      | 1/8                                                               | 5.90E-06       | 70.1                                 | 28.8                         | 0.0                  | 1.1                                                      | --             | --                                   | --                           | --   |      |
|                        |                |             |                       |              |                   | Benzo(k)fluoranthene       | C                      | 0.54 - 0.54                      | 5.40E-01      | 1/8                 | 1.60E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   |                              |      |      |
|                        |                |             |                       |              |                   | Benzo(k)fluoranthene       | C                      | 0.56 - 0.56                      | 5.60E-01      | 1/8                 | 1.66E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   |                              |      |      |
| Indeno(1,2,3-cd)pyrene | C              | 0.41 - 0.41 | 4.10E-01              | 1/8          | 1.18E-06          | 65.3                       | 26.8                   | 0.0                              | 8.0           | --                  | --                            | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |      |      |
| 45                     | RD             | 045075      | --                    | 1E+01        | 4E+00             | Metal                      | Copper                 | NC                               | 90 - 170      | 1.70E+02            | 2/3                           | --                                                                | --             | --                                   | --                           | 1.07E+00             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         |      |      |
|                        |                |             |                       |              |                   |                            | Iron                   | NC                               | 26200 - 67900 | 6.79E+04            | 3/3                           | --                                                                | --             | --                                   | --                           | --                   | 3.09E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4  |      |
|                        |                |             |                       |              |                   |                            | Manganese              | NC                               | 735 - 2520    | 2.52E+03            | 3/3                           | --                                                                | --             | --                                   | --                           | --                   | 2.99E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
|                        |                |             |                       |              |                   |                            | Vanadium               | NC                               | 27.5 - 172    | 1.72E+02            | 3/3                           | --                                                                | --             | --                                   | --                           | --                   | 2.65E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1 |      |
| 45                     | RD             | 045078      | 1E-03                 | 4E+00        | 3E+00             | Metal                      | Arsenic                | C/NC                             | 49.9 - 49.9   | 4.99E+01            | 1/2                           | 1.30E-03                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | 3.19E+00                                                 | 66.8           | 5.6                                  | 0.1                          | 27.5 |      |
| 45                     | RD             | 046072      | 4E-08                 | 2E+00        | <1                | Metal                      | Thallium               | NC                               | 5.1 - 7.1     | 7.10E+00            | 2/2                           | --                                                                | --             | --                                   | --                           | 1.41E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          |      |      |
| 45                     | RD             | 046074      | 3E-06                 | 2E+01        | 1E+01             | Metal                      | Copper                 | NC                               | 13.2 - 536    | 5.36E+02            | 3/3                           | --                                                                | --             | --                                   | --                           | --                   | 3.37E+00                                                 | 5.5            | 0.0                                  | 0.0                          | 94.5 |      |
|                        |                |             |                       |              |                   |                            | Manganese              | NC                               | 438 - 2100    | 2.10E+03            | 3/3                           | --                                                                | --             | --                                   | --                           | --                   | 2.49E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
|                        |                |             |                       |              |                   |                            | Mercury                | NC                               | 17.5 - 17.5   | 1.75E+01            | 1/3                           | --                                                                | --             | --                                   | --                           | --                   | 1.10E+01                                                 | 6.8            | 0.0                                  | 0.0                          | 93.2 |      |
|                        |                |             |                       |              |                   |                            | Vanadium               | NC                               | 36.6 - 180    | 1.80E+02            | 3/3                           | --                                                                | --             | --                                   | --                           | --                   | 2.78E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1 |      |
|                        |                |             |                       |              |                   |                            | Zinc                   | NC                               | 36.7 - 567    | 5.67E+02            | 3/3                           | --                                                                | --             | --                                   | --                           | --                   | 1.52E+00                                                 | 1.6            | 0.0                                  | 0.0                          | 98.4 |      |

TABLE 5-12: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |    |        |       |       |       | Chemicals of Concern (COC) |                   | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |               |             |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |      |      |
|------------------------------------------------------------------------------------------------|----|--------|-------|-------|-------|----------------------------|-------------------|------------------------------------------------------------------------------------------------------|---------------|-------------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|------|------|
|                                                                                                |    |        |       |       |       |                            |                   |                                                                                                      |               |             |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |      |      |
| 45                                                                                             | RD | 046074 | 3E-06 | 2E+01 | 1E+01 | PAH                        | Benzo(a)pyrene    | C                                                                                                    | 0.04 - 0.04   | 4.00E-02    | 1/3      | 1.07E-06                                                          | 70.1           | 28.8                                 | 0.0                          | 1.1                  | --                                                       | --             | --                                   | --                           | --   |      |
| 45                                                                                             | RD | 046076 | 6E-08 | 3E+00 | 3E+00 | Metal                      | Manganese         | NC                                                                                                   | 745 - 2440    | 2.22E+03    | 4/4      | --                                                                | --             | --                                   | --                           | --                   | 2.63E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
| 45                                                                                             | RD | 046082 | 4E-04 | 6E+01 | 3E+01 | Metal                      | Antimony          | NC                                                                                                   | 3.4 - 22.3    | 2.23E+01    | 2/3      | --                                                                | --             | --                                   | --                           | --                   | 2.18E+00                                                 | 32.7           | 0.0                                  | 0.0                          | 67.3 |      |
|                                                                                                |    |        |       |       |       |                            | Arsenic           | C                                                                                                    | 1.4 - 15.2    | 1.52E+01    | 3/3      | 3.97E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           | --   |      |
|                                                                                                |    |        |       |       |       |                            | Copper            | NC                                                                                                   | 45.9 - 5230   | 5.23E+03    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 3.29E+01                                                 | 5.5            | 0.0                                  | 0.0                          | 94.5 |      |
|                                                                                                |    |        |       |       |       |                            | Lead              | --                                                                                                   | 3.8 - 4850    | 4.85E+03    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | --   |      |
|                                                                                                |    |        |       |       |       |                            | Mercury           | NC                                                                                                   | 0.13 - 17     | 1.70E+01    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 1.07E+01                                                 | 6.8            | 0.0                                  | 0.0                          | 93.2 |      |
|                                                                                                |    |        |       |       |       |                            | Zinc              | NC                                                                                                   | 48.9 - 2220   | 2.22E+03    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 5.95E+00                                                 | 1.6            | 0.0                                  | 0.0                          | 98.4 |      |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene    | C                                                                                                    | 0.093 - 0.093 | 9.30E-02    | 1/3      | 2.49E-06                                                          | 70.1           | 28.8                                 | 0.0                          | 1.1                  | --                                                       | --             | --                                   | --                           | --   |      |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1260      | C/NC                                                                                                 | 1.4 - 1.4     | 1.40E+00    | 1/3      | 6.63E-06                                                          | 66.1           | 29.2                                 | 0.0                          | 4.7                  | 1.29E+00                                                 | 69.6           | 27.3                                 | 0.0                          | 3.1  |      |
| 45                                                                                             | RD | 047074 | 3E-04 | 9E+00 | 6E+00 | Metal                      | Arsenic           | C                                                                                                    | 12 - 12       | 1.20E+01    | 1/1      | 3.13E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           | --   |      |
|                                                                                                |    |        |       |       |       |                            | Copper            | NC                                                                                                   | 176 - 176     | 1.76E+02    | 1/1      | --                                                                | --             | --                                   | --                           | --                   | 1.11E+00                                                 | 5.5            | 0.0                                  | 0.0                          | 94.5 |      |
|                                                                                                |    |        |       |       |       |                            | Manganese         | NC                                                                                                   | 5260 - 5260   | 5.26E+03    | 1/1      | --                                                                | --             | --                                   | --                           | --                   | 6.24E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
| 45                                                                                             | RD | 047076 | 1E-06 | 4E+00 | 4E+00 | Metal                      | Mercury           | NC                                                                                                   | 0.1 - 5.4     | 5.40E+00    | 4/6      | --                                                                | --             | --                                   | --                           | --                   | 3.39E+00                                                 | 6.8            | 0.0                                  | 0.0                          | 93.2 |      |
| 45                                                                                             | RD | 047089 | 4E-06 | 3E+00 | <1    | Metal                      | Copper            | NC                                                                                                   | 188 - 188     | 1.88E+02    | 1/1      | --                                                                | --             | --                                   | --                           | --                   | 1.18E+00                                                 | 5.5            | 0.0                                  | 0.0                          | 94.5 |      |
|                                                                                                |    |        |       |       |       |                            | Lead              | --                                                                                                   | 1080 - 1080   | 1.08E+03    | 1/1      | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | --   |      |
|                                                                                                |    |        |       |       |       |                            | Zinc              | NC                                                                                                   | 401 - 401     | 4.01E+02    | 1/1      | --                                                                | --             | --                                   | --                           | --                   | 1.07E+00                                                 | 1.6            | 0.0                                  | 0.0                          | 98.4 |      |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1260      | C                                                                                                    | 0.75 - 0.75   | 7.50E-01    | 1/1      | 3.55E-06                                                          | 66.1           | 29.2                                 | 0.0                          | 4.7                  | <1                                                       | --             | --                                   | --                           | --   |      |
| 45                                                                                             | RD | 047092 | 4E-09 | <1    | <1    | Metal                      | Lead              | --                                                                                                   | 187 - 187     | 1.87E+02    | 1/1      | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | --   |      |
| 45                                                                                             | RD | 048072 | 1E-05 | 3E+00 | 3E+00 | Metal                      | Iron              | NC                                                                                                   | 12200 - 61100 | 6.11E+04    | 4/4      | --                                                                | --             | --                                   | --                           | --                   | 2.78E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4  |      |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene    | C                                                                                                    | 0.46 - 0.46   | 4.60E-01    | 1/4      | 1.23E-05                                                          | 70.1           | 28.8                                 | 0.0                          | 1.1                  | --                                                       | --             | --                                   | --                           | --   |      |
| 45                                                                                             | RD | 048080 | 7E-06 | 7E+01 | 7E+01 | Metal                      | Antimony          | NC                                                                                                   | 29 - 29       | 2.90E+01    | 1/3      | --                                                                | --             | --                                   | --                           | --                   | 2.84E+00                                                 | 32.7           | 0.0                                  | 0.0                          | 67.3 |      |
|                                                                                                |    |        |       |       |       |                            | Copper            | NC                                                                                                   | 52.3 - 10400  | 1.04E+04    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 6.53E+01                                                 | 5.5            | 0.0                                  | 0.0                          | 94.5 |      |
|                                                                                                |    |        |       |       |       |                            | Lead              | --                                                                                                   | 5.9 - 1900    | 1.90E+03    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | --   |      |
|                                                                                                |    |        |       |       |       |                            | Zinc              | NC                                                                                                   | 59.5 - 784    | 7.84E+02    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 2.10E+00                                                 | 1.6            | 0.0                                  | 0.0                          | 98.4 |      |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1260      | C/NC                                                                                                 | 1.4 - 1.4     | 1.40E+00    | 1/3      | 6.63E-06                                                          | 66.1           | 29.2                                 | 0.0                          | 4.7                  | 1.29E+00                                                 | 69.6           | 27.3                                 | 0.0                          | 3.1  |      |
| 45                                                                                             | RD | 048089 | --    | 3E+00 | 3E+00 | Metal                      | Iron              | NC                                                                                                   | 45300 - 59300 | 5.93E+04    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 2.70E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4  |      |
| 45                                                                                             | RD | 049075 | 7E-08 | 3E+00 | 3E+00 | Metal                      | Manganese         | NC                                                                                                   | 1060 - 2380   | 2.38E+03    | 2/2      | --                                                                | --             | --                                   | --                           | --                   | 2.82E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
| 45                                                                                             | RD | 049079 | 2E-05 | 9E+00 | 4E+00 | Metal                      | Cadmium           | NC                                                                                                   | 4 - 4         | 4.00E+00    | 1/3      | 6.78E-09                                                          | --             | --                                   | --                           | --                   | 1.16E+00                                                 | 8.8            | 0.0                                  | 0.0                          | 91.1 |      |
|                                                                                                |    |        |       |       |       |                            | Copper            | NC                                                                                                   | 12.1 - 619    | 6.19E+02    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 3.89E+00                                                 | 5.5            | 0.0                                  | 0.0                          | 94.5 |      |
|                                                                                                |    |        |       |       |       |                            | Lead              | --                                                                                                   | 2 - 1070      | 1.07E+03    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | --   |      |
|                                                                                                |    |        |       |       |       |                            | Aroclor-1260      | C/NC                                                                                                 | 3.3 - 3.3     | 3.30E+00    | 1/3      | 1.56E-05                                                          | 66.1           | 29.2                                 | 0.0                          | 4.7                  | 3.03E+00                                                 | 69.6           | 27.3                                 | 0.0                          | 3.1  |      |
| 45                                                                                             | RD | 049088 | 3E-04 | <1    | <1    | Metal                      | Arsenic           | C                                                                                                    | 3.4 - 11.3    | 1.13E+01    | 3/4      | 2.95E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           | --   |      |
| 45                                                                                             | RD | 049091 | 5E-07 | 2E+00 | <1    | Metal                      | Antimony          | NC                                                                                                   | 5.3 - 15.1    | 1.51E+01    | 3/4      | --                                                                | --             | --                                   | --                           | --                   | 1.48E+00                                                 | 32.7           | 0.0                                  | 0.0                          | 67.3 |      |
| 45                                                                                             | RD | 050071 | 7E-09 | 2E+00 | 2E+00 | Metal                      | Manganese         | NC                                                                                                   | 1270 - 1510   | 1.51E+03    | 2/2      | --                                                                | --             | --                                   | --                           | --                   | 1.79E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
| 45                                                                                             | RD | 050077 | 6E-06 | 4E+00 | 2E+00 | Metal                      | Vanadium          | NC                                                                                                   | 12.1 - 121    | 1.21E+02    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 1.87E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1 |      |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1260      | C/NC                                                                                                 | 1.1 - 1.1     | 1.10E+00    | 1/3      | 5.21E-06                                                          | 66.1           | 29.2                                 | 0.0                          | 4.7                  | 1.01E+00                                                 | 69.6           | 27.3                                 | 0.0                          | 3.1  |      |
| 45                                                                                             | RD | 050080 | 4E-04 | 4E+00 | 3E+00 | Metal                      | Arsenic           | C/NC                                                                                                 | 1.4 - 16.7    | 1.67E+01    | 3/3      | 4.36E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | 1.07E+00                                                 | 66.8           | 5.6                                  | 0.1                          | 27.5 |      |
|                                                                                                |    |        |       |       |       |                            | Iron              | NC                                                                                                   | 41300 - 62400 | 6.24E+04    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 2.84E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4  |      |
|                                                                                                |    |        |       |       |       |                            | PAH               | Benzo(a)pyrene                                                                                       | C             | 0.04 - 0.04 | 4.00E-02 | 1/3                                                               | 1.07E-06       | 70.1                                 | 28.8                         | 0.0                  | 1.1                                                      | --             | --                                   | --                           | --   | --   |
| 45                                                                                             | RD | 050083 | --    | 2E+00 | 2E+00 | Metal                      | Mercury           | NC                                                                                                   | 2.3 - 2.3     | 2.30E+00    | 1/1      | --                                                                | --             | --                                   | --                           | --                   | 1.45E+00                                                 | 6.8            | 0.0                                  | 0.0                          | 93.2 |      |
| 45                                                                                             | RD | 050086 | 5E-06 | <1    | <1    | SVOC                       | Pentachlorophenol | C                                                                                                    | 10 - 10       | 1.00E+01    | 1/1      | 3.85E-06                                                          | 48.8           | 38.5                                 | 0.0                          | 12.6                 | <1                                                       | --             | --                                   | --                           | --   |      |
| 45                                                                                             | RD | 052075 | --    | 6E+00 | 4E+00 | Metal                      | Manganese         | NC                                                                                                   | 690 - 3370    | 3.37E+03    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 4.00E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
|                                                                                                |    |        |       |       |       |                            | Vanadium          | NC                                                                                                   | 34.2 - 121    | 1.21E+02    | 3/3      | --                                                                | --             | --                                   | --                           | --                   | 1.87E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1 |      |
|                                                                                                |    |        |       |       |       |                            | Arsenic           | C/NC                                                                                                 | 16.4 - 16.4   | 1.64E+01    | 1/1      | 4.28E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | 1.05E+00                                                 | 66.8           | 5.6                                  | 0.1                          | 27.5 |      |
|                                                                                                |    |        |       |       |       |                            | Copper            | NC                                                                                                   | 3400 - 3400   | 3.40E+03    | 1/1      | --                                                                | --             | --                                   | --                           | --                   | 2.14E+01                                                 | 5.5            | 0.0                                  | 0.0                          | 94.5 |      |
|                                                                                                |    |        |       |       |       |                            | Lead              | --                                                                                                   | 367 - 367     | 3.67E+02    | 1/1      | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | --   | --   |
|                                                                                                |    |        |       |       |       |                            | Mercury           | NC                                                                                                   | 10 - 10       | 1.00E+01    | 1/1      | --                                                                | --             | --                                   | --                           | --                   | 6.28E+00                                                 | 6.8            | 0.0                                  | 0.0                          | 93.2 |      |
|                                                                                                |    |        |       |       |       | Zinc                       | NC                | 582 - 582                                                                                            | 5.82E+02      | 1/1         | --       | --                                                                | --             | --                                   | --                           | 1.56E+00             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         |      |      |
| 45                                                                                             | RD | 052085 | 3E-07 | 3E+00 | 2E+00 | Metal                      | Manganese         | NC                                                                                                   | 373 - 1590    | 1.59E+03    | 4/4      | --                                                                | --             | --                                   | --                           | --                   | 1.89E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2 |      |
| 45                                                                                             | RD | 053081 | 3E-04 | 4E+00 | 3E+00 | Metal                      | Arsenic           | C                                                                                                    | 12.6 - 12.6   | 1.26E+01    | 1/1      | 3.29E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           | --   |      |
|                                                                                                |    |        |       |       |       |                            | Cadmium           | NC                                                                                                   | 11.3 - 11.3   | 1.13E+01    | 1/4      | 1.92E-08                                                          | --             | --                                   | --                           | --                   | --                                                       | 3.27E+00       | 8.8                                  | 0.0                          | 0.0  | 91.1 |
| 45                                                                                             | RD | 053083 | 2E-08 | 2E+00 | 2E+00 | Metal                      | Thallium          | NC                                                                                                   | 5.5 - 5.5     | 5.50E+00    | 1/2      | --                                                                | --             | --                                   | --                           | --                   | 1.09E+00                                                 | 97.3           | 0.0                                  | 0.0                          | 2.7  |      |



TABLE 5-12: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |    |        |       |       |       | Chemicals of Concern (COC) |                            | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |               |             |          |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |    |
|------------------------------------------------------------------------------------------------|----|--------|-------|-------|-------|----------------------------|----------------------------|------------------------------------------------------------------------------------------------------|---------------|-------------|----------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|----|
|                                                                                                |    |        |       |       |       |                            |                            |                                                                                                      |               |             |          |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |    |
| 45                                                                                             | RD | 053085 | 4E-06 | 3E+00 | 2E+00 | Metal                      | Manganese                  | NC                                                                                                   | 374 - 1670    | 1.52E+03    | 4/4      | --       | --                                                                | --             | --                                   | 1.80E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 |                              |    |
| 45                                                                                             | RD | 054074 | 2E-06 | 7E+00 | 3E+00 | SVOC                       | Bis(2-ethylhexyl)phthalate | C                                                                                                    | 3.6 - 3.6     | 3.60E+00    | 1/4      | 3.15E-06 | 2.5                                                               | 0.8            | 0.0                                  | 96.7                         | <1                   | --                                                       | --             | --                                   | --                           |    |
|                                                                                                |    |        |       |       |       | Metal                      | Lead                       | --                                                                                                   | 3.5 - 597     | 5.97E+02    | 3/3      | --       | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | -- |
|                                                                                                |    |        |       |       |       |                            | Manganese                  | NC                                                                                                   | 368 - 1540    | 1.54E+03    | 3/3      | --       | --                                                                | --             | --                                   | --                           | 1.83E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         |    |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1260               | C                                                                                                    | 0.32 - 0.32   | 3.20E-01    | 1/3      | 1.52E-06 | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --             | --                                   | --                           |    |
| 45                                                                                             | RD | 054075 | --    | 3E+00 | 3E+00 | Metal                      | Manganese                  | NC                                                                                                   | 680 - 2410    | 2.41E+03    | 2/2      | --       | --                                                                | --             | --                                   | 2.86E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 |                              |    |
| 45                                                                                             | RD | 054077 | --    | 2E+00 | <1    | Metal                      | Thallium                   | NC                                                                                                   | 2.8 - 6.8     | 6.80E+00    | 2/2      | --       | --                                                                | --             | --                                   | 1.35E+00                     | 97.3                 | 0.0                                                      | 0.0            | 2.7                                  |                              |    |
| 45                                                                                             | RD | 054079 | --    | <1    | <1    | Metal                      | Thallium                   | NC                                                                                                   | 5 - 5.9       | 5.90E+00    | 2/2      | --       | --                                                                | --             | --                                   | 1.17E+00                     | 97.3                 | 0.0                                                      | 0.0            | 2.7                                  |                              |    |
| 45                                                                                             | RD | 054081 | 1E-07 | 4E+00 | 3E+00 | Metal                      | Manganese                  | NC                                                                                                   | 741 - 1890    | 1.89E+03    | 2/2      | --       | --                                                                | --             | --                                   | 2.24E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 |                              |    |
|                                                                                                |    |        |       |       |       |                            | Thallium                   | NC                                                                                                   | 6.6 - 6.6     | 6.60E+00    | 1/2      | --       | --                                                                | --             | --                                   | 1.31E+00                     | 97.3                 | 0.0                                                      | 0.0            | 2.7                                  |                              |    |
| 45                                                                                             | RD | 055073 | --    | 2E+00 | 2E+00 | Metal                      | Manganese                  | NC                                                                                                   | 942 - 1710    | 1.71E+03    | 2/2      | --       | --                                                                | --             | --                                   | 2.03E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 |                              |    |
| 45                                                                                             | RD | 059078 | 1E-07 | 8E+00 | 3E+00 | Metal                      | Cadmium                    | NC                                                                                                   | 4.7 - 4.7     | 4.70E+00    | 1/8      | 7.97E-09 | --                                                                | --             | --                                   | --                           | 1.36E+00             | 8.8                                                      | 0.0            | 0.0                                  | 91.1                         |    |
|                                                                                                |    |        |       |       |       |                            | Iron                       | NC                                                                                                   | 10400 - 65400 | 5.04E+04    | 8/8      | --       | --                                                                | --             | --                                   | 2.30E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  |                              |    |
|                                                                                                |    |        |       |       |       |                            | Manganese                  | NC                                                                                                   | 209 - 2660    | 1.63E+03    | 8/8      | --       | --                                                                | --             | --                                   | 1.94E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 |                              |    |
|                                                                                                |    |        |       |       |       |                            | Vanadium                   | NC                                                                                                   | 28 - 175      | 1.11E+02    | 8/8      | --       | --                                                                | --             | --                                   | 1.71E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 |                              |    |
| EMI-1                                                                                          | MI | BA34   | 2E-05 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 0.79 - 12     | 7.10E+00    | 7/9      | 1.64E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene             | C                                                                                                    | 0.052 - 0.46  | 4.60E-01    | 3/21     | 2.62E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BB32   | 6E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C                                                                                                    | 0.043 - 0.6   | 6.00E-01    | 2/12     | 3.42E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1260               | C                                                                                                    | 0.019 - 1.5   | 1.50E+00    | 3/12     | 1.49E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           |    |
| EMI-1                                                                                          | MI | BB33   | 4E-05 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 2.7 - 13      | 1.30E+01    | 10/15    | 3.00E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene             | C                                                                                                    | 0.039 - 0.38  | 3.42E-01    | 4/25     | 1.95E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1254               | C                                                                                                    | 1.9 - 6.9     | 6.90E+00    | 2/25     | 6.87E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           |    |
| EMI-1                                                                                          | MI | BB34   | 2E-05 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 3.2 - 14.5    | 7.20E+00    | 11/24    | 1.66E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BC33   | 3E-05 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 0.59 - 14.5   | 9.86E+00    | 10/12    | 2.27E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BD32   | 1E-04 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 3.5 - 48.6    | 4.86E+01    | 6/10     | 1.12E-04 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BD33   | 3E-05 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 0.85 - 62     | 1.15E+01    | 25/26    | 2.64E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene             | C                                                                                                    | 0.081 - 0.99  | 5.78E-01    | 4/21     | 3.29E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BD34   | 3E-05 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 0.67 - 14.5   | 9.23E+00    | 15/20    | 2.13E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1254               | C                                                                                                    | 0.087 - 3.3   | 3.30E+00    | 3/17     | 3.28E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           |    |
| EMI-1                                                                                          | MI | BE31   | 3E-05 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 1.2 - 12      | 1.20E+01    | 4/5      | 2.77E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BE32   | 3E-05 | <1    | <1    | PAH                        | Benzo(a)anthracene         | C                                                                                                    | 0.076 - 2.9   | 2.67E+00    | 6/12     | 1.52E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       |                            | Benzo(a)pyrene             | C                                                                                                    | 0.096 - 5.3   | 4.18E+00    | 6/12     | 2.38E-05 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       |                            | Benzo(k)fluoranthene       | C                                                                                                    | 0.064 - 4.2   | 4.05E+00    | 9/12     | 2.30E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       |                            | Benzo(k)fluoranthene       | C                                                                                                    | 0.043 - 3.2   | 3.20E+00    | 8/12     | 1.82E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BE33   | 2E-05 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 1.6 - 12      | 6.25E+00    | 44/45    | 1.44E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene             | C                                                                                                    | 0.039 - 3.9   | 4.72E-01    | 15/45    | 2.69E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BE34   | 5E-05 | 3E+00 | 3E+00 | Metal                      | Arsenic                    | C                                                                                                    | 2.5 - 11.8    | 4.91E+00    | 17/26    | 1.13E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1254               | C/NC                                                                                                 | 30 - 38       | 3.80E+01    | 2/25     | 3.78E-05 | 35.1                                                              | 64.9           | 0.0                                  |                              | 2.65E+00             | 35.1                                                     | 64.9           | 0.0                                  |                              |    |
| EMI-1                                                                                          | MI | BF31   | 1E-04 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 0.76 - 58.1   | 5.81E+01    | 6/6      | 1.34E-04 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       |                            | Lead                       | --                                                                                                   | 16 - 4300     | 4.30E+03    | 6/6      | --       | --                                                                | --             | --                                   | --                           | --                   | --                                                       |                |                                      |                              |    |
| EMI-1                                                                                          | MI | BF34   | 2E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C                                                                                                    | 0.038 - 0.36  | 2.10E-01    | 4/10     | 1.20E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BG32   | 6E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C                                                                                                    | 0.27 - 0.7    | 7.00E-01    | 2/9      | 3.99E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BG33   | 5E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C                                                                                                    | 0.076 - 0.99  | 4.99E-01    | 5/34     | 2.84E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BG34   | 4E-05 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 1.9 - 12      | 6.65E+00    | 9/10     | 1.53E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           |    |
|                                                                                                |    |        |       |       |       |                            |                            | Benzo(a)anthracene                                                                                   | C             | 0.057 - 4.7 | 3.97E+00 | 4/10     | 2.26E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   | --                           |    |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene             | C                                                                                                    | 0.066 - 3.9   | 2.29E+00    | 5/10     | 1.31E-05 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       |                            | Benzo(k)fluoranthene       | C                                                                                                    | 0.11 - 4.2    | 3.34E+00    | 5/10     | 1.90E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       |                            | Dibenz(a,h)anthracene      | C                                                                                                    | 0.098 - 0.42  | 4.20E-01    | 2/10     | 1.46E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       |                            | Indeno(1,2,3-cd)pyrene     | C                                                                                                    | 0.31 - 2.3    | 2.30E+00    | 2/10     | 1.31E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
| EMI-1                                                                                          | MI | BI34   | 2E-04 | <1    | <1    | Metal                      | Arsenic                    | C                                                                                                    | 2.1 - 99.5    | 8.18E+01    | 6/11     | 1.89E-04 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       |                            |                            | Lead                                                                                                 | --            | 3.2 - 1340  | 8.36E+02 | 7/11     | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             |                                      |                              |    |
| EMI-1                                                                                          | MI | BJ32   | 2E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene             | C                                                                                                    | 0.21 - 0.6    | 6.00E-01    | 2/10     | 3.42E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |
|                                                                                                |    |        |       |       |       |                            | Benzo(a)pyrene             | C                                                                                                    | 0.05 - 0.26   | 2.60E-01    | 2/4      | 1.48E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |    |

TABLE 5-12: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                     |               |             |                       |              |                   |                            |                |               |                                  |          |                     |                               | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| EMI-1               | MI            | BJ33        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 4.1 - 12.1                       | 1.09E+01 | 4/4                 | 2.51E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BK32        | 6E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene | C             | 0.012 - 0.74                     | 7.40E-01 | 3/4                 | 4.21E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |

Notes: All concentrations shown in milligrams per kilogram (mg/kg).

- <1
- Less than 1
- 
- Not applicable or chemical is not a COC for this endpoint
- %
- Percent
- bgs
- Below ground surface
- C
- Cancer effect
- COC
- Chemical of concern
- EPC
- Exposure point concentration
- HHRA
- Human health risk assessment
- HI
- Hazard index
- IND
- Industrial (industrial exposure scenario)
- MI
- Maritime industrial (industrial exposure scenario)
- MU
- Mixed use (residential exposure scenario)
- NC
- Noncancer effect
- PAH
- Polynuclear aromatic hydrocarbon
- Pest/PCB
- Pesticide/polychlorinated biphenyl
- RD
- Research and development (residential exposure scenario)
- RME
- Reasonable maximum exposure
- SVOC
- Semivolatile organic compound
- VOC
- Volatile organic compound



TABLE 5-13: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |     |      |       |       |       | Chemicals of Concern (COC) |                        | Basis for COC | Range of Detected Concentrations | RME EPC  | DF    | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|------------------------------------------------------------------------------------------------|-----|------|-------|-------|-------|----------------------------|------------------------|---------------|----------------------------------|----------|-------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                                                                                                |     |      |       |       |       |                            |                        |               |                                  |          |       |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| 31B/36                                                                                         | IND | AR27 | 2E-09 | <1    | <1    | Metal                      | Manganese              | NC            | 542 - 8010                       | 8.01E+03 | 6/6   | --                            | --                                                                | --             | --                                   | 1.16E+00                     | 92.7                 | 0.0                                                      | 7.3            |                                      |                              |
| 31B/36                                                                                         | IND | AR28 | 6E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 0.44 - 32.3                      | 9.89E+00 | 9/14  | 6.10E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 31B/36                                                                                         | IND | AS29 | 8E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 0.77 - 15.7                      | 9.29E+00 | 14/23 | 5.73E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       | PAH                        | Benzo(a)pyrene         | C             | 1.2 - 1.2                        | 1.20E+00 | 1/21  | 1.86E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             |                                      |                              |
| 31B/36                                                                                         | IND | AT29 | 3E-05 | 2E+00 | <1    | Metal                      | Arsenic                | C             | 0.83 - 130                       | 4.94E+01 | 11/14 | 3.04E-05                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 31B/36                                                                                         | IND | AU29 | 7E-05 | 2E+00 | 2E+00 | Metal                      | Arsenic                | C/NC          | 4.4 - 105                        | 1.05E+02 | 13/14 | 6.47E-05                      | 70.7                                                              | 29.3           | 0.0                                  | 1.60E+00                     | 70.6                 | 29.3                                                     | 0.1            |                                      |                              |
|                                                                                                |     |      |       |       |       | --                         | Lead                   | --            | 8.2 - 980                        | 9.80E+02 | 11/14 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       |                |                                      |                              |
| 31B/36                                                                                         | IND | AV29 | 2E-05 | 2E+00 | <1    | Metal                      | Arsenic                | C             | 2.4 - 50.9                       | 4.01E+01 | 18/23 | 2.47E-05                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       |                            |                        |               |                                  |          |       |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |
| 40                                                                                             | IND | AW31 | 7E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 1.9 - 12.3                       | 1.17E+01 | 4/4   | 7.21E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 40                                                                                             | IND | BA33 | 1E-05 | 5E+00 | 3E+00 | Metal                      | Arsenic                | C             | 0.7 - 21                         | 1.39E+01 | 16/18 | 8.57E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       | Pest/PCB                   | Aroclor-1254           | NC            | 3.4 - 3.4                        | 3.40E+00 | 1/18  | 9.20E-07                      | --                                                                | --             | --                                   |                              | 1.61E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |
|                                                                                                |     |      |       |       |       |                            | Aroclor-1260           | NC            | 2.8 - 2.8                        | 2.80E+00 | 1/18  | 7.58E-07                      | --                                                                | --             | --                                   |                              | 1.33E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |
|                                                                                                |     |      |       |       |       |                            |                        |               |                                  |          |       |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |
| 41                                                                                             | IND | BA29 | 3E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 0.64 - 12.9                      | 4.38E+00 | 35/43 | 2.70E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 41                                                                                             | IND | BA30 | 3E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 0.77 - 11.6                      | 3.47E+00 | 36/58 | 2.14E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 41                                                                                             | IND | BB30 | 3E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene         | C             | 0.014 - 4.8                      | 6.59E-01 | 7/29  | 1.02E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       |                            |                        |               |                                  |          |       |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |
| 43                                                                                             | IND | AP29 | 6E-05 | 2E+00 | 2E+00 | Metal                      | Arsenic                | C/NC          | 0.59 - 244                       | 9.97E+01 | 12/19 | 6.15E-05                      | 70.7                                                              | 29.3           | 0.0                                  | 1.52E+00                     | 70.6                 | 29.3                                                     | 0.1            |                                      |                              |
| 43                                                                                             | IND | AQ30 | 8E-06 | 5E+00 | 5E+00 | Metal                      | Arsenic                | C             | 0.31 - 12                        | 6.87E+00 | 9/9   | 4.24E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.04 - 16                        | 9.56E+00 | 12/19 | 2.59E-06                      | 34.1                                                              | 65.9           | 0.0                                  | 4.53E+00                     | 34.1                 | 65.9                                                     | 0.0            |                                      |                              |
| 43                                                                                             | IND | AR31 | 5E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 1.8 - 13                         | 7.07E+00 | 25/29 | 4.36E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 43                                                                                             | IND | AR32 | 8E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 0.39 - 12.6                      | 1.13E+01 | 43/49 | 6.98E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 43                                                                                             | IND | AS30 | 5E-07 | 2E+00 | <1    | Metal                      | Iron                   | NC            | 15100 - 122000                   | 1.15E+05 | 6/6   | --                            | --                                                                | --             | --                                   | 1.24E+00                     | 100.0                | 0.0                                                      | 0.0            |                                      |                              |
| 43                                                                                             | IND | AS32 | 1E-05 | <1    | <1    | Metal                      | Arsenic                | C             | 0.81 - 27                        | 2.30E+01 | 24/34 | 1.42E-05                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 43                                                                                             | IND | AS33 | 3E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 1.8 - 15                         | 4.30E+00 | 12/22 | 2.65E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 43                                                                                             | IND | AT32 | 9E-05 | 4E+00 | 2E+00 | Metal                      | Arsenic                | C/NC          | 4.4 - 168                        | 1.48E+02 | 9/10  | 9.15E-05                      | 70.7                                                              | 29.3           | 0.0                                  | 2.26E+00                     | 70.6                 | 29.3                                                     | 0.1            |                                      |                              |
|                                                                                                |     |      |       |       |       |                            | Mercury                | NC            | 0.013 - 102                      | 1.02E+02 | 9/10  | --                            | --                                                                | --             | --                                   | 1.10E+00                     | 99.9                 | 0.0                                                      | 0.1            |                                      |                              |
| 43                                                                                             | IND | AT33 | 3E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene         | C             | 0.084 - 2.4                      | 1.27E+00 | 5/9   | 1.97E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             |                                      |                              |
| 43                                                                                             | IND | AU32 | 6E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C             | 0.97 - 12                        | 7.97E+00 | 12/13 | 4.92E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 43                                                                                             | IND | AU33 | 9E-06 | <1    | <1    | PAH                        | Benzo(a)anthracene     | C             | 0.086 - 6.5                      | 6.50E+00 | 8/16  | 1.01E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       |                            | Benzo(a)pyrene         | C             | 0.061 - 3.5                      | 3.50E+00 | 8/16  | 5.42E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       |                            | Arsenic                | C             | 3.3 - 14                         | 7.41E+00 | 13/16 | 4.57E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                             | IND | AV32 | 1E-05 | <1    | <1    | PAH                        | Benzo(a)pyrene         | C             | 0.19 - 2.1                       | 2.10E+00 | 3/21  | 3.25E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       | VOC                        | Benzene                | C             | 0.00038 - 19                     | 1.90E+01 | 7/16  | 2.03E-06                      | 4.3                                                               | 0.0            | 95.7                                 | <1                           | --                   | --                                                       | --             | --                                   |                              |
|                                                                                                |     |      |       |       |       | PAH                        | Dibenz(a,h)anthracene  | C             | 1.1 - 1.1                        | 1.10E+00 | 1/54  | 1.04E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   |                              |
| 43                                                                                             | IND | AV34 | 5E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 1.1 - 11.2                       | 6.89E+00 | 8/12  | 4.25E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 43                                                                                             | IND | AW33 | 1E-05 | <1    | <1    | Metal                      | Arsenic                | C             | 4.8 - 20                         | 1.59E+01 | 6/6   | 9.83E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 43                                                                                             | IND | AW34 | 6E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 1.4 - 11.2                       | 5.33E+00 | 12/22 | 3.29E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       | PAH                        | Benzo(a)pyrene         | C             | 0.099 - 2.2                      | 8.88E-01 | 7/30  | 1.38E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       |                            |                        |               |                                  |          |       |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |
| 44                                                                                             | IND | AL32 | 2E-06 | 2E+00 | 2E+00 | Pest/PCB                   | Aroclor-1260           | NC            | 0.36 - 3.6                       | 3.60E+00 | 2/6   | 9.75E-07                      | --                                                                | --             | --                                   | 1.71E+00                     | 34.1                 | 65.9                                                     | 0.0            |                                      |                              |
| 44                                                                                             | IND | AM32 | 1E-05 | 2E+01 | 2E+01 | Metal                      | Lead                   | --            | 1.7 - 6570                       | 5.13E+03 | 14/14 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       | Pest/PCB                   | Aroclor-1254           | C/NC          | 0.57 - 33                        | 2.69E+01 | 4/14  | 7.27E-06                      | 34.1                                                              | 65.9           | 0.0                                  | 1.27E+01                     | 34.1                 | 65.9                                                     | 0.0            |                                      |                              |
|                                                                                                |     |      |       |       |       |                            | Aroclor-1260           | C/NC          | 0.086 - 10                       | 9.48E+00 | 6/14  | 2.57E-06                      | 34.1                                                              | 65.9           | 0.0                                  | 4.49E+00                     | 34.1                 | 65.9                                                     | 0.0            |                                      |                              |
| 44                                                                                             | IND | AM33 | 8E-06 | 5E+00 | 2E+00 | Metal                      | Arsenic                | C             | 2.2 - 14.1                       | 8.03E+00 | 10/10 | 4.95E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       |                            | Vanadium               | NC            | 6.2 - 645                        | 4.36E+02 | 10/10 | --                            | --                                                                | --             | --                                   | 1.41E+00                     | 100.0                | 0.0                                                      | 0.0            |                                      |                              |
|                                                                                                |     |      |       |       |       | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.1 - 3.9                        | 3.90E+00 | 7/10  | 1.06E-06                      | 34.1                                                              | 65.9           | 0.0                                  | 1.85E+00                     | 34.1                 | 65.9                                                     | 0.0            |                                      |                              |
| 44                                                                                             | IND | AM34 | 8E-06 | 4E+00 | 3E+00 | Metal                      | Arsenic                | C             | 0.64 - 13                        | 6.99E+00 | 13/16 | 4.31E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       | PAH                        | Benzo(a)pyrene         | C             | 0.092 - 0.75                     | 7.50E-01 | 2/16  | 1.16E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.39 - 5.3                       | 5.30E+00 | 3/16  | 1.43E-06                      | 34.1                                                              | 65.9           | 0.0                                  | 2.51E+00                     | 34.1                 | 65.9                                                     | 0.0            |                                      |                              |
| 44                                                                                             | IND | AM35 | 2E-05 | 1E+01 | 6E+00 | Metal                      | Arsenic                | C             | 3.5 - 32                         | 1.73E+01 | 6/15  | 1.07E-05                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       | PAH                        | Benzo(a)pyrene         | C             | 0.051 - 3.6                      | 3.60E+00 | 11/17 | 5.57E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             |                                      |                              |
|                                                                                                |     |      |       |       |       | Pest/PCB                   | Aroclor-1248           | C/NC          | 7.1 - 7.1                        | 7.10E+00 | 1/15  | 1.92E-06                      | 34.1                                                              | 65.9           | 0.0                                  | 3.36E+00                     | 34.1                 | 65.9                                                     | 0.0            |                                      |                              |
|                                                                                                |     |      |       |       |       | VOC                        | 1,2,4-Trimethylbenzene | NC            | 440 - 440                        | 4.40E+02 | 1/1   | --                            | --                                                                | --             | --                                   | 2.60E+00                     | 1.1                  | 0.0                                                      | 98.9           |                                      |                              |
|                                                                                                |     |      |       |       |       |                            | 1,3,5-Trimethylbenzene | NC            | 200 - 200                        | 2.00E+02 | 1/1   | --                            | --                                                                | --             | --                                   | 2.88E+00                     | 0.4                  | 0.0                                                      | 99.6           |                                      |                              |
| 44                                                                                             | IND | AN33 | 2E-06 | 2E+00 | <1    | --                         | No COCs Identified     | --            | --                               | --       | --    | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             |                                      |                              |
| 44                                                                                             | IND | AP32 | 7E-06 | <1    | <1    | Metal                      | Arsenic                | C             | 3.9 - 11.2                       | 1.06E+01 | 4/4   | 6.53E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             |                                      |                              |
| 44                                                                                             | IND | AP37 | 2E-06 | 2E+00 | 2E+00 | Pest/PCB                   | Aroclor-1260           | NC            | 0.019 - 4.3                      | 3.31E+00 | 4/12  | 8.97E-07                      | --                                                                | --             | --                                   | 1.57E+00                     | 34.1                 | 65.9                                                     | 0.0            |                                      |                              |
| 44                                                                                             | IND | AQ35 | 4E-06 | 2E+01 | 1E+01 | VOC                        | 1,2,4-Trimethylbenzene | NC            | 1400 - 1400                      | 1.40E+03 | 1/1   | --                            | --                                                                | --             | --                                   | 8.29E+00                     | 1.1                  | 0.0                                                      | 98.9           |                                      |                              |
|                                                                                                |     |      |       |       |       |                            | 1,3,5-Trimethylbenzene | NC            | 290 - 290                        | 2.90E+02 | 1/1   | --                            | --                                                                | --             | --                                   | 4.17E+00                     | 0.4                  | 0.0                                                      | 99.6           |                                      |                              |
|                                                                                                |     |      |       |       |       |                            | Naphthalene            | C/NC          | 0.17 - 210                       | 2.10E+02 | 2/10  | 2.79E-06                      | 41.6                                                              | 0.0            | 58.4                                 | 1.14E+00                     | 3.0                  | 0.0                                                      | 97.0           |                                      |                              |

TABLE 5-13: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                    | Basis for COC | Range of Detected Concentrations | RME EPC  | DF    | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|--------------------|---------------|----------------------------------|----------|-------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                     |               |             |                       |              |                   |                            |                    |               |                                  |          |       |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| 44                  | IND           | AQ36        | 7E-06                 | 3E+00        | 2E+00             | Metal                      | Arsenic            | C             | 2.6 - 17.6                       | 9.36E+00 | 11/16 | 5.77E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Lead               | --            | 7.6 - 1150                       | 1.15E+03 | 14/16 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Vanadium           | NC            | 22.1 - 3570                      | 6.77E+02 | 16/16 | --                            | --                                                                | --             | --                                   |                              | 2.19E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |
| 44                  | IND           | AR35        | 3E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene     | C             | 0.23 - 1.2                       | 1.20E+00 | 2/2   | 1.86E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AR36        | 1E-05                 | 2E+00        | <1                | Metal                      | Arsenic            | C             | 2 - 42.9                         | 1.41E+01 | 7/11  | 8.69E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AV36        | 8E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 2.8 - 15                         | 1.22E+01 | 13/13 | 7.53E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AW36        | 6E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 2.1 - 13                         | 7.14E+00 | 12/12 | 4.40E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 44                  | IND           | AY35        | 7E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 4.3 - 11.9                       | 1.19E+01 | 3/3   | 7.34E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AH27        | 1E-05                 | <1           | <1                | Metal                      | Arsenic            | C             | 0.72 - 16.5                      | 1.65E+01 | 2/3   | 1.02E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AI27        | 2E-05                 | <1           | <1                | Metal                      | Arsenic            | C             | 2.4 - 21.8                       | 2.18E+01 | 4/8   | 1.34E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene     | C             | 0.76 - 0.76                      | 7.60E-01 | 1/8   | 1.18E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AI28        | 1E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene     | C             | 0.67 - 0.67                      | 6.70E-01 | 1/5   | 1.04E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AJ25        | 7E-06                 | 2E+00        | <1                | Metal                      | Arsenic            | C             | 3.2 - 11.6                       | 1.07E+01 | 4/4   | 6.60E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AJ28        | 6E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 4.2 - 17.9                       | 7.47E+00 | 11/19 | 4.60E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AK26        | 3E-06                 | 2E+00        | <1                | Metal                      | Arsenic            | C             | 0.88 - 12                        | 4.52E+00 | 14/19 | 2.79E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AK27        | 2E-05                 | <1           | <1                | Metal                      | Arsenic            | C             | 2.9 - 49.9                       | 3.64E+01 | 7/15  | 2.24E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AK28        | 1E-05                 | <1           | <1                | Metal                      | Arsenic            | C             | 1.2 - 15.2                       | 1.52E+01 | 8/13  | 9.37E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Lead               | --            | 3.3 - 4850                       | 1.04E+03 | 13/13 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AL27        | 9E-07                 | 2E+00        | 2E+00             | Pest/PCB                   | Aroclor-1260       | NC            | 3.3 - 3.3                        | 3.30E+00 | 1/11  | 8.93E-07                      | --                                                                | --             | --                                   |                              | 1.56E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |
| 45                  | RD            | AL28        | 4E-07                 | 2E+00        | <1                | Metal                      | Lead               | --            | 5.9 - 1900                       | 1.90E+03 | 3/3   | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AL30        | 5E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 3.1 - 11.3                       | 8.46E+00 | 4/5   | 5.22E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AM28        | 1E-05                 | <1           | <1                | Metal                      | Arsenic            | C             | 1.4 - 16.7                       | 1.55E+01 | 4/4   | 9.57E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AM29        | 1E-05                 | <1           | <1                | Metal                      | Arsenic            | C             | 5 - 16.4                         | 1.64E+01 | 3/4   | 1.01E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| 45                  | RD            | AN28        | 6E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 1.6 - 12.6                       | 9.66E+00 | 4/5   | 5.96E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BA34        | 5E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 0.79 - 12                        | 7.10E+00 | 7/9   | 4.38E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BA35        | 1E-07                 | 2E+00        | <1                | Metal                      | Manganese          | NC            | 570 - 7730                       | 7.73E+03 | 5/5   | --                            | --                                                                | --             | --                                   |                              | 1.12E+00             | 92.7                                                     | 0.0            | 7.3                                  |                              |
| EMI-1               | MI            | BB32        | 2E-06                 | <1           | <1                | --                         | No COCs Identified | --            | --                               | --       | --    | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BB33        | 1E-05                 | 4E+00        | 3E+00             | Metal                      | Arsenic            | C             | 2.7 - 13                         | 1.30E+01 | 10/15 | 8.02E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254       | C/NC          | 1.9 - 6.9                        | 6.90E+00 | 2/25  | 1.87E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 3.27E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |
| EMI-1               | MI            | BB34        | 5E-06                 | 2E+00        | <1                | Metal                      | Arsenic            | C             | 3.2 - 14.5                       | 7.20E+00 | 11/24 | 4.44E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BC33        | 7E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 0.59 - 14.5                      | 9.86E+00 | 10/12 | 6.08E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BD32        | 3E-05                 | <1           | <1                | Metal                      | Arsenic            | C             | 3.5 - 48.6                       | 4.86E+01 | 6/10  | 3.00E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BD33        | 8E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 0.85 - 62                        | 1.15E+01 | 25/26 | 7.07E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BD34        | 7E-06                 | 3E+00        | 2E+00             | Metal                      | Arsenic            | C             | 0.67 - 14.5                      | 9.23E+00 | 15/20 | 5.69E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254       | NC            | 0.087 - 3.3                      | 3.30E+00 | 3/17  | 8.93E-07                      | --                                                                | --             | --                                   |                              | 1.56E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |
| EMI-1               | MI            | BE31        | 7E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 1.2 - 12                         | 1.20E+01 | 4/5   | 7.40E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BE32        | 8E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene     | C             | 0.096 - 5.3                      | 4.18E+00 | 6/12  | 6.46E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BE33        | 5E-06                 | <1           | <1                | Metal                      | Arsenic            | C             | 1.6 - 12                         | 6.25E+00 | 44/45 | 3.85E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BE34        | 1E-05                 | 2E+01        | 2E+01             | Metal                      | Arsenic            | C             | 2.5 - 11.8                       | 4.91E+00 | 17/26 | 3.03E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254       | C/NC          | 30 - 38                          | 3.80E+01 | 2/25  | 1.03E-05                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 1.80E+01             | 34.1                                                     | 65.9           | 0.0                                  |                              |
| EMI-1               | MI            | BF31        | 4E-05                 | 3E+00        | <1                | Metal                      | Arsenic            | C             | 0.76 - 58.1                      | 5.81E+01 | 6/6   | 3.58E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Copper             | NC            | 59 - 15000                       | 1.50E+04 | 6/6   | --                            | --                                                                | --             | --                                   |                              | 1.31E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |
|                     |               |             |                       |              |                   |                            | Lead               | --            | 16 - 4300                        | 4.30E+03 | 6/6   | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BG32        | 2E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene     | C             | 0.27 - 0.7                       | 7.00E-01 | 2/9   | 1.08E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BG34        | 1E-05                 | <1           | <1                | Metal                      | Arsenic            | C             | 1.9 - 12                         | 6.65E+00 | 9/10  | 4.10E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene     | C             | 0.066 - 3.9                      | 2.29E+00 | 5/10  | 3.55E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BI34        | 5E-05                 | 2E+00        | <1                | Metal                      | Arsenic            | C/NC          | 2.1 - 99.5                       | 8.18E+01 | 6/11  | 5.05E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | 1.25E+00             | 70.6                                                     | 29.3           | 0.1                                  |                              |
|                     |               |             |                       |              |                   |                            | Lead               | --            | 3.2 - 1340                       | 8.36E+02 | 7/11  | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BJ33        | 7E-06                 | 2E+00        | <1                | Metal                      | Arsenic            | C             | 4.1 - 12.1                       | 1.09E+01 | 4/4   | 6.70E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EMI-1               | MI            | BK32        | 2E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene     | C             | 0.012 - 0.74                     | 7.40E-01 | 3/4   | 1.15E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-1               | OS            | AL35        | 1E-05                 | 2E+00        | <1                | Metal                      | Arsenic            | C             | 6.9 - 12                         | 1.20E+01 | 2/3   | 7.40E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Vanadium           | NC            | 73 - 390                         | 3.90E+02 | 3/3   | --                            | --                                                                | --             | --                                   |                              | 1.26E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene     | C             | 0.17 - 1.1                       | 1.10E+00 | 2/3   | 1.70E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-1               | OS            | AL36        | 3E-05                 | 8E+00        | 3E+00             | Metal                      | Antimony           | NC            | 19 - 209                         | 2.09E+02 | 2/7   | --                            | --                                                                | --             | --                                   |                              | 1.69E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |
|                     |               |             |                       |              |                   |                            | Arsenic            | C             | 2.9 - 31                         | 3.10E+01 | 2/7   | 1.91E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Iron               | NC            | 6300 - 140000                    | 1.40E+05 | 7/7   | --                            | --                                                                | --             | --                                   |                              | 1.51E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene     | C             | 0.18 - 2.5                       | 2.50E+00 | 4/7   | 3.87E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260       | C/NC          | 0.11 - 5.5                       | 5.50E+00 | 6/7   | 1.49E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.61E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |

TABLE 5-13: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse         | Grid Number   | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                        | Basis for COC | Range of Detected Concentrations | RME EPC  | DF       | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |  |
|---------------------|-----------------------|---------------|-----------------------|--------------|-------------------|----------------------------|------------------------|---------------|----------------------------------|----------|----------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--|
|                     |                       |               |                       |              |                   |                            |                        |               |                                  |          |          |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |  |
| EOS-1               | OS                    | AM36          | 2E-05                 | 2E+01        | 1E+01             | Metal                      | Arsenic                | C             | 3.1 - 26                         | 1.40E+01 | 9/14     | 8.63E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |  |
|                     |                       |               |                       |              |                   |                            | Lead                   | --            | 9.3 - 883                        | 8.83E+02 | 13/14    | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |  |
|                     |                       |               |                       |              |                   |                            | Vanadium               | NC            | 16 - 720                         | 3.99E+02 | 14/14    | --                            | --                                                                | --             | --                                   |                              | 1.29E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.045 - 1.8                      | 1.80E+00 | 5/14     | 2.79E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |  |
| EOS-1               | OS                    | AM37          | 3E-05                 | 1E+01        | 8E+00             | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.022 - 110                      | 2.52E+01 | 7/14     | 6.83E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 1.20E+01             | 34.1                                                     | 65.9           | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   |                            |                        |               |                                  |          |          |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |  |
|                     |                       |               |                       |              |                   | Metal                      | Antimony               | NC            | 14.7 - 343                       | 3.43E+02 | 8/14     | --                            | --                                                                | --             | --                                   |                              | 2.77E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   |                            | Arsenic                | C             | 2.8 - 20.3                       | 1.01E+01 | 11/14    | 6.26E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   |                            | Lead                   | --            | 160 - 10600                      | 2.91E+03 | 13/14    | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 0.15 - 20                        | 2.00E+01 | 7/14     | 3.10E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.1 - 6.6                        | 6.60E+00 | 9/14     | 1.02E-05                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.15 - 12                        | 1.20E+01 | 9/14     | 1.86E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   |                            | Dibenz(a,h)anthracene  | C             | 0.041 - 1.5                      | 1.50E+00 | 4/14     | 1.41E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   | Pest/PCB                   | Aroclor-1254           | NC            | 0.15 - 2.2                       | 2.20E+00 | 4/14     | 5.96E-07                      | --                                                                | --             | --                                   |                              | 1.04E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |  |
| Aroclor-1260        | C/NC                  | 0.074 - 15    | 1.50E+01              | 12/14        | 4.06E-06          |                            | 34.1                   | 65.9          | 0.0                              |          | 7.11E+00 | 34.1                          | 65.9                                                              | 0.0            |                                      |                              |                      |                                                          |                |                                      |                              |  |
| EOS-1               | OS                    | AM38          | 1E-05                 | 3E+00        | <1                | Metal                      | Arsenic                | C             | 2.1 - 19.2                       | 1.92E+01 | 4/6      | 1.18E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |  |
|                     |                       |               |                       |              |                   |                            | Lead                   | --            | 19.2 - 1180                      | 9.27E+02 | 6/6      | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |  |
| EOS-1               | OS                    | AN36          | 2E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 1.3 - 1.3                        | 1.30E+00 | 1/3      | 2.01E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |  |
| EOS-1               | OS                    | AN37          | 1E-04                 | 3E+02        | 2E+02             | Metal                      | Antimony               | NC            | 11.8 - 1930                      | 1.93E+03 | 5/6      | --                            | --                                                                | --             | --                                   |                              | 1.56E+01             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   |                            | Arsenic                | C             | 2.7 - 13.7                       | 9.53E+00 | 6/6      | 5.88E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   |                            | Copper                 | NC            | 29.9 - 198000                    | 1.98E+05 | 6/6      | --                            | --                                                                | --             | --                                   |                              | 1.73E+01             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   |                            | Iron                   | NC            | 6220 - 194000                    | 1.94E+05 | 6/6      | --                            | --                                                                | --             | --                                   |                              | 2.09E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   |                            | Lead                   | --            | 139 - 8910                       | 5.71E+03 | 6/6      | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   |                            | Nickel                 | NC            | 109 - 10300                      | 1.03E+04 | 6/6      | 1.99E-08                      | --                                                                | --             | --                                   | --                           |                      | 1.77E+00                                                 | 93.8           | 0.0                                  | 6.2                          |  |
|                     |                       |               |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.3 - 490                        | 4.90E+02 | 6/8      | 1.33E-04                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.32E+02             | 34.1                                                     | 65.9           | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   | EOS-1                      | OS                     | AN38          | 4E-05                            | 1E+01    | 6E+00    | Metal                         | Arsenic                                                           | C              | 2 - 29.5                             | 2.58E+01                     | 13/14                | 1.59E-05                                                 | 70.7           | 29.3                                 | 0.0                          |  |
| Copper              | NC                    | 224 - 85600   | 2.10E+04              | 14/14        | --                |                            |                        |               |                                  |          |          |                               | --                                                                | --             | --                                   |                              | 1.83E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
| Iron                | NC                    | 1740 - 198000 | 1.76E+05              | 14/14        | --                |                            |                        |               |                                  |          |          |                               | --                                                                | --             | --                                   |                              | 1.90E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
| Lead                | --                    | 211 - 4130    | 2.32E+03              | 14/14        | --                |                            |                        |               |                                  |          |          |                               | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   | --                           |  |
| PAH                 | Benzo(a)anthracene    | C             | 0.079 - 36            | 1.84E+01     | 8/14              |                            |                        |               |                                  |          |          | 2.85E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           |  |
|                     | Benzo(a)pyrene        | C             | 0.064 - 14            | 7.07E+00     | 9/14              |                            |                        |               |                                  |          |          | 1.09E-05                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           |  |
|                     | Benzo(b)fluoranthene  | C             | 0.13 - 21             | 8.42E+00     | 11/14             |                            |                        |               |                                  |          |          | 1.30E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           |  |
|                     | Benzo(k)fluoranthene  | C             | 0.045 - 20            | 9.71E+00     | 9/14              |                            |                        |               |                                  |          |          | 1.50E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           |  |
| Pest/PCB            | Dibenz(a,h)anthracene | C             | 0.049 - 1.7           | 1.70E+00     | 6/14              | 1.60E-06                   | 35.8                   | 64.2          | 0.0                              |          | --       | --                            | --                                                                | --             | --                                   |                              |                      |                                                          |                |                                      |                              |  |
|                     | Aldrin                | C             | 0.65 - 0.65           | 6.50E-01     | 1/14              | 1.21E-06                   | 42.0                   | 58.0          | 0.0                              |          | <1       | --                            | --                                                                | --             | --                                   |                              |                      |                                                          |                |                                      |                              |  |
| EOS-1               | OS                    | AN39          | 5E-07                 | 2E+00        | <1                | Metal                      | Aroclor-1260           | C/NC          | 0.44 - 4.8                       | 4.80E+00 | 7/8      | 1.30E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.27E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   |                            | Lead                   | --            | 275 - 875                        | 8.75E+02 | 2/2      | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |  |
| EOS-1               | OS                    | AO37          | 7E-06                 | <1           | <1                | Metal                      | Arsenic                | C             | 5.2 - 12                         | 1.20E+01 | 3/3      | 7.40E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |  |
| EOS-1               | OS                    | AO39          | 9E-06                 | 7E+00        | 3E+00             | Metal                      | Antimony               | NC            | 175 - 364                        | 3.64E+02 | 3/4      | --                            | --                                                                | --             | --                                   |                              | 2.94E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   |                            | Arsenic                | C             | 9.3 - 13.3                       | 1.33E+01 | 2/5      | 8.20E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   |                            | Iron                   | NC            | 40100 - 178000                   | 1.48E+05 | 5/5      | --                            | --                                                                | --             | --                                   |                              | 1.59E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   |                            | Lead                   | --            | 12.6 - 17600                     | 1.27E+04 | 5/5      | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   | --                           |  |
| EOS-1               | OS                    | AP38          | 1E-05                 | 2E+01        | 1E+01             | Metal                      | Antimony               | NC            | 13.7 - 1510                      | 1.51E+03 | 2/2      | --                            | --                                                                | --             | --                                   |                              | 1.22E+01             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   |                            | Arsenic                | C             | 6 - 15.9                         | 1.59E+01 | 2/2      | 9.80E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   |                            | Iron                   | NC            | 25500 - 200000                   | 2.00E+05 | 2/2      | --                            | --                                                                | --             | --                                   |                              | 2.15E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   |                            | Lead                   | --            | 92.2 - 19700                     | 1.97E+04 | 2/2      | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   | --                           |  |
| EOS-1               | OS                    | AQ39          | 8E-06                 | <1           | <1                | Metal                      | Arsenic                | C             | 13 - 13                          | 1.30E+01 | 1/7      | 8.02E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |  |
|                     |                       |               |                       |              |                   |                            | Lead                   | --            | 9.3 - 2300                       | 2.30E+03 | 5/7      | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   | --                           |  |
| EOS-1               | OS                    | AR40          | 2E-05                 | 7E+00        | 6E+00             | Metal                      | Arsenic                | C             | 2 - 85.3                         | 1.80E+01 | 15/17    | 1.11E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |  |
|                     |                       |               |                       |              |                   |                            | Lead                   | --            | 7 - 2300                         | 2.30E+03 | 15/17    | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.082 - 3.1                      | 6.89E-01 | 5/15     | 1.07E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           |  |
| EOS-1               | OS                    | AS38          | 2E-05                 | 2E+00        | <1                | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.037 - 45                       | 1.22E+01 | 13/17    | 3.31E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 5.79E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   | Metal                      | Arsenic                | C             | 5.4 - 56.1                       | 3.45E+01 | 9/9      | 2.13E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   |                            | Lead                   | --            | 18 - 1440                        | 1.44E+03 | 2/9      | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   | --                           |  |
| EOS-1               | OS                    | AT38          | 1E-05                 | 2E+00        | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.11 - 2                         | 9.87E-01 | 5/9      | 1.53E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |  |
|                     |                       |               |                       |              |                   |                            |                        |               |                                  |          |          |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |  |
|                     |                       |               |                       |              |                   | Metal                      | Antimony               | NC            | 160 - 160                        | 1.60E+02 | 1/13     | --                            | --                                                                | --             | --                                   |                              | 1.29E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |  |
| Arsenic             | C                     | 6.1 - 12      | 1.02E+01              | 13/13        | 6.29E-06          |                            | 70.7                   | 29.3          | 0.0                              |          | <1       | --                            | --                                                                | --             | --                                   |                              |                      |                                                          |                |                                      |                              |  |
| EOS-1               | OS                    | AT39          | 8E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.084 - 5.1                      | 1.25E+00 | 6/13     | 1.94E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |  |
| EOS-1               | OS                    | AU37          | 4E-04                 | 7E+02        | 7E+02             | Metal                      | Arsenic                | C             | 11 - 12                          | 1.20E+01 | 2/2      | 7.40E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |  |
| EOS-1               | OS                    | AV37          | 2E-04                 | 3E+02        | 3E+02             | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.065 - 6600                     | 1.54E+03 | 6/12     | 4.17E-04                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 7.30E+02             | 34.1                                                     | 65.9           | 0.0                                  |                              |  |
|                     |                       |               |                       |              |                   | VOC                        | 1,2,4-Trichlorobenzene | NC            | 0.26 - 830                       | 8.30E+02 | 3/12     | 1.38E-07                      | --                                                                | --             | --                                   |                              | 3.69E+00             | 7.3                                                      | 0.0            | 92.7                                 |                              |  |
|                     |                       |               |                       |              |                   | Metal                      | Arsenic                | C             | 3.3 - 24                         | 1.06E+01 | 19/19    | 6.55E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           |  |
|                     |                       |               |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.055 - 3700                     | 5.37E+02 | 13/19    | 1.45E-04                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.55E+02             | 34.1                                                     | 65.9           | 0.0                                  |                              |  |

TABLE 5-13: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                            | Basis for COC | Range of Detected Concentrations | RME EPC  | DF    | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------------------|---------------|----------------------------------|----------|-------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                     |               |             |                       |              |                   |                            |                            |               |                                  |          |       |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| EOS-2               | OS            | AX36        | 1E-05                 | 3E+00        | <1                | Metal                      | Arsenic                    | C             | 0.66 - 95.5                      | 1.59E+01 | 14/21 | 9.79E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EOS-2               | OS            | AX37        | 5E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene             | C             | 0.24 - 2.1                       | 2.10E+00 | 2/2   | 3.25E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-2               | OS            | AY36        | 6E-05                 | 3E+01        | 2E+01             | Metal                      | Arsenic                    | C/NC          | 2 - 200                          | 7.28E+01 | 16/16 | 4.49E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | 1.11E+00             | 70.6                                                     | 29.3           | 0.1                                  |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC          | 0.013 - 47                       | 4.70E+01 | 12/16 | 1.27E-05                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.23E+01             | 34.1                                                     | 65.9           | 0.0                                  |                              |
| EOS-2               | OS            | AY37        | 1E-05                 | 5E+00        | 2E+00             | Metal                      | Arsenic                    | C             | 3.1 - 19.7                       | 1.42E+01 | 10/10 | 8.77E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                            | --            | 14.4 - 1480                      | 1.48E+03 | 10/10 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC          | 0.19 - 12                        | 5.00E+00 | 6/11  | 1.35E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.37E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |
|                     |               |             |                       |              |                   | SVOC                       | n-Nitroso-di-n-propylamine | C             | 2.8 - 2.8                        | 2.80E+00 | 1/11  | 2.15E-06                      | 42.0                                                              | 58.0           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-2               | OS            | AZ36        | 5E-05                 | 4E+00        | 2E+00             | Metal                      | Arsenic                    | C             | 0.72 - 63                        | 3.12E+01 | 24/25 | 1.93E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                            | --            | 1.5 - 1700                       | 1.18E+03 | 24/25 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene         | C             | 0.087 - 14                       | 1.40E+01 | 5/10  | 2.17E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C             | 0.053 - 11                       | 1.10E+01 | 4/10  | 1.70E-05                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene       | C             | 0.19 - 30                        | 3.00E+01 | 5/10  | 4.64E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene       | C             | 0.11 - 6.9                       | 6.90E+00 | 4/10  | 1.07E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene      | C             | 0.16 - 2.1                       | 2.10E+00 | 2/10  | 1.98E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene     | C             | 0.04 - 9.8                       | 9.80E+00 | 4/10  | 1.52E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC          | 0.016 - 4.1                      | 4.10E+00 | 14/25 | 1.11E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 1.94E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |
| EOS-2               | OS            | AZ37        | 1E-05                 | 3E+00        | <1                | Metal                      | Arsenic                    | C             | 2 - 35.1                         | 1.67E+01 | 11/11 | 1.03E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                            | --            | 18.7 - 1140                      | 1.14E+03 | 11/11 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.21 - 1.5                       | 1.50E+00 | 5/12  | 2.32E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-2               | OS            | BA36        | 4E-05                 | 3E+00        | <1                | Metal                      | Arsenic                    | C             | 0.59 - 641                       | 5.93E+01 | 35/35 | 3.66E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.058 - 3.1                      | 2.52E+00 | 7/18  | 3.90E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-2               | OS            | BB36        | 6E-06                 | <1           | <1                | Metal                      | Arsenic                    | C             | 3.2 - 11.2                       | 7.24E+00 | 10/10 | 4.46E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BE35        | 7E-06                 | <1           | <1                | Metal                      | Arsenic                    | C             | 1.2 - 12.6                       | 5.23E+00 | 20/24 | 3.23E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                            | --            | 3.8 - 6130                       | 5.02E+03 | 23/24 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.52 - 1.4                       | 1.40E+00 | 2/18  | 2.17E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BE36        | 2E-05                 | 2E+00        | <1                | Metal                      | Arsenic                    | C             | 2.2 - 34                         | 2.97E+01 | 5/10  | 1.83E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.051 - 3.3                      | 2.53E+00 | 7/10  | 3.92E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BF35        | 5E-06                 | <1           | <1                | Metal                      | Arsenic                    | C             | 0.87 - 22                        | 7.01E+00 | 15/20 | 4.32E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BF36        | 3E-05                 | <1           | <1                | PAH                        | Benzo(a)anthracene         | C             | 0.36 - 18                        | 1.80E+01 | 3/11  | 2.79E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C             | 0.25 - 15                        | 1.34E+01 | 5/11  | 2.07E-05                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene       | C             | 0.038 - 12                       | 1.20E+01 | 6/11  | 1.86E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene       | C             | 14 - 14                          | 1.40E+01 | 1/11  | 2.17E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BG36        | 1E-05                 | 2E+00        | <1                | Metal                      | Arsenic                    | C             | 3.9 - 19.3                       | 1.11E+01 | 9/13  | 6.85E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.1 - 2                          | 1.24E+00 | 10/13 | 1.92E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Dioxin                     | 2,3,4,7,8-PECDF            | C             | 0.000235 - 0.000235              | 2.35E-04 | 1/1   | 1.15E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BG37        | 4E-05                 | 5E+00        | 2E+00             | Metal                      | Antimony                   | NC            | 4.8 - 240                        | 2.40E+02 | 2/2   | --                            | --                                                                | --             | --                                   |                              | 1.94E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |
|                     |               |             |                       |              |                   |                            | Arsenic                    | C             | 4.6 - 30                         | 3.00E+01 | 2/2   | 1.85E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                            | --            | 39 - 1800                        | 1.80E+03 | 2/2   | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BG37        | 4E-05                 | 5E+00        | 2E+00             | Dioxin                     | 1,2,3,7,8-PECDD            | C             | 0.00025 - 0.00025                | 2.50E-04 | 1/1   | 2.45E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | 2,3,4,6,7,8-HXCDF          | C             | 0.00125 - 0.00125                | 1.25E-03 | 1/1   | 1.22E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | 2,3,4,7,8-PECDF            | C             | 0.00132 - 0.00132                | 1.32E-03 | 1/1   | 6.46E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BH36        | 1E-05                 | 1E+01        | 5E+00             | Metal                      | Arsenic                    | C             | 3.1 - 14                         | 6.28E+00 | 10/16 | 3.87E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                            | --            | 28.1 - 1500                      | 9.53E+02 | 13/16 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Vanadium                   |                            | NC            | 27 - 1660                        | 1.49E+03 | 15/16 | --                            | --                                                                | --             | --                                   |                              | 4.81E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.06 - 0.96                      | 9.60E-01 | 9/15  | 1.49E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC          | 0.02 - 5.6                       | 5.60E+00 | 10/19 | 1.52E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.65E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |
|                     |               |             |                       |              |                   | Dioxin                     | 2,3,4,7,8-PECDF            | C             | 0.000578 - 0.000578              | 5.78E-04 | 1/4   | 2.83E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BH37        | 2E-05                 | <1           | <1                | Metal                      | Arsenic                    | C             | 3.4 - 28                         | 2.29E+01 | 7/7   | 1.41E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Dioxin                     | 2,3,4,7,8-PECDF            | C             | 0.0000673 - 0.000321             | 3.21E-04 | 4/4   | 1.57E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BI36        | 1E-05                 | 2E+00        | <1                | Metal                      | Arsenic                    | C             | 1.2 - 73                         | 1.53E+01 | 17/22 | 9.44E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C             | 0.038 - 0.73                     | 7.30E-01 | 10/21 | 1.13E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BI37        | 2E-05                 | 7E+00        | 3E+00             | Metal                      | Arsenic                    | C             | 9.3 - 18                         | 1.60E+01 | 5/5   | 9.85E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Lead                       |                            | --            | 330 - 4700                       | 3.34E+03 | 5/5   | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Vanadium                   |                            | NC            | 53 - 880                         | 8.80E+02 | 5/5   | --                            | --                                                                | --             | --                                   |                              | 2.84E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC          | 0.17 - 4                         | 4.00E+00 | 5/5   | 1.08E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 1.90E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              |
|                     |               |             |                       |              |                   | Dioxin                     | 2,3,4,7,8-PECDF            | C             | 0.00013 - 0.000414               | 3.73E-04 | 4/5   | 1.82E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
| EOS-3               | OS            | BJ36        | 2E-05                 | 5E+00        | 2E+00             | Metal                      | Antimony                   | NC            | 170 - 170                        | 1.70E+02 | 1/1   | --                            | --                                                                | --             | --                                   |                              | 1.37E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |
|                     |               |             |                       |              |                   |                            | Arsenic                    | C             | 18 - 18                          | 1.80E+01 | 1/1   | 1.11E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Copper                     | NC            | 21000 - 21000                    | 2.10E+04 | 1/1   | --                            | --                                                                | --             | --                                   |                              | 1.83E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              |
|                     |               |             |                       |              |                   | Lead                       |                            | --            | 1900 - 1900                      | 1.90E+03 | 1/1   | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | Dioxin                     | 1,2,3,7,8-PECDD            | C             | 0.000235 - 0.000235              | 2.35E-04 | 1/1   | 2.30E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | 2,3,4,7,8-PECDF            | C             | 0.000796 - 0.000796              | 7.96E-04 | 1/1   | 3.90E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |

TABLE 5-13: INCREMENTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO (CONTINUED)  
Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                       | Basis for COC | Range of Detected Concentrations | RME EPC  | DF    | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|-----------------------|---------------|----------------------------------|----------|-------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|
|                     |               |             |                       |              |                   |                            |                       |               |                                  |          |       |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |
| EOS-5               | OS            | ZZ01        | 1E-05                 | <1           | <1                | Metal                      | Arsenic               | C             | 1.8 - 12.8                       | 4.09E+00 | 34/39 | 2.52E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene    | C             | 0.031 - 8.8                      | 8.80E+00 | 3/39  | 1.36E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene        | C             | 0.052 - 13                       | 2.78E+00 | 4/39  | 4.30E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene  | C             | 0.068 - 21                       | 2.10E+01 | 3/39  | 3.25E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene | C             | 0.075 - 1.7                      | 1.70E+00 | 2/39  | 1.60E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              |

- Notes:
- All concentrations shown in mg/kg.
- 
- Not applicable or chemical is not a COC for this endpoint  
Not evaluated because exposure pathway is incomplete
- bgs
- Below ground surface
- C
- Cancer effect
- COC
- Chemical of concern
- DF
- Detection frequency
- EPC
- Exposure point concentration
- HI
- Hazard index
- HXCDF
- Hexachlorodibenzofuran
- IND
- Industrial (industrial exposure scenario)
- mg/kg
- Milligram per kilogram
- MI
- Maritime/Industrial (industrial exposure scenario)
- NC
- Noncancer effect
- OS
- Open space (recreational exposure scenario)
- PAH
- Polynuclear aromatic hydrocarbon
- Pest
- Pesticide
- PCB
- Polychlorinated biphenyl
- PECDD
- Pentachlorodibenzo-p-dioxin
- PECDF
- Pentachlorodibenzofuran
- RD
- Research and development (residential exposure scenario)
- RME
- Reasonable maximum exposure
- SVOC
- Semivolatile organic compound
- VOC
- Volatile organic compound

TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) | Basis for COC         | Range of Detected Concentrations | RME EPC      | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |     |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|-----------------------|----------------------------------|--------------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|-----|
|                     |               |             |                       |              |                   |                            |                       |                                  |              |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |     |
|                     |               |             |                       |              |                   |                            |                       |                                  |              |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |     |
| 43                  | IND           | AR31        | 3E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 2.3 - 13     | 9.13E+00            | 10/10                         | 2.11E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | Yes |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.039 - 0.19 | 1.90E-01            | 2/12                          | 1.08E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260          | C                                | 0.038 - 9    | 5.82E+00            | 7/10                          | 5.79E-06                                                          | 35.1           | 64.9                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | --                                  | --  |
| 43                  | IND           | AR32        | 1E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 0.56 - 9.8   | 4.70E+00            | 13/15                         | 1.08E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.21 - 0.21  | 2.10E-01            | 1/18                          | 1.20E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
| 43                  | IND           | AR33        | 2E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 1.4 - 8.9    | 8.90E+00            | 2/2                           | 2.05E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
| 43                  | IND           | AS30        | 3E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 0.6 - 10.8   | 1.08E+01            | 2/3                           | 2.49E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.23 - 0.23  | 2.30E-01            | 1/3                           | 1.31E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
| 43                  | IND           | AS31        | 2E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 5.5 - 9.9    | 9.90E+00            | 3/3                           | 2.28E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
| 43                  | IND           | AS32        | 3E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 0.81 - 27    | 1.15E+01            | 12/14                         | 2.65E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | Yes |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.041 - 0.38 | 3.80E-01            | 3/16                          | 2.16E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
| 43                  | IND           | AS33        | 7E-06                 | <1           | <1                | Metal                      | Arsenic               | C                                | 2.9 - 3.8    | 2.90E+00            | 5/10                          | 6.69E-06                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
| 43                  | IND           | AS34        | 2E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 4.8 - 10.6   | 1.06E+01            | 2/2                           | 2.44E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
| 43                  | IND           | AT30        | 1E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 0.35 - 4.6   | 4.60E+00            | 2/2                           | 1.06E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
| 43                  | IND           | AT31        | 1E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 1.5 - 6.6    | 5.32E+00            | 5/6                           | 1.23E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
| 43                  | IND           | AT32        | 3E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 4.4 - 15     | 1.16E+01            | 4/5                           | 2.68E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | Yes |
| 43                  | IND           | AT33        | 3E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 2.9 - 5.6    | 4.91E+00            | 4/5                           | 1.13E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.16 - 2.4   | 2.40E+00            | 3/4                           | 1.37E-05                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
| 43                  | IND           | AU32        | 2E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 0.97 - 7.6   | 6.86E+00            | 5/5                           | 1.58E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260          | C                                | 0.053 - 2.3  | 2.30E+00            | 3/5                           | 2.29E-06                                                          | 35.1           | 64.9                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | --                                  | --  |
| 43                  | IND           | AU33        | 1E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 2.8 - 4      | 4.00E+00            | 2/2                           | 9.22E-06                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
| 43                  | IND           | AU34        | 2E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 6 - 6        | 6.00E+00            | 1/4                           | 1.38E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.3 - 0.3    | 3.00E-01            | 1/4                           | 1.71E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
| 43                  | IND           | AV32        | 1E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 3.6 - 6.8    | 5.29E+00            | 4/6                           | 1.22E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.19 - 0.19  | 1.90E-01            | 1/7                           | 1.08E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
| 43                  | IND           | AV33        | 7E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 6.5 - 8      | 8.00E+00            | 4/5                           | 1.84E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene    | C                                | 0.13 - 8.2   | 8.20E+00            | 2/8                           | 4.67E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene        | C                                | 0.082 - 6.4  | 6.40E+00            | 2/8                           | 3.64E-05                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene  | C                                | 0.21 - 13    | 1.30E+01            | 3/8                           | 7.40E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene | C                                | 1.1 - 1.1    | 1.10E+00            | 1/8                           | 3.81E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
| 43                  | IND           | AV34        | 2E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 6.4 - 7      | 7.00E+00            | 2/4                           | 1.61E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.32 - 0.36  | 3.60E-01            | 2/4                           | 2.05E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
| 43                  | IND           | AW33        | 2E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 5.4 - 8      | 8.00E+00            | 2/2                           | 1.84E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
| 43                  | IND           | AW34        | 3E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 3 - 6.2      | 6.20E+00            | 2/5                           | 1.43E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene    | C                                | 0.12 - 5.7   | 5.70E+00            | 6/9                           | 3.25E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene        | C                                | 0.16 - 2.2   | 1.33E+00            | 6/9                           | 7.56E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene  | C                                | 0.33 - 5.2   | 3.03E+00            | 6/9                           | 1.73E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260          | C                                | 0.083 - 1.8  | 1.80E+00            | 3/5                           | 1.79E-06                                                          | 35.1           | 64.9                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | --                                  | --  |
| 44                  | IND           | AL32        | 2E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 2.4 - 4.9    | 4.90E+00            | 2/3                           | 1.13E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.036 - 0.43 | 4.30E-01            | 2/3                           | 2.45E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260          | C                                | 0.36 - 3.6   | 3.60E+00            | 2/3                           | 3.58E-06                                                          | 35.1           | 64.9                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | --                                  | --  |
| 44                  | IND           | AM31        | 9E-06                 | <1           | <1                | Metal                      | Arsenic               | C                                | 3.9 - 3.9    | 3.90E+00            | 1/1                           | 8.99E-06                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
| 44                  | IND           | AM32        | 2E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 2.5 - 6.2    | 6.20E+00            | 5/5                           | 1.43E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.043 - 0.53 | 3.76E-01            | 4/5                           | 2.14E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
| 44                  | IND           | AM33        | 2E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 2.9 - 5.6    | 5.60E+00            | 3/3                           | 1.29E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.049 - 0.64 | 6.40E-01            | 2/3                           | 3.64E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene  | C                                | 0.11 - 1.8   | 1.80E+00            | 3/3                           | 1.03E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260          | C                                | 0.33 - 3.9   | 3.90E+00            | 2/3                           | 3.88E-06                                                          | 35.1           | 64.9                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | --                                  | --  |
| 44                  | IND           | AM34        | 3E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 3.4 - 7.7    | 7.70E+00            | 3/3                           | 1.78E-05                                                          | 71.6           | 28.4                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | 11.1                                | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene        | C                                | 0.75 - 0.75  | 7.50E-01            | 1/3                           | 4.27E-06                                                          | 36.8           | 63.2                                 | 0.0                          |                      | --                                                       | --             | --                                   |                              | --     | --                                  |     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254          | C                                | 1.6 - 1.6    | 1.60E+00            | 1/3                           | 1.59E-06                                                          | 35.1           | 64.9                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | --                                  | --  |
|                     |               |             |                       |              |                   |                            | Aroclor-1260          | C                                | 5.3 - 5.3    | 5.30E+00            | 1/3                           | 5.28E-06                                                          | 35.1           | 64.9                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           |        | --                                  | --  |
| 44                  | IND           | AM35        | 8E-05                 | <1           | <1                | Metal                      | Arsenic               | C                                | 3.6 -        |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |     |



TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                     |               |             |                       |              |                   |                            |                |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| 44                  | IND           | AN32        | 2E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.2 - 6.9                        | 6.90E+00 | 2/2                 | 1.59E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                  | IND           | AN33        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 2 - 7.3                          | 6.87E+00 | 6/6                 | 1.58E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene | C             | 0.19 - 1                         | 1.00E+00 | 2/6                 | 5.70E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260   | C             | 1.6 - 1.6                        | 1.60E+00 | 1/6                 | 1.59E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 44                  | IND           | AO35        | 8E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.3 - 3.3                        | 3.30E+00 | 1/1                 | 7.61E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                  | IND           | AP34        | 1E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.3 - 4.7                        | 4.70E+00 | 2/2                 | 1.08E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene | C             | 0.19 - 0.19                      | 1.90E-01 | 1/2                 | 1.08E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| 44                  | IND           | AP37        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.8 - 8.9                        | 8.90E+00 | 2/5                 | 2.05E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254   | C             | 1.3 - 1.3                        | 1.30E+00 | 1/5                 | 1.29E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                     |               |             |                       |              |                   |                            | Aroclor-1260   | C             | 0.044 - 4.3                      | 4.30E+00 | 3/5                 | 4.28E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 44                  | IND           | AQ33        | 8E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.6 - 3.6                        | 3.60E+00 | 1/1                 | 8.30E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                  | IND           | AQ35        | 1E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 4.4 - 4.9                        | 4.90E+00 | 2/4                 | 1.13E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene | C             | 0.38 - 0.38                      | 3.80E-01 | 1/4                 | 2.16E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| 44                  | IND           | AQ36        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 2.6 - 16                         | 1.15E+01 | 5/7                 | 2.64E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 44                  | IND           | AR34        | 1E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 6.1 - 6.1                        | 6.10E+00 | 1/1                 | 1.41E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                  | IND           | AR35        | 2E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene | C             | 0.23 - 0.23                      | 2.30E-01 | 1/1                 | 1.31E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| 44                  | IND           | AR36        | 1E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 2 - 3.4                          | 3.34E+00 | 4/6                 | 7.70E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene | C             | 0.22 - 0.22                      | 2.20E-01 | 1/4                 | 1.25E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| 44                  | IND           | AR37        | 8E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 2.7 - 2.7                        | 2.70E+00 | 1/1                 | 6.23E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                  | IND           | AS36        | 8E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.3 - 3.3                        | 3.30E+00 | 1/1                 | 7.61E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                  | IND           | AU35        | 8E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.5 - 3.5                        | 3.50E+00 | 1/1                 | 8.07E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                  | IND           | AU36        | 5E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 2.2 - 2.2                        | 2.20E+00 | 1/1                 | 5.07E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                  | IND           | AV36        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 9.2 - 15                         | 1.50E+01 | 5/5                 | 3.46E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 44                  | IND           | AW36        | 2E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 2.1 - 8.6                        | 6.36E+00 | 6/6                 | 1.47E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                  | IND           | AX35        | 1E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 4.5 - 4.5                        | 4.50E+00 | 1/1                 | 1.04E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                  | IND           | AY35        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 11.9 - 11.9                      | 1.19E+01 | 1/1                 | 2.74E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                  | RD            | 032075      | 2E-07                 | 1E+01        | 5E+00             | Metal                      | Iron           | NC            | 44000 - 44000                    | 4.40E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.00E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 1100 - 1100                      | 1.10E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.30E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 1420 - 1420                      | 1.42E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 4.70E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
| 45                  | RD            | 033077      | 8E-05                 | 1E+01        | 7E+00             | Metal                      | Arsenic        | C             | 3.2 - 3.2                        | 3.20E+00 | 1/1                 | 8.36E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 25500 - 25500                    | 2.55E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.16E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 6040 - 6040                      | 6.04E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 7.16E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |
| 45                  | RD            | 034074      | 2E-07                 | 9E+00        | 5E+00             | Metal                      | Iron           | NC            | 45500 - 45500                    | 4.55E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.07E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 897 - 897                        | 8.97E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.06E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 1440 - 1440                      | 1.44E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 4.77E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
| 45                  | RD            | 035079      | 4E-04                 | 5E+00        | 2E+00             | Metal                      | Arsenic        | C/NC          | 16.5 - 16.5                      | 1.65E+01 | 1/1                 | 4.31E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.05E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 34900 - 34900                    | 3.49E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.59E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
| 45                  | RD            | 036074      | 1E-07                 | 1E+01        | 3E+00             | Metal                      | Iron           | NC            | 64100 - 64100                    | 6.41E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.92E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | Yes                                 |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 1560 - 1560                      | 1.56E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.85E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 397 - 397                        | 3.97E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.31E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                     |               |             |                       |              |                   |                            | Vanadium       | NC            | 191 - 191                        | 1.91E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.95E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | Yes                                 |
| 45                  | RD            | 037076      | 5E-05                 | 7E+00        | 4E+00             | Metal                      | Arsenic        | C             | 2 - 2                            | 2.00E+00 | 1/1                 | 5.22E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 29000 - 29000                    | 2.90E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.32E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 2840 - 2840                      | 2.84E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 3.37E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |
| 45                  | RD            | 038074      | 3E-07                 | 1E+01        | 5E+00             | Metal                      | Iron           | NC            | 59200 - 59200                    | 5.92E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.70E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | Yes                                 |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 919 - 919                        | 9.19E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.09E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 1660 - 1660                      | 1.66E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 5.49E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                     |               |             |                       |              |                   |                            | Thallium       | NC            | 5.7 - 5.7                        | 5.70E+00 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.13E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          | 0.81   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Vanadium       | NC            | 76.4 - 76.4                      | 7.64E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.18E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |
| 45                  | RD            | 038079      | 6E-04                 | 3E+01        | 2E+01             | Metal                      | Antimony       | NC            | 38.4 - 38.4                      | 3.84E+01 | 1/2                 | --                            | --                                                                | --             | --                                   | --                           | 3.76E+00             | 32.7                                                     | 0.0            | 0.0                                  | 67.3                         | 9.05   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Arsenic        | C/NC          | 10.7 - 21.8                      | 2.18E+01 | 2/2                 | 5.69E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.39E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Cadmium        | NC            | 8.2 - 8.2                        | 8.20E+00 | 1/2                 | --                            | --                                                                | --             | --                                   | --                           | 2.37E+00             | 8.8                                                      | 0.0            | 0.0                                  | 91.1                         | 3.14   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Copper         | NC            | 33.7 - 165                       | 1.65E+02 | 2/2                 | --                            | --                                                                | --             | --                                   |                              |                      |                                                          |                |                                      |                              |        |                                     |

TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                            | Basis for COC      | Range of Detected Concentrations | RME EPC     | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |     |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------------------|--------------------|----------------------------------|-------------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|-----|
|                     |               |             |                       |              |                   |                            |                            |                    |                                  |             |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |     |
|                     |               |             |                       |              |                   |                            |                            |                    |                                  |             |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |     |
| 45                  | RD            | 038079      | 6E-04                 | 3E+01        | 2E+01             | PAH                        | Benzo(a)anthracene         | C                  | 0.55 - 0.55                      | 5.50E-01    | 1/2                 | 1.49E-06                      | 69.5                                                              | 28.5           | 0.0                                  | 2.0                          | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C                  | 0.76 - 0.76                      | 7.60E-01    | 1/2                 | 2.04E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene       | C                  | 1.2 - 1.2                        | 1.20E+00    | 1/2                 | 3.55E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |     |
|                     |               |             |                       |              |                   |                            | Pest/PCB                   | Aroclor-1260       | C                                | 0.58 - 0.58 | 5.80E-01            | 1/2                           | 2.75E-06                                                          | 66.1           | 29.2                                 | 0.0                          | 4.7                  | <1                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                     |               |             |                       |              |                   | SVOC                       | Bis(2-ethylhexyl)phthalate | C                  | 5.4 - 5.4                        | 5.40E+00    | 1/2                 | 4.73E-06                      | 2.5                                                               | 0.8            | 0.0                                  | 96.7                         | <1                   | --                                                       | --             | --                                   | --                           | --     |                                     |     |
| 45                  | RD            | 040073      | 3E-07                 | 1E+01        | 6E+00             | Metal                      | Iron                       | NC                 | 49700 - 49700                    | 4.97E+04    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.26E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC                 | 1930 - 1930                      | 1.93E+03    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 6.39E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
| 45                  | RD            | 040074      | 4E-05                 | 5E+00        | 2E+00             | Metal                      | Arsenic                    | C                  | 1.4 - 1.4                        | 1.40E+00    | 1/1                 | 3.66E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                     |               |             |                       |              |                   |                            | Iron                       | NC                 | 36300 - 36300                    | 3.63E+04    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.65E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC                 | 91.9 - 91.9                      | 9.19E+01    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.42E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1   | 117.17                              | No  |
| 45                  | RD            | 040075      | 1E-04                 | 8E+00        | 5E+00             | Metal                      | Arsenic                    | C                  | 4.7 - 4.7                        | 4.70E+00    | 1/1                 | 1.23E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC                 | 4390 - 4390                      | 4.39E+03    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 5.21E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2   | 1431                                | Yes |
| 45                  | RD            | 040082      | 2E-04                 | 3E+00        | <1                | Metal                      | Arsenic                    | C                  | 8 - 8                            | 8.00E+00    | 1/1                 | 2.09E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
| 45                  | RD            | 041082      | 2E-04                 | 6E+00        | <1                | Metal                      | Arsenic                    | C                  | 6.2 - 6.2                        | 6.20E+00    | 1/1                 | 1.62E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                     |               |             |                       |              |                   |                            | Iron                       | NC                 | 31500 - 31500                    | 3.15E+04    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.43E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC                 | 67.5 - 67.5                      | 6.75E+01    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.04E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1   | 117.17                              | No  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene         | C                  | 0.59 - 0.59                      | 5.90E-01    | 1/1                 | 1.60E-06                      | 69.5                                                              | 28.5           | 0.0                                  | 2.0                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C                  | 0.94 - 0.94                      | 9.40E-01    | 1/1                 | 2.52E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene       | C                  | 1.2 - 1.2                        | 1.20E+00    | 1/1                 | 3.55E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene       | C                  | 0.47 - 0.47                      | 4.70E-01    | 1/1                 | 1.39E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene     | C                  | 0.6 - 0.6                        | 6.00E-01    | 1/1                 | 1.73E-06                      | 65.3                                                              | 26.8           | 0.0                                  | 8.0                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Dieldrin                   | C                  | 0.005 - 0.005                    | 5.00E-03    | 1/1                 | 7.58E-06                      | 1.7                                                               | 0.5            | 0.0                                  | 97.8                         | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
| 45                  | RD            | 042073      | 2E-04                 | 1E+01        | 3E+00             | Metal                      | Arsenic                    | C                  | 3.8 - 6.2                        | 6.20E+00    | 2/2                 | 1.62E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                     |               |             |                       |              |                   |                            | Iron                       | NC                 | 23400 - 46500                    | 4.65E+04    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 2.12E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC                 | 843 - 2530                       | 2.53E+03    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 3.00E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2   | 1431                                | Yes |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC                 | 106 - 769                        | 7.69E+02    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 2.55E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
|                     |               |             |                       |              |                   |                            | Thallium                   | NC                 | 7.1 - 7.1                        | 7.10E+00    | 1/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.41E+00                                                 | 97.3           | 0.0                                  | 0.0                          | 2.7    | 0.81                                | Yes |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC                 | 68.6 - 87.2                      | 8.72E+01    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.34E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1   | 117.17                              | No  |
| 45                  | RD            | 042081      | 4E-04                 | 1E+01        | 5E+00             | Metal                      | Arsenic                    | C/NC               | 16.3 - 16.3                      | 1.63E+01    | 1/2                 | 4.26E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.04E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         | 11.1   | Yes                                 |     |
|                     |               |             |                       |              |                   |                            | Iron                       | NC                 | 29500 - 37500                    | 3.75E+04    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.71E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC                 | 883 - 1390                       | 1.39E+03    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.65E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2   | 1431                                | No  |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC                 | 28.9 - 1370                      | 1.37E+03    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 4.53E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
| 45                  | RD            | 042082      | 2E-04                 | 2E+01        | 5E+00             | Metal                      | Antimony                   | NC                 | 11.9 - 11.9                      | 1.19E+01    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.16E+00                                                 | 32.7           | 0.0                                  | 0.0                          | 67.3   | 9.05                                | Yes |
|                     |               |             |                       |              |                   |                            | Arsenic                    | C                  | 7.5 - 7.5                        | 7.50E+00    | 1/1                 | 1.96E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                     |               |             |                       |              |                   |                            | Copper                     | NC                 | 771 - 771                        | 7.71E+02    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 4.84E+00                                                 | 5.5            | 0.0                                  | 0.0                          | 94.5   | 124.31                              | Yes |
|                     |               |             |                       |              |                   |                            | Iron                       | NC                 | 46000 - 46000                    | 4.60E+04    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 2.09E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                     |               |             |                       |              |                   |                            | Lead                       | --                 | 321 - 321                        | 3.21E+02    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | --     | 8.99                                | Yes |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC                 | 1130 - 1130                      | 1.13E+03    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.34E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2   | 1431                                | No  |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC                 | 85.9 - 85.9                      | 8.59E+01    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.32E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1   | 117.17                              | No  |
|                     |               |             |                       |              |                   |                            | Zinc                       | NC                 | 794 - 794                        | 7.94E+02    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 2.13E+00                                                 | 1.6            | 0.0                                  | 0.0                          | 98.4   | 109.86                              | Yes |
|                     |               |             |                       |              |                   |                            | PAH                        | Benzo(a)anthracene | C                                | 1.3 - 1.3   | 1.30E+00            | 1/1                           | 3.51E-06                                                          | 69.5           | 28.5                                 | 0.0                          | 2.0                  | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
|                     |               |             |                       |              |                   | Benzo(a)pyrene             |                            | C                  | 0.79 - 0.79                      | 7.90E-01    | 1/1                 | 2.12E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                     |               |             |                       |              |                   | Benzo(b)fluoranthene       |                            | C                  | 2.5 - 2.5                        | 2.50E+00    | 1/1                 | 7.39E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                     |               |             |                       |              |                   | Benzo(k)fluoranthene       |                            | C                  | 0.75 - 0.75                      | 7.50E-01    | 1/1                 | 2.22E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                     |               |             |                       |              |                   | Dibenz(a,h)anthracene      |                            | C                  | 0.14 - 0.14                      | 1.40E-01    | 1/1                 | 2.42E-06                      | 66.2                                                              | 27.2           | 0.0                                  | 6.7                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                     |               |             |                       |              |                   | Indeno(1,2,3-cd)pyrene     | C                          | 0.45 - 0.45        | 4.50E-01                         | 1/1         | 1.30E-06            | 65.3                          | 26.8                                                              | 0.0            | 8.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C                  | 0.82 - 0.82                      | 8.20E-01    | 1/1                 | 3.89E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
| 45                  | RD            | 043081      | 5E-04                 | 1E+01        | 7E+00             | Metal                      | Arsenic                    | C/NC               | 17.9 - 17.9                      | 1.79E+01    | 1/2                 | 4.68E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.14E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         | 11.1   | Yes                                 |     |
|                     |               |             |                       |              |                   |                            | Iron                       | NC                 | 44600 - 49900                    | 4.99E+04    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 2.27E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC                 | 886 - 1090                       | 1.09E+03    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.29E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2   | 1431                                | No  |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC                 | 33.9 - 2050                      | 2.05E+03    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 6.79E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC                 | 52.7 - 67                        | 6.70E+01    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.03E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1   | 117.17                              | No  |
| 45                  | RD            | 043082      | 2E-07                 | 1E+01        | 5E+00             | Metal                      | Iron                       | NC                 | 37800 - 37800                    | 3.78E+04    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.72E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC                 | 1590 - 1590                      | 1.59E+03    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 5.26E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
| 45                  | RD            | 044073      | 2E-04                 | 7E+00        | 2E+00             | Metal                      | Arsenic                    | C                  | 7.4 - 7.4                        | 7.40E+00    | 1/1                 | 1.93E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                     |               |             |                       |              |                   |                            | Iron                       | NC                 | 33800 - 33800                    | 3.38E+04    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.54E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC                 | 359 - 359                        | 3.59E+02    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.19E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
|                     |               |             |                       |              |                   |                            | Thallium                   | NC                 | 5.6 - 5.6                        | 5.60E+00    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.11E+00                                                 | 97.3           | 0.0                                  | 0.0                          | 2.7    | 0.81                                | Yes |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC                 | 79.2 - 79.2                      | 7.92E+01    | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | 1.22E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1   | 117.17                              | No  |



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TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                | Basis for COC | Range of Detected Concentrations | RME EPC       | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals   |                                     |     |     |      |        |      |    |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------|---------------|----------------------------------|---------------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------|-------------------------------------|-----|-----|------|--------|------|----|
|                     |               |             |                       |              |                   |                            |                |               |                                  |               |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL     | Maximum Concentration Exceeds HPAL? |     |     |      |        |      |    |
| 45                  | RD            | 046082      | 3E-04                 | 5E+01        | 3E+01             | Metal                      | Antimony       | NC            | 22.3 - 22.3                      | 2.23E+01      | 1/1                 | --                            | --                                                                | --             | --                                   | 2.18E+00                     | 32.7                 | 0.0                                                      | 0.0            | 67.3                                 | 9.05                         | Yes      |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Arsenic        | C             | 9.8 - 9.8                        | 9.80E+00      | 1/1                 | 2.56E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1     | No                                  |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Copper         | NC            | 5230 - 5230                      | 5.23E+03      | 1/1                 | --                            | --                                                                | --             | --                                   | 3.29E+01                     | 5.5                  | 0.0                                                      | 0.0            | 94.5                                 | 124.31                       | Yes      |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 49900 - 49900                    | 4.99E+04      | 1/1                 | --                            | --                                                                | --             | --                                   | 2.27E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Lead           | --            | 4850 - 4850                      | 4.85E+03      | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | 8.99                         | Yes      |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 986 - 986                        | 9.86E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.17E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Mercury        | NC            | 3.7 - 3.7                        | 3.70E+00      | 1/1                 | --                            | --                                                                | --             | --                                   | 2.33E+00                     | 6.8                  | 0.0                                                      | 0.0            | 93.2                                 | 2.28                         | Yes      |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Zinc           | NC            | 2220 - 2220                      | 2.22E+03      | 1/1                 | --                            | --                                                                | --             | --                                   | 5.95E+00                     | 1.6                  | 0.0                                                      | 0.0            | 98.4                                 | 109.86                       | Yes      |                                     |     |     |      |        |      |    |
| 45                  | RD            | 047076      | 9E-05                 | 6E+00        | 2E+00             | Pest/PCB                   | Aroclor-1260   | C/NC          | 1.4 - 1.4                        | 1.40E+00      | 1/1                 | 6.63E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | 1.29E+00             | 69.6                                                     | 27.3           | 0.0                                  | 3.1                          | --       | --                                  |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Metal          | Arsenic       | C                                | 3.4 - 3.4     | 3.40E+00            | 1/2                           | 8.88E-05                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           | --       | 11.1                                | No  |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            |                | Iron          | NC                               | 13900 - 36000 | 3.60E+04            | 2/2                           | --                                                                | --             | --                                   | --                           | 1.64E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000    | No                                  |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            |                | Manganese     | NC                               | 213 - 894     | 8.94E+02            | 2/2                           | --                                                                | --             | --                                   | --                           | 1.06E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431     | No                                  |     |     |      |        |      |    |
| 45                  | RD            | 047077      | 2E-04                 | 6E+00        | 2E+00             | Metal                      |                | Vanadium      | NC                               | 36.5 - 67.8   | 6.78E+01            | 2/2                           | --                                                                | --             | --                                   | --                           | 1.05E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17   | No                                  |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Arsenic        | C             | 7.7 - 8.6                        | 8.60E+00      | 2/2                 | 2.25E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1     | No                                  |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 39500 - 42700                    | 4.27E+04      | 2/2                 | --                            | --                                                                | --             | --                                   | 1.94E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 1060 - 1270                      | 1.27E+03      | 2/2                 | --                            | --                                                                | --             | --                                   | 1.51E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No       |                                     |     |     |      |        |      |    |
| 45                  | RD            | 047086      | 8E-05                 | 5E+00        | <1                | Metal                      | Vanadium       | NC            | 55 - 65.8                        | 6.58E+01      | 2/2                 | --                            | --                                                                | --             | --                                   | 1.01E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Arsenic        | C             | 3.1 - 3.1                        | 3.10E+00      | 1/1                 | 8.10E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1     | No                                  |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 25600 - 25600                    | 2.56E+04      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.17E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 1040 - 1040                      | 1.04E+03      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.23E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No       |                                     |     |     |      |        |      |    |
| 45                  | RD            | 047089      | 1E-04                 | 9E+00        | 2E+00             | Metal                      | Nickel         | NC            | 347 - 347                        | 3.47E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.15E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Arsenic        | C             | 5.4 - 5.4                        | 5.40E+00      | 1/1                 | 1.41E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1     | No                                  |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Copper         | NC            | 188 - 188                        | 1.88E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.18E+00                     | 5.5                  | 0.0                                                      | 0.0            | 94.5                                 | 124.31                       | Yes      |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 41100 - 41100                    | 4.11E+04      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.87E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No       |                                     |     |     |      |        |      |    |
| 45                  | RD            | 047092      | 2E-07                 | 7E+00        | 4E+00             | Metal                      | Lead           | --            | 1080 - 1080                      | 1.08E+03      | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | 8.99     | Yes                                 |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 991 - 991                        | 9.91E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.18E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Zinc           | NC            | 401 - 401                        | 4.01E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.07E+00                     | 1.6                  | 0.0                                                      | 0.0            | 98.4                                 | 109.86                       | Yes      |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Aroclor-1260   | C             | 0.75 - 0.75                      | 7.50E-01      | 1/1                 | 3.55E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --             | --                                   | --                           | --       | --                                  |     |     |      |        |      |    |
|                     |               |             |                       |              |                   | 45                         | RD             | 048072        | 7E-05                            | 1E+01         | 8E+00               | Metal                         | Iron                                                              | NC             | 36400 - 36400                        | 3.64E+04                     | 1/1                  | --                                                       | --             | --                                   | --                           | 1.66E+00 | 93.6                                | 0.0 | 0.0 | 6.4  | 58000  | No   |    |
|                     |               |             |                       |              |                   |                            |                |               |                                  |               |                     |                               | Nickel                                                            | NC             | 1110 - 1110                          | 1.11E+03                     | 1/1                  | --                                                       | --             | --                                   | --                           | 3.67E+00 | 19.3                                | 0.0 | 1.0 | 79.6 | *      | No   |    |
|                     |               |             |                       |              |                   |                            |                |               |                                  |               |                     |                               | Arsenic                                                           | C              | 2 - 2                                | 2.00E+00                     | 1/2                  | 5.22E-05                                                 | 56.6           | 5.4                                  | 0.0                          | 38.0     | <1                                  | --  | --  | --   | --     | 11.1 | No |
|                     |               |             |                       |              |                   |                            |                |               |                                  |               |                     |                               | Iron                                                              | NC             | 12200 - 61100                        | 6.11E+04                     | 2/2                  | --                                                       | --             | --                                   | --                           | 2.78E+00 | 93.6                                | 0.0 | 0.0 | 6.4  | 58000  | Yes  |    |
| 45                  | RD            | 048080      | 2E-04                 | 8E+01        | 7E+01             | Metal                      | Manganese      | NC            | 219 - 1030                       | 1.03E+03      | 2/2                 | --                            | --                                                                | --             | --                                   | 1.22E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 34.5 - 2400                      | 2.40E+03      | 2/2                 | --                            | --                                                                | --             | --                                   | 7.94E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene | C             | 0.46 - 0.46                      | 4.60E-01      | 1/2                 | 1.23E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Antimony       | NC            | 29 - 29                          | 2.90E+01      | 1/1                 | --                            | --                                                                | --             | --                                   | 2.84E+00                     | 32.7                 | 0.0                                                      | 0.0            | 67.3                                 | 9.05                         | Yes      |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   | 45                         | RD             | 049079        | 2E-04                            | 1E+01         | 4E+00               | Metal                         | Arsenic                                                           | C              | 7.8 - 7.8                            | 7.80E+00                     | 1/1                  | 2.04E-04                                                 | 56.6           | 5.4                                  | 0.0                          | 38.0     | <1                                  | --  | --  | --   | --     | 11.1 | No |
|                     |               |             |                       |              |                   |                            |                |               |                                  |               |                     |                               | Copper                                                            | NC             | 10400 - 10400                        | 1.04E+04                     | 1/1                  | --                                                       | --             | --                                   | --                           | 6.53E+01 | 5.5                                 | 0.0 | 0.0 | 94.5 | 124.31 | Yes  |    |
|                     |               |             |                       |              |                   |                            |                |               |                                  |               |                     |                               | Iron                                                              | NC             | 32400 - 32400                        | 3.24E+04                     | 1/1                  | --                                                       | --             | --                                   | --                           | 1.48E+00 | 93.6                                | 0.0 | 0.0 | 6.4  | 58000  | No   |    |
|                     |               |             |                       |              |                   |                            |                |               |                                  |               |                     |                               | Lead                                                              | --             | 1900 - 1900                          | 1.90E+03                     | 1/1                  | --                                                       | --             | --                                   | --                           | --       | --                                  | --  | --  | --   | 8.99   | Yes  |    |
| 45                  | RD            | 049085      | 2E-07                 | 9E+00        | 5E+00             | Metal                      | Nickel         | NC            | 323 - 323                        | 3.23E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.07E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Vanadium       | NC            | 74 - 74                          | 7.40E+01      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.14E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Zinc           | NC            | 784 - 784                        | 7.84E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 2.10E+00                     | 1.6                  | 0.0                                                      | 0.0            | 98.4                                 | 109.86                       | Yes      |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Aroclor-1260   | C/NC          | 1.4 - 1.4                        | 1.40E+00      | 1/1                 | 6.63E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | 1.29E+00             | 69.6                                                     | 27.3           | 0.0                                  | 3.1                          | --       | --                                  |     |     |      |        |      |    |
|                     |               |             |                       |              |                   | 45                         | RD             | 049088        | 3E-07                            | 9E+00         | 6E+00               | Metal                         | Iron                                                              | NC             | 44600 - 44600                        | 4.46E+04                     | 1/1                  | --                                                       | --             | --                                   | --                           | 2.03E+00 | 93.6                                | 0.0 | 0.0 | 6.4  | 58000  | No   |    |
|                     |               |             |                       |              |                   |                            |                |               |                                  |               |                     |                               | Manganese                                                         | NC             | 1080 - 1080                          | 1.08E+03                     | 1/1                  | --                                                       | --             | --                                   | --                           | 1.28E+00 | 44.9                                | 0.0 | 2.9 | 52.2 | 1431   | No   |    |
|                     |               |             |                       |              |                   |                            |                |               |                                  |               |                     |                               | Nickel                                                            | NC             | 1490 - 1490                          | 1.49E+03                     | 1/1                  | --                                                       | --             | --                                   | --                           | 4.93E+00 | 19.3                                | 0.0 | 1.0 | 79.6 | *      | No   |    |
|                     |               |             |                       |              |                   |                            |                |               |                                  |               |                     |                               | Iron                                                              | NC             | 37000 - 37000                        | 3.70E+04                     | 1/1                  | --                                                       | --             | --                                   | --                           | 1.68E+00 | 93.6                                | 0.0 | 0.0 | 6.4  | 58000  | No   |    |
| 45                  | RD            | 049091      | 1E-04                 | 8E+00        | 3E+00             | Metal                      | Nickel         | NC            | 1740 - 1740                      | 1.74E+03      | 1/1                 | --                            | --                                                                | --             | --                                   | 5.76E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Arsenic        | C             | 4.8 - 4.8                        | 4.80E+00      | 1/1                 | 1.25E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1     | No                                  |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 43200 - 43200                    | 4.32E+04      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.97E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No       |                                     |     |     |      |        |      |    |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 852 - 852                        | 8.52E+02      | 1/1                 | --                            | --                                                                | --             | --                                   | 2.82E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No       |                                     |     |     |      |        |      |    |
| 45                  | RD            |             |                       |              |                   | Metal                      | Vanadium       | NC            | 73.8 - 73.8                      | 7.38E+01      | 1/1                 | --                            | --                                                                | --             | --                                   | 1.14E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No       |                                     |     |     |      |        |      |    |

TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                            | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                     |               |             |                       |              |                   |                            |                            |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| 45                  | RD            | 050071      | 2E-07                 | 9E+00        | 4E+00             | Metal                      | Iron                       | NC            | 47000 - 47000                    | 4.70E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 2.14E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 1270 - 1270                      | 1.27E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.51E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 1270 - 1270                      | 1.27E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 4.20E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 66.3 - 66.3                      | 6.63E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.02E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 050077      | 3E-04                 | 7E+00        | 2E+00             | Metal                      | Arsenic                    | C             | 9.7 - 9.7                        | 9.70E+00 | 1/1                 | 2.53E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 344 - 344                        | 3.44E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.14E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 121 - 121                        | 1.21E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.87E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | Yes    |                                     |
| 45                  | RD            | 050083      | 3E-08                 | 7E+00        | 3E+00             | Pest/PCB                   | Aroclor-1260               | C/NC          | 1.1 - 1.1                        | 1.10E+00 | 1/1                 | 5.21E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | 1.01E+00             | 69.6                                                     | 27.3           | 0.0                                  | 3.1                          | --     | --                                  |
|                     |               |             |                       |              |                   | Metal                      | Iron                       | NC            | 38300 - 38300                    | 3.83E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.74E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Mercury                    | NC            | 2.3 - 2.3                        | 2.30E+00 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.45E+00                     | 6.8                  | 0.0                                                      | 0.0            | 93.2                                 | 2.28                         | Yes    |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 114 - 114                        | 1.14E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.76E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 050086      | 1E-04                 | 6E+00        | 2E+00             | Metal                      | Arsenic                    | C             | 3.8 - 3.8                        | 3.80E+00 | 1/1                 | 9.93E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron                       | NC            | 32500 - 32500                    | 3.25E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.48E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 660 - 660                        | 6.60E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 2.18E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   | SVOC                       | Pentachlorophenol          | C             | 10 - 10                          | 1.00E+01 | 1/1                 | 3.85E-06                      | 48.8                                                              | 38.5           | 0.0                                  | 12.6                         | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
| 45                  | RD            | 050088      | 3E-07                 | 9E+00        | 6E+00             | Metal                      | Iron                       | NC            | 43400 - 43400                    | 4.34E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.98E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 1770 - 1770                      | 1.77E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 5.86E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 052071      | 4E-07                 | 1E+01        | 9E+00             | Metal                      | Iron                       | NC            | 45800 - 45800                    | 4.58E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 2.09E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 2690 - 2690                      | 2.69E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 8.90E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 052075      | 3E-05                 | 1E+01        | 6E+00             | Metal                      | Arsenic                    | C             | 1.1 - 1.1                        | 1.10E+00 | 1/1                 | 2.87E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron                       | NC            | 44600 - 44600                    | 4.46E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 2.03E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 920 - 920                        | 9.20E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.09E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 1880 - 1880                      | 1.88E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 6.22E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 052082      | 5E-07                 | 9E+00        | 4E+00             | Metal                      | Iron                       | NC            | 51800 - 51800                    | 5.18E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 2.36E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 1010 - 1010                      | 1.01E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.20E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 1060 - 1060                      | 1.06E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 3.51E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 99.9 - 99.9                      | 9.99E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.54E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 052085      | 1E-07                 | 6E+00        | 2E+00             | Metal                      | Iron                       | NC            | 29600 - 29600                    | 2.96E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.35E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 1590 - 1590                      | 1.59E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.89E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | Yes    |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 324 - 324                        | 3.24E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.07E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 75.2 - 75.2                      | 7.52E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.16E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 053080      | 2E-04                 | 5E+00        | 2E+00             | Metal                      | Arsenic                    | C             | 6.6 - 6.6                        | 6.60E+00 | 1/1                 | 1.72E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron                       | NC            | 39100 - 39100                    | 3.91E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.78E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 972 - 972                        | 9.72E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.15E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
| 45                  | RD            | 053081      | 2E-07                 | 1E+01        | 4E+00             | Metal                      | Cadmium                    | NC            | 11.3 - 11.3                      | 1.13E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | 3.27E+00                     | 8.8                  | 0.0                                                      | 0.0            | 91.1                                 | 3.14                         | Yes    |                                     |
|                     |               |             |                       |              |                   |                            | Iron                       | NC            | 37000 - 37000                    | 3.70E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.68E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 1040 - 1040                      | 1.04E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 3.44E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 053082      | 2E-07                 | 6E+00        | 2E+00             | Metal                      | Iron                       | NC            | 37100 - 37100                    | 3.71E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.69E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 420 - 420                        | 4.20E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.39E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 82.6 - 82.6                      | 8.26E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.27E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 053083      | 5E-05                 | 7E+00        | 2E+00             | Metal                      | Arsenic                    | C             | 1.9 - 1.9                        | 1.90E+00 | 1/1                 | 4.96E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron                       | NC            | 33400 - 33400                    | 3.34E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.52E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 869 - 869                        | 8.69E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.03E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 527 - 527                        | 5.27E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.74E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 72.8 - 72.8                      | 7.28E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.12E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 053085      | 6E-05                 | 7E+00        | <1                | Metal                      | Arsenic                    | C             | 2 - 2                            | 2.00E+00 | 2/2                 | 5.22E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron                       | NC            | 21600 - 28700                    | 2.87E+04 | 2/2                 | --                            | --                                                                | --             | --                                   | 1.31E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Lead                       | --            | 12.5 - 169                       | 1.69E+02 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   |                            | Nickel                     | NC            | 25.2 - 411                       | 4.11E+02 | 2/2                 | --                            | --                                                                | --             | --                                   | 1.36E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 054071      | 8E-08                 | 7E+00        | 2E+00             | SVOC                       | Bis(2-ethylhexyl)phthalate | C             | 3.6 - 3.6                        | 3.60E+00 | 1/2                 | 3.15E-06                      | 2.5                                                               | 0.8            | 0.0                                  | 96.7                         | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                     |               |             |                       |              |                   | Metal                      | Iron                       | NC            | 52500 - 52500                    | 5.25E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 2.39E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese                  | NC            | 1200 - 1200                      | 1.20E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.42E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 109 - 109                        | 1.09E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.68E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 054074      | 1E-04                 | 5E+00        | <1                | Metal                      | Arsenic                    | C             | 3.9 - 3.9                        | 3.90E+00 | 1/1                 | 1.02E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron                       | NC            | 26200 - 26200                    | 2.62E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.19E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Lead                       | --            | 597 - 597                        | 5.97E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C             | 0.32 - 0.32                      | 3.20E-01 | 1/1                 | 1.52E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
| 45                  | RD            | 054075      | 1E-04                 | 5E+00        | 2E+00             | Metal                      | Arsenic                    | C             | 4.2 - 4.2                        | 4.20E+00 | 1/1                 | 1.10E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron                       | NC            | 33400 - 33400                    | 3.34E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.52E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC            | 78.6 - 78.6                      | 7.86E+01 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.21E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |

TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                     |               |             |                       |              |                   |                            |                |               |                                  |          |                     |                               | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              |                      | Percent Contribution by Exposure Pathway to Total RME HI |                      |                                      |                                      | Metals                       |                                     |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------------|--------------------------------------|--------------------------------------|------------------------------|-------------------------------------|
|                     |               |             |                       |              |                   |                            |                |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Chemical-Specific HI                                     | Incidental Ingestion | Dermal Contact                       | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL                                |
| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | Chemical-Specific HI | Incidental Ingestion                                     | Dermal Contact       | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion         | HPAL                         | Maximum Concentration Exceeds HPAL? |
| 45                  | RD            | 054077      | 5E-05                 | 9E+00        | 4E+00             | Metal                      | Arsenic        | C             | 2 - 2                            | 2.00E+00 | 1/1                 | 5.22E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --                   | --                                   | --                                   | 11.1                         | No                                  |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 42000 - 42000                    | 4.20E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.91E+00             | 93.6                                                     | 0.0                  | 0.0                                  | 6.4                                  | 58000                        | No                                  |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 1080 - 1080                      | 1.08E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 3.58E+00             | 19.3                                                     | 0.0                  | 1.0                                  | 79.6                                 | *                            | No                                  |
|                     |               |             |                       |              |                   |                            | Thallium       | NC            | 6.8 - 6.8                        | 6.80E+00 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.35E+00             | 97.3                                                     | 0.0                  | 0.0                                  | 2.7                                  | 0.81                         | Yes                                 |
| 45                  | RD            | 054079      | 4E-05                 | 9E+00        | 4E+00             | Metal                      | Arsenic        | C             | 1.6 - 1.6                        | 1.60E+00 | 1/1                 | 4.18E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --                   | --                                   | --                                   | 11.1                         | No                                  |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 40000 - 40000                    | 4.00E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.82E+00             | 93.6                                                     | 0.0                  | 0.0                                  | 6.4                                  | 58000                        | No                                  |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 1060 - 1060                      | 1.06E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 3.51E+00             | 19.3                                                     | 0.0                  | 1.0                                  | 79.6                                 | *                            | No                                  |
| 45                  | RD            | 054081      | 4E-05                 | 8E+00        | 3E+00             | Metal                      | Arsenic        | C             | 1.6 - 1.6                        | 1.60E+00 | 1/1                 | 4.18E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --                   | --                                   | --                                   | 11.1                         | No                                  |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 36100 - 36100                    | 3.61E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.64E+00             | 93.6                                                     | 0.0                  | 0.0                                  | 6.4                                  | 58000                        | No                                  |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 1890 - 1890                      | 1.89E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.24E+00             | 44.9                                                     | 0.0                  | 2.9                                  | 52.2                                 | 1431                         | Yes                                 |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 820 - 820                        | 8.20E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.71E+00             | 19.3                                                     | 0.0                  | 1.0                                  | 79.6                                 | *                            | No                                  |
| 45                  | RD            | 055073      | 3E-07                 | 1E+01        | 6E+00             | Metal                      | Iron           | NC            | 47100 - 47100                    | 4.71E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 2.14E+00             | 93.6                                                     | 0.0                  | 0.0                                  | 6.4                                  | 58000                        | No                                  |
|                     |               |             |                       |              |                   |                            | Manganese      | NC            | 942 - 942                        | 9.42E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 1.12E+00             | 44.9                                                     | 0.0                  | 2.9                                  | 52.2                                 | 1431                         | No                                  |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 1730 - 1730                      | 1.73E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | --                           | 5.73E+00             | 19.3                                                     | 0.0                  | 1.0                                  | 79.6                                 | *                            | No                                  |
|                     |               |             |                       |              |                   |                            | Iron           | NC            | 40000 - 51000                    | 5.10E+04 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 2.32E+00             | 93.6                                                     | 0.0                  | 0.0                                  | 6.4                                  | 58000                        | No                                  |
| 45                  | RD            | 059078      | 3E-07                 | 9E+00        | 3E+00             | Metal                      | Manganese      | NC            | 743 - 1230                       | 1.23E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 1.46E+00             | 44.9                                                     | 0.0                  | 2.9                                  | 52.2                                 | 1431                         | No                                  |
|                     |               |             |                       |              |                   |                            | Nickel         | NC            | 583 - 973                        | 9.73E+02 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 3.22E+00             | 19.3                                                     | 0.0                  | 1.0                                  | 79.6                                 | *                            | No                                  |
|                     |               |             |                       |              |                   |                            | Vanadium       | NC            | 75.6 - 91.3                      | 9.13E+01 | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | 1.41E+00             | 82.9                                                     | 0.0                  | 0.0                                  | 17.1                                 | 117.17                       | No                                  |
| EMI-1               | MI            | AZ35        | 5E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 1.5 - 1.5                        | 1.50E+00 | 1/1                 | 3.46E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
| EMI-1               | MI            | BA34        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 2.8 - 9.9                        | 9.90E+00 | 3/4                 | 2.28E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene | C             | 0.052 - 0.46                     | 4.60E-01 | 3/10                | 2.62E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --                   | --                                   |                                      | --                           | --                                  |
| EMI-1               | MI            | BA35        | 3E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 0.84 - 1.4                       | 1.40E+00 | 2/2                 | 3.23E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
| EMI-1               | MI            | BB32        | 2E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.8 - 3.8                        | 3.80E+00 | 1/5                 | 8.76E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene | C             | 0.043 - 0.6                      | 6.00E-01 | 2/6                 | 3.42E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --                   | --                                   |                                      | --                           | --                                  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260   | C             | 0.019 - 1.5                      | 1.50E+00 | 3/6                 | 1.49E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | --                           | --                                  |
| EMI-1               | MI            | BB33        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 2.7 - 11                         | 8.69E+00 | 5/6                 | 2.00E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene | C             | 0.13 - 0.38                      | 3.80E-01 | 2/11                | 2.16E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --                   | --                                   |                                      | --                           | --                                  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254   | C             | 6.9 - 6.9                        | 6.90E+00 | 1/11                | 6.87E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | --                           | --                                  |
| EMI-1               | MI            | BB34        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.4 - 14.5                       | 8.89E+00 | 6/14                | 2.05E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | Yes                                 |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene | C             | 0.014 - 0.31                     | 3.10E-01 | 8/16                | 1.77E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --                   | --                                   |                                      | --                           | --                                  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260   | C             | 0.02 - 1.6                       | 1.60E+00 | 3/9                 | 1.59E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | --                           | --                                  |
| EMI-1               | MI            | BB35        | 7E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 3 - 3                            | 3.00E+00 | 1/1                 | 6.92E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
| EMI-1               | MI            | BC32        | 7E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.2 - 3.2                        | 3.20E+00 | 1/1                 | 7.38E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
| EMI-1               | MI            | BC33        | 1E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 0.59 - 4.3                       | 4.30E+00 | 3/4                 | 9.92E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene | C             | 0.068 - 0.29                     | 2.90E-01 | 2/14                | 1.65E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --                   | --                                   |                                      | --                           | --                                  |
| EMI-1               | MI            | BC34        | 4E-06                 | <1           | <1                | Metal                      | Arsenic        | C             | 1.4 - 1.4                        | 1.40E+00 | 1/2                 | 3.23E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
| EMI-1               | MI            | BD32        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.5 - 12                         | 1.20E+01 | 3/5                 | 2.77E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | Yes                                 |
| EMI-1               | MI            | BD33        | 6E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.5 - 62                         | 2.54E+01 | 12/12               | 5.87E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | Yes                                 |
|                     |               |             |                       |              |                   |                            | Lead           | --            | 5.5 - 1420                       | 1.42E+03 | 11/13               | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --                   | --                                   |                                      | 8.99                         | Yes                                 |
| EMI-1               | MI            | BD34        | 2E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 0.84 - 14.5                      | 8.32E+00 | 7/9                 | 1.92E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | Yes                                 |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254   | C             | 0.46 - 3.3                       | 3.30E+00 | 2/6                 | 3.28E-06                      | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | --                           | --                                  |
| EMI-1               | MI            | BE30        | 1E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.6 - 5.1                        | 4.72E+00 | 4/6                 | 1.09E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
| EMI-1               | MI            | BE31        | 3E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 7.9 - 12                         | 1.20E+01 | 2/2                 | 2.77E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | Yes                                 |
| EMI-1               | MI            | BE32        | 2E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.2 - 8.8                        | 7.10E+00 | 5/6                 | 1.64E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene | C             | 0.096 - 0.85                     | 8.50E-01 | 2/6                 | 4.84E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --                   | --                                   |                                      | --                           | --                                  |
| EMI-1               | MI            | BE33        | 2E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 1.6 - 11                         | 6.16E+00 | 21/21               | 1.42E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
| EMI-1               | MI            | BE34        | 5E-05                 | 3E+00        | 3E+00             | Metal                      | Arsenic        | C             | 2.5 - 11.8                       | 6.93E+00 | 7/11                | 1.60E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | Yes                                 |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254   | C/NC          | 30 - 38                          | 3.80E+01 | 2/11                | 3.78E-05                      | 35.1                                                              | 64.9           | 0.0                                  |                              | 2.65E+00             | 35.1                                                     | 64.9                 | 0.0                                  |                                      | --                           | --                                  |
| EMI-1               | MI            | BF31        | 1E-04                 | <1           | <1                | Metal                      | Arsenic        | C             | 4.4 - 45                         | 4.50E+01 | 3/3                 | 1.04E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | Yes                                 |
|                     |               |             |                       |              |                   |                            | Lead           | --            | 35.6 - 4300                      | 4.30E+03 | 3/3                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --                   | --                                   |                                      | 8.99                         | Yes                                 |
| EMI-1               | MI            | BF32        | 2E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 5.5 - 9.7                        | 9.70E+00 | 2/2                 | 2.24E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
| EMI-1               | MI            | BF33        | 1E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 5.3 - 6.2                        | 6.20E+00 | 2/2                 | 1.43E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
| EMI-1               | MI            | BF34        | 2E-05                 | <1           | <1                | Metal                      | Arsenic        | C             | 3.9 - 7.5                        | 7.50E+00 | 3/3                 | 1.73E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --                   | --                                   |                                      | 11.1                         | No                                  |
| EMI-1               | MI            | BG32        | 6E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene | C             | 0                                |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                      |                                      |                                      |                              |                                     |

TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                        | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |     |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|------------------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-----|
|                     |               |             |                       |              |                   |                            |                        |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |        |     |
|                     |               |             |                       |              |                   |                            |                        |               |                                  |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |     |
| EMI-1               | MI            | BH33        | 6E-06                 | <1           | <1                | Metal                      | Arsenic                | C             | 1.6 - 2.3                        | 2.30E+00 | 2/4                 | 5.30E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No  |
| EMI-1               | MI            | BH34        | 4E-06                 | <1           | <1                | Metal                      | Arsenic                | C             | 1.7 - 1.7                        | 1.70E+00 | 1/1                 | 3.92E-06                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No  |
| EMI-1               | MI            | BI32        | 2E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 9.4 - 9.4                        | 9.40E+00 | 1/1                 | 2.17E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No  |
| EMI-1               | MI            | BI34        | 2E-04                 | <1           | <1                | Metal                      | Arsenic                | C             | 3.6 - 99.5                       | 9.95E+01 | 2/5                 | 2.29E-04                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes |
|                     |               |             |                       |              |                   | Lead                       | --                     | 8.7 - 1340    | 1.34E+03                         | 3/5      | --                  | --                            | --                                                                | --             |                                      | --                           | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |     |
| EMI-1               | MI            | BJ33        | 3E-05                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.21 - 0.21                      | 2.10E-01 | 1/4                 | 1.20E-06                      | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |     |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                | C             | 12.1 - 12.1                      | 1.21E+01 | 1/1                 | 2.79E-05                      | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes |
| EOS-1               | OS            | AL35        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 6.9 - 12                         | 1.20E+01 | 2/2                 | 3.23E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.17 - 0.17                      | 1.70E-01 | 1/2                 | 1.30E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
| EOS-1               | OS            | AL36        | 1E-04                 | 3E+00        | <1                | Metal                      | Arsenic                | C             | 2.9 - 31                         | 3.10E+01 | 2/5                 | 8.34E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes |
|                     |               |             |                       |              |                   | Lead                       | --                     | 28 - 470      | 4.13E+02                         | 5/5      | --                  | --                            | --                                                                | --             |                                      | --                           | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 2.7 - 2.7                        | 2.70E+00 | 1/5                 | 2.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.25 - 2.5                       | 2.50E+00 | 2/5                 | 1.91E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.085 - 3.5                      | 3.50E+00 | 2/5                 | 2.68E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C             | 1.7 - 1.7                        | 1.70E+00 | 1/5                 | 1.30E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C             | 0.17 - 1.4                       | 1.40E+00 | 2/5                 | 1.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.13 - 5.5                       | 5.50E+00 | 4/5                 | 7.40E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 1.39E+00             | 29.0                                                     | 71.0           | 0.0                                  |                              | --     | --  |
| EOS-1               | OS            | AL37        | 2E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 8.6 - 8.6                        | 8.60E+00 | 1/1                 | 2.31E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No  |
| EOS-1               | OS            | AM36        | 1E-04                 | 1E+01        | 1E+01             | Metal                      | Arsenic                | C             | 8.4 - 18                         | 1.80E+01 | 3/6                 | 4.85E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes |
|                     |               |             |                       |              |                   | Lead                       | --                     | 38 - 700      | 5.72E+02                         | 5/6      | --                  | --                            | --                                                                | --             |                                      | --                           | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.045 - 0.15                     | 1.50E-01 | 2/6                 | 1.15E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.15 - 40                        | 4.00E+01 | 3/6                 | 5.39E-05                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 1.01E+01             | 29.0                                                     | 71.0           | 0.0                                  |                              | --     | --  |
| EOS-1               | OS            | AM37        | 1E-04                 | 5E+00        | 3E+00             | Metal                      | Arsenic                | C             | 6.2 - 12                         | 1.20E+01 | 3/4                 | 3.23E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes |
|                     |               |             |                       |              |                   | Lead                       | --                     | 270 - 871     | 8.65E+02                         | 4/4      | --                  | --                            | --                                                                | --             |                                      | --                           | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 0.52 - 20                        | 2.00E+01 | 3/4                 | 1.53E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.1 - 3.5                        | 3.50E+00 | 3/4                 | 2.68E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.15 - 6.5                       | 6.50E+00 | 3/4                 | 4.98E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Chrysene               | C             | 0.58 - 20                        | 2.00E+01 | 3/4                 | 1.53E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C             | 0.61 - 0.61                      | 6.10E-01 | 1/4                 | 2.84E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C             | 0.38 - 2.3                       | 2.30E+00 | 2/4                 | 1.76E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.074 - 12                       | 1.20E+01 | 4/4                 | 1.62E-05                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 3.02E+00             | 29.0                                                     | 71.0           | 0.0                                  |                              | --     | --  |
| EOS-1               | OS            | AM38        | 6E-05                 | 2E+00        | <1                | Metal                      | Arsenic                | C             | 5.2 - 19.2                       | 1.92E+01 | 2/3                 | 5.17E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes |
|                     |               |             |                       |              |                   | Lead                       | --                     | 19.2 - 1180   | 1.18E+03                         | 3/3      | --                  | --                            | --                                                                | --             |                                      | --                           | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.33 - 0.33                      | 3.30E-01 | 1/3                 | 2.53E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C             | 0.5 - 1.3                        | 1.30E+00 | 2/3                 | 1.75E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --  |
| EOS-1               | OS            | AN37        | 4E-05                 | 2E+00        | 2E+00             | Metal                      | Arsenic                | C             | 4.4 - 6.8                        | 6.80E+00 | 3/3                 | 1.83E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No  |
|                     |               |             |                       |              |                   | Lead                       | --                     | 509 - 4810    | 4.81E+03                         | 3/3      | --                  | --                            | --                                                                | --             |                                      | --                           | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.17 - 0.86                      | 8.60E-01 | 3/4                 | 6.58E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.41 - 1.5                       | 1.50E+00 | 3/4                 | 1.15E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.7 - 6.4                        | 5.61E+00 | 4/4                 | 7.56E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 1.41E+00             | 29.0                                                     | 71.0           | 0.0                                  |                              | --     | --  |
| EOS-1               | OS            | AN38        | 1E-04                 | 4E+00        | 3E+00             | Metal                      | Arsenic                | C             | 2 - 29.5                         | 2.08E+01 | 11/11               | 5.61E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes |
|                     |               |             |                       |              |                   | Lead                       | --                     | 740 - 4130    | 2.71E+03                         | 11/11    | --                  | --                            | --                                                                | --             |                                      | --                           | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 0.079 - 11                       | 6.74E+00 | 7/11                | 5.16E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.064 - 6.5                      | 4.15E+00 | 8/11                | 3.18E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.13 - 21                        | 8.36E+00 | 9/11                | 6.40E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C             | 0.045 - 20                       | 1.47E+01 | 8/11                | 1.12E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Chrysene               | C             | 0.081 - 19                       | 1.33E+01 | 8/11                | 1.02E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C             | 0.049 - 1.7                      | 1.70E+00 | 6/11                | 7.92E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C             | 0.045 - 3.3                      | 3.13E+00 | 8/11                | 2.40E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.44 - 4.8                       | 4.07E+00 | 5/5                 | 5.47E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 1.02E+00             | 29.0                                                     | 71.0           | 0.0                                  |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | PCB-105                | C             | 0.015 - 0.12                     | 1.20E-01 | 2/6                 | 1.21E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | PCB-118                | C             | 0.012 - 0.22                     | 2.20E-01 | 5/6                 | 2.22E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | PCB-187                | C             | 0.024 - 1                        | 1.00E+00 | 6/6                 | 1.35E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   |                            | PCB-206                | C             | 0.004 - 1.2                      | 1.20E+00 | 5/6                 | 1.62E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --  |
| EOS-1               | OS            | AN39        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 8.6 - 9.3                        | 9.30E+00 | 2/2                 | 2.50E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No  |
|                     |               |             |                       |              |                   | Lead                       | --                     | 275 - 875     | 8.75E+02                         | 2/2      | --                  | --                            | --                                                                | --             |                                      | --                           | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |     |
| EOS-1               | OS            | AO37        | 1E-05                 | <1           | <1                | Pest/PCB                   | Aroclor-1260           | C             | 1.5 - 1.8                        | 1.80E+00 | 2/2                 | 2.42E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --  |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                | C             | 5.2 - 5.2                        | 5.20E+00 | 1/1                 | 1.40E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No  |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 618 - 618                        | 6.18E+02 | 1/1                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |     |

TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                        | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|------------------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                     |               |             |                       |              |                   |                            |                        |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |        |                                     |
|                     |               |             |                       |              |                   |                            |                        |               |                                  |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              | HPAL   | Maximum Concentration Exceeds HPAL? |
| EOS-1               | OS            | AO39        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 9.3 - 9.3                        | 9.30E+00 | 1/2                 | 2.50E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 12.6 - 232                       | 2.32E+02 | 2/2                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C             | 0.055 - 1.3                      | 1.30E+00 | 2/2                 | 1.75E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EOS-1               | OS            | AP38        | 2E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 6 - 6                            | 6.00E+00 | 1/1                 | 1.62E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EOS-1               | OS            | AQ40        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 7 - 7.2                          | 7.20E+00 | 2/2                 | 1.94E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 92 - 200                         | 2.00E+02 | 2/2                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.33 - 0.33                      | 3.30E-01 | 1/1                 | 2.53E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C             | 0.22 - 0.22                      | 2.20E-01 | 1/1                 | 1.02E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C             | 0.25 - 1.7                       | 1.70E+00 | 2/2                 | 2.29E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EOS-1               | OS            | AR39        | 1E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 2.8 - 2.8                        | 2.80E+00 | 1/8                 | 7.54E-06                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 17 - 260                         | 2.60E+02 | 5/8                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.035 - 0.21                     | 2.10E-01 | 3/12                | 1.61E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-1               | OS            | AR40        | 2E-04                 | 1E+01        | 1E+01             | Metal                      | Arsenic                | C             | 2 - 85.3                         | 3.20E+01 | 10/11               | 8.61E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 7 - 968                          | 9.68E+02 | 10/11               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.1 - 3.1                        | 3.10E+00 | 3/10                | 2.37E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.042 - 7.7                      | 4.86E+00 | 5/10                | 3.72E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C             | 0.034 - 2                        | 2.00E+00 | 3/10                | 1.53E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C             | 0.069 - 0.57                     | 5.70E-01 | 2/10                | 2.65E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C             | 0.048 - 2.5                      | 2.50E+00 | 3/10                | 1.91E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.038 - 45                       | 4.50E+01 | 8/11                | 6.06E-05                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 1.13E+01             | 29.0                                                     | 71.0           | 0.0                                  | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                | C             | 11 - 56.1                        | 5.18E+01 | 4/4                 | 1.39E-04                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EOS-1               | OS            | AS38        | 2E-04                 | <1           | <1                |                            | Lead                   | --            | 1440 - 1440                      | 1.44E+03 | 1/4                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 0.1 - 1.4                        | 1.40E+00 | 3/4                 | 1.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.13 - 2                         | 2.00E+00 | 4/4                 | 1.53E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.26 - 3.7                       | 3.70E+00 | 3/4                 | 2.83E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C             | 0.44 - 0.44                      | 4.40E-01 | 1/4                 | 2.05E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-1               | OS            | AT38        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 8.1 - 10                         | 9.94E+00 | 6/6                 | 2.68E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 26 - 230                         | 1.93E+02 | 5/6                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.084 - 0.52                     | 4.66E-01 | 4/6                 | 3.57E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-1               | OS            | AT39        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 12 - 12                          | 1.20E+01 | 1/1                 | 3.23E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EOS-1               | OS            | AU37        | 9E-03                 | 2E+03        | 2E+03             | Metal                      | Arsenic                | C             | 6.9 - 9.1                        | 9.10E+00 | 3/4                 | 2.45E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(b)fluoranthene   | C             | 0.2 - 1.4                        | 1.40E+00 | 2/4                 | 1.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.16 - 6600                      | 6.60E+03 | 3/4                 | 8.89E-03                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 1.66E+03             | 29.0                                                     | 71.0           | 0.0                                  | --                           | --     |                                     |
| EOS-1               | OS            | AV37        | 5E-03                 | 9E+02        | 9E+02             | Metal                      | Arsenic                | C             | 3.3 - 24                         | 1.38E+01 | 9/9                 | 3.72E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 23 - 487                         | 2.82E+02 | 8/9                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.038 - 0.52                     | 5.20E-01 | 5/9                 | 3.98E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.24 - 3700                      | 3.70E+03 | 7/9                 | 4.98E-03                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 9.33E+02             | 29.0                                                     | 71.0           | 0.0                                  | --                           | --     |                                     |
| EOS-1               | OS            | AW37        | 2E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 8 - 8                            | 8.00E+00 | 1/1                 | 2.15E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.18 - 0.18                      | 1.80E-01 | 1/1                 | 1.38E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            |                        |               |                                  |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |
| EOS-2               | OS            | AX36        | 2E-04                 | 2E+00        | <1                | Metal                      | Arsenic                | C             | 3 - 95.5                         | 8.17E+01 | 4/8                 | 2.20E-04                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 5.5 - 660                        | 6.60E+02 | 5/8                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.27 - 0.27                      | 2.70E-01 | 1/8                 | 2.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1254           | C             | 0.89 - 0.89                      | 8.90E-01 | 1/8                 | 1.20E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EOS-2               | OS            | AX37        | 3E-05                 | <1           | <1                |                            | Aroclor-1260           | C             | 0.016 - 0.81                     | 8.10E-01 | 2/8                 | 1.09E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                | C             | 4 - 4                            | 4.00E+00 | 1/1                 | 1.08E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 1.7 - 1.7                        | 1.70E+00 | 1/1                 | 1.30E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 2.1 - 2.1                        | 2.10E+00 | 1/1                 | 1.61E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 3 - 3                            | 3.00E+00 | 1/1                 | 2.30E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-2               | OS            | AY36        | 1E-04                 | <1           | <1                |                            | Benzo(k)fluoranthene   | C             | 1.4 - 1.4                        | 1.40E+00 | 1/1                 | 1.07E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                | C             | 2.2 - 50                         | 5.00E+01 | 6/6                 | 1.35E-04                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.67 - 0.67                      | 6.70E-01 | 1/4                 | 5.13E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C             | 0.027 - 1.7                      | 1.70E+00 | 4/6                 | 2.29E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                     |               |             |                       |              |                   | Metal                      | Arsenic                | C             | 3.1 - 19.7                       | 1.97E+01 | 3/3                 | 5.30E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EOS-2               | OS            | AY37        | 7E-05                 | 4E+00        | 3E+00             | PAH                        | Benzo(a)pyrene         | C             | 0.39 - 0.39                      | 3.90E-01 | 1/4                 | 2.99E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C/NC          | 0.19 - 12                        | 1.20E+01 | 2/4                 | 1.62E-05                      | 26.6                                                              | 73.4           | 0.0                                  |                              | 3.02E+00             | 29.0                                                     | 71.0           | 0.0                                  | --                           | --     |                                     |



TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                        | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|------------------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                     |               |             |                       |              |                   |                            |                        |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
|                     |               |             |                       |              |                   |                            |                        |               |                                  |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |
| EOS-2               | OS            | AZ36        | 3E-04                 | 3E+00        | <1                | Metal                      | Arsenic                | C             | 0.72 - 63                        | 6.30E+01 | 10/10               | 1.70E-04                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 1.5 - 453                        | 4.53E+02 | 10/10               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 0.087 - 14                       | 1.40E+01 | 4/5                 | 1.07E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.053 - 11                       | 1.10E+01 | 3/5                 | 8.42E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.19 - 30                        | 3.00E+01 | 4/5                 | 2.30E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C             | 0.11 - 6.9                       | 6.90E+00 | 3/5                 | 5.28E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Chrysene               | C             | 0.26 - 19                        | 1.90E+01 | 4/5                 | 1.45E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C             | 2.1 - 2.1                        | 2.10E+00 | 1/5                 | 9.78E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C             | 0.04 - 9.8                       | 9.80E+00 | 3/5                 | 7.50E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C             | 0.016 - 3.9                      | 3.90E+00 | 5/10                | 5.25E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EOS-2               | OS            | AZ37        | 7E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 16.1 - 18.2                      | 1.82E+01 | 2/2                 | 4.90E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 118 - 163                        | 1.63E+02 | 2/2                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 0.15 - 1.6                       | 1.60E+00 | 2/3                 | 1.22E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.21 - 1.5                       | 1.50E+00 | 2/3                 | 1.15E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.3 - 2                          | 2.00E+00 | 2/3                 | 1.53E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C             | 0.59 - 1.4                       | 1.40E+00 | 2/3                 | 1.88E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EOS-2               | OS            | BA36        | 1E-03                 | 5E+00        | 3E+00             | Metal                      | Arsenic                | C/NC          | 2.7 - 641                        | 4.30E+02 | 12/12               | 1.16E-03                      | 62.8                                                              | 37.2           | 0.0                                  |                              | 3.20E+00             | 65.5                                                     | 34.4           | 0.1                                  |                              | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 7.6 - 1080                       | 1.08E+03 | 12/12               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 0.84 - 4                         | 4.00E+00 | 2/7                 | 3.06E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.9 - 3.1                        | 3.10E+00 | 2/7                 | 2.37E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.098 - 2.9                      | 2.90E+00 | 4/7                 | 2.22E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C             | 0.83 - 3.1                       | 3.10E+00 | 2/7                 | 2.37E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C             | 0.014 - 1.5                      | 1.50E+00 | 6/12                | 2.02E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EOS-2               | OS            | BA37        | 4E-06                 | <1           | <1                | PAH                        | Benzo(a)pyrene         | C             | 0.36 - 0.36                      | 3.60E-01 | 1/1                 | 2.76E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-2               | OS            | BB36        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 3.8 - 11.2                       | 1.05E+01 | 5/5                 | 2.84E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.061 - 0.39                     | 3.90E-01 | 2/4                 | 2.99E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            |                        |               |                                  |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |
| EOS-3               | OS            | BC36        | 2E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 3.2 - 5.7                        | 5.70E+00 | 2/2                 | 1.53E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.073 - 0.46                     | 4.60E-01 | 2/2                 | 3.52E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-3               | OS            | BD35        | 2E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 6.8 - 6.8                        | 6.80E+00 | 1/1                 | 1.83E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EOS-3               | OS            | BE35        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 2.2 - 6.5                        | 4.35E+00 | 7/10                | 1.17E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 3.8 - 6130                       | 6.13E+03 | 10/10               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 0.39 - 1.7                       | 1.70E+00 | 2/7                 | 1.30E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.52 - 1.4                       | 1.40E+00 | 2/7                 | 1.07E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.79 - 4.4                       | 4.40E+00 | 2/7                 | 3.37E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C             | 0.4 - 0.4                        | 4.00E-01 | 1/6                 | 1.86E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260           | C             | 0.094 - 1.1                      | 1.10E+00 | 3/10                | 1.48E-06                      | 26.6                                                              | 73.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EOS-3               | OS            | BE36        | 1E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 2.2 - 2.2                        | 2.20E+00 | 1/4                 | 5.92E-06                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 49.9 - 200                       | 2.00E+02 | 4/4                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.17 - 0.31                      | 3.10E-01 | 3/4                 | 2.37E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-3               | OS            | BF35        | 9E-06                 | <1           | <1                | Metal                      | Arsenic                | C             | 0.87 - 2.8                       | 2.80E+00 | 3/7                 | 7.54E-06                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 4.9 - 310                        | 3.10E+02 | 6/7                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.047 - 0.21                     | 2.10E-01 | 2/7                 | 1.61E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-3               | OS            | BF36        | 2E-04                 | <1           | <1                | Metal                      | Arsenic                | C             | 4.5 - 4.5                        | 4.50E+00 | 1/4                 | 1.21E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene     | C             | 0.36 - 18                        | 1.80E+01 | 3/4                 | 1.38E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene         | C             | 0.25 - 15                        | 1.29E+01 | 4/4                 | 9.89E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene   | C             | 0.33 - 12                        | 1.10E+01 | 4/4                 | 8.42E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene   | C             | 14 - 14                          | 1.40E+01 | 1/4                 | 1.07E-05                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Chrysene               | C             | 0.66 - 19                        | 1.90E+01 | 4/4                 | 1.45E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene  | C             | 0.53 - 0.78                      | 7.80E-01 | 2/4                 | 3.63E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene | C             | 0.33 - 5.8                       | 5.80E+00 | 3/4                 | 4.44E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-3               | OS            | BG35        | 2E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 6.3 - 6.3                        | 6.30E+00 | 1/1                 | 1.70E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.58 - 0.58                      | 5.80E-01 | 1/1                 | 4.44E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-3               | OS            | BG36        | 5E-05                 | <1           | <1                | Metal                      | Arsenic                | C             | 6.1 - 19.3                       | 1.28E+01 | 5/7                 | 3.43E-05                      | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Lead                   | --            | 25.9 - 460                       | 4.60E+02 | 5/7                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene         | C             | 0.1 - 0.2                        | 2.00E-01 | 5/7                 | 1.53E-06                      | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Dieldrin               | C             | 0.14 - 0.14                      | 1.40E-01 | 1/7                 | 1.19E-06                      | 33.6                                                              | 66.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |

TABLE 5-5: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SURFACE SOIL (0 TO 2 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block<br>Planned Reuse<br>Grid Number<br>Total RME Cancer Risk<br>Total RME HI<br>RME Segregated HI |    |      |       |       |    | Chemicals of Concern (COC) |                      | Basis for COC<br>Range of Detected Concentrations<br>RME EPC<br>Detection Frequency<br>Chemical-Specific Cancer Risk |                    |          |       |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|-------------------------------------------------------------------------------------------------------------------|----|------|-------|-------|----|----------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------|--------------------|----------|-------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                                                                                                                   |    |      |       |       |    |                            |                      |                                                                                                                      |                    |          |       |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| EOS-3                                                                                                             | OS | BG36 | 5E-05 | <1    | <1 | Dioxin                     | 1,2,3,4,6,7,8-HPCDD  | C                                                                                                                    | 0.00353 - 0.00353  | 3.53E-03 | 1/1   | 1.51E-06 | 62.8                                                              | 37.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                                   |    |      |       |       |    |                            | 1,2,3,7,8-PECDD      | C                                                                                                                    | 0.000606 - 0.00006 | 6.06E-05 | 1/1   | 2.59E-06 | 62.8                                                              | 37.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                                   |    |      |       |       |    |                            | 2,3,4,7,8-PECDF      | C                                                                                                                    | 0.000235 - 0.00023 | 2.35E-04 | 1/1   | 5.02E-06 | 62.8                                                              | 37.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-3                                                                                                             | OS | BH36 | 2E-05 | <1    | <1 | Metal                      | Arsenic              | C                                                                                                                    | 4.9 - 5.2          | 5.20E+00 | 2/5   | 1.40E-05 | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |    |      |       |       |    | PAH                        | Benzo(a)pyrene       | C                                                                                                                    | 0.074 - 0.82       | 8.20E-01 | 3/5   | 6.28E-06 | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-3                                                                                                             | OS | BI35 | 7E-06 | <1    | <1 | Metal                      | Arsenic              | C                                                                                                                    | 2.4 - 2.4          | 2.40E+00 | 1/2   | 6.46E-06 | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |    |      |       |       |    | Lead                       | --                   | 155 - 155                                                                                                            | 1.55E+02           | 1/2      | --    | --       | --                                                                | --             |                                      | --                           | --                   | --                                                       |                | 8.99                                 | Yes                          |        |                                     |
| EOS-3                                                                                                             | OS | BI36 | 2E-04 | 2E+00 | <1 | Metal                      | Arsenic              | C                                                                                                                    | 5.1 - 73           | 7.30E+01 | 5/8   | 1.96E-04 | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                                   |    |      |       |       |    |                            | Lead                 | --                                                                                                                   | 36.8 - 370         | 2.01E+02 | 6/8   | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                                                                                                                   |    |      |       |       |    | PAH                        | Benzo(a)pyrene       | C                                                                                                                    | 0.038 - 0.69       | 6.90E-01 | 4/7   | 5.28E-06 | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                                   |    |      |       |       |    |                            | Benzo(b)fluoranthene | C                                                                                                                    | 0.087 - 1.4        | 1.40E+00 | 5/8   | 1.07E-06 | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                                   |    |      |       |       |    |                            |                      |                                                                                                                      |                    |          |       |          |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |
| EOS-4                                                                                                             | OS | AF26 | 1E-05 | <1    | <1 | Metal                      | Arsenic              | C                                                                                                                    | 5.4 - 5.4          | 5.40E+00 | 1/1   | 1.45E-05 | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EOS-4                                                                                                             | OS | AG27 | 9E-06 | <1    | <1 | Metal                      | Arsenic              | C                                                                                                                    | 3.2 - 3.2          | 3.20E+00 | 1/1   | 8.61E-06 | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |    |      |       |       |    |                            |                      |                                                                                                                      |                    |          |       |          |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |
| EOS-5                                                                                                             | OS | ZZ01 | 2E-05 | <1    | <1 | Metal                      | Arsenic              | C                                                                                                                    | 2 - 12.8           | 7.08E+00 | 11/13 | 1.91E-05 | 62.8                                                              | 37.2           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                                   |    |      |       |       |    |                            | Lead                 | --                                                                                                                   | 6.1 - 1280         | 1.28E+03 | 13/13 | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             |                                      | 8.99                         | Yes    |                                     |
|                                                                                                                   |    |      |       |       |    | PAH                        | Benzo(a)pyrene       | C                                                                                                                    | 0.18 - 0.18        | 1.80E-01 | 1/13  | 1.38E-06 | 28.0                                                              | 71.9           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |

- Notes: All concentrations shown in milligrams per kilogram (mg/kg).
- <1

Less than 1
- Not applicable or chemical is not a COC for this endpoint
- %

Percent
- bgs

Below ground surface
- C

Cancer effect
- COC

Chemical of concern
- EPC

Exposure point concentration
- HHRA

Human health risk assessment
- HI

Hazard index
- HPAL

Hunters Point ambient level
- HPCDD

Heptachlorodibenzo-p-dioxin
- IND

Industrial (industrial exposure scenario)
- MI

Maritime industrial (industrial exposure scenario)
- NC

Noncancer effect
- OS

Open space (recreational exposure scenario)
- PAH

Polynuclear aromatic hydrocarbon
- PECDD

Pentachlorodibenzo-p-dioxin
- PECDF

Pentachlorodibenzofuran
- Pest/PCB

Pesticide/polychlorinated biphenyl
- RD

Research and development
- RME

Reasonable maximum exposure
- SVOC

Semivolatile organic compound
- VOC

Volatile organic compound



Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

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Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

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TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HIRME Segregated HI |             |      |           |          |       | Chemicals of Concern (COC) |                        | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |              |          |       |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|-----------------------------------------------------------------------------------------------|-------------|------|-----------|----------|-------|----------------------------|------------------------|------------------------------------------------------------------------------------------------------|--------------|----------|-------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                                                                                               |             |      |           |          |       |                            |                        |                                                                                                      |              |          |       |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| 43                                                                                            | IND         | AV33 | 3E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.8 - 8      | 6.05E+00 | 14/23 | 1.40E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.044 - 6.4  | 6.36E-01 | 11/54 | 3.62E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       |                            | Dibenz(a,h)anthracene  | C                                                                                                    | 1.1 - 1.1    | 1.10E+00 | 1/54  | 3.81E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       | VOC                        | Benzene                | C                                                                                                    | 0.4 - 0.68   | 6.80E-01 | 2/37  | 1.75E-06 | 0.7                                                               | 0.0            | 99.3                                 | <1                           | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 43                                                                                            | IND         | AV34 | 2E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.1 - 11.2   | 6.89E+00 | 8/12  | 1.59E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.19 - 0.36  | 3.60E-01 | 3/12  | 2.05E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 43                                                                                            | IND         | AW33 | 4E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 4.8 - 20     | 1.59E+01 | 6/6   | 3.67E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 43                                                                                            | IND         | AW34 | 2E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.4 - 11.2   | 5.33E+00 | 12/22 | 1.23E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.099 - 2.2  | 8.88E-01 | 7/30  | 5.06E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 43                                                                                            | IND         | AX34 | 9E-06     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.2 - 4      | 4.00E+00 | 3/3   | 9.22E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND         | AL32 | 2E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.4 - 9.7    | 6.67E+00 | 4/6   | 1.54E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.036 - 0.43 | 4.30E-01 | 2/6   | 2.45E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       | Pest/PCB                   | Aroclor-1260           | C                                                                                                    | 0.36 - 3.6   | 3.60E+00 | 2/6   | 3.58E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 44                                                                                            | IND         | AM31 | 9E-06     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.4 - 3.9    | 3.90E+00 | 2/2   | 8.99E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND         | AM32 | 6E-05     | 3E+00    | 3E+00 | Metal                      | Arsenic                | C                                                                                                    | 1.4 - 8.7    | 6.77E+00 | 14/14 | 1.56E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                               |             |      |           |          |       |                            | Lead                   | --                                                                                                   | 1.7 - 6570   | 5.13E+03 | 14/14 | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   | 8.99                         | Yes    |                                     |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.043 - 0.53 | 3.26E-01 | 5/14  | 1.86E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       | Pest/PCB                   | Aroclor-1254           | C/NC                                                                                                 | 0.57 - 33    | 2.69E+01 | 4/14  | 2.67E-05 | 35.1                                                              | 64.9           | 0.0                                  |                              | 1.87E+00             | 35.1                                                     | 64.9           | 0.0                                  |                              | --     | --                                  |
|                                                                                               |             |      |           |          |       |                            | Aroclor-1260           | C                                                                                                    | 0.086 - 10   | 9.48E+00 | 6/14  | 9.44E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 44                                                                                            | IND         | AM33 | 3E-05     | <1       | <1    | VOC                        | Naphthalene            | C                                                                                                    | 0.038 - 5.3  | 5.30E+00 | 3/14  | 1.14E-06 | 9.8                                                               | 0.0            | 90.2                                 |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                                                                                               |             |      |           |          |       | Metal                      | Arsenic                | C                                                                                                    | 2.2 - 14.1   | 8.03E+00 | 10/10 | 1.85E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.049 - 0.64 | 6.40E-01 | 4/10  | 3.64E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       |                            | Benzo(b)fluoranthene   | C                                                                                                    | 0.079 - 1.8  | 1.80E+00 | 6/10  | 1.03E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 44                                                                                            | IND         | AM34 | 3E-05     | <1       | <1    | Pest/PCB                   | Aroclor-1260           | C                                                                                                    | 0.1 - 3.9    | 3.90E+00 | 7/10  | 3.88E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                                                                                               |             |      |           |          |       | Metal                      | Arsenic                | C                                                                                                    | 0.64 - 13    | 6.99E+00 | 13/16 | 1.61E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.092 - 0.75 | 7.50E-01 | 2/16  | 4.27E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       | Pest/PCB                   | Aroclor-1254           | C                                                                                                    | 1.6 - 1.6    | 1.60E+00 | 1/16  | 1.59E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 44                                                                                            | IND         | AM35 | 8E-05     | 7E+00    | 6E+00 |                            | Aroclor-1260           | C                                                                                                    | 0.39 - 5.3   | 5.30E+00 | 3/16  | 5.28E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                                                                                               |             |      |           |          |       | Metal                      | Arsenic                | C                                                                                                    | 3.5 - 32     | 1.73E+01 | 6/15  | 3.99E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)anthracene     | C                                                                                                    | 0.052 - 2.3  | 2.30E+00 | 11/17 | 1.31E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       |                            | Benzo(a)pyrene         | C                                                                                                    | 0.051 - 3.6  | 3.60E+00 | 11/17 | 2.05E-05 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       |                            | Benzo(b)fluoranthene   | C                                                                                                    | 0.1 - 6.4    | 6.40E+00 | 11/17 | 3.64E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       |                            | Dibenz(a,h)anthracene  | C                                                                                                    | 0.071 - 0.81 | 8.10E-01 | 5/17  | 2.81E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       |                            | Indeno(1,2,3-cd)pyrene | C                                                                                                    | 0.1 - 2.3    | 2.30E+00 | 9/17  | 1.31E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       | Pest/PCB                   | Aroclor-1248           | C                                                                                                    | 7.1 - 7.1    | 7.10E+00 | 1/15  | 7.07E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       | VOC                        | 1,2,4-Trimethylbenzene | NC                                                                                                   | 440 - 440    | 4.40E+02 | 1/1   | --       | --                                                                | --             | --                                   |                              | 2.58E+00             | 0.2                                                      | 0.0            | 99.8                                 |                              | --     | --                                  |
|                                                                                               |             |      |           |          |       |                            | 1,3,5-Trimethylbenzene | NC                                                                                                   | 200 - 200    | 2.00E+02 | 1/1   | --       | --                                                                | --             | --                                   |                              | 2.87E+00             | 0.1                                                      | 0.0            | 99.9                                 |                              | --     | --                                  |
|                                                                                               | Naphthalene | C    | 6.9 - 6.9 | 6.90E+00 | 1/18  | 1.48E-06                   | 9.8                    | 0.0                                                                                                  | 90.2         |          | <1    | --       | --                                                                | --             | --                                   | --                           | --                   |                                                          |                |                                      |                              |        |                                     |
| 44                                                                                            | IND         | AN31 | 2E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.5 - 8.4    | 8.40E+00 | 4/4   | 1.94E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND         | AN32 | 2E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.9 - 6.9    | 6.90E+00 | 3/3   | 1.59E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND         | AN33 | 2E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 2 - 11.1     | 7.14E+00 | 10/11 | 1.65E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.06 - 1     | 5.30E-01 | 4/11  | 3.02E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       | Pest/PCB                   | Aroclor-1260           | C                                                                                                    | 1.6 - 1.6    | 1.60E+00 | 1/11  | 1.59E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 44                                                                                            | IND         | AO35 | 9E-06     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 3.3 - 3.7    | 3.70E+00 | 2/4   | 8.53E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND         | AO36 | 6E-06     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.4 - 2.4    | 2.40E+00 | 1/1   | 5.53E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND         | AP32 | 2E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 3.9 - 11.2   | 1.06E+01 | 4/4   | 2.44E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 44                                                                                            | IND         | AP33 | 1E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 4.7 - 5      | 5.00E+00 | 2/3   | 1.15E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND         | AP34 | 1E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.8 - 6.4    | 4.46E+00 | 5/8   | 1.03E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.19 - 0.19  | 1.90E-01 | 1/7   | 1.08E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 44                                                                                            | IND         | AP37 | 2E-05     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 3.8 - 8.9    | 6.12E+00 | 6/12  | 1.41E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                               |             |      |           |          |       | Pest/PCB                   | Aroclor-1254           | C                                                                                                    | 1.3 - 1.3    | 1.30E+00 | 1/12  | 1.29E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       |                            | Aroclor-1260           | C                                                                                                    | 0.019 - 4.3  | 3.31E+00 | 4/12  | 3.30E-06 | 35.1                                                              | 64.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 44                                                                                            | IND         | AQ33 | 8E-06     | <1       | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.5 - 3.6    | 3.60E+00 | 2/2   | 8.30E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND         | AQ35 | 6E-05     | 1E+01    | 1E+01 | Metal                      | Arsenic                | C                                                                                                    | 3.5 - 9.1    | 6.18E+00 | 5/9   | 1.43E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                               |             |      |           |          |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.053 - 0.38 | 2.81E-01 | 4/9   | 1.60E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |             |      |           |          |       | VOC                        | 1,2,4-Trimethylbenzene | NC                                                                                                   | 1400 - 1400  | 1.40E+03 | 1/1   | --       | --                                                                | --             | --                                   |                              | 8.21E+00             | 0.2                                                      | 0.0            | 99.8                                 |                              | --     | --                                  |
|                                                                                               |             |      |           |          |       |                            | 1,3,5-Trimethylbenzene | NC                                                                                                   | 290 - 290    | 2.90E+02 | 1/1   | --       | --                                                                | --             | --                                   |                              | 4.16E+00             | 0.1                                                      | 0.0            | 99.9                                 |                              | --     | --                                  |
|                                                                                               |             |      |           |          |       |                            | Naphthalene            | C/NC                                                                                                 | 0.17 - 210   | 2.10E+02 | 2/10  | 4.51E-05 | 9.8                                                               | 0.0            | 90.2                                 |                              | 1.11E+00             | 0.5                                                      | 0.0            | 99.5                                 |                              | --     | --                                  |

TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HIRME Segregated HI |     |        |       |       |       | Chemicals of Concern (COC) |                      | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |               |          |       |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|-----------------------------------------------------------------------------------------------|-----|--------|-------|-------|-------|----------------------------|----------------------|------------------------------------------------------------------------------------------------------|---------------|----------|-------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                                                                                               |     |        |       |       |       |                            |                      |                                                                                                      |               |          |       |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| 44                                                                                            | IND | AQ36   | 3E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 2.6 - 17.6    | 9.36E+00 | 11/16 | 2.16E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                               |     |        |       |       |       |                            | Lead                 | --                                                                                                   | 7.6 - 1150    | 1.15E+03 | 14/16 | --       | --                                                                | --             | --                                   | --                           | --                   | --                                                       |                | 8.99                                 | Yes                          |        |                                     |
|                                                                                               |     |        |       |       |       | PAH                        | Benzo(a)pyrene       | C                                                                                                    | 0.004 - 0.28  | 2.80E-01 | 7/16  | 1.59E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |     |        |       |       |       | Pest/PCB                   | Aldrin               | C                                                                                                    | 0.21 - 0.21   | 2.10E-01 | 1/16  | 1.45E-06 | 43.1                                                              | 56.9           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 44                                                                                            | IND | AR34   | 2E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 0.42 - 6.1    | 6.10E+00 | 3/4   | 1.41E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND | AR35   | 1E-05 | <1    | <1    | PAH                        | Benzo(a)anthracene   | C                                                                                                    | 0.24 - 1.9    | 1.90E+00 | 2/2   | 1.08E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |     |        |       |       |       |                            | Benzo(a)pyrene       | C                                                                                                    | 0.23 - 1.2    | 1.20E+00 | 2/2   | 6.83E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |     |        |       |       |       |                            | Benzo(b)fluoranthene | C                                                                                                    | 0.47 - 2.6    | 2.60E+00 | 2/2   | 1.48E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 44                                                                                            | IND | AR36   | 4E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 2 - 42.9      | 1.41E+01 | 7/11  | 3.25E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                               |     |        |       |       |       | PAH                        | Benzo(a)pyrene       | C                                                                                                    | 0.22 - 0.22   | 2.20E-01 | 1/8   | 1.25E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                                                                                               |     |        |       |       |       | VOC                        | Naphthalene          | C                                                                                                    | 12 - 15       | 1.50E+01 | 2/10  | 3.22E-06 | 9.8                                                               | 0.0            | 90.2                                 |                              | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
| 44                                                                                            | IND | AR37   | 1E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 2.7 - 3.5     | 3.46E+00 | 4/4   | 7.99E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND | AS36   | 9E-06 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 3.1 - 3.5     | 3.50E+00 | 3/3   | 8.07E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND | AU35   | 8E-06 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 1.4 - 3.5     | 3.50E+00 | 3/4   | 8.07E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND | AU36   | 5E-06 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 2.2 - 2.2     | 2.20E+00 | 1/1   | 5.07E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND | AV36   | 3E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 2.8 - 15      | 1.22E+01 | 13/13 | 2.82E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 44                                                                                            | IND | AW35   | 2E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 4.3 - 7.5     | 7.50E+00 | 2/4   | 1.73E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND | AW36   | 2E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 2.1 - 13      | 7.14E+00 | 12/12 | 1.65E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                               |     |        |       |       |       | PAH                        | Benzo(a)pyrene       | C                                                                                                    | 0.059 - 1.3   | 4.38E-01 | 6/12  | 2.49E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 44                                                                                            | IND | AX35   | 1E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 1.9 - 4.5     | 4.50E+00 | 4/4   | 1.04E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                            | IND | AY35   | 3E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 4.3 - 11.9    | 1.19E+01 | 3/3   | 2.74E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                            | RD  | 032075 | 3E-07 | 1E+01 | 6E+00 | Metal                      | Iron                 | NC                                                                                                   | 44000 - 56900 | 5.69E+04 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 2.59E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
|                                                                                               |     |        |       |       |       |                            | Manganese            | NC                                                                                                   | 1100 - 1160   | 1.16E+03 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 1.38E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |
|                                                                                               |     |        |       |       |       |                            | Nickel               | NC                                                                                                   | 1420 - 1670   | 1.67E+03 | 2/2   | 1.72E-07 | --                                                                | --             | --                                   | --                           | 5.53E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
| 45                                                                                            | RD  | 033077 | 8E-05 | 1E+01 | 7E+00 | Metal                      | Arsenic              | C                                                                                                    | 3.2 - 3.2     | 3.20E+00 | 1/2   | 8.36E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                                                                                               |     |        |       |       |       |                            | Iron                 | NC                                                                                                   | 25500 - 36900 | 3.69E+04 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 1.68E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
|                                                                                               |     |        |       |       |       |                            | Manganese            | NC                                                                                                   | 700 - 6040    | 6.04E+03 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 7.16E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |
| 45                                                                                            | RD  | 034074 | 3E-07 | 1E+01 | 7E+00 | Metal                      | Nickel               | NC                                                                                                   | 88.7 - 1020   | 1.02E+03 | 2/2   | 1.05E-07 | --                                                                | --             | --                                   | --                           | 3.38E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                                                                                               |     |        |       |       |       |                            | Iron                 | NC                                                                                                   | 45500 - 50700 | 5.07E+04 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 2.31E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
|                                                                                               |     |        |       |       |       |                            | Manganese            | NC                                                                                                   | 821 - 897     | 8.97E+02 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 1.06E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |
| 45                                                                                            | RD  | 035079 | 4E-04 | 9E+00 | 4E+00 | Metal                      | Nickel               | NC                                                                                                   | 1440 - 2030   | 2.03E+03 | 2/2   | 2.09E-07 | --                                                                | --             | --                                   | --                           | 6.72E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                                                                                               |     |        |       |       |       |                            | Thallium             | NC                                                                                                   | 6.8 - 6.8     | 6.80E+00 | 1/2   | --       | --                                                                | --             | --                                   | --                           | 1.35E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          | 0.81   | Yes                                 |
|                                                                                               |     |        |       |       |       |                            | Arsenic              | C/NC                                                                                                 | 0.72 - 16.5   | 1.65E+01 | 2/3   | 4.31E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.05E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         | 11.1   | Yes                                 |
| 45                                                                                            | RD  | 036074 | 3E-07 | 1E+01 | 5E+00 | Metal                      | Iron                 | NC                                                                                                   | 23500 - 34900 | 3.49E+04 | 3/3   | --       | --                                                                | --             | --                                   | --                           | 1.59E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
|                                                                                               |     |        |       |       |       |                            | Nickel               | NC                                                                                                   | 31 - 1200     | 1.20E+03 | 3/3   | 1.23E-07 | --                                                                | --             | --                                   | --                           | 3.97E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                                                                                               |     |        |       |       |       |                            | Iron                 | NC                                                                                                   | 56500 - 64100 | 6.41E+04 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 2.92E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | Yes                                 |
| 45                                                                                            | RD  | 037074 | 4E-05 | 6E+00 | 2E+00 | Metal                      | Manganese            | NC                                                                                                   | 1560 - 1580   | 1.58E+03 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 1.87E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |
|                                                                                               |     |        |       |       |       |                            | Nickel               | NC                                                                                                   | 397 - 1440    | 1.44E+03 | 2/2   | 1.48E-07 | --                                                                | --             | --                                   | --                           | 4.77E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                                                                                               |     |        |       |       |       |                            | Vanadium             | NC                                                                                                   | 42.9 - 191    | 1.91E+02 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 2.95E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | Yes                                 |
| 45                                                                                            | RD  | 037076 | 4E-05 | 6E+00 | 2E+00 | Metal                      | Arsenic              | C                                                                                                    | 1.6 - 1.6     | 1.60E+00 | 1/1   | 4.18E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                                                                                               |     |        |       |       |       |                            | Iron                 | NC                                                                                                   | 38400 - 38400 | 3.84E+04 | 1/1   | --       | --                                                                | --             | --                                   | --                           | 1.75E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
|                                                                                               |     |        |       |       |       |                            | Nickel               | NC                                                                                                   | 459 - 459     | 4.59E+02 | 1/1   | 4.72E-08 | --                                                                | --             | --                                   | --                           | 1.52E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
| 45                                                                                            | RD  | 037076 | 5E-05 | 1E+01 | 4E+00 | Metal                      | Vanadium             | NC                                                                                                   | 71.8 - 71.8   | 7.18E+01 | 1/1   | --       | --                                                                | --             | --                                   | --                           | 1.11E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |
|                                                                                               |     |        |       |       |       |                            | Arsenic              | C                                                                                                    | 2 - 2         | 2.00E+00 | 1/2   | 5.22E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                                                                                               |     |        |       |       |       |                            | Iron                 | NC                                                                                                   | 29000 - 37700 | 3.77E+04 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 1.72E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
| 45                                                                                            | RD  | 038074 | 3E-05 | 1E+01 | 7E+00 | Metal                      | Manganese            | NC                                                                                                   | 878 - 2840    | 2.84E+03 | 2/2   | --       | --                                                                | --             | --                                   | --                           | 3.37E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |
|                                                                                               |     |        |       |       |       |                            | Nickel               | NC                                                                                                   | 45.5 - 1170   | 1.17E+03 | 2/2   | 1.20E-07 | --                                                                | --             | --                                   | --                           | 3.87E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                                                                                               |     |        |       |       |       |                            | Arsenic              | C                                                                                                    | 1.1 - 1.1     | 1.10E+00 | 1/5   | 2.87E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
| 45                                                                                            | RD  | 038077 | 1E-04 | 1E+01 | 4E+00 | Metal                      | Iron                 | NC                                                                                                   | 32200 - 59200 | 5.47E+04 | 5/5   | --       | --                                                                | --             | --                                   | --                           | 2.49E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | Yes                                 |
|                                                                                               |     |        |       |       |       |                            | Manganese            | NC                                                                                                   | 565 - 1080    | 9.96E+02 | 5/5   | --       | --                                                                | --             | --                                   | --                           | 1.18E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |
|                                                                                               |     |        |       |       |       |                            | Nickel               | NC                                                                                                   | 832 - 2210    | 2.16E+03 | 5/5   | 2.22E-07 | --                                                                | --             | --                                   | --                           | 7.14E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
| 45                                                                                            | RD  | 038077 | 1E-04 | 1E+01 | 4E+00 | Metal                      | Thallium             | NC                                                                                                   | 5.7 - 5.7     | 5.70E+00 | 1/5   | --       | --                                                                | --             | --                                   | --                           | 1.13E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          | 0.81   | Yes                                 |
|                                                                                               |     |        |       |       |       |                            | Vanadium             | NC                                                                                                   | 7.4 - 76.4    | 6.94E+01 | 5/5   | --       | --                                                                | --             | --                                   | --                           | 1.07E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |
|                                                                                               |     |        |       |       |       |                            | Arsenic              | C                                                                                                    | 5.2 - 5.2     | 5.20E+00 | 1/3   | 1.36E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
| 45                                                                                            | RD  | 038077 | 1E-04 | 1E+01 | 4E+00 | Metal                      | Iron                 | NC                                                                                                   | 32100 - 34800 | 3.48E+04 | 3/3   | --       | --                                                                | --             | --                                   | --                           | 1.58E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |
|                                                                                               |     |        |       |       |       |                            | Lead                 | --                                                                                                   | 2.8 - 161     | 1.61E+02 | 3/3   | --       | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | 8.99                         | Yes    |                                     |
|                                                                                               |     |        |       |       |       |                            | Nickel               | NC                                                                                                   | 244 - 1250    | 1.25E+03 | 3/3   | 1.29E-07 | --                                                                | --             | --                                   | --                           | 4.14E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
| 45                                                                                            | RD  | 038077 | 1E-04 | 1E+01 | 4E+00 | Vanadium                   | NC                   | 24.5 - 85.7                                                                                          | 8.57E+01      | 3/3      | --    | --       | --                                                                | --             | --                                   | 1.32E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |

TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number   | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                            | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|---------------------|---------------|---------------|-----------------------|--------------|-------------------|----------------------------|----------------------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                     |               |               |                       |              |                   |                            |                            |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| 45                  | RD            | 038079        | 6E-04                 | 4E+01        | 2E+01             | Metal                      | Antimony                   | NC            | 38.4 - 38.4                      | 3.84E+01 | 1/3                 | --                            | --                                                                | --             | --                                   | 3.76E+00                     | 32.7                 | 0.0                                                      | 0.0            | 67.3                                 | 9.05                         | Yes    |                                     |
|                     |               |               |                       |              |                   |                            | Arsenic                    | C/NC          | 10.7 - 21.8                      | 2.18E+01 | 2/3                 | 5.69E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.39E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         | 11.1   | Yes                                 |
|                     |               |               |                       |              |                   |                            | Cadmium                    | NC            | 8.2 - 8.2                        | 8.20E+00 | 1/3                 | 1.39E-08                      | --                                                                | --             | --                                   | --                           | 2.37E+00             | 8.8                                                      | 0.0            | 0.0                                  | 91.1                         | 3.14   | Yes                                 |
|                     |               |               |                       |              |                   |                            | Copper                     | NC            | 15.4 - 165                       | 1.65E+02 | 3/3                 | --                            | --                                                                | --             | --                                   | 1.04E+00                     | 5.5                  | 0.0                                                      | 0.0            | 94.5                                 | 124.31                       | Yes    |                                     |
|                     |               |               |                       |              |                   |                            | Iron                       | NC            | 34000 - 43100                    | 4.31E+04 | 3/3                 | --                            | --                                                                | --             | --                                   | 1.96E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |               |                       |              |                   |                            | Lead                       | --            | 1.9 - 504                        | 5.04E+02 | 3/3                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | 8.99                         | Yes    |                                     |
|                     |               |               |                       |              |                   |                            | Nickel                     | NC            | 461 - 2800                       | 2.80E+03 | 3/3                 | 2.88E-07                      | --                                                                | --             | --                                   | --                           | 9.27E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                     |               |               |                       |              |                   |                            | Zinc                       | NC            | 40.4 - 5400                      | 5.40E+03 | 3/3                 | --                            | --                                                                | --             | --                                   | 1.45E+01                     | 1.6                  | 0.0                                                      | 0.0            | 98.4                                 | 109.86                       | Yes    |                                     |
|                     |               |               |                       |              |                   | PAH                        | Benzo(a)anthracene         | C             | 0.55 - 0.55                      | 5.50E-01 | 1/3                 | 1.49E-06                      | 69.5                                                              | 28.5           | 0.0                                  | 2.0                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                     |               |               |                       |              |                   |                            | Benzo(a)pyrene             | C             | 0.76 - 0.76                      | 7.60E-01 | 1/3                 | 2.04E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                     |               |               |                       |              |                   |                            | Benzo(b)fluoranthene       | C             | 1.2 - 1.2                        | 1.20E+00 | 1/3                 | 3.55E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                     |               |               |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C             | 0.58 - 0.58                      | 5.80E-01 | 1/3                 | 2.75E-06                      | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
|                     |               |               |                       |              |                   | SVOC                       | Bis(2-ethylhexyl)phthalate | C             | 5.4 - 5.4                        | 5.40E+00 | 1/3                 | 4.73E-06                      | 2.5                                                               | 0.8            | 0.0                                  | 96.7                         | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |
| 45                  | RD            | 039075        | 9E-05                 | 1E+01        | 4E+00             | Metal                      | Arsenic                    | C             | 1 - 3.6                          | 3.60E+00 | 2/2                 | 9.40E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | 11.1                         | No     |                                     |
|                     |               |               |                       |              |                   |                            | Iron                       | NC            | 30600 - 40700                    | 4.07E+04 | 2/2                 | --                            | --                                                                | --             | --                                   | 1.85E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |               |                       |              |                   |                            | Manganese                  | NC            | 830 - 2600                       | 2.60E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | 3.08E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | Yes    |                                     |
|                     |               |               |                       |              |                   |                            | Nickel                     | NC            | 782 - 1140                       | 1.14E+03 | 2/2                 | 1.17E-07                      | --                                                                | --             | --                                   | --                           | 3.77E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
| 45                  | RD            | 039076        | 4E-07                 | 1E+01        | 5E+00             | Metal                      | Iron                       | NC            | 34000 - 37800                    | 3.78E+04 | 2/2                 | --                            | --                                                                | --             | --                                   | 1.72E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |               |                       |              |                   |                            | Nickel                     | NC            | 484 - 1490                       | 1.49E+03 | 2/2                 | 1.53E-07                      | --                                                                | --             | --                                   | --                           | 4.93E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                     |               |               |                       |              |                   |                            | Vanadium                   | NC            | 19.8 - 65.9                      | 6.59E+01 | 2/2                 | --                            | --                                                                | --             | --                                   | 1.02E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
|                     |               |               |                       |              |                   |                            |                            |               |                                  |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |
| 45                  | RD            | 040073        | 2E-04                 | 1E+01        | 6E+00             | Metal                      | Arsenic                    | C             | 6.4 - 6.4                        | 6.40E+00 | 1/2                 | 1.67E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | 11.1                         | No     |                                     |
|                     |               |               |                       |              |                   |                            | Iron                       | NC            | 49700 - 56600                    | 5.66E+04 | 2/2                 | --                            | --                                                                | --             | --                                   | 2.58E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |               |                       |              |                   |                            | Manganese                  | NC            | 837 - 1580                       | 1.58E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | 1.87E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | Yes    |                                     |
|                     |               |               |                       |              |                   |                            | Nickel                     | NC            | 1600 - 1930                      | 1.93E+03 | 2/2                 | 1.98E-07                      | --                                                                | --             | --                                   | --                           | 6.39E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                     |               |               |                       |              |                   |                            | Vanadium                   | NC            | 51.2 - 81.3                      | 8.13E+01 | 2/2                 | --                            | --                                                                | --             | --                                   | 1.25E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
|                     |               |               |                       |              |                   |                            |                            |               |                                  |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |
| 45                  | RD            | 040074        | 4E-05                 | 1E+01        | 7E+00             | Metal                      | Arsenic                    | C             | 1.4 - 1.4                        | 1.40E+00 | 1/3                 | 3.66E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | 11.1                         | No     |                                     |
|                     |               |               |                       |              |                   |                            | Iron                       | NC            | 36300 - 45900                    | 4.59E+04 | 3/3                 | --                            | --                                                                | --             | --                                   | 2.09E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |               |                       |              |                   |                            | Nickel                     | NC            | 129 - 2240                       | 2.24E+03 | 3/3                 | 2.30E-07                      | --                                                                | --             | --                                   | --                           | 7.41E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                     |               |               |                       |              |                   |                            | Vanadium                   | NC            | 8.9 - 91.9                       | 9.19E+01 | 3/3                 | --                            | --                                                                | --             | --                                   | 1.42E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
|                     |               |               |                       |              |                   |                            |                            |               |                                  |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |
| 45                  | RD            | 040075        | 1E-04                 | 1E+01        | 5E+00             | Metal                      | Arsenic                    | C             | 0.91 - 4.7                       | 4.70E+00 | 2/2                 | 1.23E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | 11.1                         | No     |                                     |
|                     |               |               |                       |              |                   |                            | Manganese                  | NC            | 386 - 4390                       | 4.39E+03 | 2/2                 | --                            | --                                                                | --             | --                                   | 5.21E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | Yes    |                                     |
|                     |               |               |                       |              |                   |                            | Nickel                     | NC            | 33 - 854                         | 8.54E+02 | 2/2                 | 8.78E-08                      | --                                                                | --             | --                                   | --                           | 2.83E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
| 45                  | RD            | 040077        | 2E-07                 | 7E+00        | 3E+00             | Metal                      | Iron                       | NC            | 26000 - 26000                    | 2.60E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.18E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |               |                       |              |                   |                            | Nickel                     | NC            | 1020 - 1020                      | 1.02E+03 | 1/1                 | 1.05E-07                      | --                                                                | --             | --                                   | --                           | 3.38E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
| 45                  | RD            | 040079        | 6E-05                 | 8E+00        | 3E+00             | Metal                      | Arsenic                    | C             | 2.4 - 2.4                        | 2.40E+00 | 1/1                 | 6.27E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | 11.1                         | No     |                                     |
|                     |               |               |                       |              |                   |                            | Iron                       | NC            | 36100 - 36100                    | 3.61E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 1.64E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |               |                       |              |                   |                            | Nickel                     | NC            | 1030 - 1030                      | 1.03E+03 | 1/1                 | 1.06E-07                      | --                                                                | --             | --                                   | --                           | 3.41E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
| 45                  | RD            | 040082        | 2E-04                 | 6E+00        | 2E+00             | Metal                      | Arsenic                    | C             | 2.1 - 8                          | 8.00E+00 | 3/3                 | 2.09E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | 11.1                         | No     |                                     |
|                     |               |               |                       |              |                   |                            | Manganese                  | NC            | 181 - 905                        | 9.05E+02 | 3/3                 | --                            | --                                                                | --             | --                                   | 1.07E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |               |                       |              |                   |                            | Nickel                     | NC            | 53 - 485                         | 4.85E+02 | 3/3                 | 4.99E-08                      | --                                                                | --             | --                                   | --                           | 1.61E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |
|                     |               |               |                       |              |                   | PAH                        | Benzo(a)anthracene         | C             | 1 - 1                            | 1.00E+00 | 1/3                 | 2.70E-06                      | 69.5                                                              | 28.5           | 0.0                                  | 2.0                          | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                     |               |               |                       |              |                   |                            | Benzo(a)pyrene             | C             | 0.67 - 0.67                      | 6.70E-01 | 1/3                 | 1.80E-05                      | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                     |               |               |                       |              |                   |                            | Benzo(b)fluoranthene       | C             | 1 - 1                            | 1.00E+00 | 1/3                 | 2.96E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                     |               |               |                       |              |                   |                            | Benzo(k)fluoranthene       | C             | 0.4 - 0.4                        | 4.00E-01 | 1/3                 | 1.18E-06                      | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
|                     |               |               |                       |              |                   | Metal                      | Arsenic                    | C             | 2.6 - 5.6                        | 5.60E+00 | 2/2                 | 1.46E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
| Iron                | NC            | 27400 - 42500 | 4.25E+04              | 2/2          | --                |                            | --                         | --            | --                               | 1.94E+00 | 93.6                | 0.0                           | 0.0                                                               | 6.4            | 58000                                | No                           |                      |                                                          |                |                                      |                              |        |                                     |
| Manganese           | NC            | 936 - 2550    | 2.55E+03              | 2/2          | --                |                            | --                         | --            | --                               | 3.02E+00 | 44.9                | 0.0                           | 2.9                                                               | 52.2           | 1431                                 | Yes                          |                      |                                                          |                |                                      |                              |        |                                     |
| Nickel              | NC            | 172 - 1050    | 1.05E+03              | 2/2          | 1.08E-07          |                            | --                         | --            | --                               | --       | 3.48E+00            | 19.3                          | 0.0                                                               | 1.0            | 79.6                                 | *                            | No                   |                                                          |                |                                      |                              |        |                                     |
| Vanadium            | NC            | 134 - 134     | 1.34E+02              | 1/1          | --                |                            | --                         | --            | --                               | 2.07E+00 | 82.9                | 0.0                           | 0.0                                                               | 17.1           | 117.17                               | Yes                          |                      |                                                          |                |                                      |                              |        |                                     |
| 45                  | RD            | 041079        | 8E-05                 | 1E+01        | 4E+00             | Metal                      | Arsenic                    | C             | 3 - 3                            | 3.00E+00 | 1/1                 | 7.84E-05                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | 11.1                         | No     |                                     |
|                     |               |               |                       |              |                   |                            | Iron                       | NC            | 48400 - 48400                    | 4.84E+04 | 1/1                 | --                            | --                                                                | --             | --                                   | 2.20E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |               |                       |              |                   |                            | Manganese                  | NC            | 2950 - 2950                      | 2.95E+03 | 1/1                 | --                            | --                                                                | --             | --                                   | 3.50E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | Yes    |                                     |
|                     |               |               |                       |              |                   |                            | Vanadium                   | NC            | 134 - 134                        | 1.34E+02 | 1/1                 | --                            | --                                                                | --             | --                                   | 2.07E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | Yes    |                                     |
|                     |               |               |                       |              |                   |                            |                            |               |                                  |          |                     |                               |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |
|                     |               |               |                       |              |                   | Metal                      | Arsenic                    | C             | 0.81 - 11.8                      | 9.23E+00 | 6/6                 | 2.41E-04                      | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | Yes                                 |
|                     |               |               |                       |              |                   |                            | Cadmium                    | NC            | 3 - 6.8                          | 6.80E+00 | 2/6                 | 1.15E-08                      | --                                                                | --             | --                                   | --                           | 1.97E+00             | 8.8                                                      | 0.0            | 0.0                                  | 91.1                         | 3.14   | Yes                                 |
|                     |               |               |                       |              |                   |                            | Iron                       | NC            | 28900 - 75700                    | 5.95E+04 | 6/6                 | --                            | --                                                                | --             | --                                   | 2.71E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | Yes    |                                     |
|                     |               |               |                       |              |                   |                            | Manganese                  | NC            | 642 - 2070                       | 1.54E+03 | 6/6                 | --                            | --                                                                | --             | --                                   | 1.82E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | Yes    |                                     |
|                     |               |               |                       |              |                   |                            | Mercury                    | NC            | 0.26 - 5.6                       | 5.60E+00 | 5/6                 | --                            | --                                                                | --             | --                                   | 3.52E+00                     | 6.8                  | 0.0                                                      | 0.0            | 93.2                                 | 2.28                         | Yes    |                                     |
| Metal               | Nickel        | NC            | 91.7 - 1130           | 1.13E+03     | 6/6               | 1.16E-07                   | --                         | --            | --                               | --       | 3.74E+00            | 19.3                          | 0.0                                                               | 1.0            | 79.6                                 | *                            | No                   |                                                          |                |                                      |                              |        |                                     |
|                     | Silver        | NC            | 5 - 59.9              | 5.99E+01     | 2/6               | --                         | --                         | --            | --                               | 1.21E+00 | 12.7                | 0.0                           | 0.0                                                               | 87.3           | 1.43                                 | Yes                          |                      |                                                          |                |                                      |                              |        |                                     |
|                     | Vanadium      | NC            | 55.4 - 88.6           | 7.81E+01     | 6/6               | --                         | --                         | --            | --                               | 1.20E+00 | 82.9                | 0.0                           | 0.0                                                               | 17.1           | 117.17                               | No                           |                      |                                                          |                |                                      |                              |        |                                     |
|                     | Zinc          | NC            | 98.7 - 650            | 6.38E+02     | 6/6               | --                         | --                         | --            | --                               | 1.71E+00 | 1.6                 | 0.0                           | 0.0                                                               | 98.4           | 109.86                               | Yes                          |                      |                                                          |                |                                      |                              |        |                                     |

TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block<br>Planned Reuse<br>Grid Number<br>Total RME Cancer Risk<br>Total RME HI<br>RME Segregated HI |    |        |       |       |       | Chemicals of Concern (COC) |                        | Basis for COC<br>Range of Detected Concentrations<br>RME EPC<br>Detection Frequency<br>Chemical-Specific Cancer Risk |               |               |          |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |     |
|-------------------------------------------------------------------------------------------------------------------|----|--------|-------|-------|-------|----------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------|---------------|---------------|----------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|-----|
|                                                                                                                   |    |        |       |       |       |                            |                        |                                                                                                                      |               |               |          |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |     |
|                                                                                                                   |    |        |       |       |       | PAH                        | Benzo(a)anthracene     | C                                                                                                                    | 0.59 - 0.59   | 5.90E-01      | 1/6      | 1.60E-06 | 69.5                                                              | 28.5           | 0.0                                  | 2.0                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Benzo(a)pyrene         | C                                                                                                                    | 0.94 - 0.94   | 9.40E-01      | 1/6      | 2.52E-05 | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
|                                                                                                                   |    |        |       |       |       |                            | Benzo(b)fluoranthene   | C                                                                                                                    | 0.2 - 1.2     | 1.20E+00      | 2/6      | 3.55E-06 | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
|                                                                                                                   |    |        |       |       |       |                            | Benzo(k)fluoranthene   | C                                                                                                                    | 0.47 - 0.47   | 4.70E-01      | 1/6      | 1.39E-06 | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
|                                                                                                                   |    |        |       |       |       |                            | Indeno(1,2,3-cd)pyrene | C                                                                                                                    | 0.6 - 0.6     | 6.00E-01      | 1/6      | 1.73E-06 | 65.3                                                              | 26.8           | 0.0                                  | 8.0                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
| 45                                                                                                                | RD | 042073 | 3E-04 | 2E+01 | 5E+00 | Pest/PCB                   | Dieldrin               | C                                                                                                                    | 0.005 - 0.005 | 5.00E-03      | 1/6      | 7.58E-06 | 1.7                                                               | 0.5            | 0.0                                  | 97.8                         | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Metal                  | Arsenic                                                                                                              | C             | 3.2 - 11.6    | 1.07E+01 | 4/4      | 2.80E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           | --     | 11.1                                | Yes |
|                                                                                                                   |    |        |       |       |       |                            |                        | Iron                                                                                                                 | NC            | 23400 - 61200 | 6.03E+04 | 4/4      | --                                                                | --             | --                                   | --                           | --                   | 2.74E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | Yes |
|                                                                                                                   |    |        |       |       |       |                            |                        | Manganese                                                                                                            | NC            | 843 - 3200    | 3.20E+03 | 4/4      | --                                                                | --             | --                                   | --                           | --                   | 3.80E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2   | 1431                                | Yes |
|                                                                                                                   |    |        |       |       |       |                            |                        | Nickel                                                                                                               | NC            | 106 - 1540    | 1.43E+03 | 4/4      | 1.47E-07                                                          | --             | --                                   | --                           | --                   | 4.75E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
| 45                                                                                                                | RD | 042074 | 5E-05 | 1E+01 | 4E+00 | Metal                      |                        | Thallium                                                                                                             | NC            | 7.1 - 7.1     | 7.10E+00 | 1/4      | --                                                                | --             | --                                   | --                           | --                   | 1.41E+00                                                 | 97.3           | 0.0                                  | 0.0                          | 2.7    | 0.81                                | Yes |
|                                                                                                                   |    |        |       |       |       |                            | Vanadium               | NC                                                                                                                   | 62 - 134      | 1.26E+02      | 4/4      | --       | --                                                                | --             | --                                   | --                           | 1.95E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | Arsenic                | C                                                                                                                    | 1.9 - 1.9     | 1.90E+00      | 1/1      | 4.96E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Iron                   | NC                                                                                                                   | 53300 - 53300 | 5.33E+04      | 1/1      | --       | --                                                                | --             | --                                   | --                           | 2.43E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Manganese              | NC                                                                                                                   | 1520 - 1520   | 1.52E+03      | 1/1      | --       | --                                                                | --             | --                                   | --                           | 1.80E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |     |
| 45                                                                                                                | RD | 042081 | 3E-04 | 1E+01 | 4E+00 | Metal                      | Vanadium               | NC                                                                                                                   | 202 - 202     | 2.02E+02      | 1/1      | --       | --                                                                | --             | --                                   | --                           | 3.12E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | Arsenic                | C                                                                                                                    | 4.8 - 16.3    | 1.06E+01      | 4/6      | 2.77E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | Iron                   | NC                                                                                                                   | 29500 - 37500 | 3.64E+04      | 6/6      | --       | --                                                                | --             | --                                   | --                           | 1.66E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Manganese              | NC                                                                                                                   | 584 - 2350    | 1.74E+03      | 6/6      | --       | --                                                                | --             | --                                   | --                           | 2.06E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                 | NC                                                                                                                   | 28.9 - 1370   | 1.09E+03      | 6/6      | 1.12E-07 | --                                                                | --             | --                                   | --                           | 3.60E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |     |
| 45                                                                                                                | RD | 042082 | 2E-04 | 2E+01 | 5E+00 | Metal                      | Vanadium               | NC                                                                                                                   | 22 - 73       | 6.80E+01      | 6/6      | --       | --                                                                | --             | --                                   | --                           | 1.05E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | PAH                    | Benzo(a)pyrene                                                                                                       | C             | 0.2 - 0.2     | 2.00E-01 | 1/6      | 5.36E-06                                                          | 70.1           | 28.8                                 | 0.0                          | 1.1                  | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
|                                                                                                                   |    |        |       |       |       |                            |                        | Benzo(b)fluoranthene                                                                                                 | C             | 0.34 - 0.34   | 3.40E-01 | 1/6      | 1.00E-06                                                          | 63.6           | 26.1                                 | 0.0                          | 10.3                 | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
|                                                                                                                   |    |        |       |       |       |                            |                        | Antimony                                                                                                             | NC            | 11.9 - 11.9   | 1.19E+01 | 1/1      | --                                                                | --             | --                                   | --                           | --                   | 1.16E+00                                                 | 32.7           | 0.0                                  | 0.0                          | 67.3   | 9.05                                | Yes |
|                                                                                                                   |    |        |       |       |       |                            |                        | Arsenic                                                                                                              | C             | 7.5 - 7.5     | 7.50E+00 | 1/1      | 1.96E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           | --     | 11.1                                | No  |
| 45                                                                                                                | RD | 043075 | 3E-07 | 1E+01 | 5E+00 | Metal                      |                        | Copper                                                                                                               | NC            | 771 - 771     | 7.71E+02 | 1/1      | --                                                                | --             | --                                   | --                           | --                   | 4.84E+00                                                 | 5.5            | 0.0                                  | 0.0                          | 94.5   | 124.31                              | Yes |
|                                                                                                                   |    |        |       |       |       |                            | Iron                   | NC                                                                                                                   | 46000 - 46000 | 4.60E+04      | 1/1      | --       | --                                                                | --             | --                                   | --                           | 2.09E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Lead                   | --                                                                                                                   | 321 - 321     | 3.21E+02      | 1/1      | --       | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | 8.99   | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | Manganese              | NC                                                                                                                   | 1130 - 1130   | 1.13E+03      | 1/1      | --       | --                                                                | --             | --                                   | --                           | 1.34E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Vanadium               | NC                                                                                                                   | 85.9 - 85.9   | 8.59E+01      | 1/1      | --       | --                                                                | --             | --                                   | --                           | 1.32E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |     |
| 45                                                                                                                | RD | 043081 | 5E-04 | 2E+01 | 5E+00 | Metal                      | Zinc                   | NC                                                                                                                   | 794 - 794     | 7.94E+02      | 1/1      | --       | --                                                                | --             | --                                   | --                           | 2.13E+00             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         | 109.86 | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | PAH                    | Benzo(a)anthracene                                                                                                   | C             | 1.3 - 1.3     | 1.30E+00 | 1/1      | 3.51E-06                                                          | 69.5           | 28.5                                 | 0.0                          | 2.0                  | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
|                                                                                                                   |    |        |       |       |       |                            |                        | Benzo(a)pyrene                                                                                                       | C             | 0.79 - 0.79   | 7.90E-01 | 1/1      | 2.12E-05                                                          | 70.1           | 28.8                                 | 0.0                          | 1.1                  | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
|                                                                                                                   |    |        |       |       |       |                            |                        | Benzo(b)fluoranthene                                                                                                 | C             | 2.5 - 2.5     | 2.50E+00 | 1/1      | 7.39E-06                                                          | 63.6           | 26.1                                 | 0.0                          | 10.3                 | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
|                                                                                                                   |    |        |       |       |       |                            |                        | Benzo(k)fluoranthene                                                                                                 | C             | 0.75 - 0.75   | 7.50E-01 | 1/1      | 2.22E-06                                                          | 63.6           | 26.1                                 | 0.0                          | 10.3                 | --                                                       | --             | --                                   | --                           | --     | --                                  | --  |
| 45                                                                                                                | RD | 043082 | 2E-06 | 1E+01 | 5E+00 | Metal                      |                        | Dibenz(a,h)anthracene                                                                                                | C             | 0.14 - 0.14   | 1.40E-01 | 1/1      | 2.42E-06                                                          | 66.2           | 27.2                                 | 0.0                          | 6.7                  | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Indeno(1,2,3-cd)pyrene | C                                                                                                                    | 0.45 - 0.45   | 4.50E-01      | 1/1      | 1.30E-06 | 65.3                                                              | 26.8           | 0.0                                  | 8.0                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Pest/PCB               | Aroclor-1260                                                                                                         | C             | 0.82 - 0.82   | 8.20E-01 | 1/1      | 3.89E-06                                                          | 66.1           | 29.2                                 | 0.0                          | 4.7                  | <1                                                       | --             | --                                   | --                           | --     | --                                  | --  |
|                                                                                                                   |    |        |       |       |       |                            |                        | Iron                                                                                                                 | NC            | 43100 - 43100 | 4.31E+04 | 1/1      | --                                                                | --             | --                                   | --                           | --                   | 1.96E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                                                                                                                   |    |        |       |       |       |                            |                        | Nickel                                                                                                               | NC            | 1540 - 1540   | 1.54E+03 | 1/1      | 1.58E-07                                                          | --             | --                                   | --                           | --                   | 5.10E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
| 45                                                                                                                | RD | 043082 | 2E-06 | 1E+01 | 5E+00 | Metal                      | Arsenic                | C/NC                                                                                                                 | 4.6 - 17.9    | 1.79E+01      | 2/5      | 4.68E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.14E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         | 11.1   | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | Iron                   | NC                                                                                                                   | 36900 - 49900 | 4.88E+04      | 5/5      | --       | --                                                                | --             | --                                   | --                           | 2.22E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Manganese              | NC                                                                                                                   | 824 - 3360    | 2.55E+03      | 5/5      | --       | --                                                                | --             | --                                   | --                           | 3.02E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                 | NC                                                                                                                   | 33.9 - 2050   | 1.51E+03      | 5/5      | 1.56E-07 | --                                                                | --             | --                                   | --                           | 5.01E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Vanadium               | NC                                                                                                                   | 52.7 - 100    | 9.33E+01      | 5/5      | --       | --                                                                | --             | --                                   | --                           | 1.44E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |     |
| 45                                                                                                                | RD | 044073 | 2E-04 | 1E+01 | 5E+00 | Metal                      | Benzo(a)pyrene         | C                                                                                                                    | 0.073 - 0.073 | 7.30E-02      | 1/5      | 1.96E-06 | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |     |
|                                                                                                                   |    |        |       |       |       |                            | Antimony               | NC                                                                                                                   | 7.3 - 43.5    | 4.35E+01      | 2/3      | --       | --                                                                | --             | --                                   | --                           | 4.26E+00             | 32.7                                                     | 0.0            | 0.0                                  | 67.3                         | 9.05   | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | Iron                   | NC                                                                                                                   | 27700 - 38300 | 3.83E+04      | 3/3      | --       | --                                                                | --             | --                                   | --                           | 1.74E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                 | NC                                                                                                                   | 909 - 1590    | 1.59E+03      | 3/3      | 1.64E-07 | --                                                                | --             | --                                   | --                           | 5.26E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Pest/PCB               | Aroclor-1254                                                                                                         | C             | 0.18 - 0.18   | 1.80E-01 | 1/3      | 1.94E-06                                                          | 29.1           | 12.9                                 | 0.0                          | 58.0                 | <1                                                       | --             | --                                   | --                           | --     | --                                  | --  |
| 45                                                                                                                | RD | 044079 | 4E-04 | 1E+01 | 5E+00 | Metal                      |                        | Arsenic                                                                                                              | C             | 7.4 - 7.4     | 7.40E+00 | 1/2      | 1.93E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           | --     | 11.1                                | No  |
|                                                                                                                   |    |        |       |       |       |                            |                        | Iron                                                                                                                 | NC            | 33800 - 51000 | 5.10E+04 | 2/2      | --                                                                | --             | --                                   | --                           | --                   | 2.32E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                                                                                                                   |    |        |       |       |       |                            | Manganese              | NC                                                                                                                   | 636 - 1170    | 1.17E+03      | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.39E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                 | NC                                                                                                                   | 359 - 1470    | 1.47E+03      | 2/2      | 1.51E-07 | --                                                                | --             | --                                   | --                           | 4.87E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Thallium               | NC                                                                                                                   | 5.6 - 5.8     | 5.80E+00      | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.15E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          | 0.81   | Yes                                 |     |
| 45                                                                                                                | RD | 044079 | 4E-04 | 1E+01 | 5E+00 | Metal                      | Vanadium               | NC                                                                                                                   | 79.2 - 87.7   | 8.77E+01      | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.35E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Arsenic                | C                                                                                                                    | 14.3 - 14.3   | 1.43E+01      | 1/3      | 3.74E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | Iron                   | NC                                                                                                                   | 35500 - 43100 | 4.31E+04      | 3/3      | --       | --                                                                | --             | --                                   | --                           | 1.96E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                                   |    |        |       |       |       |                            | Manganese              | NC                                                                                                                   | 600 - 2440    | 2.44E+03      | 3/3      | --       | --                                                                | --             | --                                   | --                           | 2.89E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |     |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                 | NC                                                                                                                   | 25.3 - 1590   | 1.59E+03      | 3/3      | 1.64E-07 | --                                                                | --             | --                                   | --                           | 5.26E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |     |



TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |    |        |        |       |       | Chemicals of Concern (COC) |                        | Basis for COCRange of Detected ConcentrationsRME EPCRME Detection FrequencyChemical-Specific Cancer Risk |               |           |          |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |    |  |  |  |
|------------------------------------------------------------------------------------------------|----|--------|--------|-------|-------|----------------------------|------------------------|----------------------------------------------------------------------------------------------------------|---------------|-----------|----------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|----|--|--|--|
|                                                                                                |    |        |        |       |       |                            |                        |                                                                                                          |               |           |          |          |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            |                        |                                                                                                          |               |           |          |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |    |  |  |  |
| 45                                                                                             | RD | 044080 | 6E-05  | 1E+01 | 9E+00 | Metal                      | Arsenic                | C                                                                                                        | 2.1 - 2.1     | 2.10E+00  | 1/3      | 5.49E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |    |  |  |  |
| 45                                                                                             | RD | 044081 | 1E-04  | 1E+01 | 5E+00 | Metal                      | Iron                   | NC                                                                                                       | 32300 - 44300 | 4.43E+04  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 2.02E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Nickel                 | NC                                                                                                       | 863 - 2760    | 2.76E+03  | 3/3      | 2.84E-07 | --                                                                | --             | --                                   | --                           | 9.14E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Arsenic                | C                                                                                                        | 4.4 - 4.4     | 4.40E+00  | 1/2      | 1.15E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Iron                   | NC                                                                                                       | 37700 - 46700 | 4.67E+04  | 2/2      | --       | --                                                                | --             | --                                   | --                           | 2.13E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Manganese              | NC                                                                                                       | 989 - 1010    | 1.01E+03  | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.20E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |    |  |  |  |
| 45                                                                                             | RD | 045073 | 3E-05  | 9E+00 | 5E+00 | Metal                      | Nickel                 | NC                                                                                                       | 541 - 1460    | 1.46E+03  | 2/2      | 1.50E-07 | --                                                                | --             | --                                   | --                           | 4.83E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Vanadium               | NC                                                                                                       | 64.6 - 77.7   | 7.77E+01  | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.20E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Arsenic                | C                                                                                                        | 1.3 - 1.3     | 1.30E+00  | 1/2      | 3.40E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Iron                   | NC                                                                                                       | 18900 - 34600 | 3.46E+04  | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.58E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Nickel                 | NC                                                                                                       | 169 - 1530    | 1.53E+03  | 2/2      | 1.57E-07 | --                                                                | --             | --                                   | --                           | 5.06E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
| 45                                                                                             | RD | 045074 | 2E-04  | 1E+01 | 4E+00 | Metal                      | Arsenic                | C                                                                                                        | 0.88 - 6.2    | 6.20E+00  | 6/8      | 1.62E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Iron                   | NC                                                                                                       | 14600 - 64100 | 4.82E+04  | 8/8      | --       | --                                                                | --             | --                                   | --                           | 2.19E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Manganese              | NC                                                                                                       | 546 - 3430    | 2.37E+03  | 8/8      | --       | --                                                                | --             | --                                   | --                           | 2.82E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Nickel                 | NC                                                                                                       | 29.1 - 1200   | 1.20E+03  | 8/8      | 1.23E-07 | --                                                                | --             | --                                   | --                           | 3.97E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Vanadium               | NC                                                                                                       | 15.1 - 181    | 1.03E+02  | 8/8      | --       | --                                                                | --             | --                                   | --                           | 1.59E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       | PAH                        | Benzo(a)pyrene         | C                                                                                                        | 0.22 - 0.22   | 2.20E-01  | 1/8      | 5.90E-06 | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  | -- |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Benzo(b)fluoranthene   | C                                                                                                        | 0.54 - 0.54   | 5.40E-01  | 1/8      | 1.60E-06 | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  | -- |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Benzo(k)fluoranthene   | C                                                                                                        | 0.56 - 0.56   | 5.60E-01  | 1/8      | 1.66E-06 | 63.6                                                              | 26.1           | 0.0                                  | 10.3                         | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  | -- |  |  |  |
| 45                                                                                             | RD | 045075 | 6E-05  | 2E+01 | 4E+00 | Metal                      | Indeno(1,2,3-cd)pyrene | C                                                                                                        | 0.41 - 0.41   | 4.10E-01  | 1/8      | 1.18E-06 | 65.3                                                              | 26.8           | 0.0                                  | 8.0                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Arsenic                | C                                                                                                        | 2.1 - 2.2     | 2.20E+00  | 2/3      | 5.75E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Copper                 | NC                                                                                                       | 90 - 170      | 1.70E+02  | 2/3      | --       | --                                                                | --             | --                                   | --                           | 1.07E+00             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         | 124.31 | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Iron                   | NC                                                                                                       | 26200 - 67900 | 6.79E+04  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 3.09E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Manganese              | NC                                                                                                       | 735 - 2520    | 2.52E+03  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 2.99E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Nickel                 | NC                                                                                                       | 49.6 - 1180   | 1.18E+03  | 3/3      | 1.21E-07 | --                                                                | --             | --                                   | --                           | 3.91E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
| 45                                                                                             | RD | 045077 | 9E-05  | 6E+00 | 2E+00 | Metal                      | Vanadium               | NC                                                                                                       | 27.5 - 172    | 1.72E+02  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 2.65E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Arsenic                | C                                                                                                        | 3.5 - 3.5     | 3.50E+00  | 1/1      | 9.14E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Iron                   | NC                                                                                                       | 41600 - 41600 | 4.16E+04  | 1/1      | --       | --                                                                | --             | --                                   | --                           | 1.89E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Nickel                 | NC                                                                                                       | 408 - 408     | 4.08E+02  | 1/1      | 4.20E-08 | --                                                                | --             | --                                   | --                           | 1.35E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Vanadium               | NC                                                                                                       | 75.5 - 75.5   | 7.55E+01  | 1/1      | --       | --                                                                | --             | --                                   | --                           | 1.16E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |    |  |  |  |
| 45                                                                                             | RD | 045078 | 1E-03  | 1E+01 | 5E+00 | Metal                      | Arsenic                | C/NC                                                                                                     | 49.9 - 49.9   | 4.99E+01  | 1/2      | 1.30E-03 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 3.19E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         | 11.1   | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Iron                   | NC                                                                                                       | 29300 - 35100 | 3.51E+04  | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.60E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Nickel                 | NC                                                                                                       | 126 - 1530    | 1.53E+03  | 2/2      | 1.57E-07 | --                                                                | --             | --                                   | --                           | 5.06E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Vanadium               | NC                                                                                                       | 16.6 - 66.6   | 6.66E+01  | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.03E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |    |  |  |  |
| 45                                                                                             | RD | 045080 | 3E-04  | 1E+01 | 6E+00 | Metal                      | Arsenic                | C                                                                                                        | 1.2 - 10.9    | 1.09E+01  | 3/3      | 2.85E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Iron                   | NC                                                                                                       | 41700 - 56100 | 5.61E+04  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 2.55E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Manganese              | NC                                                                                                       | 816 - 1100    | 1.10E+03  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 1.30E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Nickel                 | NC                                                                                                       | 316 - 1710    | 1.71E+03  | 3/3      | 1.76E-07 | --                                                                | --             | --                                   | --                           | 5.66E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Vanadium               | NC                                                                                                       | 67.4 - 81.7   | 8.17E+01  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 1.26E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |    |  |  |  |
| 45                                                                                             | RD | 046072 | 2E-04  | 1E+01 | 3E+00 | Metal                      | Arsenic                | C                                                                                                        | 6 - 6         | 6.00E+00  | 1/2      | 1.57E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Iron                   | NC                                                                                                       | 47900 - 52000 | 5.20E+04  | 2/2      | --       | --                                                                | --             | --                                   | --                           | 2.37E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Manganese              | NC                                                                                                       | 1040 - 1080   | 1.08E+03  | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.28E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Nickel                 | NC                                                                                                       | 769 - 912     | 9.12E+02  | 2/2      | 9.38E-08 | --                                                                | --             | --                                   | --                           | 3.02E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Thallium               | NC                                                                                                       | 5.1 - 7.1     | 7.10E+00  | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.41E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          | 0.81   | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Vanadium               | NC                                                                                                       | 87.8 - 117    | 1.17E+02  | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.80E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Arsenic                | C                                                                                                        | 2.8 - 2.8     | 2.80E+00  | 1/3      | 7.31E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |    |  |  |  |
| 45                                                                                             | RD | 046074 | 8E-05  | 3E+01 | 1E+01 | Metal                      | Copper                 | NC                                                                                                       | 13.2 - 536    | 5.36E+02  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 3.37E+00             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         | 124.31 | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Iron                   | NC                                                                                                       | 25900 - 55100 | 5.51E+04  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 2.51E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Manganese              | NC                                                                                                       | 438 - 2100    | 2.10E+03  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 2.49E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Mercury                | NC                                                                                                       | 17.5 - 17.5   | 1.75E+01  | 1/3      | --       | --                                                                | --             | --                                   | --                           | 1.10E+01             | 6.8                                                      | 0.0            | 0.0                                  | 93.2                         | 2.28   | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Nickel                 | NC                                                                                                       | 182 - 1080    | 1.08E+03  | 3/3      | 1.11E-07 | --                                                                | --             | --                                   | --                           | 3.58E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Vanadium               | NC                                                                                                       | 36.6 - 180    | 1.80E+02  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 2.78E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       |                            | Zinc                   | NC                                                                                                       | 36.7 - 567    | 5.67E+02  | 3/3      | --       | --                                                                | --             | --                                   | --                           | 1.52E+00             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         | 109.86 | Yes                                 |    |  |  |  |
|                                                                                                |    |        |        |       |       | PAH                        | Benzo(a)pyrene         | C                                                                                                        | 0.04 - 0.04   | 4.00E-02  | 1/3      | 1.07E-06 | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |    |  |  |  |
|                                                                                                | 45 | RD     | 046076 | 2E-04 | 1E+01 | 3E+00                      | Metal                  | Arsenic                                                                                                  | C             | 3.5 - 7.5 | 7.50E+00 | 4/4      | 1.96E-04                                                          | 56.6           | 5.4                                  | 0.0                          | 38.0                 | <1                                                       | --             | --                                   | --                           | --     | 11.1                                | No |  |  |  |
| Iron                                                                                           |    |        |        |       |       |                            |                        | NC                                                                                                       | 35100 - 48700 | 4.80E+04  | 4/4      | --       | --                                                                | --             | --                                   | --                           | 2.18E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |    |  |  |  |
| Manganese                                                                                      |    |        |        |       |       |                            |                        | NC                                                                                                       | 745 - 2440    | 2.22E+03  | 4/4      | --       | --                                                                | --             | --                                   | --                           | 2.63E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |    |  |  |  |
| Nickel                                                                                         |    |        |        |       |       |                            |                        | NC                                                                                                       | 219 - 798     | 7.28E+02  | 4/4      | 7.48E-08 | --                                                                | --             | --                                   | --                           | 2.41E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |    |  |  |  |
| Vanadium                                                                                       |    |        |        |       |       |                            |                        | NC                                                                                                       | 62.5 - 113    | 1.13E+02  | 4/4      | --       | --                                                                | --             | --                                   | --                           | 1.74E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |    |  |  |  |

TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |    |        |       |       |       | Chemicals of Concern (COC) |                | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |               |          |     |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk                                  |      |     |      | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI                                           |      |     |      | Metals                                  |     |
|------------------------------------------------------------------------------------------------|----|--------|-------|-------|-------|----------------------------|----------------|------------------------------------------------------------------------------------------------------|---------------|----------|-----|----------|----------------------------------------------------------------------------------------------------|------|-----|------|----------------------|----------------------------------------------------------------------------------------------------|------|-----|------|-----------------------------------------|-----|
|                                                                                                |    |        |       |       |       |                            |                |                                                                                                      |               |          |     |          | Incidental IngestionDermal ContactInhalation (Releases to Ambient Air)Home-grown Produce Ingestion |      |     |      |                      | Incidental IngestionDermal ContactInhalation (Releases to Ambient Air)Home-grown Produce Ingestion |      |     |      | HPALMaximum Concentration Exceeds HPAL? |     |
|                                                                                                |    |        |       |       |       |                            |                |                                                                                                      |               |          |     |          |                                                                                                    |      |     |      |                      |                                                                                                    |      |     |      |                                         |     |
| 45                                                                                             | RD | 046077 | 2E-04 | 1E+01 | 6E+00 | Metal                      | Arsenic        | C                                                                                                    | 3.5 - 7.7     | 7.70E+00 | 2/7 | 2.01E-04 | 56.6                                                                                               | 5.4  | 0.0 | 38.0 | <1                   | --                                                                                                 | --   | --  | --   | 11.1                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Iron           | NC                                                                                                   | 23600 - 44800 | 4.02E+04 | 7/7 | --       | --                                                                                                 | --   | --  | --   | 1.83E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Manganese      | NC                                                                                                   | 487 - 935     | 9.02E+02 | 7/7 | --       | --                                                                                                 | --   | --  | --   | 1.07E+00             | 44.9                                                                                               | 0.0  | 2.9 | 52.2 | 1431                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Nickel         | NC                                                                                                   | 668 - 2420    | 1.76E+03 | 7/7 | 1.81E-07 | --                                                                                                 | --   | --  | --   | 5.84E+00             | 19.3                                                                                               | 0.0  | 1.0 | 79.6 | *                                       | No  |
| 45                                                                                             | RD | 046079 | 2E-04 | 8E+00 | 2E+00 | Metal                      | Arsenic        | C                                                                                                    | 2.9 - 7       | 7.00E+00 | 2/2 | 1.83E-04 | 56.6                                                                                               | 5.4  | 0.0 | 38.0 | <1                   | --                                                                                                 | --   | --  | --   | 11.1                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Iron           | NC                                                                                                   | 32300 - 44000 | 4.40E+04 | 2/2 | --       | --                                                                                                 | --   | --  | --   | 2.00E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Manganese      | NC                                                                                                   | 473 - 864     | 8.64E+02 | 2/2 | --       | --                                                                                                 | --   | --  | --   | 1.02E+00             | 44.9                                                                                               | 0.0  | 2.9 | 52.2 | 1431                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Nickel         | NC                                                                                                   | 96.3 - 668    | 6.68E+02 | 2/2 | 6.87E-08 | --                                                                                                 | --   | --  | --   | 2.21E+00             | 19.3                                                                                               | 0.0  | 1.0 | 79.6 | *                                       | No  |
|                                                                                                |    |        |       |       |       |                            | Vanadium       | NC                                                                                                   | 39 - 88.3     | 8.83E+01 | 2/2 | --       | --                                                                                                 | --   | --  | --   | 1.36E+00             | 82.9                                                                                               | 0.0  | 0.0 | 17.1 | 117.17                                  | No  |
| 45                                                                                             | RD | 046080 | 3E-07 | 1E+01 | 5E+00 | Metal                      | Iron           | NC                                                                                                   | 30400 - 45400 | 4.54E+04 | 2/2 | --       | --                                                                                                 | --   | --  | --   | 2.07E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Manganese      | NC                                                                                                   | 698 - 939     | 9.39E+02 | 2/2 | --       | --                                                                                                 | --   | --  | --   | 1.11E+00             | 44.9                                                                                               | 0.0  | 2.9 | 52.2 | 1431                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Nickel         | NC                                                                                                   | 1060 - 1490   | 1.49E+03 | 2/2 | 1.53E-07 | --                                                                                                 | --   | --  | --   | 4.93E+00             | 19.3                                                                                               | 0.0  | 1.0 | 79.6 | *                                       | No  |
| 45                                                                                             | RD | 046082 | 4E-04 | 6E+01 | 3E+01 | Metal                      | Antimony       | NC                                                                                                   | 3.4 - 22.3    | 2.23E+01 | 2/3 | --       | --                                                                                                 | --   | --  | --   | 2.18E+00             | 32.7                                                                                               | 0.0  | 0.0 | 67.3 | 9.05                                    | Yes |
|                                                                                                |    |        |       |       |       |                            | Arsenic        | C                                                                                                    | 1.4 - 15.2    | 1.52E+01 | 3/3 | 3.97E-04 | 56.6                                                                                               | 5.4  | 0.0 | 38.0 | <1                   | --                                                                                                 | --   | --  | --   | 11.1                                    | Yes |
|                                                                                                |    |        |       |       |       |                            | Copper         | NC                                                                                                   | 45.9 - 5230   | 5.23E+03 | 3/3 | --       | --                                                                                                 | --   | --  | --   | 3.29E+01             | 5.5                                                                                                | 0.0  | 0.0 | 94.5 | 124.31                                  | Yes |
|                                                                                                |    |        |       |       |       |                            | Iron           | NC                                                                                                   | 40800 - 49900 | 4.99E+04 | 3/3 | --       | --                                                                                                 | --   | --  | --   | 2.27E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Lead           | --                                                                                                   | 3.8 - 4850    | 4.85E+03 | 3/3 | --       | --                                                                                                 | --   | --  | --   | --                   | --                                                                                                 | --   | --  | --   | 8.99                                    | Yes |
|                                                                                                |    |        |       |       |       |                            | Manganese      | NC                                                                                                   | 913 - 1180    | 1.18E+03 | 3/3 | --       | --                                                                                                 | --   | --  | --   | 1.40E+00             | 44.9                                                                                               | 0.0  | 2.9 | 52.2 | 1431                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Mercury        | NC                                                                                                   | 0.13 - 17     | 1.70E+01 | 3/3 | --       | --                                                                                                 | --   | --  | --   | 1.07E+01             | 6.8                                                                                                | 0.0  | 0.0 | 93.2 | 2.28                                    | Yes |
|                                                                                                |    |        |       |       |       |                            | Nickel         | NC                                                                                                   | 142 - 1030    | 1.03E+03 | 3/3 | 1.06E-07 | --                                                                                                 | --   | --  | --   | 3.41E+00             | 19.3                                                                                               | 0.0  | 1.0 | 79.6 | *                                       | No  |
|                                                                                                |    |        |       |       |       |                            | Vanadium       | NC                                                                                                   | 49.4 - 93.9   | 9.39E+01 | 3/3 | --       | --                                                                                                 | --   | --  | --   | 1.45E+00             | 82.9                                                                                               | 0.0  | 0.0 | 17.1 | 117.17                                  | No  |
|                                                                                                |    |        |       |       |       |                            | Zinc           | NC                                                                                                   | 48.9 - 2220   | 2.22E+03 | 3/3 | --       | --                                                                                                 | --   | --  | --   | 5.95E+00             | 1.6                                                                                                | 0.0  | 0.0 | 98.4 | 109.86                                  | Yes |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene | C                                                                                                    | 0.093 - 0.093 | 9.30E-02 | 1/3 | 2.49E-06 | 70.1                                                                                               | 28.8 | 0.0 | 1.1  | --                   | --                                                                                                 | --   | --  | --   | --                                      | --  |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1260   | C/NC                                                                                                 | 1.4 - 1.4     | 1.40E+00 | 1/3 | 6.63E-06 | 66.1                                                                                               | 29.2 | 0.0 | 4.7  | 1.29E+00             | 69.6                                                                                               | 27.3 | 0.0 | 3.1  | --                                      | --  |
| 45                                                                                             | RD | 047074 | 3E-04 | 1E+01 | 6E+00 | Metal                      | Arsenic        | C                                                                                                    | 12 - 12       | 1.20E+01 | 1/1 | 3.13E-04 | 56.6                                                                                               | 5.4  | 0.0 | 38.0 | <1                   | --                                                                                                 | --   | --  | --   | 11.1                                    | Yes |
|                                                                                                |    |        |       |       |       |                            | Copper         | NC                                                                                                   | 176 - 176     | 1.76E+02 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.11E+00             | 5.5                                                                                                | 0.0  | 0.0 | 94.5 | 124.31                                  | Yes |
|                                                                                                |    |        |       |       |       |                            | Iron           | NC                                                                                                   | 38100 - 38100 | 3.81E+04 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.73E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Manganese      | NC                                                                                                   | 5260 - 5260   | 5.26E+03 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 6.24E+00             | 44.9                                                                                               | 0.0  | 2.9 | 52.2 | 1431                                    | Yes |
|                                                                                                |    |        |       |       |       |                            | Vanadium       | NC                                                                                                   | 88.8 - 88.8   | 8.88E+01 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.37E+00             | 82.9                                                                                               | 0.0  | 0.0 | 17.1 | 117.17                                  | No  |
| 45                                                                                             | RD | 047075 | 2E-05 | 1E+01 | 6E+00 | Metal                      | Arsenic        | C                                                                                                    | 0.73 - 0.73   | 7.30E-01 | 1/1 | 1.91E-05 | 56.6                                                                                               | 5.4  | 0.0 | 38.0 | <1                   | --                                                                                                 | --   | --  | --   | 11.1                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Iron           | NC                                                                                                   | 43500 - 43500 | 4.35E+04 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.98E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Nickel         | NC                                                                                                   | 1780 - 1780   | 1.78E+03 | 1/1 | 1.83E-07 | --                                                                                                 | --   | --  | --   | 5.89E+00             | 19.3                                                                                               | 0.0  | 1.0 | 79.6 | *                                       | No  |
| 45                                                                                             | RD | 047076 | 1E-04 | 1E+01 | 5E+00 | Metal                      | Arsenic        | C                                                                                                    | 3.4 - 4.8     | 4.80E+00 | 2/6 | 1.25E-04 | 56.6                                                                                               | 5.4  | 0.0 | 38.0 | <1                   | --                                                                                                 | --   | --  | --   | 11.1                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Iron           | NC                                                                                                   | 13900 - 53500 | 4.42E+04 | 6/6 | --       | --                                                                                                 | --   | --  | --   | 2.01E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Manganese      | NC                                                                                                   | 213 - 1020    | 9.51E+02 | 6/6 | --       | --                                                                                                 | --   | --  | --   | 1.13E+00             | 44.9                                                                                               | 0.0  | 2.9 | 52.2 | 1431                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Mercury        | NC                                                                                                   | 0.1 - 5.4     | 5.40E+00 | 4/6 | --       | --                                                                                                 | --   | --  | --   | 3.39E+00             | 6.8                                                                                                | 0.0  | 0.0 | 93.2 | 2.28                                    | Yes |
|                                                                                                |    |        |       |       |       |                            | Nickel         | NC                                                                                                   | 43.9 - 612    | 4.14E+02 | 6/6 | 4.26E-08 | --                                                                                                 | --   | --  | --   | 1.37E+00             | 19.3                                                                                               | 0.0  | 1.0 | 79.6 | *                                       | No  |
|                                                                                                |    |        |       |       |       |                            | Vanadium       | NC                                                                                                   | 36.5 - 76.8   | 7.20E+01 | 6/6 | --       | --                                                                                                 | --   | --  | --   | 1.11E+00             | 82.9                                                                                               | 0.0  | 0.0 | 17.1 | 117.17                                  | No  |
| 45                                                                                             | RD | 047077 | 2E-04 | 1E+01 | 3E+00 | Metal                      | Arsenic        | C                                                                                                    | 4.7 - 8.6     | 7.72E+00 | 4/6 | 2.02E-04 | 56.6                                                                                               | 5.4  | 0.0 | 38.0 | <1                   | --                                                                                                 | --   | --  | --   | 11.1                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Iron           | NC                                                                                                   | 31100 - 42700 | 4.07E+04 | 6/6 | --       | --                                                                                                 | --   | --  | --   | 1.85E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Manganese      | NC                                                                                                   | 541 - 1270    | 1.09E+03 | 6/6 | --       | --                                                                                                 | --   | --  | --   | 1.29E+00             | 44.9                                                                                               | 0.0  | 2.9 | 52.2 | 1431                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Nickel         | NC                                                                                                   | 34.5 - 1400   | 1.05E+03 | 6/6 | 1.08E-07 | --                                                                                                 | --   | --  | --   | 3.49E+00             | 19.3                                                                                               | 0.0  | 1.0 | 79.6 | *                                       | No  |
|                                                                                                |    |        |       |       |       |                            | Vanadium       | NC                                                                                                   | 27 - 80       | 6.85E+01 | 6/6 | --       | --                                                                                                 | --   | --  | --   | 1.06E+00             | 82.9                                                                                               | 0.0  | 0.0 | 17.1 | 117.17                                  | No  |
| 45                                                                                             | RD | 047086 | 8E-05 | 5E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 3.1 - 3.1     | 3.10E+00 | 1/1 | 8.10E-05 | 56.6                                                                                               | 5.4  | 0.0 | 38.0 | <1                   | --                                                                                                 | --   | --  | --   | 11.1                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Iron           | NC                                                                                                   | 25600 - 25600 | 2.56E+04 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.17E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Manganese      | NC                                                                                                   | 1040 - 1040   | 1.04E+03 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.23E+00             | 44.9                                                                                               | 0.0  | 2.9 | 52.2 | 1431                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Nickel         | NC                                                                                                   | 347 - 347     | 3.47E+02 | 1/1 | 3.57E-08 | --                                                                                                 | --   | --  | --   | 1.15E+00             | 19.3                                                                                               | 0.0  | 1.0 | 79.6 | *                                       | No  |
| 45                                                                                             | RD | 047089 | 1E-04 | 9E+00 | 2E+00 | Metal                      | Arsenic        | C                                                                                                    | 5.4 - 5.4     | 5.40E+00 | 1/1 | 1.41E-04 | 56.6                                                                                               | 5.4  | 0.0 | 38.0 | <1                   | --                                                                                                 | --   | --  | --   | 11.1                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Copper         | NC                                                                                                   | 188 - 188     | 1.88E+02 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.18E+00             | 5.5                                                                                                | 0.0  | 0.0 | 94.5 | 124.31                                  | Yes |
|                                                                                                |    |        |       |       |       |                            | Iron           | NC                                                                                                   | 41100 - 41100 | 4.11E+04 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.87E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Lead           | --                                                                                                   | 1080 - 1080   | 1.08E+03 | 1/1 | --       | --                                                                                                 | --   | --  | --   | --                   | --                                                                                                 | --   | --  | --   | 8.99                                    | Yes |
|                                                                                                |    |        |       |       |       |                            | Manganese      | NC                                                                                                   | 991 - 991     | 9.91E+02 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.18E+00             | 44.9                                                                                               | 0.0  | 2.9 | 52.2 | 1431                                    | No  |
|                                                                                                |    |        |       |       |       |                            | Zinc           | NC                                                                                                   | 401 - 401     | 4.01E+02 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.07E+00             | 1.6                                                                                                | 0.0  | 0.0 | 98.4 | 109.86                                  | Yes |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1260   | C                                                                                                    | 0.75 - 0.75   | 7.50E-01 | 1/1 | 3.55E-06 | 66.1                                                                                               | 29.2 | 0.0 | 4.7  | <1                   | --                                                                                                 | --   | --  | --   | --                                      | --  |
| 45                                                                                             | RD | 047092 | 2E-07 | 7E+00 | 4E+00 | Metal                      | Iron           | NC                                                                                                   | 36400 - 36400 | 3.64E+04 | 1/1 | --       | --                                                                                                 | --   | --  | --   | 1.66E+00             | 93.6                                                                                               | 0.0  | 0.0 | 6.4  | 58000                                   | No  |
|                                                                                                |    |        |       |       |       |                            | Lead           | --                                                                                                   | 187 - 187     | 1.87E+02 | 1/1 | --       | --                                                                                                 | --   | --  | --   | --                   | --                                                                                                 | --   | --  | --   | 8.99                                    | Yes |
|                                                                                                |    |        |       |       |       |                            | Nickel         | NC                                                                                                   | 1110 - 1110   | 1.11E+03 | 1/1 | 1.14E-07 | --                                                                                                 | --   | --  | --   | 3.67E+00             | 19.3                                                                                               | 0.0  | 1.0 | 79.6 | *                                       | No  |



TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |    |             |          |       |          | Chemicals of Concern (COC) |                | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |               |          |          |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |     |
|------------------------------------------------------------------------------------------------|----|-------------|----------|-------|----------|----------------------------|----------------|------------------------------------------------------------------------------------------------------|---------------|----------|----------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|-----|
|                                                                                                |    |             |          |       |          |                            |                |                                                                                                      |               |          |          |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |     |
| 45                                                                                             | RD | 048072      | 1E-04    | 1E+01 | 7E+00    | Metal                      | Arsenic        | C                                                                                                    | 2 - 4.5       | 4.50E+00 | 2/4      | 1.18E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Iron           | NC                                                                                                   | 12200 - 61100 | 6.11E+04 | 4/4      | --       | --                                                                | --             | --                                   | --                           | --                   | 2.78E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | Yes |
|                                                                                                |    |             |          |       |          |                            | Manganese      | NC                                                                                                   | 219 - 1030    | 1.03E+03 | 4/4      | --       | --                                                                | --             | --                                   | --                           | --                   | 1.22E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2   | 1431                                | No  |
|                                                                                                |    |             |          |       |          |                            | Nickel         | NC                                                                                                   | 34.5 - 2400   | 2.20E+03 | 4/4      | 2.27E-07 | --                                                                | --             | --                                   | --                           | --                   | 7.30E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
|                                                                                                |    |             |          |       |          |                            | Vanadium       | NC                                                                                                   | 37.2 - 75.7   | 7.57E+01 | 4/4      | --       | --                                                                | --             | --                                   | --                           | --                   | 1.17E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1   | 117.17                              | No  |
|                                                                                                |    |             |          |       |          | PAH                        | Benzo(a)pyrene | C                                                                                                    | 0.46 - 0.46   | 4.60E-01 | 1/4      | 1.23E-05 | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     | --                                  |     |
| 45                                                                                             | RD | 048075      | 1E-07    | 6E+00 | 3E+00    | Metal                      | Iron           | NC                                                                                                   | 29300 - 29300 | 2.93E+04 | 1/1      | --       | --                                                                | --             | --                                   | --                           | 1.33E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Nickel         | NC                                                                                                   | 868 - 868     | 8.68E+02 | 1/1      | 8.93E-08 | --                                                                | --             | --                                   | --                           | --                   | 2.87E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
| 45                                                                                             | RD | 048076      | 2E-07    | 7E+00 | 4E+00    | Metal                      | Iron           | NC                                                                                                   | 24700 - 24700 | 2.47E+04 | 1/1      | --       | --                                                                | --             | --                                   | --                           | 1.12E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Nickel         | NC                                                                                                   | 1080 - 1080   | 1.08E+03 | 1/1      | 1.11E-07 | --                                                                | --             | --                                   | --                           | --                   | 3.58E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
| 45                                                                                             | RD | 048077      | 3E-05    | 1E+01 | 6E+00    | Metal                      | Arsenic        | C                                                                                                    | 1.3 - 1.3     | 1.30E+00 | 1/1      | 3.40E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Iron           | NC                                                                                                   | 46000 - 46000 | 4.60E+04 | 1/1      | --       | --                                                                | --             | --                                   | --                           | --                   | 2.09E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
|                                                                                                |    |             |          |       |          |                            | Manganese      | NC                                                                                                   | 1080 - 1080   | 1.08E+03 | 1/1      | --       | --                                                                | --             | --                                   | --                           | --                   | 1.28E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2   | 1431                                | No  |
|                                                                                                |    |             |          |       |          |                            | Nickel         | NC                                                                                                   | 1800 - 1800   | 1.80E+03 | 1/1      | 1.85E-07 | --                                                                | --             | --                                   | --                           | --                   | 5.96E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
|                                                                                                |    |             |          |       |          |                            | Vanadium       | NC                                                                                                   | 74.8 - 74.8   | 7.48E+01 | 1/1      | --       | --                                                                | --             | --                                   | --                           | --                   | 1.15E+00                                                 | 82.9           | 0.0                                  | 0.0                          | 17.1   | 117.17                              | No  |
| 45                                                                                             | RD | 048080      | 2E-04    | 8E+01 | 7E+01    | Metal                      | Antimony       | NC                                                                                                   | 29 - 29       | 2.90E+01 | 1/3      | --       | --                                                                | --             | --                                   | --                           | --                   | 2.84E+00                                                 | 32.7           | 0.0                                  | 0.0                          | 67.3   | 9.05                                | Yes |
|                                                                                                |    |             |          |       |          |                            | Arsenic        | C                                                                                                    | 5.7 - 7.8     | 7.80E+00 | 3/3      | 2.04E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Copper         | NC                                                                                                   | 52.3 - 10400  | 1.04E+04 | 3/3      | --       | --                                                                | --             | --                                   | --                           | 6.53E+01             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         | 124.31 | Yes                                 |     |
|                                                                                                |    |             |          |       |          |                            | Iron           | NC                                                                                                   | 32400 - 40300 | 4.03E+04 | 3/3      | --       | --                                                                | --             | --                                   | --                           | 1.83E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Lead           | --                                                                                                   | 5.9 - 1900    | 1.90E+03 | 3/3      | --       | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | 8.99   | Yes                                 |     |
|                                                                                                |    |             |          |       |          | Nickel                     | NC             | 323 - 416                                                                                            | 4.16E+02      | 3/3      | 4.28E-08 | --       | --                                                                | --             | --                                   | --                           | 1.38E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |     |
|                                                                                                |    |             |          |       |          | Vanadium                   | NC             | 65.8 - 74                                                                                            | 7.40E+01      | 3/3      | --       | --       | --                                                                | --             | --                                   | --                           | 1.14E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |     |
|                                                                                                |    |             |          |       |          | Zinc                       | NC             | 59.5 - 784                                                                                           | 7.84E+02      | 3/3      | --       | --       | --                                                                | --             | --                                   | --                           | 2.10E+00             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         | 109.86 | Yes                                 |     |
|                                                                                                |    |             |          |       |          | Pest/PCB                   | Aroclor-1260   | C/NC                                                                                                 | 1.4 - 1.4     | 1.40E+00 | 1/3      | 6.63E-06 | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | 1.29E+00             | 69.6                                                     | 27.3           | 0.0                                  | 3.1                          | --     | --                                  |     |
|                                                                                                |    |             |          |       |          | Metal                      | Arsenic        | C                                                                                                    | 6.3 - 8.5     | 8.50E+00 | 3/3      | 2.22E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Iron           | NC                                                                                                   | 45300 - 59300 | 5.93E+04 | 3/3      | --       | --                                                                | --             | --                                   | --                           | --                   | 2.70E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | Yes |
|                                                                                                |    |             |          |       |          |                            | Manganese      | NC                                                                                                   | 791 - 1340    | 1.34E+03 | 3/3      | --       | --                                                                | --             | --                                   | --                           | --                   | 1.59E+00                                                 | 44.9           | 0.0                                  | 2.9                          | 52.2   | 1431                                | No  |
| Nickel                                                                                         | NC | 233 - 639   | 6.39E+02 | 3/3   | 6.57E-08 |                            | --             | --                                                                                                   | --            | --       | --       | 2.12E+00 | 19.3                                                              | 0.0            | 1.0                                  | 79.6                         | *                    | No                                                       |                |                                      |                              |        |                                     |     |
| Vanadium                                                                                       | NC | 77 - 108    | 1.08E+02 | 3/3   | --       |                            | --             | --                                                                                                   | --            | --       | --       | 1.67E+00 | 82.9                                                              | 0.0            | 0.0                                  | 17.1                         | 117.17               | No                                                       |                |                                      |                              |        |                                     |     |
| 45                                                                                             | RD | 049075      | 4E-05    | 8E+00 | 3E+00    | Metal                      | Arsenic        | C                                                                                                    | 1.6 - 1.6     | 1.60E+00 | 1/2      | 4.18E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Iron           | NC                                                                                                   | 33800 - 47200 | 4.72E+04 | 2/2      | --       | --                                                                | --             | --                                   | --                           | 2.15E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Manganese      | NC                                                                                                   | 1060 - 2380   | 2.38E+03 | 2/2      | --       | --                                                                | --             | --                                   | --                           | 2.82E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |     |
|                                                                                                |    |             |          |       |          |                            | Vanadium       | NC                                                                                                   | 70.5 - 85     | 8.50E+01 | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.31E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Arsenic        | C                                                                                                    | 4 - 9.6       | 9.60E+00 | 2/2      | 2.51E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
| 45                                                                                             | RD | 049076      | 3E-04    | 8E+00 | 2E+00    | Metal                      | Iron           | NC                                                                                                   | 45200 - 46900 | 4.69E+04 | 2/2      | --       | --                                                                | --             | --                                   | --                           | 2.14E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Nickel         | NC                                                                                                   | 509 - 560     | 5.60E+02 | 2/2      | 5.76E-08 | --                                                                | --             | --                                   | --                           | --                   | 1.85E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
|                                                                                                |    |             |          |       |          |                            | Vanadium       | NC                                                                                                   | 76.9 - 78.8   | 7.88E+01 | 2/2      | --       | --                                                                | --             | --                                   | --                           | 1.22E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Iron           | NC                                                                                                   | 39100 - 39100 | 3.91E+04 | 1/1      | --       | --                                                                | --             | --                                   | --                           | 1.78E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Nickel         | NC                                                                                                   | 1430 - 1430   | 1.43E+03 | 1/1      | 1.47E-07 | --                                                                | --             | --                                   | --                           | --                   | 4.73E+00                                                 | 19.3           | 0.0                                  | 1.0                          | 79.6   | *                                   | No  |
| 45                                                                                             | RD | 049079      | 3E-04    | 2E+01 | 5E+00    | Metal                      | Arsenic        | C                                                                                                    | 7 - 10.9      | 1.09E+01 | 2/3      | 2.85E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Cadmium        | NC                                                                                                   | 4 - 4         | 4.00E+00 | 1/3      | 6.78E-09 | --                                                                | --             | --                                   | --                           | --                   | 1.16E+00                                                 | 8.8            | 0.0                                  | 0.0                          | 91.1   | 3.14                                | Yes |
|                                                                                                |    |             |          |       |          |                            | Copper         | NC                                                                                                   | 12.1 - 619    | 6.19E+02 | 3/3      | --       | --                                                                | --             | --                                   | --                           | 3.89E+00             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         | 124.31 | Yes                                 |     |
|                                                                                                |    |             |          |       |          |                            | Iron           | NC                                                                                                   | 28400 - 41800 | 4.18E+04 | 3/3      | --       | --                                                                | --             | --                                   | --                           | 1.90E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |     |
|                                                                                                |    |             |          |       |          |                            | Lead           | --                                                                                                   | 2 - 1070      | 1.07E+03 | 3/3      | --       | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | 8.99   | Yes                                 |     |
|                                                                                                |    |             |          |       |          | Manganese                  | NC             | 668 - 849                                                                                            | 8.49E+02      | 3/3      | --       | --       | --                                                                | --             | --                                   | --                           | 1.01E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |     |
|                                                                                                |    |             |          |       |          | Nickel                     | NC             | 90.6 - 1430                                                                                          | 1.43E+03      | 3/3      | 1.47E-07 | --       | --                                                                | --             | --                                   | --                           | 4.73E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |     |
|                                                                                                |    |             |          |       |          | Vanadium                   | NC             | 21.9 - 76.4                                                                                          | 7.64E+01      | 3/3      | --       | --       | --                                                                | --             | --                                   | --                           | 1.18E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |     |
|                                                                                                |    |             |          |       |          | Pest/PCB                   | Aroclor-1260   | C/NC                                                                                                 | 3.3 - 3.3     | 3.30E+00 | 1/3      | 1.56E-05 | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | 3.03E+00             | 69.6                                                     | 27.3           | 0.0                                  | 3.1                          | --     | --                                  |     |
|                                                                                                |    |             |          |       |          | Metal                      | Iron           | NC                                                                                                   | 44600 - 52000 | 5.20E+04 | 4/4      | --       | --                                                                | --             | --                                   | --                           | --                   | 2.37E+00                                                 | 93.6           | 0.0                                  | 0.0                          | 6.4    | 58000                               | No  |
| Manganese                                                                                      | NC | 597 - 1080  | 1.08E+03 | 4/4   | --       |                            | --             | --                                                                                                   | --            | --       | --       | 1.28E+00 | 44.9                                                              | 0.0            | 2.9                                  | 52.2                         | 1431                 | No                                                       |                |                                      |                              |        |                                     |     |
| Nickel                                                                                         | NC | 1310 - 1820 | 1.78E+03 | 4/4   | 1.83E-07 |                            | --             | --                                                                                                   | --            | --       | --       | 5.90E+00 | 19.3                                                              | 0.0            | 1.0                                  | 79.6                         | *                    | No                                                       |                |                                      |                              |        |                                     |     |
| Vanadium                                                                                       | NC | 42.4 - 67.2 | 6.50E+01 | 4/4   | --       |                            | --             | --                                                                                                   | --            | --       | --       | 1.00E+00 | 82.9                                                              | 0.0            | 0.0                                  | 17.1                         | 117.17               | No                                                       |                |                                      |                              |        |                                     |     |
| Arsenic                                                                                        | C  | 3.4 - 11.3  | 1.13E+01 | 3/4   | 2.95E-04 |                            | 56.6           | 5.4                                                                                                  | 0.0           | 38.0     | <1       | --       | --                                                                | --             | --                                   | 11.1                         | Yes                  |                                                          |                |                                      |                              |        |                                     |     |
| 45                                                                                             | RD | 049088      | 3E-04    | 1E+01 | 5E+00    | Metal                      | Iron           | NC                                                                                                   | 33300 - 43800 | 4.27E+04 | 4/4      | --       | --                                                                | --             | --                                   | --                           | 1.9                  |                                                          |                |                                      |                              |        |                                     |     |

TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                   | Basis for COC |               |          |     |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|-------------------|---------------|---------------|----------|-----|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                     |               |             |                       |              |                   |                            |                   |               |               |          |     |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| 45                  | RD            | 049091      | 3E-04                 | 1E+01        | 6E+00             | Metal                      | Antimony          | NC            | 5.3 - 15.1    | 1.51E+01 | 3/4 | --       | --                                                                | --             | --                                   | 1.48E+00                     | 32.7                 | 0.0                                                      | 0.0            | 67.3                                 | 9.05                         | Yes    |                                     |
|                     |               |             |                       |              |                   |                            | Arsenic           | C             | 1.2 - 9.9     | 9.90E+00 | 4/4 | 2.59E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron              | NC            | 38200 - 48100 | 4.75E+04 | 4/4 | --       | --                                                                | --             | --                                   | 2.16E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 139 - 1960    | 1.78E+03 | 4/4 | 1.83E-07 | --                                                                | --             | --                                   | 5.90E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium          | NC            | 19.8 - 73.8   | 7.38E+01 | 4/4 | --       | --                                                                | --             | --                                   | 1.14E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 050071      | 2E-07                 | 1E+01        | 4E+00             | Metal                      | Iron              | NC            | 47000 - 54200 | 5.42E+04 | 2/2 | --       | --                                                                | --             | --                                   | 2.47E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese         | NC            | 1270 - 1510   | 1.51E+03 | 2/2 | --       | --                                                                | --             | --                                   | 1.79E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | Yes    |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 926 - 1270    | 1.27E+03 | 2/2 | 1.31E-07 | --                                                                | --             | --                                   | 4.20E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium          | NC            | 66.3 - 89.1   | 8.91E+01 | 2/2 | --       | --                                                                | --             | --                                   | 1.37E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 050074      | 2E-07                 | 8E+00        | 3E+00             | Metal                      | Iron              | NC            | 45400 - 45400 | 4.54E+04 | 1/1 | --       | --                                                                | --             | --                                   | 2.07E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese         | NC            | 956 - 956     | 9.56E+02 | 1/1 | --       | --                                                                | --             | --                                   | 1.13E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 835 - 835     | 8.35E+02 | 1/1 | 8.59E-08 | --                                                                | --             | --                                   | 2.76E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium          | NC            | 66.4 - 66.4   | 6.64E+01 | 1/1 | --       | --                                                                | --             | --                                   | 1.02E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 050077      | 3E-04                 | 1E+01        | 5E+00             | Metal                      | Arsenic           | C             | 5.7 - 9.7     | 9.70E+00 | 2/3 | 2.53E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron              | NC            | 12500 - 39600 | 3.96E+04 | 3/3 | --       | --                                                                | --             | --                                   | 1.80E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 344 - 1550    | 1.55E+03 | 3/3 | 1.59E-07 | --                                                                | --             | --                                   | 5.13E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium          | NC            | 12.1 - 121    | 1.21E+02 | 3/3 | --       | --                                                                | --             | --                                   | 1.87E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | Yes    |                                     |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260      | C/NC          | 1.1 - 1.1     | 1.10E+00 | 1/3 | 5.21E-06 | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | 1.01E+00             | 69.6                                                     | 27.3           | 0.0                                  | 3.1                          | --     | --                                  |
| 45                  | RD            | 050080      | 4E-04                 | 1E+01        | 5E+00             | Metal                      | Arsenic           | C/NC          | 1.4 - 16.7    | 1.67E+01 | 3/3 | 4.36E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.07E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         | 11.1   | Yes                                 |
|                     |               |             |                       |              |                   |                            | Iron              | NC            | 41300 - 62400 | 6.24E+04 | 3/3 | --       | --                                                                | --             | --                                   | 2.84E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | Yes    |                                     |
|                     |               |             |                       |              |                   |                            | Manganese         | NC            | 741 - 931     | 9.31E+02 | 3/3 | --       | --                                                                | --             | --                                   | 1.10E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 284 - 1590    | 1.59E+03 | 3/3 | 1.64E-07 | --                                                                | --             | --                                   | 5.26E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium          | NC            | 46.7 - 89     | 8.90E+01 | 3/3 | --       | --                                                                | --             | --                                   | 1.37E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene    | C             | 0.04 - 0.04   | 4.00E-02 | 1/3 | 1.07E-06 | 70.1                                                              | 28.8           | 0.0                                  | 1.1                          | --                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 45                  | RD            | 050083      | 3E-08                 | 7E+00        | 3E+00             | Metal                      | Iron              | NC            | 38300 - 38300 | 3.83E+04 | 1/1 | --       | --                                                                | --             | --                                   | 1.74E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Mercury           | NC            | 2.3 - 2.3     | 2.30E+00 | 1/1 | --       | --                                                                | --             | --                                   | 1.45E+00                     | 6.8                  | 0.0                                                      | 0.0            | 93.2                                 | 2.28                         | Yes    |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium          | NC            | 114 - 114     | 1.14E+02 | 1/1 | --       | --                                                                | --             | --                                   | 1.76E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |
| 45                  | RD            | 050084      | 2E-04                 | 1E+01        | 6E+00             | Metal                      | Arsenic           | C             | 6 - 6         | 6.00E+00 | 1/1 | 1.57E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron              | NC            | 49900 - 49900 | 4.99E+04 | 1/1 | --       | --                                                                | --             | --                                   | 2.27E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese         | NC            | 845 - 845     | 8.45E+02 | 1/1 | --       | --                                                                | --             | --                                   | 1.00E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 1850 - 1850   | 1.85E+03 | 1/1 | 1.90E-07 | --                                                                | --             | --                                   | 6.12E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 050086      | 1E-04                 | 6E+00        | 2E+00             | Metal                      | Arsenic           | C             | 3.8 - 3.8     | 3.80E+00 | 1/1 | 9.93E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron              | NC            | 32500 - 32500 | 3.25E+04 | 1/1 | --       | --                                                                | --             | --                                   | 1.48E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 660 - 660     | 6.60E+02 | 1/1 | 6.79E-08 | --                                                                | --             | --                                   | 2.18E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   | SVOC                       | Pentachlorophenol | C             | 10 - 10       | 1.00E+01 | 1/1 | 3.85E-06 | 48.8                                                              | 38.5           | 0.0                                  | 12.6                         | <1                   | --                                                       | --             | --                                   | --                           | --     |                                     |
| 45                  | RD            | 050088      | 3E-07                 | 9E+00        | 6E+00             | Metal                      | Iron              | NC            | 43400 - 43400 | 4.34E+04 | 1/1 | --       | --                                                                | --             | --                                   | 1.98E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 1770 - 1770   | 1.77E+03 | 1/1 | 1.82E-07 | --                                                                | --             | --                                   | 5.86E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 051072      | 3E-05                 | 8E+00        | 4E+00             | Metal                      | Arsenic           | C             | 1.1 - 1.1     | 1.10E+00 | 1/1 | 2.87E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron              | NC            | 40600 - 40600 | 4.06E+04 | 1/1 | --       | --                                                                | --             | --                                   | 1.85E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 1130 - 1130   | 1.13E+03 | 1/1 | 1.16E-07 | --                                                                | --             | --                                   | 3.74E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 051076      | 2E-07                 | 8E+00        | 4E+00             | Metal                      | Iron              | NC            | 38000 - 38000 | 3.80E+04 | 1/1 | --       | --                                                                | --             | --                                   | 1.73E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 1100 - 1100   | 1.10E+03 | 1/1 | 1.13E-07 | --                                                                | --             | --                                   | 3.64E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 051086      | 2E-07                 | 8E+00        | 4E+00             | Metal                      | Iron              | NC            | 38300 - 38300 | 3.83E+04 | 1/1 | --       | --                                                                | --             | --                                   | 1.74E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese         | NC            | 909 - 909     | 9.09E+02 | 1/1 | --       | --                                                                | --             | --                                   | 1.08E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 1190 - 1190   | 1.19E+03 | 1/1 | 1.22E-07 | --                                                                | --             | --                                   | 3.94E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 052071      | 4E-07                 | 1E+01        | 9E+00             | Metal                      | Iron              | NC            | 45800 - 48600 | 4.86E+04 | 2/2 | --       | --                                                                | --             | --                                   | 2.21E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese         | NC            | 770 - 902     | 9.02E+02 | 2/2 | --       | --                                                                | --             | --                                   | 1.07E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 2420 - 2690   | 2.69E+03 | 2/2 | 2.77E-07 | --                                                                | --             | --                                   | 8.90E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
| 45                  | RD            | 052075      | 9E-05                 | 2E+01        | 6E+00             | Metal                      | Arsenic           | C             | 1.1 - 3.4     | 3.40E+00 | 2/3 | 8.88E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron              | NC            | 41600 - 55400 | 5.54E+04 | 3/3 | --       | --                                                                | --             | --                                   | 2.52E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese         | NC            | 690 - 3370    | 3.37E+03 | 3/3 | --       | --                                                                | --             | --                                   | 4.00E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | Yes    |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 297 - 1880    | 1.88E+03 | 3/3 | 1.93E-07 | --                                                                | --             | --                                   | 6.22E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium          | NC            | 34.2 - 121    | 1.21E+02 | 3/3 | --       | --                                                                | --             | --                                   | 1.87E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | Yes    |                                     |
| 45                  | RD            | 052082      | 2E-04                 | 1E+01        | 3E+00             | Metal                      | Arsenic           | C             | 8.5 - 8.5     | 8.50E+00 | 1/1 | 2.22E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |
|                     |               |             |                       |              |                   |                            | Iron              | NC            | 44200 - 51800 | 5.10E+04 | 4/4 | --       | --                                                                | --             | --                                   | 2.32E+00                     | 93.6                 | 0.0                                                      | 0.0            | 6.4                                  | 58000                        | No     |                                     |
|                     |               |             |                       |              |                   |                            | Manganese         | NC            | 819 - 1080    | 1.08E+03 | 4/4 | --       | --                                                                | --             | --                                   | 1.28E+00                     | 44.9                 | 0.0                                                      | 2.9            | 52.2                                 | 1431                         | No     |                                     |
|                     |               |             |                       |              |                   |                            | Nickel            | NC            | 852 - 1060    | 1.03E+03 | 4/4 | 1.06E-07 | --                                                                | --             | --                                   | 3.41E+00                     | 19.3                 | 0.0                                                      | 1.0            | 79.6                                 | *                            | No     |                                     |
|                     |               |             |                       |              |                   |                            | Vanadium          | NC            | 59.9 - 99.9   | 9.70E+01 | 4/4 | --       | --                                                                | --             | --                                   | 1.50E+00                     | 82.9                 | 0.0                                                      | 0.0            | 17.1                                 | 117.17                       | No     |                                     |

TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block<br>Planned Reuse<br>Grid Number<br>Total RME Cancer Risk<br>Total RME HI<br>RME Segregated HI |    |        |       |       |       | Chemicals of Concern (COC) |                            | Basis for COC<br>Range of Detected Concentrations<br>RME EPC<br>Detection Frequency<br>Chemical-Specific Cancer Risk |               |          |     |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |  |  |  |  |
|-------------------------------------------------------------------------------------------------------------------|----|--------|-------|-------|-------|----------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------|---------------|----------|-----|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|--|--|--|--|
|                                                                                                                   |    |        |       |       |       |                            |                            |                                                                                                                      |               |          |     |          |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            |                            |                                                                                                                      |               |          |     |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |  |  |  |  |
| 45                                                                                                                | RD | 052083 | 4E-04 | 3E+01 | 2E+01 | Metal                      | Arsenic                    | C/NC                                                                                                                 | 16.4 - 16.4   | 1.64E+01 | 1/1 | 4.28E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | 1.05E+00             | 66.8                                                     | 5.6            | 0.1                                  | 27.5                         | 11.1   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Copper                     | NC                                                                                                                   | 3400 - 3400   | 3.40E+03 | 1/1 | --       | --                                                                | --             | --                                   | --                           | 2.14E+01             | 5.5                                                      | 0.0            | 0.0                                  | 94.5                         | 124.31 | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Lead                       | --                                                                                                                   | 367 - 367     | 3.67E+02 | 1/1 | --       | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | 8.99   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Mercury                    | NC                                                                                                                   | 10 - 10       | 1.00E+01 | 1/1 | --       | --                                                                | --             | --                                   | --                           | 6.28E+00             | 6.8                                                      | 0.0            | 0.0                                  | 93.2                         | 2.28   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Zinc                       | NC                                                                                                                   | 582 - 582     | 5.82E+02 | 1/1 | --       | --                                                                | --             | --                                   | --                           | 1.56E+00             | 1.6                                                      | 0.0            | 0.0                                  | 98.4                         | 109.86 | Yes                                 |  |  |  |  |
| 45                                                                                                                | RD | 052085 | 5E-07 | 1E+01 | 5E+00 | Metal                      | Iron                       | NC                                                                                                                   | 26300 - 39500 | 3.90E+04 | 4/4 | --       | --                                                                | --             | --                                   | --                           | 1.78E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Manganese                  | NC                                                                                                                   | 373 - 1590    | 1.59E+03 | 4/4 | --       | --                                                                | --             | --                                   | --                           | 1.89E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                     | NC                                                                                                                   | 216 - 1370    | 1.37E+03 | 4/4 | 1.41E-07 | --                                                                | --             | --                                   | --                           | 4.53E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Vanadium                   | NC                                                                                                                   | 49.1 - 75.2   | 7.52E+01 | 4/4 | --       | --                                                                | --             | --                                   | --                           | 1.16E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |  |  |  |  |
| 45                                                                                                                | RD | 053080 | 2E-04 | 5E+00 | 2E+00 | Metal                      | Arsenic                    | C                                                                                                                    | 6.6 - 6.6     | 6.60E+00 | 1/1 | 1.72E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Iron                       | NC                                                                                                                   | 39100 - 39100 | 3.91E+04 | 1/1 | --       | --                                                                | --             | --                                   | --                           | 1.78E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Manganese                  | NC                                                                                                                   | 972 - 972     | 9.72E+02 | 1/1 | --       | --                                                                | --             | --                                   | --                           | 1.15E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |  |  |  |  |
| 45                                                                                                                | RD | 053081 | 3E-04 | 1E+01 | 5E+00 | Metal                      | Arsenic                    | C                                                                                                                    | 12.6 - 12.6   | 1.26E+01 | 1/1 | 3.29E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Cadmium                    | NC                                                                                                                   | 11.3 - 11.3   | 1.13E+01 | 1/4 | 1.92E-08 | --                                                                | --             | --                                   | --                           | 3.27E+00             | 8.8                                                      | 0.0            | 0.0                                  | 91.1                         | 3.14   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Iron                       | NC                                                                                                                   | 37000 - 46500 | 4.65E+04 | 4/4 | --       | --                                                                | --             | --                                   | --                           | 2.12E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                     | NC                                                                                                                   | 435 - 1600    | 1.57E+03 | 4/4 | 1.62E-07 | --                                                                | --             | --                                   | --                           | 5.21E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |  |  |  |  |
| 45                                                                                                                | RD | 053082 | 2E-07 | 6E+00 | 2E+00 | Metal                      | Iron                       | NC                                                                                                                   | 37100 - 37100 | 3.71E+04 | 1/1 | --       | --                                                                | --             | --                                   | --                           | 1.69E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                     | NC                                                                                                                   | 420 - 420     | 4.20E+02 | 1/1 | 4.32E-08 | --                                                                | --             | --                                   | --                           | 1.39E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Vanadium                   | NC                                                                                                                   | 82.6 - 82.6   | 8.26E+01 | 1/1 | --       | --                                                                | --             | --                                   | --                           | 1.27E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |  |  |  |  |
| 45                                                                                                                | RD | 053083 | 9E-05 | 9E+00 | 2E+00 | Metal                      | Arsenic                    | C                                                                                                                    | 1.9 - 3.3     | 3.30E+00 | 2/2 | 8.62E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Iron                       | NC                                                                                                                   | 33400 - 39200 | 3.92E+04 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.78E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Manganese                  | NC                                                                                                                   | 716 - 869     | 8.69E+02 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.03E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                     | NC                                                                                                                   | 527 - 612     | 6.12E+02 | 2/2 | 6.29E-08 | --                                                                | --             | --                                   | --                           | 2.03E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Thallium                   | NC                                                                                                                   | 5.5 - 5.5     | 5.50E+00 | 1/2 | --       | --                                                                | --             | --                                   | --                           | 1.09E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          | 0.81   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Vanadium                   | NC                                                                                                                   | 72.8 - 75.7   | 7.57E+01 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.17E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |  |  |  |  |
| 45                                                                                                                | RD | 053085 | 1E-04 | 1E+01 | 6E+00 | Metal                      | Arsenic                    | C                                                                                                                    | 1.5 - 5       | 4.51E+00 | 4/4 | 1.18E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Iron                       | NC                                                                                                                   | 21600 - 42300 | 4.23E+04 | 4/4 | --       | --                                                                | --             | --                                   | --                           | 1.93E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Manganese                  | NC                                                                                                                   | 374 - 1670    | 1.52E+03 | 4/4 | --       | --                                                                | --             | --                                   | --                           | 1.80E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                     | NC                                                                                                                   | 25.2 - 1910   | 1.84E+03 | 4/4 | 1.90E-07 | --                                                                | --             | --                                   | --                           | 6.10E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       | SVOC                       | Bis(2-ethylhexyl)phthalate | C                                                                                                                    | 3.6 - 3.6     | 3.60E+00 | 1/4 | 3.15E-06 | 2.5                                                               | 0.8            | 0.0                                  | 96.7                         | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |  |  |  |  |
| 45                                                                                                                | RD | 054071 | 4E-07 | 1E+01 | 7E+00 | Metal                      | Iron                       | NC                                                                                                                   | 52500 - 53800 | 5.38E+04 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 2.45E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Manganese                  | NC                                                                                                                   | 982 - 1200    | 1.20E+03 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.42E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                     | NC                                                                                                                   | 93.9 - 2260   | 2.26E+03 | 2/2 | 2.32E-07 | --                                                                | --             | --                                   | --                           | 7.48E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Vanadium                   | NC                                                                                                                   | 32.8 - 109    | 1.09E+02 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.68E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |  |  |  |  |
| 45                                                                                                                | RD | 054074 | 1E-04 | 1E+01 | 3E+00 | Metal                      | Arsenic                    | C                                                                                                                    | 3.9 - 5.3     | 5.30E+00 | 2/3 | 1.38E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Iron                       | NC                                                                                                                   | 26200 - 76500 | 7.65E+04 | 3/3 | --       | --                                                                | --             | --                                   | --                           | 3.48E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Lead                       | --                                                                                                                   | 3.5 - 597     | 5.97E+02 | 3/3 | --       | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   | --                           | 8.99   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Manganese                  | NC                                                                                                                   | 368 - 1540    | 1.54E+03 | 3/3 | --       | --                                                                | --             | --                                   | --                           | 1.83E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       | Pest/PCB                   | Aroclor-1260               | C                                                                                                                    | 0.32 - 0.32   | 3.20E-01 | 1/3 | 1.52E-06 | 66.1                                                              | 29.2           | 0.0                                  | 4.7                          | <1                   | --                                                       | --             | --                                   | --                           | --     | --                                  |  |  |  |  |
| 45                                                                                                                | RD | 054075 | 1E-04 | 1E+01 | 3E+00 | Metal                      | Arsenic                    | C                                                                                                                    | 4.2 - 5.7     | 5.70E+00 | 2/2 | 1.49E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Iron                       | NC                                                                                                                   | 33400 - 40500 | 4.05E+04 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.84E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Manganese                  | NC                                                                                                                   | 680 - 2410    | 2.41E+03 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 2.86E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                     | NC                                                                                                                   | 130 - 850     | 8.50E+02 | 2/2 | 8.74E-08 | --                                                                | --             | --                                   | --                           | 2.81E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Vanadium                   | NC                                                                                                                   | 70.1 - 78.6   | 7.86E+01 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.21E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |  |  |  |  |
| 45                                                                                                                | RD | 054077 | 5E-05 | 1E+01 | 4E+00 | Metal                      | Arsenic                    | C                                                                                                                    | 0.68 - 2      | 2.00E+00 | 2/2 | 5.22E-05 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Iron                       | NC                                                                                                                   | 38200 - 42000 | 4.20E+04 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.91E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Manganese                  | NC                                                                                                                   | 797 - 1060    | 1.06E+03 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.26E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                     | NC                                                                                                                   | 887 - 1080    | 1.08E+03 | 2/2 | 1.11E-07 | --                                                                | --             | --                                   | --                           | 3.58E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Thallium                   | NC                                                                                                                   | 2.8 - 6.8     | 6.80E+00 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.35E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          | 0.81   | Yes                                 |  |  |  |  |
| 45                                                                                                                | RD | 054079 | 1E-04 | 1E+01 | 4E+00 | Metal                      | Arsenic                    | C                                                                                                                    | 1.6 - 4.8     | 4.80E+00 | 2/2 | 1.25E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Iron                       | NC                                                                                                                   | 38800 - 40000 | 4.00E+04 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.82E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                     | NC                                                                                                                   | 628 - 1060    | 1.06E+03 | 2/2 | 1.09E-07 | --                                                                | --             | --                                   | --                           | 3.51E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Thallium                   | NC                                                                                                                   | 5 - 5.9       | 5.90E+00 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.17E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          | 0.81   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Vanadium                   | NC                                                                                                                   | 50.5 - 73.4   | 7.34E+01 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.13E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |  |  |  |  |
| 45                                                                                                                | RD | 054081 | 1E-04 | 1E+01 | 3E+00 | Metal                      | Arsenic                    | C                                                                                                                    | 1.6 - 4.1     | 4.10E+00 | 2/2 | 1.07E-04 | 56.6                                                              | 5.4            | 0.0                                  | 38.0                         | <1                   | --                                                       | --             | --                                   | --                           | 11.1   | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Iron                       | NC                                                                                                                   | 34800 - 36100 | 3.61E+04 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.64E+00             | 93.6                                                     | 0.0            | 0.0                                  | 6.4                          | 58000  | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Manganese                  | NC                                                                                                                   | 741 - 1890    | 1.89E+03 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 2.24E+00             | 44.9                                                     | 0.0            | 2.9                                  | 52.2                         | 1431   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Nickel                     | NC                                                                                                                   | 442 - 820     | 8.20E+02 | 2/2 | 8.43E-08 | --                                                                | --             | --                                   | --                           | 2.71E+00             | 19.3                                                     | 0.0            | 1.0                                  | 79.6                         | *      | No                                  |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Thallium                   | NC                                                                                                                   | 6.6 - 6.6     | 6.60E+00 | 1/2 | --       | --                                                                | --             | --                                   | --                           | 1.31E+00             | 97.3                                                     | 0.0            | 0.0                                  | 2.7                          | 0.81   | Yes                                 |  |  |  |  |
|                                                                                                                   |    |        |       |       |       |                            | Vanadium                   | NC                                                                                                                   | 52.7 - 76     | 7.60E+01 | 2/2 | --       | --                                                                | --             | --                                   | --                           | 1.17E+00             | 82.9                                                     | 0.0            | 0.0                                  | 17.1                         | 117.17 | No                                  |  |  |  |  |

TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |    |        |       |       |       | Chemicals of Concern (COC) |                      | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |               |          |       |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |     |      | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |     |                              |                                      | Metals |                              |                                     |  |
|------------------------------------------------------------------------------------------------|----|--------|-------|-------|-------|----------------------------|----------------------|------------------------------------------------------------------------------------------------------|---------------|----------|-------|----------|-------------------------------------------------------------------|----------------|-----|------|----------------------|----------------------------------------------------------|-----|------------------------------|--------------------------------------|--------|------------------------------|-------------------------------------|--|
|                                                                                                |    |        |       |       |       |                            |                      |                                                                                                      |               |          |       |          |                                                                   |                |     |      |                      | Inhalation (Releases to Ambient Air)                     |     | Home-grown Produce Ingestion | Inhalation (Releases to Ambient Air) |        | Home-grown Produce Ingestion | Maximum Concentration Exceeds HPAL? |  |
|                                                                                                |    |        |       |       |       |                            |                      |                                                                                                      |               |          |       |          | Incidental Ingestion                                              | Dermal Contact |     |      |                      |                                                          |     |                              |                                      |        |                              | HPAL                                |  |
| 45                                                                                             | RD | 055073 | 6E-05 | 1E+01 | 6E+00 | Metal                      | Arsenic              | C                                                                                                    | 2.1 - 2.1     | 2.10E+00 | 1/2   | 5.49E-05 | 56.6                                                              | 5.4            | 0.0 | 38.0 | <1                   | --                                                       | --  | --                           | --                                   | 11.1   | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Iron                 | NC                                                                                                   | 47100 - 57000 | 5.70E+04 | 2/2   | --       | --                                                                | --             | --  | --   | 2.60E+00             | 93.6                                                     | 0.0 | 0.0                          | 6.4                                  | 58000  | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Manganese            | NC                                                                                                   | 942 - 1710    | 1.71E+03 | 2/2   | --       | --                                                                | --             | --  | --   | 2.03E+00             | 44.9                                                     | 0.0 | 2.9                          | 52.2                                 | 1431   | Yes                          |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Nickel               | NC                                                                                                   | 421 - 1730    | 1.73E+03 | 2/2   | 1.78E-07 | --                                                                | --             | --  | --   | 5.73E+00             | 19.3                                                     | 0.0 | 1.0                          | 79.6                                 | *      | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Vanadium             | NC                                                                                                   | 41.4 - 100    | 1.00E+02 | 2/2   | --       | --                                                                | --             | --  | --   | 1.54E+00             | 82.9                                                     | 0.0 | 0.0                          | 17.1                                 | 117.17 | No                           |                                     |  |
| 45                                                                                             | RD | 055078 | 1E-04 | 1E+01 | 5E+00 | Metal                      | Arsenic              | C                                                                                                    | 5 - 5.5       | 5.50E+00 | 2/4   | 1.44E-04 | 56.6                                                              | 5.4            | 0.0 | 38.0 | <1                   | --                                                       | --  | --                           | --                                   | 11.1   | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Iron                 | NC                                                                                                   | 38400 - 43700 | 4.37E+04 | 4/4   | --       | --                                                                | --             | --  | --   | 1.99E+00             | 93.6                                                     | 0.0 | 0.0                          | 6.4                                  | 58000  | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Nickel               | NC                                                                                                   | 428 - 1540    | 1.48E+03 | 4/4   | 1.52E-07 | --                                                                | --             | --  | --   | 4.88E+00             | 19.3                                                     | 0.0 | 1.0                          | 79.6                                 | *      | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Vanadium             | NC                                                                                                   | 30.6 - 77.3   | 7.73E+01 | 4/4   | --       | --                                                                | --             | --  | --   | 1.19E+00             | 82.9                                                     | 0.0 | 0.0                          | 17.1                                 | 117.17 | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Iron                 | NC                                                                                                   | 48400 - 48400 | 4.84E+04 | 1/1   | --       | --                                                                | --             | --  | --   | 2.20E+00             | 93.6                                                     | 0.0 | 0.0                          | 6.4                                  | 58000  | No                           |                                     |  |
| 45                                                                                             | RD | 058078 | 1E-07 | 7E+00 | 2E+00 | Metal                      | Manganese            | NC                                                                                                   | 941 - 941     | 9.41E+02 | 1/1   | --       | --                                                                | --             | --  | --   | 1.12E+00             | 44.9                                                     | 0.0 | 2.9                          | 52.2                                 | 1431   | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Nickel               | NC                                                                                                   | 387 - 387     | 3.87E+02 | 1/1   | 3.98E-08 | --                                                                | --             | --  | --   | 1.28E+00             | 19.3                                                     | 0.0 | 1.0                          | 79.6                                 | *      | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Vanadium             | NC                                                                                                   | 101 - 101     | 1.01E+02 | 1/1   | --       | --                                                                | --             | --  | --   | 1.56E+00             | 82.9                                                     | 0.0 | 0.0                          | 17.1                                 | 117.17 | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Arsenic              | C                                                                                                    | 5.5 - 5.7     | 5.70E+00 | 2/7   | 1.49E-04 | 56.6                                                              | 5.4            | 0.0 | 38.0 | <1                   | --                                                       | --  | --                           | --                                   | 11.1   | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Cadmium              | NC                                                                                                   | 4.7 - 4.7     | 4.70E+00 | 1/8   | 7.97E-09 | --                                                                | --             | --  | --   | 1.36E+00             | 8.8                                                      | 0.0 | 0.0                          | 91.1                                 | 3.14   | Yes                          |                                     |  |
|                                                                                                |    |        |       |       |       | Metal                      | Iron                 | NC                                                                                                   | 10400 - 65400 | 5.04E+04 | 8/8   | --       | --                                                                | --             | --  | --   | 2.30E+00             | 93.6                                                     | 0.0 | 0.0                          | 6.4                                  | 58000  | Yes                          |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Manganese            | NC                                                                                                   | 209 - 2660    | 1.63E+03 | 8/8   | --       | --                                                                | --             | --  | --   | 1.94E+00             | 44.9                                                     | 0.0 | 2.9                          | 52.2                                 | 1431   | Yes                          |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Nickel               | NC                                                                                                   | 27.3 - 973    | 6.81E+02 | 8/8   | 7.00E-08 | --                                                                | --             | --  | --   | 2.25E+00             | 19.3                                                     | 0.0 | 1.0                          | 79.6                                 | *      | No                           |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Vanadium             | NC                                                                                                   | 28 - 175      | 1.11E+02 | 8/8   | --       | --                                                                | --             | --  | --   | 1.71E+00             | 82.9                                                     | 0.0 | 0.0                          | 17.1                                 | 117.17 | Yes                          |                                     |  |
|                                                                                                |    |        |       |       |       |                            |                      |                                                                                                      |               |          |       |          |                                                                   |                |     |      |                      |                                                          |     |                              |                                      |        |                              |                                     |  |
| EMI-1                                                                                          | MI | AZ35   | 5E-06 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 1.5 - 1.5     | 1.50E+00 | 1/1   | 3.46E-06 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | No                           |                                     |  |
| EMI-1                                                                                          | MI | BA34   | 2E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 0.79 - 12     | 7.10E+00 | 7/9   | 1.64E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | Yes                          |                                     |  |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene       | C                                                                                                    | 0.052 - 0.46  | 4.60E-01 | 3/21  | 2.62E-06 | 36.8                                                              | 63.2           | 0.0 |      | --                   | --                                                       | --  |                              | --                                   | --     |                              |                                     |  |
| EMI-1                                                                                          | MI | BA35   | 9E-06 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 0.57 - 3.9    | 3.90E+00 | 5/5   | 8.99E-06 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | No                           |                                     |  |
| EMI-1                                                                                          | MI | BB32   | 2E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 3.8 - 3.8     | 3.80E+00 | 1/9   | 8.76E-06 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | No                           |                                     |  |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene       | C                                                                                                    | 0.043 - 0.6   | 6.00E-01 | 2/12  | 3.42E-06 | 36.8                                                              | 63.2           | 0.0 |      | --                   | --                                                       | --  |                              | --                                   | --     |                              |                                     |  |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1260         | C                                                                                                    | 0.019 - 1.5   | 1.50E+00 | 3/12  | 1.49E-06 | 35.1                                                              | 64.9           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | --     | --                           |                                     |  |
| EMI-1                                                                                          | MI | BB33   | 4E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 2.7 - 13      | 1.30E+01 | 10/15 | 3.00E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | Yes                          |                                     |  |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene       | C                                                                                                    | 0.039 - 0.38  | 3.42E-01 | 4/25  | 1.95E-06 | 36.8                                                              | 63.2           | 0.0 |      | --                   | --                                                       | --  |                              | --                                   | --     |                              |                                     |  |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1254         | C                                                                                                    | 1.9 - 6.9     | 6.90E+00 | 2/25  | 6.87E-06 | 35.1                                                              | 64.9           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | --     | --                           |                                     |  |
| EMI-1                                                                                          | MI | BB34   | 2E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 3.2 - 14.5    | 7.20E+00 | 11/24 | 1.66E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | Yes                          |                                     |  |
| EMI-1                                                                                          | MI | BB35   | 1E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 0.81 - 6.6    | 6.02E+00 | 4/4   | 1.39E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | No                           |                                     |  |
| EMI-1                                                                                          | MI | BC32   | 7E-06 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 0.53 - 3.2    | 3.20E+00 | 2/2   | 7.38E-06 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | No                           |                                     |  |
| EMI-1                                                                                          | MI | BC33   | 3E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 0.59 - 14.5   | 9.86E+00 | 10/12 | 2.27E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | Yes                          |                                     |  |
| EMI-1                                                                                          | MI | BC34   | 2E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 1.4 - 7.8     | 7.80E+00 | 2/4   | 1.80E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | No                           |                                     |  |
| EMI-1                                                                                          | MI | BC35   | 9E-06 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 3.9 - 3.9     | 3.90E+00 | 1/2   | 8.99E-06 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | No                           |                                     |  |
| EMI-1                                                                                          | MI | BD32   | 1E-04 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 3.5 - 48.6    | 4.86E+01 | 6/10  | 1.12E-04 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | Yes                          |                                     |  |
| EMI-1                                                                                          | MI | BD33   | 3E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 0.85 - 62     | 1.15E+01 | 25/26 | 2.64E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | Yes                          |                                     |  |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene       | C                                                                                                    | 0.081 - 0.99  | 5.78E-01 | 4/21  | 3.29E-06 | 36.8                                                              | 63.2           | 0.0 |      | --                   | --                                                       | --  |                              | --                                   | --     |                              |                                     |  |
| EMI-1                                                                                          | MI | BD34   | 3E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 0.67 - 14.5   | 9.23E+00 | 15/20 | 2.13E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | Yes                          |                                     |  |
|                                                                                                |    |        |       |       |       | Pest/PCB                   | Aroclor-1254         | C                                                                                                    | 0.087 - 3.3   | 3.30E+00 | 3/17  | 3.28E-06 | 35.1                                                              | 64.9           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | --     | --                           |                                     |  |
| EMI-1                                                                                          | MI | BE30   | 1E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 3.6 - 5.1     | 4.50E+00 | 4/7   | 1.04E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | No                           |                                     |  |
| EMI-1                                                                                          | MI | BE31   | 3E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 1.2 - 12      | 1.20E+01 | 4/5   | 2.77E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | Yes                          |                                     |  |
| EMI-1                                                                                          | MI | BE32   | 5E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 0.87 - 9.2    | 6.57E+00 | 8/10  | 1.51E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | No                           |                                     |  |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)anthracene   | C                                                                                                    | 0.076 - 2.9   | 2.67E+00 | 6/12  | 1.52E-06 | 36.8                                                              | 63.2           | 0.0 |      | --                   | --                                                       | --  |                              | --                                   | --     |                              |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Benzo(a)pyrene       | C                                                                                                    | 0.096 - 5.3   | 4.18E+00 | 6/12  | 2.38E-05 | 36.8                                                              | 63.2           | 0.0 |      | --                   | --                                                       | --  |                              | --                                   | --     |                              |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Benzo(b)fluoranthene | C                                                                                                    | 0.064 - 4.2   | 4.05E+00 | 9/12  | 2.30E-06 | 36.8                                                              | 63.2           | 0.0 |      | --                   | --                                                       | --  |                              | --                                   | --     |                              |                                     |  |
|                                                                                                |    |        |       |       |       |                            | Benzo(k)fluoranthene | C                                                                                                    | 0.043 - 3.2   | 3.20E+00 | 8/12  | 1.82E-06 | 36.8                                                              | 63.2           | 0.0 |      | --                   | --                                                       | --  |                              | --                                   | --     |                              |                                     |  |
| EMI-1                                                                                          | MI | BE33   | 2E-05 | <1    | <1    | Metal                      | Arsenic              | C                                                                                                    | 1.6 - 12      | 6.25E+00 | 44/45 | 1.44E-05 | 71.6                                                              | 28.4           | 0.0 |      | <1                   | --                                                       | --  | --                           |                                      | 11.1   | Yes                          |                                     |  |
|                                                                                                |    |        |       |       |       | PAH                        | Benzo(a)pyrene       | C                                                                                                    | 0.039 - 3.9   | 4.72E-01 | 15/45 | 2.69E-06 | 36.8                                                              | 63.2           | 0.0 |      | --</                 |                                                          |     |                              |                                      |        |                              |                                     |  |

TABLE 5-6: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS) BY PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block<br>Planned Reuse<br>Grid Number<br>Total RME Cancer Risk<br>Total RME HI<br>RME Segregated HI |    |      |       |    |    | Chemicals of Concern (COC) |                        | Basis for COC<br>Range of Detected Concentrations<br>RME EPC<br>Detection Frequency<br>Chemical-Specific Cancer Risk |              |          |      |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|-------------------------------------------------------------------------------------------------------------------|----|------|-------|----|----|----------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------|--------------|----------|------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                                                                                                                   |    |      |       |    |    |                            |                        |                                                                                                                      |              |          |      |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| EMI-1                                                                                                             | MI | BG34 | 4E-05 | <1 | <1 | Metal                      | Arsenic                | C                                                                                                                    | 1.9 - 12     | 6.65E+00 | 9/10 | 1.53E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                                   |    |      |       |    |    | PAH                        | Benzo(a)anthracene     | C                                                                                                                    | 0.057 - 4.7  | 3.97E+00 | 4/10 | 2.26E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                                   |    |      |       |    |    |                            | Benzo(a)pyrene         | C                                                                                                                    | 0.066 - 3.9  | 2.29E+00 | 5/10 | 1.31E-05 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                                   |    |      |       |    |    |                            | Benzo(b)fluoranthene   | C                                                                                                                    | 0.11 - 4.2   | 3.34E+00 | 5/10 | 1.90E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                                   |    |      |       |    |    |                            | Dibenz(a,h)anthracene  | C                                                                                                                    | 0.098 - 0.42 | 4.20E-01 | 2/10 | 1.46E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                                   |    |      |       |    |    |                            | Indeno(1,2,3-cd)pyrene | C                                                                                                                    | 0.31 - 2.3   | 2.30E+00 | 2/10 | 1.31E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EMI-1                                                                                                             | MI | BH33 | 9E-06 | <1 | <1 | Metal                      | Arsenic                | C                                                                                                                    | 1.6 - 5.3    | 3.53E+00 | 6/11 | 8.14E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                                             | MI | BH34 | 7E-06 | <1 | <1 | Metal                      | Arsenic                | C                                                                                                                    | 1.7 - 3.2    | 3.20E+00 | 2/2  | 7.38E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                                             | MI | BI32 | 2E-05 | <1 | <1 | Metal                      | Arsenic                | C                                                                                                                    | 4.4 - 9.4    | 8.85E+00 | 4/4  | 2.04E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                                             | MI | BI34 | 2E-04 | <1 | <1 | Metal                      | Arsenic                | C                                                                                                                    | 2.1 - 99.5   | 8.18E+01 | 6/11 | 1.89E-04 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                                   |    |      |       |    |    |                            | Lead                   | --                                                                                                                   | 3.2 - 1340   | 8.36E+02 | 7/11 | --       | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |
|                                                                                                                   |    |      |       |    |    | PAH                        | Benzo(a)pyrene         | C                                                                                                                    | 0.21 - 0.6   | 6.00E-01 | 2/10 | 3.42E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EMI-1                                                                                                             | MI | BJ32 | 2E-06 | <1 | <1 |                            | Benzo(a)pyrene         | C                                                                                                                    | 0.05 - 0.26  | 2.60E-01 | 2/4  | 1.48E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EMI-1                                                                                                             | MI | BJ33 | 3E-05 | <1 | <1 | Metal                      | Arsenic                | C                                                                                                                    | 4.1 - 12.1   | 1.09E+01 | 4/4  | 2.51E-05 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EMI-1                                                                                                             | MI | BK32 | 1E-05 | <1 | <1 | Metal                      | Arsenic                | C                                                                                                                    | 3.8 - 3.8    | 3.80E+00 | 1/1  | 8.76E-06 | 71.6                                                              | 28.4           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |    |      |       |    |    | PAH                        | Benzo(a)pyrene         | C                                                                                                                    | 0.012 - 0.74 | 7.40E-01 | 3/4  | 4.21E-06 | 36.8                                                              | 63.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |

Notes: All concentrations shown in milligrams per kilogram (mg/kg).

- <1
- Less than 1
- 
- Not applicable or chemical is not a COC for this endpoint
- %
- Percent
- bgs
- Below ground surface
- C
- Cancer effect
- COC
- Chemical of concern
- EPC
- Exposure point concentration
- HHRA
- Human health risk assessment
- HI
- Hazard index
- HPAL
- Hunters Point ambient level
- IND
- Industrial (industrial exposure scenario)
- MI
- Maritime industrial (industrial exposure scenario)
- MU
- Mixed use (residential exposure scenario)
- NC
- Noncancer effect
- PAH
- Polynuclear aromatic hydrocarbon
- Pest/PCB
- Pesticide/polychlorinated biphenyl
- RD
- Redevelopment block
- RME
- Reasonable maximum exposure
- SVOC
- Semivolatile organic compound
- VOC
- Volatile organic compound

TABLE 5-7: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO  
Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |     |      |       |       |       | Chemicals of Concern (COC) |                | Basis for COC | Range of Detected Concentrations | RME EPC  | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|------------------------------------------------------------------------------------------------|-----|------|-------|-------|-------|----------------------------|----------------|---------------|----------------------------------|----------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                                                                                                |     |      |       |       |       |                            |                |               |                                  |          |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| 31A                                                                                            | MU  | AO25 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 3.4 - 3.4                        | 3.40E+00 | 1/4                 | 2.10E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31A                                                                                            | MU  | AP26 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 5.3 - 6.1                        | 6.10E+00 | 2/2                 | 3.76E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AP27 | 2E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 2.4 - 5.7                        | 3.32E+00 | 5/13                | 2.05E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AQ26 | 3E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 2.6 - 5.2                        | 5.20E+00 | 3/10                | 3.21E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AQ28 | 2E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 2.5 - 3.1                        | 3.10E+00 | 2/4                 | 1.91E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AR27 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 1.8 - 3.5                        | 3.44E+00 | 5/6                 | 2.12E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |       |       |                            | Manganese      | NC            | 542 - 8010                       | 8.01E+03 | 6/6                 | --                            | --                                                                | --             | --                                   |                              | 1.16E+00             | 92.7                                                     | 0.0            | 7.3                                  |                              | 1431   | Yes                                 |
| 31B/36                                                                                         | IND | AR28 | 6E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 0.44 - 32.3                      | 9.89E+00 | 9/14                | 6.10E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 31B/36                                                                                         | IND | AS27 | 5E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 1.5 - 7.8                        | 7.80E+00 | 2/2                 | 4.81E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AS28 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 2.2 - 6.5                        | 5.11E+00 | 4/6                 | 3.15E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AS29 | 8E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 0.77 - 15.7                      | 9.29E+00 | 14/23               | 5.73E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |     |      |       |       |       | PAH                        | Benzo(a)pyrene | C             | 1.2 - 1.2                        | 1.20E+00 | 1/21                | 1.86E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 31B/36                                                                                         | IND | AT26 | 5E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 2.5 - 7.3                        | 7.30E+00 | 3/4                 | 4.50E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AT27 | 3E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 2.7 - 6.5                        | 5.41E+00 | 5/6                 | 3.34E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AT28 | 2E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 1.7 - 4.2                        | 2.95E+00 | 4/8                 | 1.82E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AT29 | 3E-05 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 0.83 - 130                       | 4.94E+01 | 11/14               | 3.04E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 31B/36                                                                                         | IND | AU28 | 5E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 1.3 - 9.2                        | 7.56E+00 | 6/6                 | 4.66E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AU29 | 7E-05 | 3E+00 | 2E+00 | Metal                      | Arsenic        | C/NC          | 4.4 - 105                        | 1.05E+02 | 13/14               | 6.47E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | 1.60E+00             | 70.6                                                     | 29.3           | 0.1                                  |                              | 11.1   | Yes                                 |
|                                                                                                |     |      |       |       |       |                            | Lead           | --            | 8.2 - 980                        | 9.80E+02 | 11/14               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |
| 31B/36                                                                                         | IND | AU30 | 2E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 2.2 - 3.9                        | 3.66E+00 | 4/4                 | 2.26E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AU31 | 3E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 1.5 - 7.2                        | 3.92E+00 | 6/10                | 2.42E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 31B/36                                                                                         | IND | AV29 | 2E-05 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 2.4 - 50.9                       | 4.01E+01 | 18/23               | 2.47E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 31B/36                                                                                         | IND | AV30 | 8E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 4.3 - 11                         | 1.10E+01 | 4/7                 | 6.78E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | AW31 | 7E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 1.9 - 12.3                       | 1.17E+01 | 4/4                 | 7.21E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 40                                                                                             | IND | AX31 | 4E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 2.2 - 5.8                        | 5.80E+00 | 2/2                 | 3.58E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | AX33 | 6E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 4.5 - 9.4                        | 9.40E+00 | 3/3                 | 5.80E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | AY31 | 1E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 2 - 2                            | 2.00E+00 | 1/3                 | 1.23E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | AY33 | 5E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 6.8 - 8                          | 8.00E+00 | 2/8                 | 4.93E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | AZ32 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 7.2 - 7.2                        | 7.20E+00 | 1/3                 | 4.44E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | AZ33 | 3E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 0.68 - 7.1                       | 4.70E+00 | 8/8                 | 2.90E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | AZ34 | 3E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 2.4 - 7.4                        | 5.10E+00 | 5/8                 | 3.14E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 40                                                                                             | IND | BA33 | 1E-05 | 5E+00 | 3E+00 | Metal                      | Arsenic        | C             | 0.7 - 21                         | 1.39E+01 | 16/18               | 8.57E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |       |       | Pest/PCB                   | Aroclor-1254   | NC            | 3.4 - 3.4                        | 3.40E+00 | 1/18                | 9.20E-07                      | --                                                                | --             | --                                   |                              | 1.61E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
|                                                                                                |     |      |       |       |       |                            | Aroclor-1260   | NC            | 2.8 - 2.8                        | 2.80E+00 | 1/18                | 7.58E-07                      | --                                                                | --             | --                                   |                              | 1.33E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| 41                                                                                             | IND | AX30 | 4E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 5.6 - 5.6                        | 5.60E+00 | 1/1                 | 3.45E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 41                                                                                             | IND | AZ29 | 3E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 1.7 - 4.6                        | 4.60E+00 | 3/3                 | 2.84E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 41                                                                                             | IND | BA29 | 3E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 0.64 - 12.9                      | 4.38E+00 | 35/43               | 2.70E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 41                                                                                             | IND | BA30 | 3E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 0.77 - 11.6                      | 3.47E+00 | 36/58               | 2.14E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 41                                                                                             | IND | BA31 | 3E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 3.6 - 4.1                        | 4.10E+00 | 2/3                 | 2.53E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 41                                                                                             | IND | BA32 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 3.1 - 3.1                        | 3.10E+00 | 1/1                 | 1.91E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 41                                                                                             | IND | BB29 | 2E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 0.38 - 7.9                       | 3.29E+00 | 18/21               | 2.03E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 41                                                                                             | IND | BB30 | 5E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 1.1 - 8                          | 3.64E+00 | 12/17               | 2.25E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |       |       | PAH                        | Benzo(a)pyrene | C             | 0.014 - 4.8                      | 6.59E-01 | 7/29                | 1.02E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 41                                                                                             | IND | BB31 | 3E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 1.7 - 5.6                        | 5.60E+00 | 3/3                 | 3.45E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AN30 | 3E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 0.33 - 7.2                       | 5.11E+00 | 7/8                 | 3.15E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AO29 | 1E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 0.75 - 1.7                       | 1.70E+00 | 2/3                 | 1.05E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AO30 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 0.57 - 6.3                       | 5.00E+00 | 14/22               | 3.08E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AO31 | 4E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 3 - 7.8                          | 6.55E+00 | 9/9                 | 4.04E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AP28 | 3E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 4.4 - 5.5                        | 5.50E+00 | 3/4                 | 3.39E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AP29 | 6E-05 | 3E+00 | 2E+00 | Metal                      | Arsenic        | C/NC          | 0.59 - 244                       | 9.97E+01 | 12/19               | 6.15E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | 1.52E+00             | 70.6                                                     | 29.3           | 0.1                                  |                              | 11.1   | Yes                                 |
| 43                                                                                             | IND | AP30 | 3E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C             | 0.75 - 9.9                       | 5.23E+00 | 9/10                | 3.22E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AP31 | 5E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 1.6 - 10.4                       | 6.93E+00 | 8/9                 | 4.27E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AQ29 | 3E-06 | <1    | <1    | Metal                      | Arsenic        | C             | 1.2 - 4.9                        | 4.90E+00 | 3/3                 | 3.02E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                             | IND | AQ30 | 8E-06 | 6E+00 | 5E+00 | Metal                      | Arsenic        | C             | 0.31 - 12                        | 6.87E+00 | 9/9                 | 4.24E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |     |      |       |       |       | Pest/PCB                   | Aroclor-1260   | C/NC          | 0.04 - 16                        | 9.56E+00 | 12/19               | 2.59E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 4.53E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |



TABLE 5-7: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block<br>Planned Reuse<br>Grid Number<br>Total RME Cancer Risk<br>Total RME HI<br>RME Segregated HI |     |      |       |       |       | Chemicals of Concern (COC) |                       | Basis for COC<br>Range of Detected Concentrations<br>RME EPC<br>Detection Frequency<br>Chemical-Specific Cancer Risk |                |          |       |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|-------------------------------------------------------------------------------------------------------------------|-----|------|-------|-------|-------|----------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------|----------------|----------|-------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                                                                                                                   |     |      |       |       |       |                            |                       |                                                                                                                      |                |          |       |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| 43                                                                                                                | IND | AQ32 | 4E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                                    | 0.45 - 9.8     | 6.03E+00 | 7/7   | 3.72E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                                                | IND | AR29 | 2E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                                    | 1.9 - 5.4      | 3.57E+00 | 5/7   | 2.20E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                                                | IND | AR30 | 5E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 5.6 - 7.5      | 7.42E+00 | 4/4   | 4.57E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                                                | IND | AR31 | 5E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 1.8 - 13       | 7.07E+00 | 25/29 | 4.36E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 43                                                                                                                | IND | AR32 | 8E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 0.39 - 12.6    | 1.13E+01 | 43/49 | 6.98E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 43                                                                                                                | IND | AR33 | 4E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                                    | 0.99 - 8.9     | 5.77E+00 | 5/6   | 3.56E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                                                | IND | AS30 | 7E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 0.6 - 10.8     | 1.08E+01 | 3/6   | 6.66E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |     |      |       |       |       |                            | Iron                  | NC                                                                                                                   | 15100 - 122000 | 1.15E+05 | 6/6   | --       | --                                                                | --             | --                                   |                              | 1.24E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 58000  | Yes                                 |
| 43                                                                                                                | IND | AS31 | 5E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                                    | 3.7 - 9.9      | 8.09E+00 | 7/7   | 4.99E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                                                | IND | AS32 | 1E-05 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 0.81 - 27      | 2.30E+01 | 24/34 | 1.42E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 43                                                                                                                | IND | AS33 | 3E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                                    | 1.8 - 15       | 4.30E+00 | 12/22 | 2.65E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 43                                                                                                                | IND | AS34 | 5E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                                    | 3.8 - 10.6     | 7.46E+00 | 4/6   | 4.60E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                                                | IND | AT30 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 0.35 - 9.6     | 6.59E+00 | 6/7   | 4.06E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                                                | IND | AT31 | 4E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                                    | 1.5 - 6.6      | 4.82E+00 | 10/12 | 2.97E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                                                | IND | AT32 | 9E-05 | 6E+00 | 2E+00 | Metal                      | Arsenic               | C/NC                                                                                                                 | 4.4 - 168      | 1.48E+02 | 9/10  | 9.15E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | 2.26E+00             | 70.6                                                     | 29.3           | 0.1                                  |                              | 11.1   | Yes                                 |
|                                                                                                                   |     |      |       |       |       |                            | Mercury               | NC                                                                                                                   | 0.013 - 102    | 1.02E+02 | 9/10  | --       | --                                                                | --             | --                                   |                              | 1.10E+00             | 99.9                                                     | 0.0            | 0.1                                  |                              | 2.28   | Yes                                 |
| 43                                                                                                                | IND | AT33 | 6E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 2.9 - 8.7      | 5.28E+00 | 6/10  | 3.25E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |     |      |       |       |       | PAH                        | Benzo(a)pyrene        | C                                                                                                                    | 0.084 - 2.4    | 1.27E+00 | 5/9   | 1.97E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 43                                                                                                                | IND | AU32 | 6E-06 | 3E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 0.97 - 12      | 7.97E+00 | 12/13 | 4.92E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 43                                                                                                                | IND | AU33 | 1E-05 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                                    | 2.6 - 4.1      | 4.10E+00 | 4/5   | 2.53E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |     |      |       |       |       | PAH                        | Benzo(a)anthracene    | C                                                                                                                    | 0.086 - 6.5    | 6.50E+00 | 8/16  | 1.01E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                                                                                                                   |     |      |       |       |       |                            | Benzo(a)pyrene        | C                                                                                                                    | 0.061 - 3.5    | 3.50E+00 | 8/16  | 5.42E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 43                                                                                                                | IND | AU34 | 8E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                                    | 4.7 - 11.1     | 1.11E+01 | 3/10  | 6.84E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 43                                                                                                                | IND | AV32 | 1E-05 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 3.3 - 14       | 7.41E+00 | 13/16 | 4.57E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                                   |     |      |       |       |       | PAH                        | Benzo(a)pyrene        | C                                                                                                                    | 0.19 - 2.1     | 2.10E+00 | 3/21  | 3.25E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                                                                                                                   |     |      |       |       |       | VOC                        | Benzene               | C                                                                                                                    | 0.00038 - 19   | 1.90E+01 | 7/16  | 2.03E-06 | 4.3                                                               | 0.0            | 95.7                                 |                              | <1                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 43                                                                                                                | IND | AV33 | 6E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 2.8 - 8        | 6.05E+00 | 14/23 | 3.73E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |     |      |       |       |       | PAH                        | Dibenz(a,h)anthracene | C                                                                                                                    | 1.1 - 1.1      | 1.10E+00 | 1/54  | 1.04E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 43                                                                                                                | IND | AV34 | 5E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 1.1 - 11.2     | 6.89E+00 | 8/12  | 4.25E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 43                                                                                                                | IND | AW33 | 1E-05 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 4.8 - 20       | 1.59E+01 | 6/6   | 9.83E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 43                                                                                                                | IND | AW34 | 6E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 1.4 - 11.2     | 5.33E+00 | 12/22 | 3.29E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                                   |     |      |       |       |       | PAH                        | Benzo(a)pyrene        | C                                                                                                                    | 0.099 - 2.2    | 8.88E-01 | 7/30  | 1.38E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 43                                                                                                                | IND | AX34 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                                    | 2.2 - 4        | 4.00E+00 | 3/3   | 2.47E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                                                | IND | AL32 | 6E-06 | 3E+00 | 2E+00 | Metal                      | Arsenic               | C                                                                                                                    | 2.4 - 9.7      | 6.67E+00 | 4/6   | 4.11E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |     |      |       |       |       | Pest/PCB                   | Aroclor-1260          | NC                                                                                                                   | 0.36 - 3.6     | 3.60E+00 | 2/6   | 9.75E-07 | --                                                                | --             | --                                   |                              | 1.71E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| 44                                                                                                                | IND | AM31 | 2E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                                    | 1.4 - 3.9      | 3.90E+00 | 2/2   | 2.40E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                                                | IND | AM32 | 2E-05 | 2E+01 | 2E+01 | Metal                      | Arsenic               | C                                                                                                                    | 1.4 - 8.7      | 6.77E+00 | 14/14 | 4.18E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                                   |     |      |       |       |       |                            | Lead                  | --                                                                                                                   | 1.7 - 6570     | 5.13E+03 | 14/14 | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |
|                                                                                                                   |     |      |       |       |       | Pest/PCB                   | Aroclor-1254          | C/NC                                                                                                                 | 0.57 - 33      | 2.69E+01 | 4/14  | 7.27E-06 | 34.1                                                              | 65.9           | 0.0                                  |                              | 1.27E+01             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
|                                                                                                                   |     |      |       |       |       |                            | Aroclor-1260          | C/NC                                                                                                                 | 0.086 - 10     | 9.48E+00 | 6/14  | 2.57E-06 | 34.1                                                              | 65.9           | 0.0                                  |                              | 4.49E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| 44                                                                                                                | IND | AM33 | 8E-06 | 5E+00 | 2E+00 | Metal                      | Arsenic               | C                                                                                                                    | 2.2 - 14.1     | 8.03E+00 | 10/10 | 4.95E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |     |      |       |       |       |                            | Vanadium              | NC                                                                                                                   | 6.2 - 645      | 4.36E+02 | 10/10 | --       | --                                                                | --             | --                                   |                              | 1.41E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 117.17 | No                                  |
|                                                                                                                   |     |      |       |       |       | Pest/PCB                   | Aroclor-1260          | C/NC                                                                                                                 | 0.1 - 3.9      | 3.90E+00 | 7/10  | 1.06E-06 | 34.1                                                              | 65.9           | 0.0                                  |                              | 1.85E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| 44                                                                                                                | IND | AM34 | 8E-06 | 5E+00 | 3E+00 | Metal                      | Arsenic               | C                                                                                                                    | 0.64 - 13      | 6.99E+00 | 13/16 | 4.31E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                                   |     |      |       |       |       | PAH                        | Benzo(a)pyrene        | C                                                                                                                    | 0.092 - 0.75   | 7.50E-01 | 2/16  | 1.16E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                                                                                                                   |     |      |       |       |       | Pest/PCB                   | Aroclor-1260          | C/NC                                                                                                                 | 0.39 - 5.3     | 5.30E+00 | 3/16  | 1.43E-06 | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.51E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| 44                                                                                                                | IND | AM35 | 2E-05 | 1E+01 | 6E+00 | Metal                      | Arsenic               | C                                                                                                                    | 3.5 - 32       | 1.73E+01 | 6/15  | 1.07E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                                   |     |      |       |       |       | PAH                        | Benzo(a)pyrene        | C                                                                                                                    | 0.051 - 3.6    | 3.60E+00 | 11/17 | 5.57E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                                                                                                                   |     |      |       |       |       | Pest/PCB                   | Aroclor-1248          | C/NC                                                                                                                 | 7.1 - 7.1      | 7.10E+00 | 1/15  | 1.92E-06 | 34.1                                                              | 65.9           | 0.0                                  |                              | 3.36E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
|                                                                                                                   |     |      |       |       |       | VOC                        |                       |                                                                                                                      |                |          |       |          |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |

TABLE 5-7: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |     |      |       |       |       | Chemicals of Concern (COC) |                        | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |             |          |       |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|------------------------------------------------------------------------------------------------|-----|------|-------|-------|-------|----------------------------|------------------------|------------------------------------------------------------------------------------------------------|-------------|----------|-------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                                                                                                |     |      |       |       |       |                            |                        |                                                                                                      |             |          |       |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| 44                                                                                             | IND | AP34 | 3E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.8 - 6.4   | 4.46E+00 | 5/8   | 2.75E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                             | IND | AP37 | 5E-06 | 3E+00 | 2E+00 | Metal                      | Arsenic                | C                                                                                                    | 3.8 - 8.9   | 6.12E+00 | 6/12  | 3.77E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |       |       | Pest/PCB                   | Aroclor-1260           | NC                                                                                                   | 0.019 - 4.3 | 3.31E+00 | 4/12  | 8.97E-07 | --                                                                | --             | --                                   |                              | 1.57E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| 44                                                                                             | IND | AQ33 | 2E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.5 - 3.6   | 3.60E+00 | 2/2   | 2.22E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                             | IND | AQ35 | 8E-06 | 2E+01 | 1E+01 | Metal                      | Arsenic                | C                                                                                                    | 3.5 - 9.1   | 6.18E+00 | 5/9   | 3.81E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |     |      |       |       |       | VOC                        | 1,2,4-Trimethylbenzene | NC                                                                                                   | 1400 - 1400 | 1.40E+03 | 1/1   | --       | --                                                                | --             | --                                   |                              | 8.29E+00             | 1.1                                                      | 0.0            | 98.9                                 |                              | --     | --                                  |
|                                                                                                |     |      |       |       |       |                            | 1,3,5-Trimethylbenzene | NC                                                                                                   | 290 - 290   | 2.90E+02 | 1/1   | --       | --                                                                | --             | --                                   |                              | 4.17E+00             | 0.4                                                      | 0.0            | 99.6                                 |                              | --     | --                                  |
|                                                                                                |     |      |       |       |       |                            | Naphthalene            | C/NC                                                                                                 | 0.17 - 210  | 2.10E+02 | 2/10  | 2.79E-06 | 41.6                                                              | 0.0            | 58.4                                 |                              | 1.14E+00             | 3.0                                                      | 0.0            | 97.0                                 |                              | --     | --                                  |
| 44                                                                                             | IND | AQ36 | 7E-06 | 4E+00 | 2E+00 | Metal                      | Arsenic                | C                                                                                                    | 2.6 - 17.6  | 9.36E+00 | 11/16 | 5.77E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |     |      |       |       |       |                            | Lead                   | --                                                                                                   | 7.6 - 1150  | 1.15E+03 | 14/16 | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |
|                                                                                                |     |      |       |       |       |                            | Vanadium               | NC                                                                                                   | 22.1 - 3570 | 6.77E+02 | 16/16 | --       | --                                                                | --             | --                                   |                              | 2.19E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 117.17 | Yes                                 |
| 44                                                                                             | IND | AR34 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 0.42 - 6.1  | 6.10E+00 | 3/4   | 3.76E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                             | IND | AR35 | 3E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.23 - 1.2  | 1.20E+00 | 2/2   | 1.86E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 44                                                                                             | IND | AR36 | 1E-05 | 3E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 2 - 42.9    | 1.41E+01 | 7/11  | 8.69E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 44                                                                                             | IND | AR37 | 3E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.7 - 3.5   | 3.46E+00 | 4/4   | 2.14E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                             | IND | AS36 | 2E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 3.1 - 3.5   | 3.50E+00 | 3/3   | 2.16E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                             | IND | AU35 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.4 - 3.5   | 3.50E+00 | 3/4   | 2.16E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                             | IND | AU36 | 1E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.2 - 2.2   | 2.20E+00 | 1/1   | 1.36E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                             | IND | AV36 | 8E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.8 - 15    | 1.22E+01 | 13/13 | 7.53E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 44                                                                                             | IND | AW35 | 5E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 4.3 - 7.5   | 7.50E+00 | 2/4   | 4.62E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                             | IND | AW36 | 6E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.1 - 13    | 7.14E+00 | 12/12 | 4.40E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 44                                                                                             | IND | AX35 | 3E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.9 - 4.5   | 4.50E+00 | 4/4   | 2.77E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 44                                                                                             | IND | AY35 | 7E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 4.3 - 11.9  | 1.19E+01 | 3/3   | 7.34E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                             | RD  | AH26 | 1E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.6 - 2     | 2.00E+00 | 2/5   | 1.23E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AH27 | 1E-05 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 0.72 - 16.5 | 1.65E+01 | 2/3   | 1.02E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                             | RD  | AI25 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 6.4 - 6.4   | 6.40E+00 | 1/2   | 3.95E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AI26 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 0.91 - 4.7  | 3.56E+00 | 6/14  | 2.20E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AI27 | 2E-05 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.4 - 21.8  | 2.18E+01 | 4/8   | 1.34E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |     |      |       |       |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.76 - 0.76 | 7.60E-01 | 1/8   | 1.18E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 45                                                                                             | RD  | AI28 | 5E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 0.81 - 8    | 6.48E+00 | 5/5   | 3.99E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |       |       | PAH                        | Benzo(a)pyrene         | C                                                                                                    | 0.67 - 0.67 | 6.70E-01 | 1/5   | 1.04E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| 45                                                                                             | RD  | AJ25 | 7E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 3.2 - 11.6  | 1.07E+01 | 4/4   | 6.60E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                             | RD  | AJ26 | 3E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.9 - 5.6   | 5.60E+00 | 3/4   | 3.45E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AJ27 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 3 - 3       | 3.00E+00 | 1/1   | 1.85E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AJ28 | 6E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 4.2 - 17.9  | 7.47E+00 | 11/19 | 4.60E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                             | RD  | AK25 | 5E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.3 - 7.4   | 7.40E+00 | 3/6   | 4.56E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AK26 | 3E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 0.88 - 12   | 4.52E+00 | 14/19 | 2.79E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                             | RD  | AK27 | 2E-05 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.9 - 49.9  | 3.64E+01 | 7/15  | 2.24E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                             | RD  | AK28 | 1E-05 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.2 - 15.2  | 1.52E+01 | 8/13  | 9.37E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |     |      |       |       |       |                            | Lead                   | --                                                                                                   | 3.3 - 4850  | 1.04E+03 | 13/13 | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |
| 45                                                                                             | RD  | AL25 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 2 - 4.5     | 4.50E+00 | 2/4   | 2.77E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AL26 | 6E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 0.73 - 9.6  | 9.60E+00 | 6/13  | 5.92E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AL27 | 5E-06 | 3E+00 | 2E+00 | Metal                      | Arsenic                | C                                                                                                    | 1.3 - 10.9  | 6.58E+00 | 7/11  | 4.06E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |       |       | Pest/PCB                   | Aroclor-1260           | NC                                                                                                   | 3.3 - 3.3   | 3.30E+00 | 1/11  | --       | --                                                                | --             | --                                   |                              | 1.56E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| 45                                                                                             | RD  | AL28 | 5E-06 | 3E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 5.7 - 7.8   | 7.80E+00 | 3/3   | 4.81E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |     |      |       |       |       |                            | Lead                   | --                                                                                                   | 5.9 - 1900  | 1.90E+03 | 3/3   | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |
| 45                                                                                             | RD  | AL30 | 5E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 3.1 - 11.3  | 8.46E+00 | 4/5   | 5.22E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                             | RD  | AL31 | 5E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.2 - 10.1  | 7.84E+00 | 11/12 | 4.84E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AM26 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.1 - 3.4   | 3.40E+00 | 2/5   | 2.10E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AM27 | 6E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 5.7 - 9.7   | 9.70E+00 | 2/3   | 5.98E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AM28 | 1E-05 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.4 - 16.7  | 1.55E+01 | 4/4   | 9.57E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                             | RD  | AM29 | 1E-05 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 5 - 16.4    | 1.64E+01 | 3/4   | 1.01E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                             | RD  | AM30 | 2E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.4 - 4.4   | 3.41E+00 | 5/7   | 2.10E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AN25 | 1E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 2.1 - 2.1   | 2.10E+00 | 1/4   | 1.29E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AN26 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 3.9 - 5.7   | 5.70E+00 | 4/5   | 3.51E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AN27 | 3E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 0.68 - 5.5  | 5.50E+00 | 6/8   | 3.39E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| 45                                                                                             | RD  | AN28 | 6E-06 | 2E+00 | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.6 - 12.6  | 9.66E+00 | 4/5   | 5.96E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| 45                                                                                             | RD  | AN29 | 2E-06 | <1    | <1    | Metal                      | Arsenic                | C                                                                                                    | 1.2 - 5.4   | 3.79E+00 | 8/8   | 2.34E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |



TABLE 5-7: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |    |      |       |       |       | Chemicals of Concern (COC) |                | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |               |          |       |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|------------------------------------------------------------------------------------------------|----|------|-------|-------|-------|----------------------------|----------------|------------------------------------------------------------------------------------------------------|---------------|----------|-------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                                                                                                |    |      |       |       |       |                            |                |                                                                                                      |               |          |       |          |                                                                   |                |                                      |                              |                      |                                                          |                |                                      |                              |        |                                     |
|                                                                                                |    |      |       |       |       |                            |                |                                                                                                      |               |          |       |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| EMI-1                                                                                          | MI | BA34 | 5E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 0.79 - 12     | 7.10E+00 | 7/9   | 4.38E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EMI-1                                                                                          | MI | BA35 | 3E-06 | 3E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 0.57 - 3.9    | 3.90E+00 | 5/5   | 2.40E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |    |      |       |       |       |                            | Manganese      | NC                                                                                                   | 570 - 7730    | 7.73E+03 | 5/5   | --       | --                                                                | --             | --                                   |                              | 1.12E+00             | 92.7                                                     | 0.0            | 7.3                                  |                              | 1431   | Yes                                 |
| EMI-1                                                                                          | MI | BB32 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 3.8 - 3.8     | 3.80E+00 | 1/9   | 2.34E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BB33 | 1E-05 | 5E+00 | 3E+00 | Metal                      | Arsenic        | C                                                                                                    | 2.7 - 13      | 1.30E+01 | 10/15 | 8.02E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |    |      |       |       |       | Pest/PCB                   | Aroclor-1254   | C/NC                                                                                                 | 1.9 - 6.9     | 6.90E+00 | 2/25  | 1.87E-06 | 34.1                                                              | 65.9           | 0.0                                  |                              | 3.27E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| EMI-1                                                                                          | MI | BB34 | 5E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 3.2 - 14.5    | 7.20E+00 | 11/24 | 4.44E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EMI-1                                                                                          | MI | BB35 | 4E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 0.81 - 6.6    | 6.02E+00 | 4/4   | 3.71E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BC32 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 0.53 - 3.2    | 3.20E+00 | 2/2   | 1.97E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BC33 | 7E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 0.59 - 14.5   | 9.86E+00 | 10/12 | 6.08E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EMI-1                                                                                          | MI | BC34 | 5E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 1.4 - 7.8     | 7.80E+00 | 2/4   | 4.81E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BC35 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 3.9 - 3.9     | 3.90E+00 | 1/2   | 2.40E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BD32 | 3E-05 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 3.5 - 48.6    | 4.86E+01 | 6/10  | 3.00E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EMI-1                                                                                          | MI | BD33 | 8E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 0.85 - 62     | 1.15E+01 | 25/26 | 7.07E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EMI-1                                                                                          | MI | BD34 | 7E-06 | 3E+00 | 2E+00 | Metal                      | Arsenic        | C                                                                                                    | 0.67 - 14.5   | 9.23E+00 | 15/20 | 5.69E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |    |      |       |       |       | Pest/PCB                   | Aroclor-1254   | NC                                                                                                   | 0.087 - 3.3   | 3.30E+00 | 3/17  | 8.93E-07 | --                                                                | --             | --                                   |                              | 1.56E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| EMI-1                                                                                          | MI | BE30 | 3E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 3.6 - 5.1     | 4.50E+00 | 4/7   | 2.78E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BE31 | 7E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 1.2 - 12      | 1.20E+01 | 4/5   | 7.40E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EMI-1                                                                                          | MI | BE32 | 1E-05 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 0.87 - 9.2    | 6.57E+00 | 8/10  | 4.05E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |    |      |       |       |       | PAH                        | Benzo(a)pyrene | C                                                                                                    | 0.096 - 5.3   | 4.18E+00 | 6/12  | 6.46E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EMI-1                                                                                          | MI | BE33 | 5E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 1.6 - 12      | 6.25E+00 | 44/45 | 3.85E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EMI-1                                                                                          | MI | BE34 | 1E-05 | 2E+01 | 2E+01 | Metal                      | Arsenic        | C                                                                                                    | 2.5 - 11.8    | 4.91E+00 | 17/26 | 3.03E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |    |      |       |       |       | Pest/PCB                   | Aroclor-1254   | C/NC                                                                                                 | 30 - 38       | 3.80E+01 | 2/25  | 1.03E-05 | 34.1                                                              | 65.9           | 0.0                                  |                              | 1.80E+01             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| EMI-1                                                                                          | MI | BF31 | 4E-05 | 4E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 0.76 - 58.1   | 5.81E+01 | 6/6   | 3.58E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |    |      |       |       |       |                            | Copper         | NC                                                                                                   | 59 - 15000    | 1.50E+04 | 6/6   | --       | --                                                                | --             | --                                   |                              | 1.31E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 124.31 | Yes                                 |
|                                                                                                |    |      |       |       |       |                            | Lead           | --                                                                                                   | 16 - 4300     | 4.30E+03 | 6/6   | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |
| EMI-1                                                                                          | MI | BF32 | 6E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 5.5 - 9.7     | 9.70E+00 | 2/3   | 5.98E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BF33 | 4E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 4.1 - 6.2     | 5.76E+00 | 5/5   | 3.55E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BF34 | 4E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 2.4 - 7.5     | 5.61E+00 | 10/10 | 3.46E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BG32 | 2E-06 | <1    | <1    | PAH                        | Benzo(a)pyrene | C                                                                                                    | 0.27 - 0.7    | 7.00E-01 | 2/9   | 1.08E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EMI-1                                                                                          | MI | BG33 | 4E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 2.8 - 7.6     | 4.62E+00 | 10/21 | 2.85E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BG34 | 1E-05 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 1.9 - 12      | 6.65E+00 | 9/10  | 4.10E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |    |      |       |       |       | PAH                        | Benzo(a)pyrene | C                                                                                                    | 0.066 - 3.9   | 2.29E+00 | 5/10  | 3.55E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EMI-1                                                                                          | MI | BH33 | 2E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 1.6 - 5.3     | 3.53E+00 | 6/11  | 2.18E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BH34 | 2E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 1.7 - 3.2     | 3.20E+00 | 2/2   | 1.97E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BI32 | 5E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 4.4 - 9.4     | 8.85E+00 | 4/4   | 5.46E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EMI-1                                                                                          | MI | BI34 | 5E-05 | 2E+00 | <1    | Metal                      | Arsenic        | C/NC                                                                                                 | 2.1 - 99.5    | 8.18E+01 | 6/11  | 5.05E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | 1.25E+00             | 70.6                                                     | 29.3           | 0.1                                  |                              | 11.1   | Yes                                 |
|                                                                                                |    |      |       |       |       |                            | Lead           | --                                                                                                   | 3.2 - 1340    | 8.36E+02 | 7/11  | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |
| EMI-1                                                                                          | MI | BJ33 | 7E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 4.1 - 12.1    | 1.09E+01 | 4/4   | 6.70E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
| EMI-1                                                                                          | MI | BK32 | 4E-06 | <1    | <1    | Metal                      | Arsenic        | C                                                                                                    | 3.8 - 3.8     | 3.80E+00 | 1/1   | 2.34E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |    |      |       |       |       | PAH                        | Benzo(a)pyrene | C                                                                                                    | 0.012 - 0.74  | 7.40E-01 | 3/4   | 1.15E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EOS-1                                                                                          | OS | AL35 | 1E-05 | 3E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 6.9 - 12      | 1.20E+01 | 2/3   | 7.40E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |    |      |       |       |       |                            | Vanadium       | NC                                                                                                   | 73 - 390      | 3.90E+02 | 3/3   | --       | --                                                                | --             | --                                   |                              | 1.26E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 117.17 | No                                  |
|                                                                                                |    |      |       |       |       | PAH                        | Benzo(a)pyrene | C                                                                                                    | 0.17 - 1.1    | 1.10E+00 | 2/3   | 1.70E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
| EOS-1                                                                                          | OS | AL36 | 3E-05 | 8E+00 | 3E+00 | Metal                      | Antimony       | NC                                                                                                   | 19 - 209      | 2.09E+02 | 2/7   | --       | --                                                                | --             | --                                   |                              | 1.69E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 9.05   | Yes                                 |
|                                                                                                |    |      |       |       |       |                            | Arsenic        | C                                                                                                    | 2.9 - 31      | 3.10E+01 | 2/7   | 1.91E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |    |      |       |       |       |                            | Iron           | NC                                                                                                   | 6300 - 140000 | 1.40E+05 | 7/7   | --       | --                                                                | --             | --                                   |                              | 1.51E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 58000  | No                                  |
|                                                                                                |    |      |       |       |       | PAH                        | Benzo(a)pyrene | C                                                                                                    | 0.18 - 2.5    | 2.50E+00 | 4/7   | 3.87E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                                                                                                |    |      |       |       |       | Pest/PCB                   | Aroclor-1260   | C/NC                                                                                                 | 0.11 - 5.5    | 5.50E+00 | 6/7   | 1.49E-06 | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.61E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
| EOS-1                                                                                          | OS | AL37 | 6E-06 | 2E+00 | <1    | Metal                      | Arsenic        | C                                                                                                    | 5.1 - 8.6     | 8.60E+00 | 2/2   | 5.30E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EOS-1                                                                                          | OS | AM36 | 2E-05 | 2E+01 | 1E+01 | Metal                      | Arsenic        | C                                                                                                    | 3.1 - 26      | 1.40E+01 | 9/14  | 8.63E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |    |      |       |       |       |                            | Lead           | --                                                                                                   | 9.3 - 883     | 8.83E+02 | 13/14 | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |
|                                                                                                |    |      |       |       |       |                            | Vanadium       | NC                                                                                                   | 16 - 720      | 3.99E+02 | 14/14 | --       | --                                                                | --             | --                                   |                              | 1.29E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 117.17 | No                                  |
|                                                                                                |    |      |       |       |       | PAH                        | Benzo(a)pyrene | C                                                                                                    | 0.045 - 1.8   | 1.80E+00 | 5/14  | 2.79E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |
|                                                                                                |    |      |       |       |       | Pest/PCB                   | Aroclor-1260   | C/NC                                                                                                 | 0.022 - 110   | 2.52E+01 | 7/14  | 6.83E-06 | 34.1                                                              | 65.9           | 0.0                                  |                              | 1.20E+01             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |

TABLE 5-7: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse         | Grid Number    | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                       | Basis for COC | Range of Detected Concentrations | RME EPC     | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals   |       |
|---------------------|-----------------------|----------------|-----------------------|--------------|-------------------|----------------------------|-----------------------|---------------|----------------------------------|-------------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------|-------|
|                     |                       |                |                       |              |                   |                            |                       |               |                                  |             |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |          |       |
| EOS-1               | OS                    | AM37           | 3E-05                 | 1E+01        | 8E+00             | Metal                      | Antimony              | NC            | 14.7 - 343                       | 3.43E+02    | 8/14                | --                            | --                                                                | --             | --                                   | 2.77E+00                     | 100.0                | 0.0                                                      | 0.0            | --                                   | 9.05                         | Yes      |       |
|                     |                       |                |                       |              |                   |                            | Arsenic               | C             | 2.8 - 20.3                       | 1.01E+01    | 11/14               | 6.26E-06                      | 70.7                                                              | 29.3           | 0.0                                  | --                           | --                   | --                                                       | --             | 11.1                                 | No                           |          |       |
|                     |                       |                |                       |              |                   |                            | Lead                  | --            | 160 - 10600                      | 2.91E+03    | 13/14               | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | 8.99           | Yes                                  |                              |          |       |
|                     |                       |                |                       |              |                   | PAH                        | Benzo(a)anthracene    | C             | 0.15 - 20                        | 2.00E+01    | 7/14                | 3.10E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
|                     |                       |                |                       |              |                   |                            | Benzo(a)pyrene        | C             | 0.1 - 6.6                        | 6.60E+00    | 9/14                | 1.02E-05                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
|                     |                       |                |                       |              |                   |                            | Benzo(b)fluoranthene  | C             | 0.15 - 12                        | 1.20E+01    | 9/14                | 1.86E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
|                     |                       |                |                       |              |                   | Pest/PCB                   | Dibenz(a,h)anthracene | C             | 0.041 - 1.5                      | 1.50E+00    | 4/14                | 1.41E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
|                     |                       |                |                       |              |                   |                            | Aroclor-1254          | NC            | 0.15 - 2.2                       | 2.20E+00    | 4/14                | --                            | --                                                                | --             | --                                   | 1.04E+00                     | 34.1                 | 65.9                                                     | 0.0            | --                                   | --                           |          |       |
| Aroclor-1260        | C/NC                  | 0.074 - 15     | 1.50E+01              | 12/14        | 4.06E-06          | 34.1                       | 65.9                  | 0.0           | 7.11E+00                         | 34.1        | 65.9                | 0.0                           | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |          |       |
|                     | Metal                 | Arsenic        | C                     | 2.1 - 19.2   | 1.92E+01          | 4/6                        | 1.18E-05              | 70.7          | 29.3                             | 0.0         | <1                  | --                            | --                                                                | --             | 11.1                                 | Yes                          |                      |                                                          |                |                                      |                              |          |       |
| EOS-1               |                       | OS             | AM38                  | 1E-05        | 3E+00             | <1                         |                       | Lead          | --                               | 19.2 - 1180 | 9.27E+02            | 6/6                           | --                                                                | --             | --                                   | --                           | 8.99                 | Yes                                                      |                |                                      |                              |          |       |
|                     | EOS-1                 |                |                       |              |                   | OS                         | AN36                  | 7E-06         | 2E+00                            | <1          |                     | Arsenic                       | C                                                                 | 4.1 - 7.9      | 7.90E+00                             | 3/4                          | 4.87E-06             | 70.7                                                     | 29.3           | 0.0                                  | <1                           | --       | --    |
| PAH                 |                       | Benzo(a)pyrene | C                     | 1.3 - 1.3    | 1.30E+00          |                            |                       |               |                                  | 1/3         | 2.01E-06            | 35.8                          | 64.2                                                              | 0.0            | --                                   | --                           | --                   | --                                                       | --             | --                                   |                              |          |       |
|                     | EOS-1                 | OS             | AN37                  | 1E-04        | 3E+02             | 2E+02                      | Metal                 | Antimony      | NC                               | 11.8 - 1930 | 1.93E+03            | 5/6                           | --                                                                | --             | --                                   | 1.56E+01                     | 100.0                | 0.0                                                      | 0.0            | --                                   | 9.05                         | Yes      |       |
| Arsenic             |                       |                |                       |              |                   |                            |                       | C             | 2.7 - 13.7                       | 9.53E+00    | 6/6                 | 5.88E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             | --                                   | 11.1                         | Yes      |       |
| Copper              |                       |                |                       |              |                   |                            |                       | NC            | 29.9 - 198000                    | 1.98E+05    | 6/6                 | --                            | --                                                                | --             | --                                   | 1.73E+01                     | 100.0                | 0.0                                                      | 0.0            | --                                   | 124.31                       | No       |       |
| Iron                |                       |                |                       |              |                   |                            |                       | NC            | 6220 - 194000                    | 1.94E+05    | 6/6                 | --                            | --                                                                | --             | --                                   | 2.09E+00                     | 100.0                | 0.0                                                      | 0.0            | --                                   | 58000                        | Yes      |       |
| Lead                |                       |                |                       |              |                   |                            |                       | --            | 139 - 8910                       | 5.71E+03    | 6/6                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | 8.99                                 | Yes                          |          |       |
| Nickel              |                       |                |                       |              |                   |                            |                       | NC            | 109 - 10300                      | 1.03E+04    | 6/6                 | --                            | --                                                                | --             | --                                   | 1.77E+00                     | 93.8                 | 0.0                                                      | 6.2            | --                                   | *                            | No       |       |
| Pest/PCB            |                       |                |                       |              |                   |                            | Aroclor-1260          | C/NC          | 0.3 - 490                        | 4.90E+02    | 6/8                 | 1.33E-04                      | 34.1                                                              | 65.9           | 0.0                                  | 2.32E+02                     | 34.1                 | 65.9                                                     | 0.0            | --                                   | --                           |          |       |
|                     |                       |                |                       |              |                   |                            | EOS-1                 | OS            | AN38                             | 4E-05       | 1E+01               | 6E+00                         | Metal                                                             | Arsenic        | C                                    | 2 - 29.5                     | 2.58E+01             | 13/14                                                    | 1.59E-05       | 70.7                                 | 29.3                         | 0.0      | <1    |
| Copper              | NC                    | 224 - 85600    | 2.10E+04              | 14/14        | --                | --                         |                       |               |                                  |             |                     |                               |                                                                   | --             | --                                   | 1.83E+00                     | 100.0                | 0.0                                                      | 0.0            | --                                   | 124.31                       | No       |       |
| Iron                | NC                    | 1740 - 198000  | 1.76E+05              | 14/14        | --                | --                         |                       |               |                                  |             |                     |                               |                                                                   | --             | --                                   | 1.90E+00                     | 100.0                | 0.0                                                      | 0.0            | --                                   | 58000                        | No       |       |
| Lead                | --                    | 211 - 4130     | 2.32E+03              | 14/14        | --                | --                         |                       |               |                                  |             |                     |                               |                                                                   | --             | --                                   | --                           | --                   | --                                                       | --             | 8.99                                 | Yes                          |          |       |
| PAH                 | Benzo(a)anthracene    | C              | 0.079 - 36            | 1.84E+01     | 8/14              | 2.85E-06                   |                       |               |                                  |             |                     |                               | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
|                     | Benzo(a)pyrene        | C              | 0.064 - 14            | 7.07E+00     | 9/14              | 1.09E-05                   |                       |               |                                  |             |                     |                               | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
|                     | Benzo(b)fluoranthene  | C              | 0.13 - 21             | 8.42E+00     | 11/14             | 1.30E-06                   |                       |               |                                  |             |                     |                               | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
|                     | Benzo(k)fluoranthene  | C              | 0.045 - 20            | 9.71E+00     | 9/14              | 1.50E-06                   |                       |               |                                  |             |                     |                               | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
| Pest/PCB            | Dibenz(a,h)anthracene | C              | 0.049 - 1.7           | 1.70E+00     | 6/14              | 1.60E-06                   | 35.8                  | 64.2          | 0.0                              | --          | --                  | --                            | --                                                                | --             | --                                   |                              |                      |                                                          |                |                                      |                              |          |       |
|                     | Aldrin                | C              | 0.65 - 0.65           | 6.50E-01     | 1/14              | 1.21E-06                   | 42.0                  | 58.0          | 0.0                              | <1          | --                  | --                            | --                                                                | --             | --                                   |                              |                      |                                                          |                |                                      |                              |          |       |
| Aroclor-1260        | C/NC                  | 0.44 - 4.8     | 4.80E+00              | 7/8          | 1.30E-06          | 34.1                       | 65.9                  | 0.0           | 2.27E+00                         | 34.1        | 65.9                | 0.0                           | --                                                                | --             |                                      |                              |                      |                                                          |                |                                      |                              |          |       |
|                     | EOS-1                 | OS             | AN39                  | 6E-06        | 3E+00             | <1                         |                       | Arsenic       | C                                | 8.6 - 9.3   | 9.30E+00            | 2/2                           | 5.73E-06                                                          | 70.7           | 29.3                                 | 0.0                          | <1                   | --                                                       | --             | --                                   | 11.1                         | No       |       |
| Lead                |                       |                |                       |              |                   | --                         | 275 - 875             | 8.75E+02      | 2/2                              | --          | --                  | --                            | --                                                                | --             | --                                   | --                           | --                   | 8.99                                                     | Yes            |                                      |                              |          |       |
| EOS-1               | OS                    | AO37           | 7E-06                 | 2E+00        | <1                | Metal                      | Arsenic               | C             | 5.2 - 12                         | 1.20E+01    | 3/3                 | 7.40E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             | 11.1                                 | Yes                          |          |       |
|                     |                       |                |                       |              |                   |                            | EOS-1                 | OS            | AO39                             | 9E-06       | 7E+00               | 3E+00                         | Metal                                                             | Antimony       | NC                                   | 175 - 364                    | 3.64E+02             | 3/4                                                      | --             | --                                   | --                           | 2.94E+00 | 100.0 |
| Arsenic             | C                     | 9.3 - 13.3     | 1.33E+01              | 2/5          | 8.20E-06          | 70.7                       |                       |               |                                  |             |                     |                               |                                                                   | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             | --                                   | 11.1                         | Yes      |       |
| Iron                | NC                    | 40100 - 178000 | 1.48E+05              | 5/5          | --                | --                         |                       |               |                                  |             |                     |                               |                                                                   | --             | --                                   | 1.59E+00                     | 100.0                | 0.0                                                      | 0.0            | --                                   | 58000                        | Yes      |       |
| Lead                | --                    | 12.6 - 17600   | 1.27E+04              | 5/5          | --                | --                         |                       |               |                                  |             |                     |                               |                                                                   | --             | --                                   | --                           | --                   | --                                                       | --             | 8.99                                 | Yes                          |          |       |
| EOS-1               | OS                    | AP38           | 1E-05                 | 2E+01        | 1E+01             | Metal                      | Antimony              | NC            | 13.7 - 1510                      | 1.51E+03    | 2/2                 | --                            | --                                                                | --             | 1.22E+01                             | 100.0                        | 0.0                  | 0.0                                                      | --             | 9.05                                 | Yes                          |          |       |
|                     |                       |                |                       |              |                   |                            | Arsenic               | C             | 6 - 15.9                         | 1.59E+01    | 2/2                 | 9.80E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             | --                                   | 11.1                         | Yes      |       |
|                     |                       |                |                       |              |                   |                            | Iron                  | NC            | 25500 - 200000                   | 2.00E+05    | 2/2                 | --                            | --                                                                | --             | --                                   | 2.15E+00                     | 100.0                | 0.0                                                      | 0.0            | --                                   | 58000                        | Yes      |       |
|                     |                       |                |                       |              |                   |                            | Lead                  | --            | 92.2 - 19700                     | 1.97E+04    | 2/2                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | 8.99                                 | Yes                          |          |       |
| EOS-1               | OS                    | AQ39           | 8E-06                 | <1           | <1                | Metal                      | Arsenic               | C             | 13 - 13                          | 1.30E+01    | 1/7                 | 8.02E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             | 11.1                                 | Yes                          |          |       |
|                     |                       |                |                       |              |                   |                            | Lead                  | --            | 9.3 - 2300                       | 2.30E+03    | 5/7                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | 8.99                                 | Yes                          |          |       |
| EOS-1               | OS                    | AQ40           | 6E-06                 | 2E+00        | <1                | Metal                      | Arsenic               | C             | 6.5 - 7.2                        | 7.20E+00    | 4/4                 | 4.44E-06                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             | 11.1                                 | No                           |          |       |
|                     |                       |                |                       |              |                   |                            | EOS-1                 | OS            | AR39                             | 3E-06       | <1                  | Metal                         | Arsenic                                                           | C              | 2.7 - 3.5                            | 3.50E+00                     | 3/17                 | 2.16E-06                                                 | 70.7           | 29.3                                 | 0.0                          | <1       | --    |
| EOS-1               | OS                    | AR40           | 2E-05                 | 7E+00        | 6E+00             | Metal                      |                       |               |                                  |             |                     |                               | Arsenic                                                           | C              | 2 - 85.3                             | 1.80E+01                     | 15/17                | 1.11E-05                                                 | 70.7           | 29.3                                 | 0.0                          | <1       | --    |
|                     |                       |                |                       |              |                   |                            | Lead                  | --            | 7 - 2300                         | 2.30E+03    | 15/17               | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | 8.99                                 | Yes                          |          |       |
|                     |                       |                |                       |              |                   | PAH                        | Benzo(a)pyrene        | C             | 0.082 - 3.1                      | 6.89E-01    | 5/15                | 1.07E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
|                     |                       |                |                       |              |                   |                            | Aroclor-1260          | C/NC          | 0.037 - 45                       | 1.22E+01    | 13/17               | 3.31E-06                      | 34.1                                                              | 65.9           | 0.0                                  | 5.79E+00                     | 34.1                 | 65.9                                                     | 0.0            | --                                   | --                           |          |       |
| EOS-1               | OS                    | AS38           | 2E-05                 | 2E+00        | <1                | Metal                      | Arsenic               | C             | 5.4 - 56.1                       | 3.45E+01    | 9/9                 | 2.13E-05                      | 70.7                                                              | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             | 11.1                                 | Yes                          |          |       |
|                     |                       |                |                       |              |                   |                            | Lead                  | --            | 18 - 1440                        | 1.44E+03    | 2/9                 | --                            | --                                                                | --             | --                                   | --                           | --                   | --                                                       | --             | 8.99                                 | No                           |          |       |
|                     |                       |                |                       |              |                   | PAH                        | Benzo(a)pyrene        | C             | 0.11 - 2                         | 9.87E-01    | 5/9                 | 1.53E-06                      | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
|                     |                       |                |                       |              |                   |                            | EOS-1                 | OS            | AT38                             | 1E-05       | 3E+00               | <1                            | Metal                                                             | Antimony       | NC                                   | 160 - 160                    | 1.60E+02             | 1/13                                                     | --             | --                                   | --                           | 1.29E+00 | 100.0 |
| Arsenic             | C                     | 6.1 - 12       | 1.02E+01              | 13/13        | 6.29E-06          | 70.7                       |                       |               |                                  |             |                     |                               |                                                                   | 29.3           | 0.0                                  | <1                           | --                   | --                                                       | --             | --                                   | 11.1                         | Yes      |       |
| PAH                 | Benzo(a)pyrene        | C              | 0.084 - 5.1           | 1.25E+00     | 6/13              | 1.94E-06                   |                       |               |                                  |             |                     |                               | 35.8                                                              | 64.2           | 0.0                                  | --                           | --                   | --                                                       | --             | --                                   | --                           |          |       |
|                     | EOS-1                 | OS             | AT39                  | 8E-06        | <1                | <1                         |                       |               |                                  |             |                     |                               | Metal                                                             | Arsenic        | C                                    | 11 - 12                      | 1.20E+01             | 2/2                                                      | 7.40E-06       | 70.7                                 | 29.3                         | 0.0      | <1    |

TABLE 5-7: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Grid Number | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Chemicals of Concern (COC) |                            | Basis for COC        | Range of Detected Concentrations | RME EPC    | Detection Frequency | Chemical-Specific Cancer Risk | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |      |
|---------------------|---------------|-------------|-----------------------|--------------|-------------------|----------------------------|----------------------------|----------------------|----------------------------------|------------|---------------------|-------------------------------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|------|
|                     |               |             |                       |              |                   |                            |                            |                      |                                  |            |                     |                               | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |      |
| EOS-1               | OS            | AU37        | 4E-04                 | 7E+02        | 7E+02             | Metal                      | Arsenic                    | C                    | 3.2 - 10                         | 6.90E+00   | 8/12                | 4.26E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |      |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC                 | 0.065 - 6600                     | 1.54E+03   | 6/12                | 4.17E-04                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 7.30E+02             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   | VOC                        | 1,2,4-Trichlorobenzene     | NC                   | 0.26 - 830                       | 8.30E+02   | 3/12                | 1.38E-07                      | --                                                                | --             | --                                   |                              | 3.69E+00             | 7.3                                                      | 0.0            | 92.7                                 |                              | --     | --                                  |      |
| EOS-1               | OS            | AV37        | 2E-04                 | 3E+02        | 3E+02             | Metal                      | Arsenic                    | C                    | 3.3 - 24                         | 1.06E+01   | 19/19               | 6.55E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |      |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC                 | 0.055 - 3700                     | 5.37E+02   | 13/19               | 1.45E-04                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.55E+02             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |      |
| EOS-1               | OS            | AW37        | 6E-06                 | <1           | <1                | Metal                      | Arsenic                    | C                    | 8 - 9.9                          | 9.90E+00   | 2/2                 | 6.10E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |      |
| EOS-2               | OS            | AX36        | 1E-05                 | 4E+00        | <1                | Metal                      | Arsenic                    | C                    | 0.66 - 95.5                      | 1.59E+01   | 14/21               | 9.79E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |      |
| EOS-2               | OS            | AX37        | 8E-06                 | 2E+00        | <1                | Metal                      | Arsenic                    | C                    | 4 - 5.2                          | 5.20E+00   | 3/3                 | 3.21E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C                    | 0.24 - 2.1                       | 2.10E+00   | 2/2                 | 3.25E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |      |
| EOS-2               | OS            | AY36        | 6E-05                 | 3E+01        | 2E+01             | Metal                      | Arsenic                    | C/NC                 | 2 - 200                          | 7.28E+01   | 16/16               | 4.49E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | 1.11E+00             | 70.6                                                     | 29.3           | 0.1                                  |                              | 11.1   | Yes                                 |      |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC                 | 0.013 - 47                       | 4.70E+01   | 12/16               | 1.27E-05                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.23E+01             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |      |
| EOS-2               | OS            | AY37        | 1E-05                 | 5E+00        | 2E+00             | Metal                      | Arsenic                    | C                    | 3.1 - 19.7                       | 1.42E+01   | 10/10               | 8.77E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |      |
|                     |               |             |                       |              |                   | Metal                      | Lead                       | --                   | 14.4 - 1480                      | 1.48E+03   | 10/10               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |      |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC                 | 0.19 - 12                        | 5.00E+00   | 6/11                | 1.35E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 2.37E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   | SVOC                       | n-Nitroso-di-n-propylamine | C                    | 2.8 - 2.8                        | 2.80E+00   | 1/11                | 2.15E-06                      | 42.0                                                              | 58.0           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
| EOS-2               | OS            | AZ36        | 5E-05                 | 5E+00        | 2E+00             | Metal                      | Arsenic                    | C                    | 0.72 - 63                        | 3.12E+01   | 24/25               | 1.93E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |      |
|                     |               |             |                       |              |                   |                            | Lead                       | --                   | 1.5 - 1700                       | 1.18E+03   | 24/25               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene         | C                    | 0.087 - 14                       | 1.40E+01   | 5/10                | 2.17E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C                    | 0.053 - 11                       | 1.10E+01   | 4/10                | 1.70E-05                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene       | C                    | 0.19 - 30                        | 3.00E+01   | 5/10                | 4.64E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | Benzo(k)fluoranthene       | C                    | 0.11 - 6.9                       | 6.90E+00   | 4/10                | 1.07E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | Dibenz(a,h)anthracene      | C                    | 0.16 - 2.1                       | 2.10E+00   | 2/10                | 1.98E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | Indeno(1,2,3-cd)pyrene     | C                    | 0.04 - 9.8                       | 9.80E+00   | 4/10                | 1.52E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   | Pest/PCB                   | Aroclor-1260               | C/NC                 | 0.016 - 4.1                      | 4.10E+00   | 14/25               | 1.11E-06                      | 34.1                                                              | 65.9           | 0.0                                  |                              | 1.94E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |      |
| EOS-2               | OS            | AZ37        | 1E-05                 | 4E+00        | <1                | Metal                      | Arsenic                    | C                    | 2 - 35.1                         | 1.67E+01   | 11/11               | 1.03E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |      |
|                     |               |             |                       |              |                   |                            | Lead                       | --                   | 18.7 - 1140                      | 1.14E+03   | 11/11               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | No                                  |      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C                    | 0.21 - 1.5                       | 1.50E+00   | 5/12                | 2.32E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
| EOS-2               | OS            | BA36        | 4E-05                 | 3E+00        | <1                | Metal                      | Arsenic                    | C                    | 0.59 - 641                       | 5.93E+01   | 35/35               | 3.66E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C                    | 0.058 - 3.1                      | 2.52E+00   | 7/18                | 3.90E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
| EOS-2               | OS            | BB36        | 6E-06                 | 2E+00        | <1                | Metal                      | Arsenic                    | C                    | 3.2 - 11.2                       | 7.24E+00   | 10/10               | 4.46E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |      |
| EOS-3               | OS            | BC36        | 6E-06                 | <1           | <1                | Metal                      | Arsenic                    | C                    | 0.39 - 7.3                       | 7.10E+00   | 5/5                 | 4.38E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |      |
| EOS-3               | OS            | BD35        | 4E-06                 | 2E+00        | <1                | Metal                      | Arsenic                    | C                    | 2.7 - 6.8                        | 6.80E+00   | 3/3                 | 4.19E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |      |
| EOS-3               | OS            | BE35        | 7E-06                 | 2E+00        | <1                | Metal                      | Arsenic                    | C                    | 1.2 - 12.6                       | 5.23E+00   | 20/24               | 3.23E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |      |
|                     |               |             |                       |              |                   |                            | Lead                       | --                   | 3.8 - 6130                       | 5.02E+03   | 23/24               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | No                                  |      |
| EOS-3               | OS            | BE36        | 2E-05                 | 3E+00        | <1                | PAH                        | Benzo(a)pyrene             | C                    | 0.52 - 1.4                       | 1.40E+00   | 2/18                | 2.17E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | Metal                      | Arsenic              | C                                | 2.2 - 34   | 2.97E+01            | 5/10                          | 1.83E-05                                                          | 70.7           | 29.3                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           | --     |                                     | 11.1 |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C                    | 0.051 - 3.3                      | 2.53E+00   | 7/10                | 3.92E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | Metal                      | Arsenic              | C                                | 0.87 - 22  | 7.01E+00            | 15/20                         | 4.32E-06                                                          | 70.7           | 29.3                                 | 0.0                          |                      | <1                                                       | --             | --                                   | --                           | --     |                                     | 11.1 |
| EOS-3               | OS            | BF36        | 3E-05                 | <1           | <1                | Metal                      | Arsenic                    | C                    | 2.3 - 6.5                        | 3.97E+00   | 6/11                | 2.45E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)anthracene         | C                    | 0.36 - 18                        | 1.80E+01   | 3/11                | 2.79E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | Benzo(a)pyrene             | C                    | 0.25 - 15                        | 1.34E+01   | 5/11                | 2.07E-05                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | Benzo(b)fluoranthene       | C                    | 0.038 - 12                       | 1.20E+01   | 6/11                | 1.86E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            |                            | Benzo(k)fluoranthene | C                                | 14 - 14    | 1.40E+01            | 1/11                          | 2.17E-06                                                          | 35.8           | 64.2                                 | 0.0                          |                      | --                                                       | --             | --                                   | --                           |        | --                                  | --   |
| EOS-3               | OS            | BG35        | 7E-06                 | <1           | <1                | Metal                      | Arsenic                    | C                    | 6.3 - 9.3                        | 9.30E+00   | 2/2                 | 5.73E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |      |
| EOS-3               | OS            | BG36        | 1E-05                 | 2E+00        | <1                | Metal                      | Arsenic                    | C                    | 3.9 - 19.3                       | 1.11E+01   | 9/13                | 6.85E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C                    | 0.1 - 2                          | 1.24E+00   | 10/13               | 1.92E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
| EOS-3               | OS            | BG36        | 1E-05                 | 2E+00        | <1                | Dioxin                     | 2,3,4,7,8-PECDF            | C                    | 1.000235 - 0.00023               | 2.35E-04   | 1/1                 | 1.15E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
| EOS-3               | OS            | BG37        | 4E-05                 | 5E+00        | 2E+00             | Metal                      | Antimony                   | NC                   | 4.8 - 240                        | 2.40E+02   | 2/2                 | --                            | --                                                                | --             | --                                   |                              | 1.94E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 9.05   | No                                  |      |
|                     |               |             |                       |              |                   |                            | Arsenic                    | C                    | 4.6 - 30                         | 3.00E+01   | 2/2                 | 1.85E-05                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |      |
|                     |               |             |                       |              |                   |                            | Lead                       | --                   | 39 - 1800                        | 1.80E+03   | 2/2                 | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | No                                  |      |
|                     |               |             |                       |              |                   | Dioxin                     | 1,2,3,7,8-PECDD            | C                    | 0.00025 - 0.00025                | 2.50E-04   | 1/1                 | 2.45E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | 2,3,4,6,7,8-HXCDF          | C                    | 0.00125 - 0.00125                | 1.25E-03   | 1/1                 | 1.22E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | 2,3,4,7,8-PECDF            | C                    | 0.00132 - 0.00132                | 1.32E-03   | 1/1                 | 6.46E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
| EOS-3               | OS            | BH36        | 1E-05                 | 1E+01        | 5E+00             | Metal                      | Arsenic                    | C                    | 3.1 - 14                         | 6.28E+00   | 10/16               | 3.87E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |      |
|                     |               |             |                       |              |                   |                            | Lead                       | --                   | 28.1 - 1500                      | 9.53E+02   | 13/16               | --                            | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | No                                  |      |
|                     |               |             |                       |              |                   |                            | Vanadium                   | NC                   | 27 - 1660                        | 1.49E+03   | 15/16               | --                            | --                                                                | --             | --                                   |                              | 4.81E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 117.17 | No                                  |      |
|                     |               |             |                       |              |                   | PAH                        | Benzo(a)pyrene             | C                    | 0.06 - 0.96                      | 9.60E-01   | 9/15                | 1.49E-06                      | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |
|                     |               |             |                       |              |                   |                            | Pest/PCB                   | Aroclor-1260         | C/NC                             | 0.02 - 5.6 | 5.60E+00            | 10/19                         | 1.52E-06                                                          | 34.1           | 65.9                                 | 0.0                          |                      | 2.65E+00                                                 | 34.1           | 65.9                                 | 0.0                          |        | --                                  | --   |
|                     |               |             |                       |              |                   | Dioxin                     | 2,3,4,7,8-PECDF            | C                    | 1.000578 - 0.00057               | 5.78E-04   | 1/4                 | 2.83E-06                      | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             | --                                   |                              | --     | --                                  |      |

TABLE 5-7: TOTAL RISK - RISK CHARACTERIZATION ANALYSIS FOR SUBSURFACE SOIL (0 TO 10 FEET BGS), CONSTRUCTION WORKER SCENARIO (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment BlockPlanned ReuseGrid NumberTotal RME Cancer RiskTotal RME HI RME Segregated HI |    |      |       |       |       | Chemicals of Concern (COC) |                       | Basis for COCRange of Detected ConcentrationsRME EPCDetection FrequencyChemical-Specific Cancer Risk |                    |          |       |          | Percent Contribution by Exposure Pathway to Total RME Cancer Risk |                |                                      |                              | Chemical-Specific HI | Percent Contribution by Exposure Pathway to Total RME HI |                |                                      |                              | Metals |                                     |
|------------------------------------------------------------------------------------------------|----|------|-------|-------|-------|----------------------------|-----------------------|------------------------------------------------------------------------------------------------------|--------------------|----------|-------|----------|-------------------------------------------------------------------|----------------|--------------------------------------|------------------------------|----------------------|----------------------------------------------------------|----------------|--------------------------------------|------------------------------|--------|-------------------------------------|
|                                                                                                |    |      |       |       |       |                            |                       |                                                                                                      |                    |          |       |          | Incidental Ingestion                                              | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion |                      | Incidental Ingestion                                     | Dermal Contact | Inhalation (Releases to Ambient Air) | Home-grown Produce Ingestion | HPAL   | Maximum Concentration Exceeds HPAL? |
| EOS-3                                                                                          | OS | BH37 | 2E-05 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                    | 3.4 - 28           | 2.29E+01 | 7/7   | 1.41E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |    |      |       |       |       | Dioxin                     | 2,3,4,7,8-PECDF       | C                                                                                                    | 0.000673 - 0.00037 | 3.21E-04 | 4/4   | 1.57E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-3                                                                                          | OS | BI35 | 3E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                    | 2.4 - 4.7          | 3.84E+00 | 5/6   | 2.37E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EOS-3                                                                                          | OS | BI36 | 1E-05 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                    | 1.2 - 73           | 1.53E+01 | 17/22 | 9.44E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |    |      |       |       |       | PAH                        | Benzo(a)pyrene        | C                                                                                                    | 0.038 - 0.73       | 7.30E-01 | 10/21 | 1.13E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-3                                                                                          | OS | BI37 | 2E-05 | 7E+00 | 3E+00 | Metal                      | Arsenic               | C                                                                                                    | 9.3 - 18           | 1.60E+01 | 5/5   | 9.85E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |    |      |       |       |       |                            | Lead                  | --                                                                                                   | 330 - 4700         | 3.34E+03 | 5/5   | --       | --                                                                | --             | --                                   | --                           |                      | --                                                       | --             | --                                   |                              | 8.99   | No                                  |
|                                                                                                |    |      |       |       |       |                            | Vanadium              | NC                                                                                                   | 53 - 880           | 8.80E+02 | 5/5   | --       | --                                                                | --             | --                                   | --                           | 2.84E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 117.17 | No                                  |
|                                                                                                |    |      |       |       |       | Pest/PCB                   | Aroclor-1260          | C/NC                                                                                                 | 0.17 - 4           | 4.00E+00 | 5/5   | 1.08E-06 | 34.1                                                              | 65.9           | 0.0                                  |                              | 1.90E+00             | 34.1                                                     | 65.9           | 0.0                                  |                              | --     | --                                  |
|                                                                                                |    |      |       |       |       | Dioxin                     | 2,3,4,7,8-PECDF       | C                                                                                                    | 0.00013 - 0.00041  | 3.73E-04 | 4/5   | 1.82E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-3                                                                                          | OS | BJ36 | 2E-05 | 5E+00 | 2E+00 | Metal                      | Antimony              | NC                                                                                                   | 170 - 170          | 1.70E+02 | 1/1   | --       | --                                                                | --             | --                                   |                              | 1.37E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 9.05   | No                                  |
|                                                                                                |    |      |       |       |       |                            | Arsenic               | C                                                                                                    | 18 - 18            | 1.80E+01 | 1/1   | 1.11E-05 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
|                                                                                                |    |      |       |       |       |                            | Copper                | NC                                                                                                   | 21000 - 21000      | 2.10E+04 | 1/1   | --       | --                                                                | --             | --                                   |                              | 1.83E+00             | 100.0                                                    | 0.0            | 0.0                                  |                              | 124.31 | Yes                                 |
|                                                                                                |    |      |       |       |       |                            | Lead                  | --                                                                                                   | 1900 - 1900        | 1.90E+03 | 1/1   | --       | --                                                                | --             | --                                   |                              | --                   | --                                                       | --             | --                                   |                              | 8.99   | Yes                                 |
|                                                                                                |    |      |       |       |       | Dioxin                     | 1,2,3,7,8-PECDD       | C                                                                                                    | 0.000235 - 0.00023 | 2.35E-04 | 1/1   | 2.30E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                |    |      |       |       |       |                            | 2,3,4,7,8-PECDF       | C                                                                                                    | 0.000796 - 0.00079 | 7.96E-04 | 1/1   | 3.90E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
| EOS-4                                                                                          | OS | AF26 | 3E-06 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                    | 5.4 - 5.4          | 5.40E+00 | 1/2   | 3.33E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EOS-4                                                                                          | OS | AG27 | 2E-06 | 2E+00 | <1    | Metal                      | Arsenic               | C                                                                                                    | 3.2 - 3.2          | 3.20E+00 | 1/2   | 1.97E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | No                                  |
| EOS-5                                                                                          | OS | ZZ01 | 1E-05 | <1    | <1    | Metal                      | Arsenic               | C                                                                                                    | 1.8 - 12.8         | 4.09E+00 | 34/39 | 2.52E-06 | 70.7                                                              | 29.3           | 0.0                                  |                              | <1                   | --                                                       | --             | --                                   |                              | 11.1   | Yes                                 |
|                                                                                                |    |      |       |       |       | PAH                        | Benzo(a)anthracene    | C                                                                                                    | 0.031 - 8.8        | 8.80E+00 | 3/39  | 1.36E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                |    |      |       |       |       |                            | Benzo(a)pyrene        | C                                                                                                    | 0.052 - 13         | 2.78E+00 | 4/39  | 4.30E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                |    |      |       |       |       |                            | Benzo(b)fluoranthene  | C                                                                                                    | 0.068 - 21         | 2.10E+01 | 3/39  | 3.25E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |
|                                                                                                |    |      |       |       |       |                            | Dibenz(a,h)anthracene | C                                                                                                    | 0.075 - 1.7        | 1.70E+00 | 2/39  | 1.60E-06 | 35.8                                                              | 64.2           | 0.0                                  |                              | --                   | --                                                       | --             |                                      | --                           | --     |                                     |

|        |                                                                           |
|--------|---------------------------------------------------------------------------|
| Notes: | All concentrations shown in mg/kg.                                        |
| <1     | Less than 1                                                               |
| --     | Not applicable or chemical is not a chemical of concern for this endpoint |
|        | Not evaluated because exposure pathway is incomplete                      |
| bgs    | Below ground surface                                                      |
| C      | Cancer effect                                                             |
| COC    | Chemical of concern                                                       |
| DF     | Detection frequency                                                       |
| EPC    | Exposure point concentration                                              |
| HI     | Hazard index                                                              |
| HPAL   | Hunters Point ambient level                                               |
| HXCDF  | Hexachlorodibenzofuran                                                    |
| IND    | Industrial (industrial exposure scenario)                                 |
| mg/kg  | Milligram per kilogram                                                    |
| MI     | Maritime/Industrial (industrial exposure scenario)                        |
| MU     | Mixed use (residential exposure scenario)                                 |
| NC     | Noncancer effect                                                          |
| PAH    | Polynuclear aromatic hydrocarbon                                          |
| PCB    | Polychlorinated biphenyl                                                  |
| PECDD  | Pentachlorodibenzo-p-dioxin                                               |
| PECDF  | Pentachlorodibenzofuran                                                   |
| Pest   | Pesticide                                                                 |
| OS     | Open space (recreational exposure scenario)                               |
| RD     | Residential development                                                   |
| RME    | Reasonable maximum exposure                                               |
| SVOC   | Semivolatile organic compound                                             |
| VOC    | Volatile organic compound                                                 |

|    |                                                     |                 |                                                                                                                                                                                                |
|----|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 24 | Cancer risks from exposure to radionuclides in soil | Section 2.5.1.1 | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix B, Tables B-4, B-5, and B-6. |
|----|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table B-4. Radionuclide Soil Data Summary**

| Study Area                                      | Radionuclide of Concern | Sample Size | Detections | Minimum Activity | Maximum Activity | Mean Activity | Background | Incremental Risk EPC | Total Risk EPC |
|-------------------------------------------------|-------------------------|-------------|------------|------------------|------------------|---------------|------------|----------------------|----------------|
| <b>Revelopment Block MU-1</b>                   |                         |             |            |                  |                  |               |            |                      |                |
| <b>707 Triangle Area</b>                        | Cesium-137              | 123         | 123        | 0.004            | 113.960          | 1.870         | 0.048      | 113.912              | 113.960        |
|                                                 | Plutonium-239           | 2           | 2          | 0.004            | 0.025            | 0.014         | --         | 0.025                | 0.025          |
|                                                 | Radium-226              | 123         | 123        | 0.183            | 6.640            | 2.324         | 0.819      | 5.821                | 6.640          |
|                                                 | Strontium-90            | 2           | 2          | -0.154           | -0.119           | -0.133        | --         | --                   | --             |
|                                                 | Uranium-235             | 123         | 123        | 0.142            | 1.615            | 0.509         | --         | 1.615                | 1.615          |
| <b>Redevelopment Block MU-2</b>                 |                         |             |            |                  |                  |               |            |                      |                |
| <b>Building 414 Site</b>                        | Cesium-137              | 2           | 2          | 0.030            | 0.043            | 0.037         | 0.049      | --                   | 0.043          |
|                                                 | Radium-226              | 2           | 2          | 1.449            | 1.822            | 1.635         | 0.818      | 1.004                | 1.822          |
| <b>Building 506 Site</b>                        | Americium-241           | 9           | 9          | 0.045            | 0.197            | 0.128         | --         | 0.197                | 0.197          |
|                                                 | Cesium-137              | 9           | 9          | 0.017            | 0.069            | 0.041         | 0.049      | 0.020                | 0.069          |
|                                                 | Radium-226              | 9           | 9          | 0.599            | 2.175            | 1.336         | 0.818      | 1.357                | 2.175          |
| <b>Building 507 Site</b>                        | Cesium-137              | 4           | 4          | 0.020            | 0.099            | 0.040         | 0.049      | 0.050                | 0.099          |
|                                                 | Radium-226              | 4           | 4          | 0.468            | 4.402            | 1.481         | 0.818      | 3.584                | 4.402          |
| <b>Building 508 Site</b>                        | Cesium-137              | 5           | 5          | 0.018            | 0.127            | 0.048         | 0.049      | 0.078                | 0.127          |
|                                                 | Radium-226              | 5           | 5          | 0.532            | 1.058            | 0.765         | 0.818      | 0.240                | 1.058          |
| <b>Building 520 Site</b>                        | Cesium-137              | 3           | 3          | 0.017            | 0.056            | 0.038         | 0.049      | 0.007                | 0.056          |
|                                                 | Radium-226              | 3           | 3          | 1.041            | 1.978            | 1.563         | 0.818      | 1.160                | 1.978          |
| <b>Building 529 Site</b>                        | Americium-241           | 3           | 3          | 0.051            | 0.145            | 0.094         | --         | 0.145                | 0.145          |
|                                                 | Cesium-137              | 3           | 3          | 0.039            | 0.074            | 0.060         | 0.049      | 0.025                | 0.074          |
|                                                 | Radium-226              | 3           | 3          | 0.610            | 0.906            | 0.770         | 0.818      | 0.088                | 0.906          |
|                                                 | Strontium-90            | 1           | 1          | 0.507            | 0.507            | 0.507         | 0.176      | 0.331                | 0.507          |
| <b>Shack 79 Site</b>                            | Americium-241           | 2           | 2          | 0.110            | 0.236            | 0.173         | --         | 0.236                | 0.236          |
|                                                 | Cesium-137              | 2           | 2          | 0.057            | 0.137            | 0.097         | 0.049      | 0.088                | 0.137          |
|                                                 | Radium-226              | 2           | 2          | 1.901            | 2.007            | 1.954         | 0.818      | 1.189                | 2.007          |
| <b>Shack 80 Site</b>                            | Americium-241           | 32          | 32         | 0.034            | 0.391            | 0.192         | --         | 0.391                | 0.391          |
|                                                 | Cesium-137              | 32          | 32         | 0.028            | 7.713            | 0.552         | 0.049      | 7.664                | 7.713          |
|                                                 | Radium-226              | 32          | 32         | 1.297            | 4.467            | 2.293         | 0.818      | 3.649                | 4.467          |
| <b>Redevelopment Block MU-3</b>                 |                         |             |            |                  |                  |               |            |                      |                |
| <b>Building 701 Site</b>                        | Cesium-137              | 12          | 12         | 0.009            | 0.039            | 0.021         | 0.049      | --                   | 0.039          |
|                                                 | Radium-226              | 12          | 12         | 0.531            | 1.206            | 0.864         | 0.818      | 0.388                | 1.206          |
| <b>IR Site 04</b>                               | Cesium-137              | 88          | 88         | 0.001            | 1.039            | 0.105         | 0.049      | 0.990                | 1.039          |
|                                                 | Radium-226              | 88          | 88         | 0.918            | 4.205            | 2.365         | 0.818      | 3.387                | 4.205          |
| <b>Redevelopment Blocks EOS-1 through EOS-4</b> |                         |             |            |                  |                  |               |            |                      |                |
| <b>Building 509 Site</b>                        | Cesium-137              | 6           | 6          | 0.027            | 0.063            | 0.041         | 0.049      | 0.014                | 0.063          |
| <b>Building 510/510A Site</b>                   | Cesium-137              | 5           | 5          | 0.017            | 0.041            | 0.027         | 0.049      | --                   | 0.041          |
|                                                 | Radium-226              | 5           | 5          | 0.595            | 1.644            | 1.051         | 0.818      | 0.826                | 1.644          |
| <b>Building 517 Site</b>                        | Cesium-137              | 2           | 2          | 0.023            | 0.072            | 0.048         | 0.049      | 0.023                | 0.072          |
|                                                 | Cobalt-60               | 2           | 2          | 0.025            | 0.044            | 0.034         | --         | 0.044                | 0.044          |
| <b>IR Site 02 Northwest</b>                     | Cesium-137              | 25          | 10         | 0.026            | 0.319            | 0.119         | 0.049      | 0.270                | 0.319          |
|                                                 | Radium-226              | 25          | 23         | 0.230            | 1.180            | 0.455         | 0.818      | 0.362                | 1.180          |
| <b>IR Site 02 Central</b>                       | Cesium-137              | 20          | 7          | 0.040            | 0.400            | 0.173         | 0.049      | 0.351                | 0.400          |
|                                                 | Radium-226              | 20          | 19         | 0.300            | 2.000            | 0.718         | 0.818      | 1.182                | 2.000          |
| <b>IR Site 02 Southeast</b>                     | Cesium-137              | 6           | 3          | 0.051            | 0.376            | 0.161         | 0.049      | 0.327                | 0.376          |
|                                                 | Radium-226              | 6           | 6          | 0.390            | 412.100          | 75.605        | 0.818      | 411.282              | 412.100        |

Notes: All activities are presented in picocuries per gram (pCi/g)

EPC = exposure point concentration

IR = Installation Restoration

**Table B-5. Radionuclide Risk Results, Planned Reuse Exposure Scenarios**

| Redevelopment Block                                                              | Incremental Risk | Total Risk |
|----------------------------------------------------------------------------------|------------------|------------|
| <b>Redevelopment Block MU-1 (Residential Exposure Scenario)</b>                  |                  |            |
| <b>707 Triangle Area</b>                                                         |                  |            |
| Radiological Risk                                                                | 7E-03            | 7E-03      |
| Dose (mrem/year)                                                                 | 392.500          | 401.000    |
| <b>Redevelopment Block MU-2 (Residential Exposure Scenario)</b>                  |                  |            |
| <b>Building 414</b>                                                              |                  |            |
| Radiological Risk                                                                | 2E-04            | 4E-04      |
| Dose (mrem/year)                                                                 | 10.340           | 18.890     |
| <b>Building 506 Site</b>                                                         |                  |            |
| Radiological Risk                                                                | 3E-04            | 5E-04      |
| Dose (mrem/year)                                                                 | 13.700           | 22.040     |
| <b>Building 507 Site</b>                                                         |                  |            |
| Radiological Risk                                                                | 8E-04            | 9E-04      |
| Dose (mrem/year)                                                                 | 35.380           | 43.560     |
| <b>Building 508 Site</b>                                                         |                  |            |
| Radiological Risk                                                                | 6E-05            | 2E-04      |
| Dose (mrem/year)                                                                 | 2.581            | 10.760     |
| <b>Building 520 Site</b>                                                         |                  |            |
| Radiological Risk                                                                | 2E-04            | 4E-04      |
| Dose (mrem/year)                                                                 | 11.470           | 19.680     |
| <b>Building 529 Site</b>                                                         |                  |            |
| Radiological Risk                                                                | 2E-05            | 2E-04      |
| Dose (mrem/year)                                                                 | 0.744            | 7.106      |
| <b>Shack 79 Site</b>                                                             |                  |            |
| Radiological Risk                                                                | 2E-04            | 3E-04      |
| Dose (mrem/year)                                                                 | 8.765            | 14.760     |
| <b>Shack 80 Site</b>                                                             |                  |            |
| Radiological Risk                                                                | 9E-04            | 1E-03      |
| Dose (mrem/year)                                                                 | 42.910           | 107.300    |
| <b>Redevelopment Block MU-3 (Residential Exposure Scenario)</b>                  |                  |            |
| <b>Building 701 Site</b>                                                         |                  |            |
| Radiological Risk                                                                | 8E-05            | 3E-04      |
| Dose (mrem/year)                                                                 | 3.786            | 11.880     |
| <b>IR Site 04</b>                                                                |                  |            |
| Radiological Risk                                                                | 8E-04            | 1E-03      |
| Dose (mrem/year)                                                                 | 37.750           | 46.480     |
| <b>Redevelopment Blocks EOS-1 through EOS-4 (Recreational Exposure Scenario)</b> |                  |            |
| <b>Building 509 Site</b>                                                         |                  |            |
| Radiological Risk                                                                | 5E-08            | 2E-07      |
| Dose (mrem/year)                                                                 | 0.003            | 0.013      |

**Table B-5. Radionuclide Risk Results, Planned Reuse Exposure Scenarios (continued)**

| Redevelopment Block                                                                          | Incremental Risk | Total Risk |
|----------------------------------------------------------------------------------------------|------------------|------------|
| <b>Redevelopment Blocks EOS-1 through EOS-4 (Recreational Exposure Scenario) (continued)</b> |                  |            |
| <b>Building 510/510A Site</b>                                                                |                  |            |
| Radiological Risk                                                                            | 1E-05            | 2E-05      |
| Dose (mrem/year)                                                                             | 0.563            | 1.129      |
| <b>Building 517 Site</b>                                                                     |                  |            |
| Radiological Risk                                                                            | 5E-07            | 6E-07      |
| Dose (mrem/year)                                                                             | 0.045            | 0.055      |
| <b>IR Site 02 Northwest</b>                                                                  |                  |            |
| Radiological Risk                                                                            | 7E-06            | 2E-05      |
| Dose (mrem/year)                                                                             | 0.322            | 0.927      |
| <b>IR Site 02 Central</b>                                                                    |                  |            |
| Radiological Risk                                                                            | 2E-05            | 3E-05      |
| Dose (mrem/year)                                                                             | 0.936            | 1.541      |
| <b>IR Site 02 Southeast</b>                                                                  |                  |            |
| Radiological Risk                                                                            | 7E-03            | 7E-03      |
| Dose (mrem/year)                                                                             | 299.300          | 299.900    |

## Notes:

- a. Dose values are for the higher of the adult and child receptors; risk values are for the sum of adult and child receptors.

IR = Installation Restoration

mrem/year = millirems per year

**Table B-6. Radionuclide Risk Results, Residential Exposure Scenario**

| Redevelopment Block                             | Incremental Risk <sup>a</sup> | Total Risk <sup>a</sup> |
|-------------------------------------------------|-------------------------------|-------------------------|
| <b>Redevelopment Blocks EOS-1 through EOS-4</b> |                               |                         |
| <b>Building 509 Site</b>                        |                               |                         |
| Radiological Risk                               | 7E-07                         | 3E-06                   |
| Dose (mrem/year)                                | 0.039                         | 0.177                   |
| <b>Building 510/510A Site</b>                   |                               |                         |
| Radiological Risk                               | 2E-04                         | 3E-04                   |
| Dose (mrem/year)                                | 7.698                         | 15.430                  |
| <b>Building 517 Site</b>                        |                               |                         |
| Radiological Risk                               | 6E-06                         | 9E-06                   |
| Dose (mrem/year)                                | 0.602                         | 0.735                   |
| <b>IR Site 02 Northwest</b>                     |                               |                         |
| Radiological Risk                               | 9E-05                         | 3E-04                   |
| Dose (mrem/year)                                | 4.513                         | 13.080                  |
| <b>IR Site 02 Central</b>                       |                               |                         |
| Radiological Risk                               | 3E-04                         | 5E-04                   |
| Dose (mrem/year)                                | 13.190                        | 21.760                  |
| <b>IR Site 02 Southeast</b>                     |                               |                         |
| Radiological Risk                               | 9E-02                         | 9E-02                   |
| Dose (mrem/year)                                | 4236.000                      | 4244.000                |

Notes:

a. Dose values are for the higher of the adult and child receptors; risk values are for the sum of adult and child receptors.

IR = Installation Restoration

mrem/year = millirems per year



|    |                                       |                 |                                                                                                                                                                                                                                             |
|----|---------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25 | Direct exposure to shoreline sediment | Section 2.5.1.2 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 5.3.1, pages 5-18 through 5-20; Attachment 1, Tables 1-1, 1-2, 1-3, 1-4, and 1-5. |
|----|---------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

or severe. Any HQ greater than 1.0 is generally interpreted as indicating some risk in a SLERA. In a BERA, however, more realistic assessment is appropriate. Because the low TRVs, which represent a lowest observable adverse effect level, were used to derive the PSCs, an HQ greater than 1.0 does not indicate immediate unacceptable risk.

In summary, no significant unacceptable risk to ecological receptors was indicated at Parcel E. The maximum HQs based on PSCs derived using the low TRV were 2.16 (for kestrels exposed to PCBs in soil) and 2.67 for the house mouse (exposed to lead in soil). Because the house mouse is not considered to warrant protection as a species, and no other small mammals were trapped at the site, this level of risk is acceptable. The low HQ for the kestrel does not indicate population-level risk of a magnitude that warrants remediation.

### 5.3 RESULTS OF THE PARCEL E SHORELINE HUMAN HEALTH RISK ASSESSMENT AND SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

This section summarizes the potential human health and ecological risks from exposure to chemicals present in sediments along the shoreline at Parcel E and identifies COCs for human health and environmental receptors. Potential risk from exposure to chemicals present in sediment was evaluated for the entire shoreline area at HPS, including the shoreline area associated with Parcel E. The risk assessments for sediment are being conducted as part of the Parcel F (offshore area) RI/FS activities and are drawn from for use in this Revised Parcel E RI Report.

A complete description of the methods used in performing the HHRA are provided in the Final Hunters Point Shipyard Parcel F Validation Study ([Battelle, BBL, and Neptune & Company 2005](#)), and [Attachment 1](#) of this Revised RI Report contains tables from the Parcel F Validation Study summarizing the HHRA results. [Appendix G](#) presents the detailed results of the SLERA, which was performed as part of the Parcels E and E-2 Shoreline Characterization Technical Memorandum.

#### 5.3.1 Risk to Human Health Along the Parcel E Shoreline

This section presents the results of the human health evaluation of the Parcel E shoreline sediments. The HHRA was performed according to standard EPA risk assessment guidance ([EPA 1989, 1992](#)).

Current and reasonably anticipated future human exposure to COPCs associated with the shoreline along Parcel E was estimated. It was assumed that the primary exposure pathway would be through the consumption of shellfish, and that individuals harvesting shellfish would be directly exposed to sediments via direct contact and incidental ingestion. For the purposes of the human health risk assessment, the entire shoreline was considered as one exposure unit.

Risks to humans were calculated using sediment data from the Parcel E and E-2 shoreline at HPS. EPCs were developed to model exposures under both a reasonable maximum exposure (RME) and a central tendency exposure (CTE) scenarios. The RME relies on conservative exposure factors to estimate the RMEs anticipated for a site, whereas the CTE describes a more typical or average exposure to an individual. The EPCs for direct contact for both the RME and CTE were defined as the 95 percentile upper confidence limit of the surface sediments collected along the Parcels E and E-2 shoreline.

Using the EPCs for each media (sediment and shellfish tissue) and the parameters described above, doses associated with each scenario were calculated using the standard risk equations presented below.

### Sediment Exposures

$$Dose(mg / kg - day) = \frac{(C_{sed} \times IR_{sed} \times FI \times EF \times ED) + (C_{sed} \times SA \times AF \times DAF \times FI \times EF \times ED)}{BW \times AT} \quad (5-1)$$

### Consumption of Shellfish

$$Dose(mg / kg - day) = \frac{C_{tissue} \times IR_{tissue} \times EF \times ED \times FI}{BW \times AT} \quad (5-2)$$

where:

|      |   |                                                                                       |
|------|---|---------------------------------------------------------------------------------------|
| Dose | = | Rate of chemical intake across the body (milligrams per kilogram per day [mg/kg-day]) |
| C    | = | Chemical concentration in contaminated media or EPC (mg/kg)                           |
| IR   | = | Contact or ingestion rate (milligrams per day)                                        |
| EF   | = | Exposure frequency (days/year)                                                        |
| ED   | = | Exposure duration (years)                                                             |
| FI   | = | Fraction ingestion (unitless)                                                         |
| SA   | = | Skin surface area exposed (square centimeters per day)                                |
| AF   | = | Skin adherence factor (milligrams per square centimeter)                              |
| DAF  | = | Dermal absorption factor (unitless)                                                   |
| BW   | = | Body weight (kilogram)                                                                |
| AT   | = | Averaging time (days)                                                                 |

[Attachment 1](#) (see Table 1) summarizes the specific exposure factors used to derive the dose calculated for each exposure scenario. With the exception of the shellfish ingestion rate, the exposure parameters used were the same as those used to estimate risk for the Parcel F sediments in the Parcel F Validation Study ([Battelle, BBL, and Neptune & Company 2005](#)).

The doses derived in this manner for each scenario were then summed to estimate a lifetime average daily dose and average daily dose for each constituent by sampling area based on the adult and child RME and CTE exposure scenarios, respectively.

A summary of the individual risk and hazard values calculated for all chemicals evaluated within each exposure scenario is presented in [Attachment 1](#) (see Tables 2 and 3). Total cumulative risks and the risk drivers for each scenario are summarized in [Attachment 1](#) (see Tables 4 and 5). Cancer risks derived in this assessment can be compared with EPA's risk management range (that is, 1E-06 to 1E-04) for health protectiveness at Superfund sites. Based on this range, EPA typically considers 1E-06 as the "point of departure" for taking action at Superfund sites ([EPA 1989](#)).

Risks associated with direct contact to sediment were relatively low. For the RME scenario, PCBs were the only chemical with a risk greater than 1E-06. For the CTE scenario, all risks were below 1E-06 and hazards were below 1. For the shellfish ingestion pathway, the primary risk drivers associated with Parcels E and E-2 shoreline sediments were arsenic, chromium, total PCBs, and dioxins. Risks for these chemicals exceeded 1E-06 for both RME and CTE scenarios. Risks for arsenic and dioxins were similar to those for reference areas, but risks for chromium and total PCBs associated with site sediments were higher than those for reference areas ([Battelle, BBL, and Neptune & Company 2005](#)). For noncancer risks, total PCBs were the primary contributor.

Based on this evaluation, chromium and total PCBs appear to be the primary COCs for the evaluation of human health along the Parcel E shoreline.

### **5.3.2 Risk to Ecological Receptors Along the Parcel E Shoreline**

The Navy conducted a SLERA to determine if chemicals detected along the shoreline pose an ecological risk to those receptors exposed to the narrow intertidal zone of Parcels E and E-2 (see [Appendix G](#)). For the purposes of the SLERA, the habitat along the entire shoreline was considered as one exposure unit. In addition, the shoreline was not divided into Parcels E and E-2 because it would reduce sample sizes below what is practicable for assessing risk.

Sediment samples were analyzed for metals, VOCs, SVOCs, pesticides, PCBs, TPH, dioxins and furans, and organotins. All chemicals detected in sediment samples from the shoreline were screened to identify COPECs. A toxicity-based approach was used to identify site-related chemicals that may pose risks to sensitive ecological receptors, including benthic invertebrates, birds, and mammals.

**TABLE 1-1: EXPOSURE FACTORS FOR EVALUATING RISKS ALONG THE PARCELS E AND E-2 SHORELINE**

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| Exposure Parameters                        | Symbol           | Unit                 | Average           | RME               | Reference             |
|--------------------------------------------|------------------|----------------------|-------------------|-------------------|-----------------------|
| Target Risk                                | TR               | unitless             | 1.0E-06           | 1.0E-06           | EPA 2002              |
| Target Hazard Index                        | THI              | unitless             | 1                 | 1                 | EPA 2002              |
| Ingestion Rate - bivalves                  | IRshell          | kg/day               | 8.00E-04          | 2.40E-03          | SFEI 2001             |
| Fraction Ingested from Contaminated Source | FI               | unitless             | 0.5               | 1                 | Professional Judgment |
| Sediment Ingestion Rate                    | IRsed            | mg/day               | 50                | 100               | EPA 2002              |
| Exposure Frequency - Direct Contact        | EF               | days/year            | 13                | 26                | Professional Judgment |
| Skin Surface Area                          | SA               | cm <sup>2</sup> /day | 5700              | 5700              | EPA 2002              |
| Adherence Factor                           | AF               | mg/cm <sup>2</sup>   | 0.07              | 0.07              | EPA 2002              |
| Dermal Absorption Factor                   | DAF              | unitless             | chemical-specific | chemical-specific | EPA 2002              |
| Exposure Frequency - bivalve               | EF               | days/year            | 365               | 365               | EPA 1989              |
| Exposure Duration                          | ED               | years                | 9                 | 30                | EPA 1989 and 1991     |
| Body Weight                                | BW               | kg                   | 70                | 70                | EPA 2002              |
| Averaging Time- cancer                     | AT <sub>c</sub>  | days                 | 25,550            | 25,550            | EPA 2002              |
| Averaging Time - noncancer                 | AT <sub>nc</sub> | days                 | 3,285             | 10,950            | EPA 2002              |

**Notes:**

cm<sup>2</sup>/day Square centimeter per day  
EPA U.S. Environmental Protection Agency  
kg Kilogram  
mg/cm<sup>2</sup> Milligram per square centimeter  
SFEI San Francisco Estuary Institute

**References:**

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**TABLE 1-2: SUMMARY OF RISKS ASSOCIATED WITH SHELLFISH INGESTION**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical               | Site Risk |          | % Contribution to Site Risk |        | Reference Risk |          | Site Hazard |          | % Contribution to Site Hazard |       | Reference Hazard |          |
|------------------------|-----------|----------|-----------------------------|--------|----------------|----------|-------------|----------|-------------------------------|-------|------------------|----------|
|                        | RME       | CTE      | RME                         | CTE    | RME            | CTE      | RME         | CTE      | RME                           | CTE   | RME              | CTE      |
| 2-Methylnaphthalene    | ---       | ---      | ---                         | ---    | ---            | ---      | ---         | ---      | ---                           | ---   | ---              | ---      |
| 4,4'-DDD               | ND        | ND       | NA                          | NA     | 1.78E-09       | 8.92E-11 | ---         | ---      | ---                           | ---   | ---              | ---      |
| 4,4'-DDE               | 1.22E-07  | 6.08E-09 | 0.01%                       | 0.01%  | 4.36E-09       | 2.18E-10 | ---         | ---      | ---                           | ---   | ---              | ---      |
| 4,4'-DDT               | 1.38E-06  | 6.91E-08 | 0.11%                       | 0.11%  | 3.39E-10       | 1.69E-11 | 1.90E-02    | 3.16E-03 | 0.14%                         | 0.14% | 4.65E-06         | 7.75E-07 |
| Acenaphthene           | ---       | ---      | ---                         | ---    | ---            | ---      | ND          | ND       | NA                            | NA    | 1.01E-07         | 1.68E-08 |
| Acenaphthylene         | ---       | ---      | ---                         | ---    | ---            | ---      | ---         | ---      | ---                           | ---   | ---              | ---      |
| a-Chlordane            | 2.62E-07  | 1.31E-08 | 0.02%                       | 0.02%  | 2.22E-09       | 1.11E-10 | 9.41E-04    | 1.57E-04 | 0.01%                         | 0.01% | 7.97E-06         | 1.33E-06 |
| Aluminum               | ---       | ---      | ---                         | ---    | ---            | ---      | 1.98E-01    | 3.29E-02 | 1.44%                         | 1.44% | 9.57E-03         | 1.59E-03 |
| Anthracene             | ---       | ---      | ---                         | ---    | ---            | ---      | 1.22E-05    | 2.03E-06 | 0.00%                         | 0.00% | 1.36E-07         | 2.27E-08 |
| Antimony               | ---       | ---      | ---                         | ---    | ---            | ---      | 5.89E-01    | 9.81E-02 | 4.28%                         | 4.28% | 2.28E-03         | 3.80E-04 |
| Arsenic                | 1.63E-04  | 8.14E-06 | 13.38%                      | 13.38% | 8.30E-05       | 4.15E-06 | 8.44E-01    | 1.41E-01 | 6.13%                         | 6.13% | 4.30E-01         | 7.17E-02 |
| Barium                 | ---       | ---      | ---                         | ---    | ---            | ---      | 1.12E-01    | 1.86E-02 | 0.81%                         | 0.81% | 1.44E-03         | 2.40E-04 |
| Benzo(a)anthracene     | 4.95E-06  | 2.48E-07 | 0.41%                       | 0.41%  | 4.39E-08       | 2.19E-09 | ---         | ---      | ---                           | ---   | ---              | ---      |
| Benzo(a)pyrene         | 4.82E-05  | 2.41E-06 | 3.96%                       | 3.96%  | 6.66E-07       | 3.33E-08 | ---         | ---      | ---                           | ---   | ---              | ---      |
| Benzo(b)fluoranthene   | 6.07E-06  | 3.04E-07 | 0.50%                       | 0.50%  | 6.16E-08       | 3.08E-09 | ---         | ---      | ---                           | ---   | ---              | ---      |
| Benzo(g,h,i)perylene   | ---       | ---      | ---                         | ---    | ---            | ---      | ---         | ---      | ---                           | ---   | ---              | ---      |
| Benzo(k)fluoranthene   | 4.70E-06  | 2.35E-07 | 0.39%                       | 0.39%  | 7.04E-08       | 3.52E-09 | ---         | ---      | ---                           | ---   | ---              | ---      |
| Cadmium                | 2.38E-05  | 1.19E-06 | 1.96%                       | 1.96%  | 4.98E-07       | 2.49E-08 | 2.93E-01    | 4.88E-02 | 2.13%                         | 2.13% | 6.11E-03         | 1.02E-03 |
| Chromium               | 2.97E-04  | 1.48E-05 | 24.37%                      | 24.37% | 7.87E-06       | 3.93E-07 | 1.21E+00    | 2.02E-01 | 8.82%                         | 8.82% | 3.22E-02         | 5.37E-03 |
| Chrysene               | 5.55E-07  | 2.77E-08 | 0.05%                       | 0.05%  | 7.67E-09       | 3.84E-10 | ---         | ---      | ---                           | ---   | ---              | ---      |
| Cobalt                 | ---       | ---      | ---                         | ---    | ---            | ---      | 6.46E-03    | 1.08E-03 | 0.05%                         | 0.05% | 2.91E-04         | 4.85E-05 |
| Copper                 | ---       | ---      | ---                         | ---    | ---            | ---      | 7.69E-01    | 1.28E-01 | 5.59%                         | 5.59% | 2.30E-03         | 3.83E-04 |
| DBT                    | ---       | ---      | ---                         | ---    | ---            | ---      | ---         | ---      | ---                           | ---   | ---              | ---      |
| Dibenz(a,h)anthracene  | ND        | ND       | NA                          | NA     | 8.44E-09       | 4.22E-10 | ---         | ---      | ---                           | ---   | ---              | ---      |
| Dieldrin               | ND        | ND       | NA                          | NA     | 3.73E-08       | 1.87E-09 | ND          | ND       | NA                            | NA    | 1.09E-04         | 1.81E-05 |
| Endosulfan II          | ---       | ---      | ---                         | ---    | ---            | ---      | ND          | ND       | NA                            | NA    | 2.06E-07         | 3.43E-08 |
| Endrin                 | ---       | ---      | ---                         | ---    | ---            | ---      | 6.48E-03    | 1.08E-03 | 0.05%                         | 0.05% | 3.57E-06         | 5.94E-07 |
| Fluoranthene           | ---       | ---      | ---                         | ---    | ---            | ---      | 3.79E-04    | 6.32E-05 | 0.00%                         | 0.00% | 8.44E-06         | 1.41E-06 |
| Fluorene               | ---       | ---      | ---                         | ---    | ---            | ---      | ND          | ND       | NA                            | NA    | 2.20E-07         | 3.66E-08 |
| g-Chlordane            | 7.94E-07  | 3.97E-08 | 0.07%                       | 0.07%  | 1.78E-09       | 8.90E-11 | 2.85E-03    | 4.75E-04 | 0.02%                         | 0.02% | 6.39E-06         | 1.07E-06 |
| Heptachlor             | ND        | ND       | NA                          | NA     | 1.81E-09       | 9.05E-11 | ND          | ND       | NA                            | NA    | 2.06E-06         | 3.43E-07 |
| Indeno(1,2,3-cd)pyrene | 2.68E-06  | 1.34E-07 | 0.22%                       | 0.22%  | 3.22E-08       | 1.61E-09 | ---         | ---      | ---                           | ---   | ---              | ---      |
| Iron                   | ---       | ---      | ---                         | ---    | ---            | ---      | ---         | ---      | ---                           | ---   | ---              | ---      |

**TABLE 1-2: SUMMARY OF RISKS ASSOCIATED WITH SHELLFISH INGESTION (CONTINUED)**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical        | Site Risk |          | % Contribution to Site Risk |        | Reference Risk |          | Site Hazard |          | % Contribution to Site Hazard |        | Reference Hazard |          |
|-----------------|-----------|----------|-----------------------------|--------|----------------|----------|-------------|----------|-------------------------------|--------|------------------|----------|
|                 | RME       | CTE      | RME                         | CTE    | RME            | CTE      | RME         | CTE      | RME                           | CTE    | RME              | CTE      |
| Lead            | 2.44E-05  | 1.22E-06 | 2.01%                       | 2.01%  | 6.12E-08       | 3.06E-09 | ---         | ---      | ---                           | ---    | ---              | ---      |
| Manganese       | ---       | ---      | ---                         | ---    | ---            | ---      | 7.19E-01    | 1.20E-01 | 5.22%                         | 5.22%  | 1.13E-02         | 1.89E-03 |
| MBT             | ---       | ---      | ---                         | ---    | ---            | ---      | ---         | ---      | ---                           | ---    | ---              | ---      |
| Mercury         | ---       | ---      | ---                         | ---    | ---            | ---      | 3.28E-01    | 5.47E-02 | 2.39%                         | 2.39%  | 7.95E-03         | 1.33E-03 |
| Molybdenum      | ---       | ---      | ---                         | ---    | ---            | ---      | 3.81E-02    | 6.34E-03 | 0.28%                         | 0.28%  | 3.36E-03         | 5.60E-04 |
| Naphthalene     | ---       | ---      | ---                         | ---    | ---            | ---      | 2.04E-04    | 3.40E-05 | 0.00%                         | 0.00%  | 8.92E-07         | 1.49E-07 |
| Nickel          | ---       | ---      | ---                         | ---    | ---            | ---      | 2.67E-01    | 4.44E-02 | 1.94%                         | 1.94%  | 2.33E-03         | 3.89E-04 |
| Phenanthrene    | ---       | ---      | ---                         | ---    | ---            | ---      | ---         | ---      | ---                           | ---    | ---              | ---      |
| Pyrene          | ---       | ---      | ---                         | ---    | ---            | ---      | 4.87E-04    | 8.12E-05 | 0.00%                         | 0.00%  | 1.34E-05         | 2.24E-06 |
| Selenium        | ---       | ---      | ---                         | ---    | ---            | ---      | 3.49E-03    | 5.82E-04 | 0.03%                         | 0.03%  | 5.40E-03         | 9.00E-04 |
| Silver          | ---       | ---      | ---                         | ---    | ---            | ---      | 7.46E-03    | 1.24E-03 | 0.05%                         | 0.05%  | 1.64E-04         | 2.73E-05 |
| TBT             | ---       | ---      | ---                         | ---    | ---            | ---      | ---         | ---      | ---                           | ---    | ---              | ---      |
| Total Congeners | 3.46E-04  | 1.73E-05 | 28.46%                      | 28.46% | 5.76E-07       | 2.88E-08 | 8.08E+00    | 1.35E+00 | 58.71%                        | 58.71% | 1.34E-02         | 2.24E-03 |
| Total Dioxin    | 2.93E-04  | 1.47E-05 | 24.10%                      | 24.10% | 1.26E-03       | 6.32E-05 | ---         | ---      | ---                           | ---    | ---              | ---      |
| TTBT            | ---       | ---      | ---                         | ---    | ---            | ---      | ---         | ---      | ---                           | ---    | ---              | ---      |
| Vanadium        | ---       | ---      | ---                         | ---    | ---            | ---      | 2.09E-01    | 3.48E-02 | 1.52%                         | 1.52%  | 7.30E-03         | 1.22E-03 |
| Zinc            | ---       | ---      | ---                         | ---    | ---            | ---      | 5.72E-02    | 9.54E-03 | 0.42%                         | 0.42%  | 2.09E-03         | 3.48E-04 |

## Notes:

|     |                                 |
|-----|---------------------------------|
| --- | Not applicable                  |
| CTE | Central tendency exposure       |
| DBT | Dibutyltin                      |
| DDD | Dichlorodiphenyldichloroethane  |
| DDE | Dichlorodiphenyldichloroethene  |
| DDT | Dichlorodiphenyltrichloroethane |
| NA  | Not analyzed                    |
| ND  | Nondetect                       |
| RME | Reasonable maximum exposure     |
| TBT | Tributyltin                     |

**TABLE 1-3: SUMMARY OF RISKS AND HAZARDS ASSOCIATED WITH DIRECT CONTACT**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical               | Site Risk |          | % Contribution to Site Risk |       | Reference Risk |          | Site Hazard |          | % Contribution to Site Hazard |       | Reference Hazard |         |
|------------------------|-----------|----------|-----------------------------|-------|----------------|----------|-------------|----------|-------------------------------|-------|------------------|---------|
|                        | RME       | CTE      | RME                         | CTE   | RME            | CTE      | RME         | CTE      | RME                           | CTE   | RME              | CTE     |
| 2-Methylnaphthalene    | ---       | ---      | ---                         | ---   | NA             | NA       | ---         | ---      | ---                           | ---   | NA               | NA      |
| 4,4'-DDD               | ND        | ND       | NA                          | NA    | 2.36E-11       | 9.80E-13 | ---         | ---      | ---                           | ---   | ---              | ---     |
| 4,4'-DDE               | 3.58E-10  | 1.48E-11 | 0.0%                        | 0.0%  | 1.32E-11       | 5.50E-13 | ---         | ---      | ---                           | ---   | ---              | ---     |
| 4,4'-DDT               | 4.06E-09  | 1.69E-10 | 0.1%                        | 0.1%  | 1.41E-11       | 5.86E-13 | 5.58E-05    | 7.72E-06 | 0.11%                         | 0.10% | 1.9E-07          | 2.7E-08 |
| Acenaphthene           | ---       | ---      | ---                         | ---   | ---            | ---      | ND          | ND       | NA                            | NA    | 2.0E-08          | 3.3E-09 |
| Acenaphthylene         | ---       | ---      | ---                         | ---   | ---            | ---      | ---         | ---      | ---                           | ---   | ---              | ---     |
| a-Chlordane            | 7.98E-10  | 3.41E-11 | 0.0%                        | 0.0%  | 4.95E-12       | 2.11E-13 | 2.87E-06    | 4.07E-07 | 0.01%                         | 0.01% | 1.8E-08          | 2.5E-09 |
| Aluminum               | ---       | ---      | ---                         | ---   | ---            | ---      | 5.39E-04    | 7.00E-05 | 1.11%                         | 0.91% | 8.0E-03          | 1.0E-03 |
| Anthracene             | ---       | ---      | ---                         | ---   | ---            | ---      | 3.21E-08    | 4.03E-09 | 0.00%                         | 0.00% | 1.1E-08          | 1.3E-09 |
| Antimony               | ---       | ---      | ---                         | ---   | ---            | ---      | 1.61E-03    | 2.09E-04 | 3.29%                         | 2.71% | 2.4E-04          | 3.1E-05 |
| Arsenic                | 4.78E-07  | 1.99E-08 | 12.0%                       | 11.1% | 8.86E-07       | 3.68E-08 | 2.48E-03    | 3.43E-04 | 5.08%                         | 4.47% | 4.6E-03          | 6.4E-04 |
| Barium                 | ---       | ---      | ---                         | ---   | ---            | ---      | 3.04E-04    | 3.95E-05 | 0.62%                         | 0.51% | 7.3E-04          | 9.5E-05 |
| Benzo(a)anthracene     | 1.97E-08  | 9.93E-10 | 0.5%                        | 0.6%  | 7.54E-09       | 3.79E-10 | ---         | ---      | ---                           | ---   | ---              | ---     |
| Benzo(a)pyrene         | 1.92E-07  | 9.66E-09 | 4.8%                        | 5.4%  | 1.48E-07       | 7.44E-09 | ---         | ---      | ---                           | ---   | ---              | ---     |
| Benzo(b)fluoranthene   | 2.42E-08  | 1.22E-09 | 0.6%                        | 0.7%  | 9.27E-09       | 4.66E-10 | ---         | ---      | ---                           | ---   | ---              | ---     |
| Benzo(g,h,i)perylene   | ---       | ---      | ---                         | ---   | ---            | ---      | ---         | ---      | ---                           | ---   | ---              | ---     |
| Benzo(k)fluoranthene   | 1.87E-08  | 9.42E-10 | 0.5%                        | 0.5%  | 8.99E-09       | 4.52E-10 | ---         | ---      | ---                           | ---   | ---              | ---     |
| Cadmium                | 6.50E-08  | 2.53E-09 | 1.6%                        | 1.4%  | 1.11E-08       | 4.31E-10 | 7.99E-04    | 1.04E-04 | 1.64%                         | 1.35% | 1.4E-04          | 1.8E-05 |
| Chromium               | 8.10E-07  | 3.15E-08 | 20.4%                       | 17.7% | 1.52E-06       | 5.91E-08 | 3.31E-03    | 4.30E-04 | 6.79%                         | 5.60% | 6.2E-03          | 8.1E-04 |
| Chrysene               | 2.21E-09  | 1.11E-10 | 0.1%                        | 0.1%  | 8.89E-10       | 4.47E-11 | ---         | ---      | ---                           | ---   | ---              | ---     |
| Cobalt                 | ---       | ---      | ---                         | ---   | ---            | ---      | 1.76E-05    | 2.29E-06 | 0.04%                         | 0.03% | 3.8E-05          | 4.9E-06 |
| Copper                 | ---       | ---      | ---                         | ---   | ---            | ---      | 2.10E-03    | 2.72E-04 | 4.30%                         | 3.55% | 1.3E-04          | 1.7E-05 |
| DBT                    | ---       | ---      | ---                         | ---   | ---            | ---      | ---         | ---      | ---                           | ---   | ---              | ---     |
| Dibenz(a,h)anthracene  | ND        | ND       | NA                          | NA    | 5.09E-09       | 2.56E-10 | ---         | ---      | ---                           | ---   | ---              | ---     |
| Dieldrin               | ND        | ND       | NA                          | NA    | 5.37E-11       | 2.59E-12 | ND          | ND       | NA                            | NA    | 1.6E-07          | 2.5E-08 |
| Endosulfan II          | ---       | ---      | ---                         | ---   | ---            | ---      | ND          | ND       | NA                            | NA    | 1.4E-09          | 2.2E-10 |
| Endrin                 | ---       | ---      | ---                         | ---   | ---            | ---      | 2.38E-05    | 3.82E-06 | 0.05%                         | 0.05% | 2.4E-08          | 3.8E-09 |
| Fluoranthene           | ---       | ---      | ---                         | ---   | ---            | ---      | 1.51E-06    | 2.53E-07 | 0.00%                         | 0.00% | 9.0E-07          | 1.5E-07 |
| Fluorene               | ---       | ---      | ---                         | ---   | ---            | ---      | ND          | ND       | NA                            | NA    | 3.0E-08          | 4.8E-09 |
| g-Chlordane            | 2.42E-09  | 1.03E-10 | 0.1%                        | 0.1%  | 2.94E-12       | 1.26E-13 | 8.67E-06    | 1.23E-06 | 0.02%                         | 0.02% | 1.1E-08          | 1.5E-09 |
| Heptachlor             | ND        | ND       | NA                          | NA    | 1.23E-11       | 5.91E-13 | ND          | ND       | NA                            | NA    | 1.4E-08          | 2.2E-09 |
| Indeno(1,2,3-cd)pyrene | 1.07E-08  | 5.38E-10 | 0.3%                        | 0.3%  | 1.27E-08       | 6.37E-10 | ---         | ---      | ---                           | ---   | ---              | ---     |
| Iron                   | ---       | ---      | ---                         | ---   | ---            | ---      | ---         | ---      | ---                           | ---   | ---              | ---     |
| Lead                   | 6.66E-08  | 2.59E-09 | 1.7%                        | 1.5%  | 1.10E-08       | 4.29E-10 | ---         | ---      | ---                           | ---   | ---              | ---     |

**TABLE 1-3: SUMMARY OF RISKS AND HAZARDS ASSOCIATED WITH DIRECT CONTACT (CONTINUED)**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical        | Site Risk |          | % Contribution to Site Risk |       | Reference Risk |          | Site Hazard |          | % Contribution to Site Hazard |        | Reference Hazard |         |
|-----------------|-----------|----------|-----------------------------|-------|----------------|----------|-------------|----------|-------------------------------|--------|------------------|---------|
|                 | RME       | CTE      | RME                         | CTE   | RME            | CTE      | RME         | CTE      | RME                           | CTE    | RME              | CTE     |
| Manganese       | ---       | ---      | ---                         | ---   | ---            | ---      | 1.96E-03    | 2.55E-04 | 4.02%                         | 3.31%  | 2.7E-03          | 3.5E-04 |
| MBT             | ---       | ---      | ---                         | ---   | ---            | ---      | ---         | ---      | ---                           | ---    | ---              | ---     |
| Mercury         | ---       | ---      | ---                         | ---   | ---            | ---      | 8.96E-04    | 1.16E-04 | 1.84%                         | 1.51%  | 3.9E-04          | 5.0E-05 |
| Molybdenum      | ---       | ---      | ---                         | ---   | ---            | ---      | 1.40E-04    | 2.03E-05 | 0.29%                         | 0.26%  | 2.4E-05          | 3.9E-06 |
| Naphthalene     | ---       | ---      | ---                         | ---   | ---            | ---      | 7.50E-07    | 1.20E-07 | 0.00%                         | 0.00%  | 1.0E-07          | 1.6E-08 |
| Nickel          | ---       | ---      | ---                         | ---   | ---            | ---      | 7.28E-04    | 9.44E-05 | 1.49%                         | 1.23%  | 5.3E-04          | 6.9E-05 |
| Phenanthrene    | ---       | ---      | ---                         | ---   | ---            | ---      | ---         | ---      | ---                           | ---    | ---              | ---     |
| Pyrene          | ---       | ---      | ---                         | ---   | ---            | ---      | 1.79E-06    | 2.88E-07 | 0.00%                         | 0.00%  | 1.4E-06          | 2.2E-07 |
| Selenium        | ---       | ---      | ---                         | ---   | ---            | ---      | 9.53E-06    | 1.24E-06 | 0.02%                         | 0.02%  | 9.6E-06          | 1.2E-06 |
| Silver          | ---       | ---      | ---                         | ---   | ---            | ---      | 2.04E-05    | 2.64E-06 | 0.04%                         | 0.03%  | 9.4E-06          | 1.2E-06 |
| TBT             | ---       | ---      | ---                         | ---   | ---            | ---      | ---         | ---      | ---                           | ---    | ---              | ---     |
| Total Congeners | 1.42E-06  | 7.22E-08 | 35.7%                       | 40.5% | 4.90E-09       | 2.50E-10 | 3.31E-02    | 5.61E-03 | 67.75%                        | 73.06% | 1.1E-04          | 1.9E-05 |
| Total Dioxin    | 8.62E-07  | 3.58E-08 | 21.7%                       | 20.1% | NA             | NA       | ---         | ---      | ---                           | ---    | NA               | NA      |
| TTBT            | ---       | ---      | ---                         | ---   | ---            | ---      | ---         | ---      | ---                           | ---    | ---              | ---     |
| Vanadium        | ---       | ---      | ---                         | ---   | ---            | ---      | 5.69E-04    | 7.39E-05 | 1.17%                         | 0.96%  | 2.4E-03          | 3.1E-04 |
| Zinc            | ---       | ---      | ---                         | ---   | ---            | ---      | 1.56E-04    | 2.25E-05 | 0.32%                         | 0.29%  | 4.5E-05          | 5.8E-06 |

## Notes:

|     |                                 |
|-----|---------------------------------|
| --- | Not applicable                  |
| CTE | Central tendency exposure       |
| DBT | Dibutyltin                      |
| DDD | Dichlorodiphenyldichloroethane  |
| DDE | Dichlorodiphenyldichloroethene  |
| DDT | Dichlorodiphenyltrichloroethane |
| MBT | Monobutyltin                    |
| NA  | Not analyzed                    |
| ND  | Nondetect                       |
| RME | Reasonable maximum exposure     |
| TBT | Tributyltin                     |



**TABLE 1-4: SUMMARY OF CUMULATIVE RISK AND HAZARD FOR PARCELS E AND E-2 BIASED SAMPLES**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Risk Scenario          | Risk at HPS     |                 | Hazard at HPS |              | Risk from Reference Locations |                 | Hazard from Reference Locations |             | Exceedance Above Safe Risk Level (10-6)? |            | Exceedance Above Reference Risk Levels? |           |
|------------------------|-----------------|-----------------|---------------|--------------|-------------------------------|-----------------|---------------------------------|-------------|------------------------------------------|------------|-----------------------------------------|-----------|
|                        | CTE             | RME             | CTE           | RME          | CTE                           | RME             | CTE                             | RME         | CTE                                      | RME        | CTE                                     | RME       |
| Ingestion of Shellfish | 6.08E-05        | 1.22E-03        | 2.29          | 13.76        | 6.78E-05                      | 1.36E-03        | 0.09                            | 0.54        | Yes                                      | Yes        | No                                      | No        |
| Direct Contact         | 1.78E-07        | 3.97E-06        | 0.01          | 0.05         | 3.47E-03                      | 2.62E-06        | 0.003                           | 0.03        | No                                       | Yes        | No                                      | Yes       |
| <b>Cumulative</b>      | <b>6.10E-05</b> | <b>1.22E-03</b> | <b>2.30</b>   | <b>13.81</b> | <b>3.53E-03</b>               | <b>1.36E-03</b> | <b>0.09</b>                     | <b>0.56</b> | <b>Yes</b>                               | <b>Yes</b> | <b>No</b>                               | <b>No</b> |

## Notes:

CTE Central tendency exposure

HPS Hunters Point Shipyard

RME Reasonable maximum exposure

**TABLE 1-5: SUMMARY OF RISK DRIVERS**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Risk Drivers for CTE Exposures       |            |                         |                        |            |                         |                        |            |                         |                        |            |                         |
|--------------------------------------|------------|-------------------------|------------------------|------------|-------------------------|------------------------|------------|-------------------------|------------------------|------------|-------------------------|
| HPS Parcels E and E-2 Biased Samples |            |                         |                        |            |                         | Reference              |            |                         |                        |            |                         |
| Sediment Exposures                   |            |                         | Ingestion of Shellfish |            |                         | Sediment Exposures     |            |                         | Ingestion of Shellfish |            |                         |
| Hazard                               |            |                         |                        |            |                         |                        |            |                         |                        |            |                         |
| Chemical                             | HQ         | % Contribution to Total | Chemical               | HQ         | % Contribution to Total | Chemical               | HQ         | % Contribution to Total | Chemical               | HQ         | % Contribution to Total |
| Total Congeners                      | 5.61E-03   | 73                      | Total Congeners        | 1.35E+00   | 59                      | Aluminum               | 1.04E-03   | 30                      | Arsenic                | 7.17E-02   | 80                      |
| Chromium                             | 4.30E-04   | 6                       | Chromium               | 2.02E-01   | 9                       | Chromium               | 8.06E-04   | 23                      | Chromium               | 5.37E-03   | 6                       |
| Arsenic                              | 3.43E-04   | 4                       | Arsenic                | 1.41E-01   | 6                       | Arsenic                | 6.36E-04   | 18                      | Total Congeners        | 2.24E-03   | 2                       |
| Copper                               | 2.72E-04   | 4                       | Copper                 | 1.28E-01   | 6                       | Manganese              | 3.52E-04   | 10                      | Manganese              | 1.89E-03   | 2                       |
| Manganese                            | 2.55E-04   | 3                       | Manganese              | 1.20E-01   | 5                       | Vanadium               | 3.12E-04   | 9                       | Aluminum               | 1.59E-03   | 2                       |
| Risk                                 |            |                         |                        |            |                         |                        |            |                         |                        |            |                         |
| Chemical                             | Risk Level | % Contribution to Total | Chemical               | Risk Level | % Contribution to Total | Chemical               | Risk Level | % Contribution to Total | Chemical               | Risk Level | % Contribution to Total |
| Total Congeners                      | 7.22E-08   | 40                      | Total Congeners        | 1.73E-05   | 28                      | Chromium               | 5.91E-08   | 55                      | Total Dioxin           | 6.32E-05   | 93                      |
| Total Dioxin                         | 3.58E-08   | 20                      | Chromium               | 1.48E-05   | 24                      | Arsenic                | 3.68E-08   | 35                      | Arsenic                | 4.15E-06   | 6                       |
| Chromium                             | 3.15E-08   | 18                      | Total Dioxin           | 1.47E-05   | 24                      | Benzo(a)pyrene         | 7.44E-09   | 7                       | Chromium               | 3.93E-07   | 1                       |
| Arsenic                              | 1.99E-08   | 11                      | Arsenic                | 8.14E-06   | 13                      | Indeno(1,2,3-cd)pyrene | 6.37E-10   | 1                       | Benzo(a)pyrene         | 3.33E-08   | 0.05                    |
| Benzo(a)pyrene                       | 9.66E-09   | 5                       | Benzo(a)pyrene         | 2.41E-06   | 4                       | Benzo(b)fluoranthene   | 4.66E-10   | 0.4                     | Total Congeners        | 2.88E-08   | 0.04                    |

**TABLE 1-5: SUMMARY OF RISK DRIVERS (CONTINUED)**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Risk Drivers for RME Exposures |            |                         |                        |            |                         |                        |            |                         |                        |            |                         |
|--------------------------------|------------|-------------------------|------------------------|------------|-------------------------|------------------------|------------|-------------------------|------------------------|------------|-------------------------|
| HPS Parcel E Biased Samples    |            |                         |                        |            |                         | Reference              |            |                         |                        |            |                         |
| Sediment Exposures             |            |                         | Ingestion of Shellfish |            |                         | Sediment Exposures     |            |                         | Ingestion of Shellfish |            |                         |
| Hazard                         |            |                         |                        |            |                         |                        |            |                         |                        |            |                         |
| Chemical                       | HQ         | % Contribution to Total | Chemical               | HQ         | % Contribution to Total | Chemical               | HQ         | % Contribution to Total | Chemical               | HQ         | % Contribution to Total |
| Total Congeners                | 3.31E-02   | 68                      | Total Congeners        | 8.08E+00   | 59                      | Aluminum               | 8.03E-03   | 30                      | Arsenic                | 4.30E-01   | 80                      |
| Chromium                       | 3.31E-03   | 7                       | Chromium               | 1.21E+00   | 9                       | Chromium               | 6.21E-03   | 24                      | Chromium               | 3.22E-02   | 6                       |
| Arsenic                        | 2.48E-03   | 5                       | Arsenic                | 8.44E-01   | 6                       | Arsenic                | 4.60E-03   | 17                      | Total Congeners        | 1.34E-02   | 2                       |
| Copper                         | 2.10E-03   | 4                       | Copper                 | 7.69E-01   | 6                       | Manganese              | 2.71E-03   | 10                      | Manganese              | 1.13E-02   | 2                       |
| Manganese                      | 1.96E-03   | 4                       | Manganese              | 7.19E-01   | 5                       | Vanadium               | 2.40E-03   | 9                       | Aluminum               | 9.57E-03   | 2                       |
| Risk                           |            |                         |                        |            |                         |                        |            |                         |                        |            |                         |
| Chemical                       | Risk Level | % Contribution to Total | Chemical               | Risk Level | % Contribution to Total | Chemical               | Risk Level | % Contribution to Total | Chemical               | Risk Level | % Contribution to Total |
| Total Congeners                | 1.42E-06   | 36                      | Total Congeners        | 3.46E-04   | 28                      | Chromium               | 1.52E-06   | 58                      | Total Dioxin           | 1.26E-03   | 93                      |
| Total Dioxin                   | 8.62E-07   | 22                      | Chromium               | 2.97E-04   | 24                      | Arsenic                | 8.86E-07   | 34                      | Arsenic                | 8.30E-05   | 6                       |
| Chromium                       | 8.10E-07   | 20                      | Total Dioxin           | 2.93E-04   | 24                      | Benzo(a)pyrene         | 1.48E-07   | 6                       | Chromium               | 7.87E-06   | 1                       |
| Arsenic                        | 4.78E-07   | 12                      | Arsenic                | 1.63E-04   | 13                      | Indeno(1,2,3-cd)pyrene | 1.27E-08   | 0.5                     | Benzo(a)pyrene         | 6.66E-07   | 0.05                    |
| Benzo(a)pyrene                 | 1.92E-07   | 5                       | Benzo(a)pyrene         | 4.82E-05   | 4                       | Cadmium                | 1.11E-08   | 0.4                     | Total Congeners        | 5.76E-07   | 0.04                    |

## Notes:

CTE Central tendency exposure  
HPS Hunters Point Shipyard  
HQ Hazard quotient  
RME Reasonable maximum exposure

|    |                                                          |                 |                                                                                                                                                                                          |
|----|----------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 26 | HHRA results for nonradioactive chemicals in groundwater | Section 2.5.1.3 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 5.0, Tables 5-14 through 5-16. |
|----|----------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

TABLE 5-14: RISK CHARACTERIZATION ANALYSIS FOR A-AQUIFER GROUNDWATER BASED ON PLANNED REUSE

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Exposure Area | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Exposure Pathway | Source Aquifer for Exposure Pathway | Total RME Cancer Risk for Exposure Pathway | Total RME HI for Exposure Pathway | RME Segregated HI for Exposure Pathway |     |                            | Basis for COC | Detection Frequency | RME Concentration (µg/L) | Chemical-Specific Cancer Risk | Percent (%)                                                |                                                               |      |
|---------------------|---------------|---------------|-----------------------|--------------|-------------------|------------------|-------------------------------------|--------------------------------------------|-----------------------------------|----------------------------------------|-----|----------------------------|---------------|---------------------|--------------------------|-------------------------------|------------------------------------------------------------|---------------------------------------------------------------|------|
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     |                            |               |                     |                          |                               | Contribution to Total RME Cancer Risk for Exposure Pathway | Percent (%) Contribution to Total RME HI for Exposure Pathway |      |
| 31A                 | MU            | IR-12 Plume   | 7.48E-05              | 2.86E+00     | 1.54E+00          | Vapor Intrusion  | A                                   | 7.48E-05                                   | 2.86E+00                          | 1.54E+00                               | VOC | 1,1-Dichloroethane         | C             | 23 / 87             | 2.29E+01                 | 3.53E-06                      | 4.7                                                        | 1.08E-02                                                      | 0.4  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | 1,4-Dichlorobenzene        | C             | 8 / 87              | 1.90E+01                 | 8.89E-06                      | 11.9                                                       | 2.35E-03                                                      | 0.1  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Benzene                    | C             | 22 / 89             | 4.52E+00                 | 1.21E-05                      | 16.1                                                       | 3.41E-02                                                      | 1.2  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Chloroform                 | C             | 2 / 87              | 2.00E+00                 | 2.86E-06                      | 3.8                                                        | 6.14E-03                                                      | 0.2  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Isopropylbenzene           | NC            | 6 / 20              | 1.20E+01                 | --                            | --                                                         | 1.53E+00                                                      | 53.6 |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Naphthalene                | C             | 3 / 48              | 2.65E+01                 | 7.39E-06                      | 9.9                                                        | 1.74E-01                                                      | 6.1  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Tetrachloroethene          | C             | 11 / 87             | 2.01E+01                 | 3.74E-05                      | 50.0                                                       | 4.34E-01                                                      | 15.2 |
| Trichloroethene     | C             | 28 / 87       | 4.40E+00              | 1.53E-06     | 2.0               | 3.12E-03         | 0.1                                 |                                            |                                   |                                        |     |                            |               |                     |                          |                               |                                                            |                                                               |      |
| 31B/36, 43          | IND           | B406 Plume    | 6.77E-04              | 4.58E+00     | 3.21E+00          | Vapor Intrusion  | A                                   | 6.77E-04                                   | 4.58E+00                          | 3.21E+00                               | VOC | 1,2-Dichloroethene (total) | NC            | 6 / 41              | 5.80E+02                 | --                            | --                                                         | 2.77E+00                                                      | 60.6 |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | 1,4-Dichlorobenzene        | C             | 18 / 67             | 7.80E+00                 | 2.17E-06                      | 0.3                                                        | 9.65E-04                                                      | 0.0  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Carbon tetrachloride       | C             | 1 / 49              | 4.80E-01                 | 6.27E-06                      | 0.9                                                        | 2.44E-01                                                      | 5.3  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Tetrachloroethene          | C             | 7 / 66              | 1.70E+01                 | 1.88E-05                      | 2.8                                                        | 3.66E-01                                                      | 8.0  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Trichloroethene            | C             | 8 / 67              | 6.17E+02                 | 1.28E-04                      | 18.8                                                       | 4.38E-01                                                      | 9.6  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Vinyl chloride             | C             | 1 / 67              | 2.50E+01                 | 5.22E-04                      | 77.1                                                       | 2.76E-01                                                      | 6.0  |
| 31B/36, 43, 44      | IND           | IR-12 Plume   | 4.45E-05              | 2.86E+00     | 1.54E+00          | Vapor Intrusion  | A                                   | 4.45E-05                                   | 2.86E+00                          | 1.54E+00                               | VOC | 1,1-Dichloroethane         | C             | 23 / 87             | 2.29E+01                 | 2.10E-06                      | 4.7                                                        | 1.08E-02                                                      | 0.4  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | 1,4-Dichlorobenzene        | C             | 8 / 87              | 1.90E+01                 | 5.29E-06                      | 11.9                                                       | 2.35E-03                                                      | 0.1  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Benzene                    | C             | 22 / 89             | 4.52E+00                 | 7.18E-06                      | 16.1                                                       | 3.41E-02                                                      | 1.2  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Chloroform                 | C             | 2 / 87              | 2.00E+00                 | 1.70E-06                      | 3.8                                                        | 6.14E-03                                                      | 0.2  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Isopropylbenzene           | NC            | 6 / 20              | 1.20E+01                 | --                            | --                                                         | 1.53E+00                                                      | 53.6 |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Naphthalene                | C             | 3 / 48              | 2.65E+01                 | 4.40E-06                      | 9.9                                                        | 1.74E-01                                                      | 6.1  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Tetrachloroethene          | C             | 11 / 87             | 2.01E+01                 | 2.23E-05                      | 50.0                                                       | 4.34E-01                                                      | 15.2 |
| 31B/36, 40, 43, 44  | IND           | IR-39 Plume   | 1.13E-03              | 1.10E+01     | 5.31E+00          | Vapor Intrusion  | A                                   | 1.13E-03                                   | 1.10E+01                          | 5.31E+00                               | VOC | Benzene                    | C/NC          | 15 / 48             | 6.27E+02                 | 9.97E-04                      | 88.3                                                       | 4.74E+00                                                      | 42.9 |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Bromodichloromethane       | C             | 2 / 46              | 4.00E+00                 | 2.38E-06                      | 0.2                                                        | 3.75E-03                                                      | 0.0  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Carbon tetrachloride       | C             | 1 / 46              | 3.50E-01                 | 4.57E-06                      | 0.4                                                        | 1.78E-01                                                      | 1.6  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Chloroform                 | C             | 3 / 47              | 5.40E+01                 | 4.60E-05                      | 4.1                                                        | 1.66E-01                                                      | 1.5  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Naphthalene                | C             | 6 / 39              | 2.20E+02                 | 3.65E-05                      | 3.2                                                        | 1.45E+00                                                      | 13.1 |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Trichloroethene            | C             | 5 / 46              | 2.05E+02                 | 4.24E-05                      | 3.7                                                        | 1.45E-01                                                      | 1.3  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Xylene (total)             | NC            | 8 / 39              | 1.30E+03                 | --                            | --                                                         | 3.85E+00                                                      | 34.9 |
| 41                  | IND           | IR-08 Plume   | 1.70E-06              | 2.42E-02     | <1                | Vapor Intrusion  | A                                   | 1.70E-06                                   | 2.42E-02                          | <1                                     | VOC | Chloroform                 | C             | 1 / 13              | 2.00E+00                 | 1.70E-06                      | 100.0                                                      | 6.14E-03                                                      | 25.4 |
| 43                  | IND           | IR-05 Plume   | 3.19E-05              | 1.34E+00     | 1.30E+00          | Vapor Intrusion  | A                                   | 3.19E-05                                   | 1.34E+00                          | 1.30E+00                               | VOC | Naphthalene                | C/NC          | 2 / 12              | 1.90E+02                 | 3.16E-05                      | 98.9                                                       | 1.25E+00                                                      | 93.1 |
| 44                  | IND           | IR-03 Plume   | 6.99E-05              | 6.55E-01     | <1                | Vapor Intrusion  | A                                   | 6.99E-05                                   | 6.55E-01                          | <1                                     | VOC | 1,4-Dichlorobenzene        | C             | 18 / 67             | 8.36E+01                 | 2.33E-05                      | 33.3                                                       | 1.03E-02                                                      | 1.6  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Benzene                    | C             | 39 / 67             | 4.76E+00                 | 7.57E-06                      | 10.8                                                       | 3.60E-02                                                      | 5.5  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Chloroform                 | C             | 3 / 67              | 1.40E+01                 | 1.19E-05                      | 17.1                                                       | 4.30E-02                                                      | 6.6  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Naphthalene                | C             | 30 / 61             | 2.53E+01                 | 4.19E-06                      | 6.0                                                        | 1.66E-01                                                      | 25.4 |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Trichloroethene            | C             | 8 / 67              | 1.50E+01                 | 3.10E-06                      | 4.4                                                        | 1.06E-02                                                      | 1.6  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Vinyl chloride             | C             | 1 / 67              | 8.70E-01                 | 1.82E-05                      | 26.0                                                       | 9.62E-03                                                      | 1.5  |
| 45                  | RD            | IR-12 Plume   | 7.48E-05              | 2.86E+00     | 1.54E+00          | Vapor Intrusion  | A                                   | 7.48E-05                                   | 2.86E+00                          | 1.54E+00                               | VOC | 1,1-Dichloroethane         | C             | 23 / 87             | 2.29E+01                 | 3.53E-06                      | 4.7                                                        | 1.08E-02                                                      | 0.4  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | 1,4-Dichlorobenzene        | C             | 8 / 87              | 1.90E+01                 | 8.89E-06                      | 11.9                                                       | 2.35E-03                                                      | 0.1  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Benzene                    | C             | 22 / 89             | 4.52E+00                 | 1.21E-05                      | 16.1                                                       | 3.41E-02                                                      | 1.2  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Chloroform                 | C             | 2 / 87              | 2.00E+00                 | 2.86E-06                      | 3.8                                                        | 6.14E-03                                                      | 0.2  |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |     | Isopropylbenzene           | NC            | 6 / 20              | 1.20E+01                 | --                            | --                                                         | 1.53E+00                                                      | 53.6 |
| Naphthalene         | C             | 3 / 48        | 2.65E+01              | 7.39E-06     | 9.9               | 1.74E-01         | 6.1                                 |                                            |                                   |                                        |     |                            |               |                     |                          |                               |                                                            |                                                               |      |

TABLE 5-14: RISK CHARACTERIZATION ANALYSIS FOR A-AQUIFER GROUNDWATER BASED ON PLANNED REUSE (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Exposure Area | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Exposure Pathway | Source Aquifer for Exposure Pathway | Total RME Cancer Risk for Exposure Pathway | Total RME HI for Exposure Pathway | RME Segregated HI for Exposure Pathway | Chemical of Concern (COC) |                      | Basis for COC | Detection Frequency | RME Concentration (µg/L) | Chemical-Specific Cancer Risk | Percent (%) Contribution to Total RME Cancer Risk for Exposure Pathway | Chemical-Specific HI | Percent (%) Contribution to Total RME HI for Exposure Pathway |
|---------------------|---------------|---------------|-----------------------|--------------|-------------------|------------------|-------------------------------------|--------------------------------------------|-----------------------------------|----------------------------------------|---------------------------|----------------------|---------------|---------------------|--------------------------|-------------------------------|------------------------------------------------------------------------|----------------------|---------------------------------------------------------------|
| 45                  | RD            | IR-12 Plume   | 7.48E-05              | 2.86E+00     | 1.54E+00          | Vapor Intrusion  | A                                   | 7.48E-05                                   | 2.86E+00                          | 1.54E+00                               | VOC                       | Tetrachloroethene    | C             | 11 / 87             | 2.01E+01                 | 3.74E-05                      | 50.0                                                                   | 4.34E-01             | 15.2                                                          |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |                           | Trichloroethene      | C             | 28 / 87             | 4.40E+00                 | 1.53E-06                      | 2.0                                                                    | 3.12E-03             | 0.1                                                           |
| 45                  | RD            | 042073        | 2.43E-06              | 6.07E-03     | <1                | Vapor Intrusion  | A                                   | 2.43E-06                                   | 6.07E-03                          | <1                                     | VOC                       | Chloroform           | C             | 4 / 6               | 8.00E-01                 | 1.14E-06                      | 47.1                                                                   | 2.46E-03             | 40.5                                                          |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |                           | Trichloroethene      | C             | 5 / 6               | 3.70E+00                 | 1.28E-06                      | 52.9                                                                   | 2.63E-03             | 43.2                                                          |
| EMI-1               | MI            | IR-03 Plume   | 6.99E-05              | 6.55E-01     | <1                | Vapor Intrusion  | A                                   | 6.99E-05                                   | 6.55E-01                          | <1                                     | VOC                       | 1,4-Dichlorobenzene  | C             | 18 / 67             | 8.36E+01                 | 2.33E-05                      | 33.3                                                                   | 1.03E-02             | 1.6                                                           |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |                           | Benzene              | C             | 39 / 67             | 4.76E+00                 | 7.57E-06                      | 10.8                                                                   | 3.60E-02             | 5.5                                                           |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |                           | Chloroform           | C             | 3 / 67              | 1.40E+01                 | 1.19E-05                      | 17.1                                                                   | 4.30E-02             | 6.6                                                           |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |                           | Naphthalene          | C             | 30 / 61             | 2.53E+01                 | 4.19E-06                      | 6.0                                                                    | 1.66E-01             | 25.4                                                          |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |                           | Trichloroethene      | C             | 8 / 67              | 1.50E+01                 | 3.10E-06                      | 4.4                                                                    | 1.06E-02             | 1.6                                                           |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |                           | Vinyl chloride       | C             | 1 / 67              | 8.70E-01                 | 1.82E-05                      | 26.0                                                                   | 9.62E-03             | 1.5                                                           |
| EMI-1               | MI            | IR-08 Plume   | 1.70E-06              | 2.42E-02     | <1                | Vapor Intrusion  | A                                   | 1.70E-06                                   | 2.42E-02                          | <1                                     | VOC                       | Chloroform           | C             | 1 / 13              | 2.00E+00                 | 1.70E-06                      | 100.0                                                                  | 6.14E-03             | 25.4                                                          |
| EMI-1               | MI            | B521 Plume    | 5.80E-05              | 1.70E+00     | 1.55E+00          | Vapor Intrusion  | A                                   | 5.80E-05                                   | 1.70E+00                          | 1.55E+00                               | VOC                       | Benzene              | C             | 3 / 72              | 1.00E+00                 | 1.59E-06                      | 2.7                                                                    | 7.56E-03             | 0.4                                                           |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |                           | Carbon tetrachloride | C/NC          | 1 / 73              | 2.00E+00                 | 2.61E-05                      | 45.0                                                                   | 1.02E+00             | 59.7                                                          |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |                           | Chloroform           | C             | 2 / 73              | 2.40E+00                 | 2.04E-06                      | 3.5                                                                    | 7.37E-03             | 0.4                                                           |
|                     |               |               |                       |              |                   |                  |                                     |                                            |                                   |                                        |                           | Tetrachloroethene    | C             | 6 / 73              | 2.44E+01                 | 2.70E-05                      | 46.5                                                                   | 5.25E-01             | 30.8                                                          |

- Notes: All concentrations shown in micrograms per liter (µg/L).
- Not applicable or chemical is not a chemical of concern for this endpoint
- %

Percent
- C

Cancer effect
- HI

Hazard index
- IND

Industrial (industrial exposure scenario)
- IR

Installation Restoration
- MI

Maritime/industrial (industrial exposure scenario)
- MU

Mixed use (residential exposure scenario)
- NC

Noncancer effect
- RD

Research and development (residential exposure scenario)
- RME

Reasonable maximum exposure
- VOC

Volatile organic compound

TABLE 5-15: RISK CHARACTERIZATION ANALYSIS FOR A-AQUIFER GROUNDWATER, CONSTRUCTION WORKER EXPOSURE SCENARIO

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block                | Planned Reuse | Exposure Area | Total RME Cancer Risk | Total RME HI | RME Segregated HI       | Exposure Pathway        | Source Aquifer for Exposure Pathway | Total RME Cancer Risk for Exposure Pathway | Total RME HI for Exposure Pathway | RME Segregated HI for Exposure Pathway | Chemical of Concern (COC) |                            | Basis for COC      | Detection Frequency | RME Concentration | Chemical-Specific Cancer Risk | Percent (%) Contribution to Total RME Cancer Risk for Exposure Pathway | Chemical-Specific HI | Percent (%) Contribution to Total RME HI for Exposure Pathway |    |
|------------------------------------|---------------|---------------|-----------------------|--------------|-------------------------|-------------------------|-------------------------------------|--------------------------------------------|-----------------------------------|----------------------------------------|---------------------------|----------------------------|--------------------|---------------------|-------------------|-------------------------------|------------------------------------------------------------------------|----------------------|---------------------------------------------------------------|----|
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           |                            |                    |                     |                   |                               |                                                                        |                      |                                                               |    |
| EOS-1                              | OS            | IR-02 Plume   | 7.65E-05              | 9.55E-01     | <1                      | Trench Vapor Inhalation | A                                   | 7.07E-07                                   | 3.35E-01                          | --                                     | --                        | No COCs Identified         | --                 | --                  | --                | --                            | --                                                                     | --                   | --                                                            |    |
|                                    |               |               |                       |              |                         | Trench Dermal Contact   | A                                   | 7.58E-05                                   | 6.20E-01                          | --                                     | PAH                       | Benzo(a)anthracene         | C                  | 3 / 25              | 9.0E+00           | 1.3E-05                       | 17.8                                                                   | --                   | --                                                            |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           | Benzo(a)pyrene             | C                  | 1 / 25              | 2.0E+00           | 4.5E-05                       | 58.8                                                                   | --                   | --                                                            |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           | Benzo(b)fluoranthene       | C                  | 2 / 25              | 4.0E+00           | 8.9E-06                       | 11.8                                                                   | --                   | --                                                            |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           | Indeno(1,2,3-cd)pyrene     | C                  | 1 / 25              | 2.0E+00           | 6.4E-06                       | 8.4                                                                    | --                   | --                                                            |    |
| 44, EMI-1, EOS-2, IND, MI, & EOS-3 | IR-03 Plume   | 4.27E-05      | 1.77E+00              | 1.00E+00     | Trench Vapor Inhalation | A                       | 3.51E-06                            | 1.21E+00                                   | 9.24E-01                          | VOC                                    | 1,4-Dichlorobenzene       | C                          | 18 / 67            | 8.4E+01             | 1.3E-06           | 35.8                          | --                                                                     | --                   |                                                               |    |
|                                    |               |               |                       |              | Trench Dermal Contact   | A                       | 3.92E-05                            | 5.61E-01                                   | --                                | Metal                                  | Naphthalene               | C                          | 30 / 61            | 2.5E+01             | 1.1E-06           | 31.9                          | --                                                                     | --                   |                                                               |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        | Arsenic                   | C                          | 29 / 59            | 4.9E+02             | 1.2E-05           | 31.1                          | --                                                                     | --                   |                                                               |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        | Benzo(a)anthracene        | C                          | 5 / 61             | 1.2E+01             | 1.7E-05           | 43.8                          | --                                                                     | --                   |                                                               |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        | Benzo(b)fluoranthene      | C                          | 1 / 60             | 3.0E+00             | 6.7E-06           | 17.0                          | --                                                                     | --                   |                                                               |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   | PAH                                    | Chrysene                  | C                          | 5 / 61             | 1.1E+01             | 1.6E-06           | 4.0                           | --                                                                     | --                   |                                                               |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           |                            |                    |                     |                   |                               |                                                                        |                      |                                                               |    |
| 31B/36, 43                         | IND           | B406 Plume    | 7.53E-06              | 2.58E+00     | 2.32E+00                | Trench Vapor Inhalation | A                                   | 5.99E-06                                   | 2.41E+00                          | 2.19E+00                               | VOC                       | Trichloroethene            | C                  | 26 / 50             | 6.2E+02           | 1.7E-06                       | 29.2                                                                   | --                   | --                                                            |    |
|                                    |               |               |                       |              |                         | Trench Dermal Contact   | A                                   | 1.54E-06                                   | 1.71E-01                          | --                                     | --                        | Vinyl chloride             | C                  | 4 / 49              | 2.5E+01           | 4.0E-06                       | 66.3                                                                   | --                   | --                                                            |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           | 1,2-Dichloroethene (total) | NC                 | 5 / 20              | 5.8E+02           | --                            | --                                                                     | 1.9E+00              | 78.7                                                          |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           | No COCs Identified         | --                 | --                  | --                | --                            | --                                                                     | --                   | --                                                            |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           |                            |                    |                     |                   |                               |                                                                        |                      |                                                               |    |
| 43                                 | IND           | IR-05 Plume   | 1.95E-05              | 6.30E+00     | 6.08E+00                | Trench Vapor Inhalation | A                                   | 8.43E-06                                   | 6.02E+00                          | 5.92E+00                               | VOC                       | Naphthalene                | C/NC               | 1 / 21              | 1.9E+02           | 8.4E-06                       | 99.9                                                                   | 5.7E+00              | 94.9                                                          |    |
|                                    |               |               |                       |              |                         | Trench Dermal Contact   | A                                   | 1.11E-05                                   | 2.81E-01                          | --                                     | Metal                     | Arsenic                    | C                  | 21 / 21             | 1.2E+02           | 3.0E-06                       | 27.4                                                                   | --                   | --                                                            |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           | PAH                        | Benzo(a)anthracene | C                   | 1 / 49            | 3.5E+00                       | 5.2E-06                                                                | 47.1                 | --                                                            | -- |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           | VOC                        | Naphthalene        | C                   | 1 / 21            | 1.9E+02                       | 2.8E-06                                                                | 25.6                 | --                                                            | -- |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           |                            |                    |                     |                   |                               |                                                                        |                      |                                                               |    |
| 41, EMI-1                          | MI, IND       | IR-08 Plume   | 2.62E-06              | 7.55E-02     | <1                      | Trench Vapor Inhalation | A                                   | 6.81E-08                                   | 1.09E-02                          | --                                     | --                        | No COCs Identified         | --                 | --                  | --                | --                            | --                                                                     | --                   |                                                               |    |
|                                    |               |               |                       |              |                         | Trench Dermal Contact   | A                                   | 2.55E-06                                   | 6.46E-02                          | --                                     | PAH                       | Benzo(a)pyrene             | C                  | 1 / 25              | 1.0E-01           | 2.2E-06                       | 87.3                                                                   | --                   | --                                                            |    |
| 31A, 31B/36, 43, 44, 45            | MU, RD, IND   | IR-12 Plume   | 9.55E-06              | 2.60E+00     | 2.07E+00                | Trench Vapor Inhalation | A                                   | 2.32E-06                                   | 2.11E+00                          | 1.73E+00                               | VOC                       | Naphthalene                | C                  | 3 / 48              | 2.7E+01           | 1.2E-06                       | 50.6                                                                   | 8.0E-01              | 37.8                                                          |    |
|                                    |               |               |                       |              |                         | Trench Dermal Contact   | A                                   | 7.23E-06                                   | 4.92E-01                          | --                                     | PAH                       | Chrysene                   | C                  | 1 / 48              | 3.5E+01           | 5.2E-06                       | 72.3                                                                   | --                   | --                                                            |    |
| 40, 41, 43                         | IND           | IR-39 Plume   | 5.44E-05              | 1.22E+01     | 8.18E+00                | Trench Vapor Inhalation | A                                   | 4.51E-05                                   | 1.13E+01                          | 8.02E+00                               | VOC                       | Benzene                    | C/NC               | 15 / 48             | 6.3E+02           | 3.3E-05                       | 72.5                                                                   | 2.7E+00              | 23.5                                                          |    |
|                                    |               |               |                       |              |                         | Trench Dermal Contact   | A                                   | 9.21E-06                                   | 9.06E-01                          | --                                     | VOC                       | Chloroform                 | C                  | 3 / 47              | 5.4E+01           | 1.8E-06                       | 4.1                                                                    | 1.1E-01              | 1.0                                                           |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           | Naphthalene                | C/NC               | 15 / 28             | 2.2E+02           | 9.8E-06                       | 21.6                                                                   | 6.6E+00              | 58.3                                                          |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           | Benzene                    | C                  | 15 / 48             | 6.3E+02           | 2.5E-06                       | 27.1                                                                   | --                   | --                                                            |    |
|                                    |               |               |                       |              |                         |                         |                                     |                                            |                                   |                                        |                           |                            |                    |                     |                   |                               |                                                                        |                      |                                                               |    |
| EMI-1, EOS-2                       | MI, OS        | B521 Plume    | 1.60E-05              | 5.61E-01     | <1                      | Trench Dermal Contact   | A                                   | 1.54E-05                                   | 2.16E-01                          | --                                     | PAH                       | Benzo(a)anthracene         | C                  | 1 / 44              | 7.8E+00           | 1.2E-05                       | 75.2                                                                   | --                   | --                                                            |    |
|                                    |               |               |                       |              |                         | Chrysene                | C                                   | 2 / 44                                     | 1.4E+01                           | 2.1E-06                                | 13.6                      | --                         | --                 |                     |                   |                               |                                                                        |                      |                                                               |    |
| 44                                 | IND           | AM32          | 1.573E-06             | 4.41E-02     | <1                      | Trench Dermal Contact   | A                                   | 1.57E-06                                   | 4.41E-02                          | --                                     | Metal                     | Arsenic                    | C                  | 4 / 6               | 6.3E+01           | 1.6E-06                       | 100.0                                                                  | --                   | --                                                            |    |
| 44                                 | IND           | AN33          | 1.14E-06              | 3.11E-02     | <1                      | Trench Dermal Contact   | A                                   | 1.14E-06                                   | 3.11E-02                          | --                                     | Metal                     | Arsenic                    | C                  | 5 / 5               | 4.6E+01           | 1.1E-06                       | 100.0                                                                  | --                   | --                                                            |    |
| 44                                 | IND           | AT36          | 2.034E-06             | 9.54E-02     | <1                      | Trench Dermal Contact   | A                                   | 2.03E-06                                   | 9.54E-02                          | --                                     | Metal                     | Pentachlorophenol          | C                  | 1 / 8               | 1.4E+01           | 1.7E-06                       | 85.4                                                                   | --                   | --                                                            |    |
| EMI-1                              | MI            | BF29          | 1.069E-06             | 3.72E-02     | <1                      | Trench Dermal Contact   | A                                   | 1.07E-06                                   | 3.72E-02                          | --                                     | Metal                     | Arsenic                    | C                  | 6 / 6               | 4.3E+01           | 1.1E-06                       | 100.0                                                                  | --                   | --                                                            |    |

TABLE 5-15: RISK CHARACTERIZATION ANALYSIS FOR A-AQUIFER GROUNDWATER, CONSTRUCTION WORKER EXPOSURE SCENARIO (CONTINUED)

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block | Planned Reuse | Exposure Area | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Exposure Pathway      | Source Aquifer for Exposure Pathway | Total RME Cancer Risk for Exposure Pathway | Total RME HI for Exposure Pathway | RME Segregated HI for Exposure Pathway | Chemical of Concern (COC) |         | Basis for COC | Detection Frequency | RME Concentration | Chemical-Specific Cancer Risk | Percent (%) Contribution to Total RME Cancer Risk for Exposure Pathway | Chemical-Specific HI | Percent (%) Contribution to Total RME HI for Exposure Pathway |
|---------------------|---------------|---------------|-----------------------|--------------|-------------------|-----------------------|-------------------------------------|--------------------------------------------|-----------------------------------|----------------------------------------|---------------------------|---------|---------------|---------------------|-------------------|-------------------------------|------------------------------------------------------------------------|----------------------|---------------------------------------------------------------|
| EOS-1               | OS            | AV37          | 1.461E-06             | 1.37E-01     | <1                | Trench Dermal Contact | A                                   | 1.46E-06                                   | 1.37E-01                          | --                                     | Metal                     | Arsenic | C             | 5 / 7               | 5.8E+01           | 1.5E-06                       | 100.0                                                                  | --                   | --                                                            |

- Notes: All concentrations shown in micrograms per liter (µg/L).
- Not applicable or chemical is not a chemical of concern for this endpoint
- C

Cancer effect
- HI

Hazard index
- IND

Industrial
- IR

Installation Restoration
- MI

Maritime/Industrial
- MU

Mixed use (residential exposure scenario)
- NC

Noncancer effect
- OS

Open space (recreational exposure scenario)
- PAH

Polycyclic aromatic hydrocarbon
- RD

Research and development (residential exposure scenario)
- RME

Reasonable maximum exposure
- VOC

Volatile organic compound



TABLE 5-16: RISK CHARACTERIZATION ANALYSIS FOR B-AQUIFER GROUNDWATER BASED ON DOMESTIC USE

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Redevelopment Block     | Planned Reuse | Exposure Area | Total RME Cancer Risk | Total RME HI | RME Segregated HI | Exposure Pathway | Source Aquifer for Exposure Pathway | Total RME Cancer Risk for Exposure Pathway | Total RME HI for Exposure Pathway | Chemical of Concern (COC) |                     | Basis for COC | Detection Frequency | RME Concentration | Chemical-Specific Cancer Risk | Percent (%) Contribution to Total RME Cancer Risk for Exposure Pathway | Chemical-Specific HI | Percent (%) Contribution to Total RME HI for Exposure Pathway |
|-------------------------|---------------|---------------|-----------------------|--------------|-------------------|------------------|-------------------------------------|--------------------------------------------|-----------------------------------|---------------------------|---------------------|---------------|---------------------|-------------------|-------------------------------|------------------------------------------------------------------------|----------------------|---------------------------------------------------------------|
| EOS-1                   | OS            | IR-02 Plume   | 2.99E-04              | 4.03E+00     | 2.64E+00          | Domestic Use     | B                                   | 2.99E-04                                   | 4.03E+00                          | Metal                     | Arsenic             | C             | 1 / 3               | 2.1E+00           | 3.0E-04                       | 100.0                                                                  | <1                   | --                                                            |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   |                           | Manganese           | NC            | 3 / 3               | 2.3E+03           | --                            | --                                                                     | 2.6E+00              | 65.4                                                          |
| 44, EMI-1, EOS-2, EOS-3 | IND, MI, OS   | IR-03 Plume   | 8.85E-04              | 1.58E+00     | <1                | Domestic Use     | B                                   | 8.85E-04                                   | 1.58E+00                          | Metal                     | Arsenic             | C             | 5 / 8               | 6.2E+00           | 8.8E-04                       | 99.8                                                                   | <1                   | --                                                            |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   | VOC                       | Tetrachloroethene   | C             | 1 / 10              | 1.6E-01           | 1.5E-06                       | 0.2                                                                    | <1                   | --                                                            |
| 31B/36, 43              | IND           | B406 Plume    | 4.18E-04              | 4.41E+00     | 2.51E+00          | Domestic Use     | B                                   | 4.18E-04                                   | 4.41E+00                          | Metal                     | Arsenic             | C             | 2 / 3               | 2.7E+00           | 3.8E-04                       | 92.0                                                                   | <1                   | --                                                            |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   |                           | Manganese           | NC            | 3 / 3               | 2.2E+03           | --                            | --                                                                     | 2.5E+00              | 55.9                                                          |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   |                           | Thallium            | NC            | 1 / 3               | 3.5E+00           | --                            | --                                                                     | 1.5E+00              | 33.0                                                          |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   | VOC                       | 1,4-Dichlorobenzene | C             | 1 / 8               | 1.6E+00           | 5.4E-06                       | 1.3                                                                    | <1                   | --                                                            |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   |                           | Tetrachloroethene   | C             | 1 / 8               | 2.9E+00           | 2.8E-05                       | 6.7                                                                    | <1                   | --                                                            |
| 31B/36                  | IND           | 065082        | 4.52E-04              | 2.07E+00     | 1.77E+00          | Domestic Use     | B                                   | 4.52E-04                                   | 2.07E+00                          | Metal                     | Manganese           | NC            | 3 / 3               | 9.6E+02           | --                            | --                                                                     | 1.1E+00              | 52.7                                                          |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   | VOC                       | 1,4-Dichlorobenzene | C             | 1 / 8               | 1.7E+01           | 5.7E-05                       | 12.7                                                                   | <1                   | --                                                            |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   |                           | Tetrachloroethene   | C             | 1 / 8               | 4.1E+01           | 3.9E-04                       | 87.1                                                                   | <1                   | --                                                            |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   |                           | Trichloroethene     | C             | 1 / 8               | 1.5E+00           | 1.1E-06                       | 0.2                                                                    | <1                   | --                                                            |
| 31B/36                  | IND           | 071079        | 3.07E-04              | 6.57E-01     | <1                | Domestic Use     | B                                   | 3.07E-04                                   | 6.57E-01                          | Metal                     | Arsenic             | C             | 1 / 3               | 1.4E+00           | 2.0E-04                       | 65.0                                                                   | <1                   | --                                                            |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   | VOC                       | 1,4-Dichlorobenzene | C             | 1 / 9               | 2.2E+00           | 7.4E-06                       | 2.4                                                                    | <1                   | --                                                            |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   |                           | Tetrachloroethene   | C             | 1 / 9               | 6.1E+00           | 5.9E-05                       | 19.1                                                                   | <1                   | --                                                            |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   |                           | Vinyl chloride      | C             | 1 / 9               | 1.3E+00           | 4.1E-05                       | 13.4                                                                   | <1                   | --                                                            |
| EOS-3                   | OS            | 099102        | 7.40E-04              | 3.96E+00     | 2.59E+00          | Domestic Use     | B                                   | 7.40E-04                                   | 3.96E+00                          | Metal                     | Arsenic             | C             | 3 / 3               | 5.2E+00           | 7.4E-04                       | 100.0                                                                  | <1                   | --                                                            |
|                         |               |               |                       |              |                   |                  |                                     |                                            |                                   |                           | Manganese           | NC            | 3 / 3               | 2.2E+03           | --                            | --                                                                     | 2.5E+00              | 63.8                                                          |

Notes: All concentrations shown in micrograms per liter (µg/L).  
Risk results shown are based on based on residential exposure to B-aquifer groundater from domestic use. The risk chracterization analysis for domestic use of groundwater in the B-aquifer is based on risk results parcel-wide, regardless of planned reuse.

-- Not applicable or chemical is not a chemical of concern for this endpoint  
C Cancer effect  
HI Hazard index  
IND Industrial (industrial exposure scenario)  
IR Installation Restoration  
MI Maritime/Industrial (industrial exposure scenario)  
NC Noncancer effect  
OS Open space (recreational exposure scenario)  
RME Reasonable maximum exposure  
VOC Volatile organic compound



|    |                                     |               |                                                                                                                                                                                                         |
|----|-------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 27 | Baseline ecological risk assessment | Section 2.5.2 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 5.2, pages 5-11 through 5-18, and Table 5-17. |
|----|-------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Exposure Scenario         | Chemicals of Concern in A-Aquifer Groundwater                                                                    |                                                                                                               |
|---------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Construction <sup>b</sup> | 1,2-DCE (total)<br>1,4-DCB<br>Arsenic<br>Benzene<br>Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene | Chloroform<br>Chrysene<br>Indeno(1,2,3-cd)pyrene<br>Naphthalene<br>Pentachlorophenol<br>TCE<br>Vinyl chloride |

Notes:

- a COCs identified for this exposure scenario are based on the planned reuse for Parcel E.  
b The construction worker exposure scenario is not associated with a specific planned reuse for Parcel E.

Table 5-16 shows the risk results from exposure to groundwater in the B-aquifer. The risk results shown in Table 5-16 are limited to those exposure areas for which the cancer risk exceeded 1E-06 or the noncancer HI exceeded 1.0. Risk results for groundwater in the B-aquifer, which was evaluated for residential exposure from domestic use, are based on each exposure area evaluated, regardless of planned reuse. The following chemicals were identified as COCs in groundwater in the B-aquifer based on planned reuse.

| Exposure Scenario | Chemicals of Concern in B-Aquifer Groundwater |                              |
|-------------------|-----------------------------------------------|------------------------------|
| Residential       | 1,4-DCB<br>Arsenic<br>Manganese<br>Thallium   | PCE<br>TCE<br>Vinyl Chloride |

## 5.2 BASELINE ECOLOGICAL RISK ASSESSMENT

This section summarizes the results of the BERA of ecological receptors exposed to soil in the open space at Parcel E. The complete BERA is provided in Appendix J of this Revised RI Report. ERAs are intended to fulfill the following three basic tasks under CERCLA:

1. Document whether actual or potential ecological risks exist at a site
2. Identify chemicals at a site that pose an unacceptable ecological risk
3. Generate data to be used to evaluate cleanup options, if necessary

All three of these tasks have been accomplished in part by previously completed investigations at Parcel E. Appendix J summarizes work completed to date and provides a refinement of the conclusions reached in the 1997 ERA (Tetra Tech, LFR, and U&A 1997), the Draft Final Validation Study Report (Tetra Tech and LFR 2000a), and the PSC Technical Memorandum (Tetra Tech and LFR 2000b). Soil samples collected since the 2000 Parcel E Validation Study were evaluated using methods consistent with the previous investigations.

### 5.2.1 Overview of the Ecological Risk Assessment Process at Parcel E

The EPA separates the ERA process into the following eight steps ([EPA 1997](#)):

- Step 1: Screening-level problem formulation and evaluation of ecological effects
- Step 2: Screening-level preliminary exposure estimate and risk calculation
- Step 3: Baseline risk assessment problem formulation
- Step 4: Study design and data quality objectives
- Step 5: Field verification of sampling design
- Step 6: Site investigation and analysis of exposure and effects
- Step 7: Risk characterization
- Step 8: Risk management

This BERA was initiated before the current 8-step framework guidance by EPA was released; however, the essential elements of the current guidance are represented. Elements of the screening-level ecological risk assessment (SLERA) and problem formulation (Steps 1, 2, and 3) are summarized in [Sections 5.2.2](#) (Ecological Setting), [5.2.3](#) (Data Evaluated), and [5.2.4](#) (Conceptual Site Model and Risk Questions). The results of the Step 3a risk refinement are described in [Section 5.2.5](#) (Chemicals of Potential Ecological Concern). Steps 4, 5, and 6, which were completed in 2000, are summarized in [Section 5.2.6](#) (Update of the Validation Study and Calculation of Additional Protective Soil Concentrations). [Section 5.2.7](#) summarizes the results of the evaluation of risk to birds and mammals based on the RI data set, and [Section 5.2.8](#) presents the results of the risk characterization. [Section 5.2.9](#) presents the conclusions of the BERA. Step 8, risk management, will occur in cooperation with the regulatory agencies at a later date.

### 5.2.2 Ecological Setting

Parcel E is characterized by patches of ruderal vegetation, industrial areas, and landscaped areas, as described in [Section 3.7](#) of the Revised RI Report. This BERA addresses only areas that are unpaved and not occupied by buildings. The unpaved open space evaluated in this BERA includes terrestrial areas designated as Redevelopment Blocks EOS-1, EOS-2, and EOS-3 on [Figure 5-11](#).

The terrestrial area of Parcel E is a relatively simple habitat dominated by a variety of weedy and ornamental plant species. Plants, the primary producers in these ecosystems, provide leafy vegetation, seeds, and fruits for the primary consumers. The most common observed primary consumer was an omnivorous mammal, the house mouse, and a typical herbivorous insect at the

site is the grasshopper. Granivores, such as mourning doves (*Zenaida macroura*), house finches (*Carpodacus mexicanus*), and sparrows, feed on plant seeds. Terrestrial invertebrates, such as insects and earthworms, are consumed by a variety of birds, including the mockingbird (*Mimus polyglottos*), meadowlark (*Sturnella neglecta*), loggerhead shrike (*Lanius ludovicianus*), and American kestrel. Top predators include the red-tailed hawk (*Buteo jamaicensis*) and red fox (*Vulpes vulpes*).

### 5.2.3 Data Evaluated

All chemicals detected in soil samples from open space areas (Redevelopment Blocks EOS-1, EOS-2, and EOS-3) in Parcel E were screened to identify chemicals of potential ecological concern (COPEC). Inorganic and organic chemicals were screened against toxicity benchmarks for selected receptors, as recommended by EPA (1997). Due to poor habitat quality, plants and terrestrial invertebrates were eliminated as receptors of concern during previous phases of this investigation (PRC 1994a, 1996a, 1996b; Tetra Tech, LFR, and U&A 1997; Tetra Tech and LFR 2000a, 2000b). This risk assessment focused on terrestrial birds and mammals as ecological receptors of concern.

The open space designated as Redevelopment Blocks EOS-1, EOS-2, and EOS-3 was considered a single exposure unit in this BERA. Most of the area is unpaved; however, limited paved areas were included for geographic continuity. This land is planned for future recreational use as open space.

The site-specific data set used in this BERA included laboratory analysis of surface soil samples for metals, VOCs, SVOCs, pesticides, PCBs, TPH, and dioxins and furans. Soil samples collected from 0 to 3 feet bgs were evaluated as a single exposure unit.

All samples collected from 0 to 3 feet bgs from areas that are now within the boundary of Parcel E open space are included, regardless of when they were collected. Samples collected from the Parcel E shoreline, which represents the area below the high tide line, were excluded. Samples from areas that are now considered Parcel E-2 also were excluded. Any samples from areas that were excavated prior to December 2004 as part of a removal action also were removed from the data set. The combined data set used in this BERA included nearly 300 surface soil samples (collected between 0 and 3 feet bgs), although the sample size varied by type of analysis (see Appendix J, Table J-1).

### 5.2.4 Conceptual Site Model and Risk Questions

During previous investigations, plants and terrestrial invertebrates were evaluated as assessment endpoints. The poor quality and fragmentation of the habitat was acknowledged by the regulatory agencies during review of previous reports on Parcel E (see Appendix A of the Draft Final Validation Study [Tetra Tech and LFR 2000a]), and it was agreed that this BERA would consider risk to birds and mammals only.

The CSM for this BERA contains few complete exposure pathways, thus it is relatively straightforward (see [Figure 5-12](#)). Carnivorous terrestrial birds and omnivorous small mammals were assumed to be exposed to chemicals in surface soil and food items at Parcel E, based on surveys performed during previous phases of the RI ([Tetra Tech and LFR 2000a, 2000b](#)). Neither ingestion of surface water, dermal exposure, nor inhalation was considered significant at Parcel E.

The risk question at Parcel E is equally straight forward: *Do chemicals in soil or food items at Parcel E pose a risk to the continued health and well-being of populations of carnivorous birds or omnivorous small mammals that forage there?* Components of this overall question included the evaluation of effects on survival, growth, and reproduction of key species. The metrics used to answer the risk question were detected concentrations of COPECs in soil and PSCs.

The open space in Parcel E provides foraging habitat for a variety of birds and mammals with broad habitat requirements and a high tolerance for human disturbance. Results of previous investigations of Parcel E indicated the house mouse is a fairly common permanent resident and the red-tailed hawk and American kestrel are frequent visitors ([Tetra Tech and LFR 2000a](#)). Therefore, these three species were selected as representative or surrogate species for this BERA. Carnivorous birds, represented by the kestrel and the red-tailed hawk, spend only a portion of their time foraging at Parcel E, which provides low-quality habitat for these wide-ranging species. Small mammals, in contrast, were assumed to forage exclusively at Parcel E.

The specific assessment endpoints are sufficient rates of survival, growth, and reproduction to sustain populations of species representing the trophic guilds listed below.

- Carnivorous bird (represented by the American kestrel)
- Raptors (represented by the red-tailed hawk)
- Omnivorous mammals (represented by the house mouse)

### **5.2.5 Chemicals of Potential Ecological Concern**

The inorganic chemicals for which both the toxicity screening value and the HPAL were exceeded, as well as inorganic chemicals for which no screening values were available, were evaluated further in this BERA (see [Appendix J, Table J-4](#)). The following chemicals were retained as COPECs in the ERA for birds and mammals:

- |            |              |
|------------|--------------|
| • Antimony | • Lead       |
| • Arsenic  | • Molybdenum |
| • Barium   | • Nickel     |
| • Chromium | • Zinc       |
| • Copper   |              |

Organic chemicals were largely eliminated as COPECs during the 1997 ERA and Parcel E Validation Study ([Tetra Tech, LFR, and U&A 1997](#); [Tetra Tech and LFR 2000a, 2000b](#)). In this BERA, organic chemicals were considered COPECs if the EPC exceeded the EPCs reported in the 1997 RI Report by at least 10 percent. Concentrations of chemicals for which the current EPCs were within 10 percent of the previously evaluated EPCs were considered unchanged since the 1997 RI, so no update was required. As a result, the following organic COPECs were reevaluated in this BERA (see [Appendix J, Table J-4](#)):

- Toluene
- TCE
- Xylene
- PCBs (as total Aroclors)
- Total DDTs

### **5.2.6 Update of the Validation Study and Calculation of Additional Protective Soil Concentrations**

This section expands on the formulation presented in the Parcel E Validation Study ([Tetra Tech and LFR 2000a](#)) and incorporates comments received from the regulatory agencies and natural resource trustees on the Validation Study. The purpose of the Parcel E Validation Study was to refine the Phase 1 ERA for birds and mammals by using site-specific bioaccumulation factors in the food chain model.

Subsequent to the findings of the Validation Study that birds and mammals may be at risk from several metals in soil at Parcel E, the Navy and the regulatory agencies agreed to calculate site-specific PSCs that represent metals concentration in soil that, if met, would reduce the risk to acceptable levels. In 2000, PSCs were calculated for cadmium, copper (for birds only), lead, nickel, selenium, and zinc using the results for collocated soil and tissue samples collected from Parcel E during the Validation Study ([Tetra Tech and LFR 2000b](#)).

Since the PSCs were derived, additional soil samples were collected, removal actions were completed, and the boundaries of Parcel E were changed (see [Appendix A](#) of this Revised RI Report). The conclusions of the 1997 ERA and the Validation Study are considered valid for the area that was evaluated at that time, and the PSCs that were derived are applicable to all of Parcel E. As a result, it is not necessary to reevaluate the conclusions of the 1997 ERA or the Validation Study. However, the Navy was concerned that chemicals eliminated as COPECs during the Validation Study may be elevated above risk-based concentrations in the new data set due to the spatial heterogeneity of soil concentrations. To address this issue, the new data set was evaluated for consistency with the previous data set to identify any additional chemicals that should be included in the ERA.

Based on the comparison of pre-2000 data with all data, PSCs were calculated for the following chemicals: molybdenum, toluene, TCE, xylene, total DDTs, and total Aroclors. New PSCs were calculated for copper (for mammals only), molybdenum, toluene, TCE, xylene, total DDTs, and total Aroclors because none were provided in the PSC Technical Memorandum ([Tetra Tech and](#)

[LFR 2000b](#)). PSCs for lead in mammals were recalculated because new mammalian toxicity reference values (TRV) for lead became available after the original PSCs were developed. Risk estimates for mammals based on both the previous TRV (adjusted for bioavailability) and the new TRV (not adjusted for bioavailability) are provided in [Appendix J, Section J5.4](#).

### **5.2.7 Evaluation of Risk to Birds and Mammals**

Of the inorganic chemicals carried forward from the Phase 1 ERA and the Validation Study, or added during this update only copper and lead were shown to pose unacceptable risk to birds or mammals under the site-specific conditions at Parcel E assessed in this ERA. EPCs for cadmium and selenium at Parcel E were less than HPALs; EPCs for nickel and zinc exceeded HPALS but were less than the PSCs for birds and mammals. [Table 5-17](#) lists the EPCs and hazard quotients (HQ) calculated for each of the representative receptors for selected chemicals.

The identification of risk posed by lead is problematical because the result depends on which TRV and bioavailability assumption is used. The original TRV was coupled with an estimate that lead in soil at Parcel E is 10 percent as bioavailable as lead acetate was in the laboratory study from which the low TRV was derived. As a result, HQs less than 1.0 were calculated for both birds and mammals. The revised TRV required by the regulatory agencies, with an assumption of 100 percent bioavailability, resulted in an HQ of 2.67 for the house mouse (adult) and 1.19 for the kestrel.

The only organic chemicals that were retained as COPECs were PCBs (total Aroclors and total DDTs). Both total Aroclors and total DDTs were eliminated as COPECs during the Phase 1 ERA and Validation Study. However, the EPCs for total Aroclors and total DDTs in the RI soil data set were substantially greater than the concentrations reported in earlier reports, so these chemicals were reevaluated in the ERA. The HQs for total Aroclors ranged from 1.29 to 2.16. The HQs for DDTs were all less than 1.0.

Results of the risk evaluation indicated carnivorous birds (such as the American kestrel) and small omnivorous mammals (such as the house mouse) may be at risk from ingested doses of copper, lead, and PCBs at Parcel E. Both lead and copper occur at concentrations well above the HPALs, and both of these metals are known to cause adverse effects to vertebrates when ingested. However, the magnitude of the HQ (all less than 2.7) and the low quality of the habitat at Parcel E suggests that risk is not immediate or severe. Because the low TRVs, which represent a lowest observable adverse effect level, were used to derive the PSCs, an HQ greater than 1.0 does not indicate immediate unacceptable risk. Nevertheless, any HQ greater than 1.0 is generally interpreted as indicating some risk.

### **5.2.8 Risk Characterization**

The open area in Parcel E is best characterized as marginal, ruderal habitat of limited ecological significance. This description is corroborated by the California Department of Fish and Game's comments on the Parcel E Validation Study, which stated, "The onshore habitat at Parcel E is of

moderate quality and isolated from good wildlife habitat. Consequently, this site is not considered a high priority for terrestrial receptors by DFG” (Tetra Tech and LFR 2000a; Appendix E). The Navy agrees with this general evaluation of Parcel E. The principal concern at Parcel E is that chemicals in soil will be transported to the more ecologically sensitive and valuable offshore area (Parcel F). The migration of chemicals to the Bay is being concurrently addressed under a separate investigation, the results of which are presented in Appendix G of this Revised RI Report.

The only resident small mammal documented at Parcel E is the house mouse, which is not normally considered to warrant government protection. A 200-trap night effort yielded several house mice but no deer mice, the native small mammal that was the original focus of the Phase 1 ERA. The house mouse was shown to be at risk from ingested doses of copper, lead, and PCBs, with HQs ranging from 1.29 (PCBs) to 2.67 (lead). These values do not indicate significant, immediate risk to mammals.

The house mouse is of interest primarily as a potential conduit of chemicals to the red-tailed hawk. Dose estimates for the red-tailed hawk, based on a diet of house mouse, were below risk-based concentrations for all chemicals. High-quality habitat with intact vegetation and limited human disturbance is available to the red-tailed hawk in the nearby hills, west of HPS. Although individual red-tailed hawks have been observed at Parcel E, the parcel does not represent a significant foraging ground for the population. No risk to the hawk was suggested by any of the data collected at Parcel E.

The American kestrel is widely distributed in open habitats throughout the entire state of California and throughout the United States. It is of interest in the risk assessment because it consumes a variety of large insect and small vertebrate prey, which may contain chemicals accumulated from soil at Parcel E. The kestrel may be at risk from lead (HQ = 1.19) and PCBs (HQ = 2.16) ingested in soil and food items. Although any HQ greater than 1.0 is interpreted as indicating potential risk, the values calculated for the kestrel do not raise significant concerns about the overall health of kestrel populations in the area.

### **5.2.9 Summary and Conclusions of the Ecological Risk Assessment**

The open space of Parcel E that was investigated in this ERA is slated for future use as a recreational area for the human population of the greater Bay area. The land immediately adjacent to the open space is designated industrial, maritime/industrial, or mixed use. The most likely use of the adjacent area is as a business park. The physical disturbances that typically occur in such an urban park setting are expected to limit the attractiveness of the open space to all but the most tolerant wildlife species, such as the house mouse and kestrel.

Results of the risk evaluation indicated carnivorous birds (such as the American kestrel) and small omnivorous mammals (such as the house mouse) may be at risk from ingested doses of copper, lead, and PCBs at Parcel E. Lead occurs at concentrations well above the HPALs, and is known to cause adverse effects to vertebrates when ingested. However, the magnitude of the HQ (all less than 2.7) and the low quality of the habitat at Parcel E suggests that risk is not immediate



or severe. Any HQ greater than 1.0 is generally interpreted as indicating some risk in a SLERA. In a BERA, however, more realistic assessment is appropriate. Because the low TRVs, which represent a lowest observable adverse effect level, were used to derive the PSCs, an HQ greater than 1.0 does not indicate immediate unacceptable risk.

In summary, no significant unacceptable risk to ecological receptors was indicated at Parcel E. The maximum HQs based on PSCs derived using the low TRV were 2.16 (for kestrels exposed to PCBs in soil) and 2.67 for the house mouse (exposed to lead in soil). Because the house mouse is not considered to warrant protection as a species, and no other small mammals were trapped at the site, this level of risk is acceptable. The low HQ for the kestrel does not indicate population-level risk of a magnitude that warrants remediation.

### **5.3 RESULTS OF THE PARCEL E SHORELINE HUMAN HEALTH RISK ASSESSMENT AND SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT**

This section summarizes the potential human health and ecological risks from exposure to chemicals present in sediments along the shoreline at Parcel E and identifies COCs for human health and environmental receptors. Potential risk from exposure to chemicals present in sediment was evaluated for the entire shoreline area at HPS, including the shoreline area associated with Parcel E. The risk assessments for sediment are being conducted as part of the Parcel F (offshore area) RI/FS activities and are drawn from for use in this Revised Parcel E RI Report.

A complete description of the methods used in performing the HHRA are provided in the Final Hunters Point Shipyard Parcel F Validation Study ([Battelle, BBL, and Neptune & Company 2005](#)), and [Attachment 1](#) of this Revised RI Report contains tables from the Parcel F Validation Study summarizing the HHRA results. [Appendix G](#) presents the detailed results of the SLERA, which was performed as part of the Parcels E and E-2 Shoreline Characterization Technical Memorandum.

#### **5.3.1 Risk to Human Health Along the Parcel E Shoreline**

This section presents the results of the human health evaluation of the Parcel E shoreline sediments. The HHRA was performed according to standard EPA risk assessment guidance ([EPA 1989, 1992](#)).

Current and reasonably anticipated future human exposure to COPCs associated with the shoreline along Parcel E was estimated. It was assumed that the primary exposure pathway would be through the consumption of shellfish, and that individuals harvesting shellfish would be directly exposed to sediments via direct contact and incidental ingestion. For the purposes of the human health risk assessment, the entire shoreline was considered as one exposure unit.



**TABLE 5-17: RISK TO BIRDS AND MAMMALS AT PARCEL E**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Analyte             | EPC<br>(mg/kg) | House Mouse    |          |                |          | American Kestrel |      | Red-tailed Hawk |        |
|---------------------|----------------|----------------|----------|----------------|----------|------------------|------|-----------------|--------|
|                     |                | Adult          |          | Juvenile       |          |                  |      |                 |        |
|                     |                | PSC<br>(mg/kg) | HQ       | PSC<br>(mg/kg) | HQ       | PSC<br>(mg/kg)   | HQ   | PSC<br>(mg/kg)  | HQ     |
| Metals              |                |                |          |                |          |                  |      |                 |        |
| Copper              | 1,061.84       | 470            | 2.26     | 598            | 1.78     | 1,084            | 0.98 | 133,137         | 0.01   |
| Lead - original TRV | 525.63         | 808            | 0.65     | 1,365          | 0.39     | 442              | 1.19 | 1,057           | 0.50   |
| Lead - revised TRV  | 525.63         | 197            | 2.67     | 252            | 2.09     | 442              | 1.19 | 1,057           | 0.50   |
| Molybdenum          | 30.82          | 46             | 0.67     | 58             | 0.53     | 1,269            | 0.02 | 170,885         | 0.0002 |
| Nickel              | 359.32         | 1,941          | 0.19     | 2,751          | 0.13     | 2,563            | 0.14 | NA              | NC     |
| Zinc                | 700.13         | 719            | 0.97     | 1,111          | 0.63     | 1,927            | 0.36 | NA              | NC     |
| Organic Compounds   |                |                |          |                |          |                  |      |                 |        |
| Toluene             | 0.01           | 4,577          | 0.000003 | 5,811          | 0.000002 | NA               | NC   | NA              | NC     |
| Trichloroethene     | 0.21           | 123            | 0.0017   | 157            | 0.001    | NA               | NC   | NA              | NC     |
| Xylene              | 0.01           | 369            | 0.00002  | 469            | 0.00002  | NA               | NC   | NA              | NC     |
| Total Aroclors      | 79.91          | 62             | 1.29     | 37             | 2.16     | 37               | 2.16 | 4,984           | 0.02   |
| Total DDTs          | 0.29           | 162            | 0.002    | 206            | 0.001    | 4                | 0.07 | 476             | 0.001  |

Notes: Shaded and bold text indicates HQ exceeded 1.

DDT Dichlorodiphenyltrichloroethane

EPC Exposure point concentration; the lower of the maximum or the UCL<sub>95</sub> concentration in soil in Parcel E

HQ Hazard quotient

mg/kg Milligram per kilogram

NA Not available

NC Not calculated

PSC Protective soil concentration

UCL<sub>95</sub> 95 percent upper confidence limit on the mean

TRV Toxicity reference value

|    |                                            |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----|--------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 28 | Screening-level ecological risk assessment | Section 2.5.2 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Section 5.3.2, pages 5-20 through 5-22.<br><br>Draft Parcels E and E-2 Shoreline Characterization Technical Memorandum, Hunters Point Shipyard, San Francisco, California. SulTech. June 2007. Tables 4 and 5. (note: this document was accepted as final and was provided as Appendix G to the Final Revised Remedial Investigation Report for Parcel E) |
|----|--------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The doses derived in this manner for each scenario were then summed to estimate a lifetime average daily dose and average daily dose for each constituent by sampling area based on the adult and child RME and CTE exposure scenarios, respectively.

A summary of the individual risk and hazard values calculated for all chemicals evaluated within each exposure scenario is presented in [Attachment 1](#) (see Tables 2 and 3). Total cumulative risks and the risk drivers for each scenario are summarized in [Attachment 1](#) (see Tables 4 and 5). Cancer risks derived in this assessment can be compared with EPA's risk management range (that is, 1E-06 to 1E-04) for health protectiveness at Superfund sites. Based on this range, EPA typically considers 1E-06 as the "point of departure" for taking action at Superfund sites ([EPA 1989](#)).

Risks associated with direct contact to sediment were relatively low. For the RME scenario, PCBs were the only chemical with a risk greater than 1E-06. For the CTE scenario, all risks were below 1E-06 and hazards were below 1. For the shellfish ingestion pathway, the primary risk drivers associated with Parcels E and E-2 shoreline sediments were arsenic, chromium, total PCBs, and dioxins. Risks for these chemicals exceeded 1E-06 for both RME and CTE scenarios. Risks for arsenic and dioxins were similar to those for reference areas, but risks for chromium and total PCBs associated with site sediments were higher than those for reference areas ([Battelle, BBL, and Neptune & Company 2005](#)). For noncancer risks, total PCBs were the primary contributor.

Based on this evaluation, chromium and total PCBs appear to be the primary COCs for the evaluation of human health along the Parcel E shoreline.

### 5.3.2 Risk to Ecological Receptors Along the Parcel E Shoreline

The Navy conducted a SLERA to determine if chemicals detected along the shoreline pose an ecological risk to those receptors exposed to the narrow intertidal zone of Parcels E and E-2 (see [Appendix G](#)). For the purposes of the SLERA, the habitat along the entire shoreline was considered as one exposure unit. In addition, the shoreline was not divided into Parcels E and E-2 because it would reduce sample sizes below what is practicable for assessing risk.

Sediment samples were analyzed for metals, VOCs, SVOCs, pesticides, PCBs, TPH, dioxins and furans, and organotins. All chemicals detected in sediment samples from the shoreline were screened to identify COPECs. A toxicity-based approach was used to identify site-related chemicals that may pose risks to sensitive ecological receptors, including benthic invertebrates, birds, and mammals.

This section summarizes the characterization of risk posed to benthic invertebrates, birds, and mammals from surface and subsurface sediments. Concentrations of chemicals in sediment were compared with effects ranges to assess potential risk to benthic invertebrates. Food-chain models were used to assess the exposure of birds and mammals to ingested chemicals. Ingested doses were estimated for three birds (willet, surf scoter, and red tailed-hawk) and one mammal (house mouse). Details of the values used in the dose equation and the assumptions of the exposure assessment are provided in [Appendix G](#), Shoreline Technical Memorandum.

### ***Risk to Benthic Invertebrates***

The characterization of risk posed to benthic invertebrates from surface and subsurface sediment is summarized below.

**Surface Sediment:** All detected inorganic and organic chemicals in sediment were evaluated in the toxicological screen by evaluating the HQ (ratio of exposure point concentrations in surface sediment to effects range-median [ER-M] values). Chemicals with HQs greater than 1.0 were considered COPECs for benthic invertebrates. [Table G-6](#) in [Appendix G](#), Shoreline Technical Memorandum, presents the HQs.

HQs ranged from 1.30 for zinc to 3.19 for nickel for benthic invertebrates. No ER-M value is available for molybdenum, so it was considered a COPEC by default. The HQ for cadmium was less than 1.0; therefore, it was eliminated as a COPEC for benthic invertebrates.

Exposure concentrations for 4,4'-dichlorodiphenyldichloroethane (DDD), 4,4'-dichlorodiphenyldichloroethene (DDE), 4,4'-DDT, total DDTs, and PCBs exceeded their respective ER-M values; therefore, they were retained as primary COPECs for benthic invertebrates. HQs for these COPECs ranged from 1.19 (DDE) to 356.67 (total PCBs) (see [Table G-6](#) in [Appendix G](#), Shoreline Technical Memorandum).

**Subsurface Sediment:** Risk to benthic invertebrates from subsurface sediment was evaluated exactly as described above for surface sediment. Chemicals with HQs greater than 1.0 were considered COPECs for benthic invertebrates. [Table G-7](#) in [Appendix G](#), Shoreline Technical Memorandum) presents HQs based on the ratio of exposure point concentrations in subsurface sediment to ER-M values. HQs ranged from 1.12 for antimony to 65.46 for copper.

Exposure concentrations for 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, total DDTs, dieldrin, endrin, and PCBs exceeded their respective ER-M values; therefore, they were retained as primary COPECs for benthic invertebrates. HQs for these COPECs ranged from 2.9 (DDD) to 1,500 (total PCBs).

In summary, copper, lead, zinc, and PCBs were measured at concentrations that pose a potential risk to benthic invertebrates in surface and subsurface sediment from the Parcels E and E-2 shoreline. For all of these metals, exposure point concentrations are higher in the subsurface samples. Several HQs for pesticides in sediment indicated potential risk, especially DDT and dieldrin in the subsurface samples.

### **Risk to Birds**

Based on life history and foraging habits, daily doses were estimated for the surf scoter, willet, and red-tailed hawk feeding along the Parcels E and E-2 shoreline. Site-specific daily dose estimates were compared with high and low TRVs to evaluate the potential adverse biological effects on each receptor (see [Table 4](#) in [Appendix G](#)). Based on this comparison, the risk to representative receptors was characterized; this comparison was performed in a manner consistent with EPA's HQ methodology ([EPA 1998](#)), as presented below.

$$HQ = \frac{Dose}{TRV} = \frac{(mg / kg - day)}{(mg / kg - day)} \quad (5-3)$$

where:

|      |   |                                                                         |
|------|---|-------------------------------------------------------------------------|
| HQ   | = | Hazard quotient (unitless)                                              |
| Dose | = | Chemical-, receptor-, and site-specific daily dose estimate (mg/kg-day) |
| TRV  | = | Chemical- and receptor-specific toxicity reference value (mg/kg-day)    |

A receptor is considered to exhibit potential significant risk if the HQ is greater than 1 using the high TRV. In contrast, a receptor is considered to exhibit only a potential risk if the HQ is greater than 1 using the low TRV.

Significant risk to birds was indicated only for the willet exposed to total PCBs. Results of the food-chain modeling indicated no significant risk to either the surf scoter or the red-tailed hawk. Other chemicals for which potential risk to birds is suggested include cadmium, copper, lead, mercury, PCBs, total DDTs, and dieldrin.

### **Risk to Mammals**

Risk to mammals was evaluated in the same way as risk to birds described above. Based on life history and foraging habits, daily dose estimates were calculated for the omnivorous house mouse feeding along the Parcels E and E-2 shoreline. HQs were calculated using the high and low TRVs. Doses for aluminum, antimony, molybdenum, and PCBs indicated significant risk to the mouse from both surface and subsurface sediment. Doses based on surface samples also exceeded the high TRV for cadmium and vanadium. Subsurface doses exceeded the high TRV for copper and zinc (see [Table 5](#) of [Appendix G](#)). A complete set of HQs is provided in [Table G-18](#) of [Appendix G](#).

The greatest significant risk (high TRV HQ) was indicated for PCBs ingested by the house mouse. A complete discussion of the chemicals posing risk and the chemicals that pose no significant risk to the house mouse is presented in [Appendix G](#).

Based on the results of the SLERA, risk to invertebrates, birds, and mammals along the shoreline should be evaluated further in an FS to determine the appropriate remedial alternative for the intertidal sediments along the entire Parcels E and E-2 shoreline.

**TABLE 4: HQS FOR WILLET, SURF SCOTER, AND RED-TAILED HAWK**

Draft Parcels E and E-2 Shoreline Characterization Technical Memorandum, Hunters Point Shipyard, San Francisco, California

|                  | Surf Scoter           |                      |                       |                      | Willet <sub>Macoma</sub> |                      |                       |                      | Willet <sub>sbi</sub> |                      |                       |                      | Red-tailed Hawk       |                      |                       |                      |
|------------------|-----------------------|----------------------|-----------------------|----------------------|--------------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
|                  | 0 to 0.5 foot bgs     |                      | 2 to 2.5 feet bgs     |                      | 0 to 0.5 foot bgs        |                      | 2 to 2.5 feet bgs     |                      | 0 to 0.5 foot bgs     |                      | 2 to 2.5 feet bgs     |                      | 0 to 0.5 foot bgs     |                      | 2 to 2.5 feet bgs     |                      |
|                  | HQ<br>(dose/high TRV) | HQ<br>(dose/low TRV) | HQ<br>(dose/high TRV) | HQ<br>(dose/low TRV) | HQ<br>(dose/high TRV)    | HQ<br>(dose/low TRV) | HQ<br>(dose/high TRV) | HQ<br>(dose/low TRV) | HQ<br>(dose/high TRV) | HQ<br>(dose/low TRV) | HQ<br>(dose/high TRV) | HQ<br>(dose/low TRV) | HQ<br>(dose/high TRV) | HQ<br>(dose/low TRV) | HQ<br>(dose/high TRV) | HQ<br>(dose/low TRV) |
| Cadmium          | <1.0                  | <1.0                 | <1.0                  | <1.0                 | <1.0                     | <1.0                 | <1.0                  | <1.0                 | <1.0                  | <b>2.23</b>          | <1.0                  | <1.0                 | <1.0                  | <1.0                 | <1.0                  | <1.0                 |
| Copper           | <1.0                  | <1.0                 | <1.0                  | <1.0                 | <1.0                     | <1.0                 | <1.0                  | <b>2.66</b>          | <1.0                  | <b>1.16</b>          | <1.0                  | <b>7.46</b>          | <1.0                  | <1.0                 | <1.0                  | <b>1.09</b>          |
| Lead             | <1.0                  | <b>2.91</b>          | <1.0                  | <b>8.96</b>          | <1.0                     | <b>9.02</b>          | <1.0                  | <b>28.8</b>          | <1.0                  | <b>33</b>            | <1.0                  | <b>102</b>           | <1.0                  | <b>3.63</b>          | <1.0                  | <b>1.12</b>          |
| Mercury          | <1.0                  | <1.0                 | <1.0                  | <1.0                 | <1.0                     | <1.0                 | <1.0                  | <b>1.09</b>          | <1.0                  | <1.0                 | <1.0                  | <b>2.18</b>          | <1.0                  | <1.0                 | <1.0                  | <1.0                 |
| PCBs (congeners) | <1.0                  | <1.0                 | NA                    | NA                   | <1.0                     | <b>6.78</b>          | NA                    | NA                   | <b>1.93</b>           | <b>23.3</b>          | NA                    | NA                   | <1.0                  | <b>1.30</b>          | NA                    | NA                   |
| PCBs (Aroclors)  | <1.0                  | <1.0                 | <1.0                  | <b>9.22</b>          | <1.0                     | <b>1.02</b>          | <b>2.36</b>           | <b>28.6</b>          | <1.0                  | <b>3.50</b>          | <b>8.12</b>           | <b>98.4</b>          | <1.0                  | <1.0                 | <1.0                  | <1.0                 |
| Total DDTs       | <1.0                  | <1.0                 | <1.0                  | <b>2.14</b>          | <1.0                     | <1.0                 | <1.0                  | <b>6.64</b>          | <1.0                  | <b>2.07</b>          | <1.0                  | <b>27</b>            | <1.0                  | <1.0                 | <1.0                  | <1.0                 |
| Dieldrin         | <1.0                  | <1.0                 | <1.0                  | <1.0                 | <1.0                     | <1.0                 | <1.0                  | <1.0                 | <1.0                  | <1.0                 | <1.0                  | <b>1.08</b>          | <1.0                  | <1.0                 | <1.0                  | <1.0                 |

Notes: Highlighted cells show HQ<sub>(dose/high TRV)</sub> values that exceed 1.0.

bgs Below ground surface  
 DDT Dichlorodiphenyltrichloroethane  
 HQ Hazard quotient  
 NA Not available  
 PCB Polychlorinated biphenyls

**TABLE 5: HQS FOR THE HOUSE MOUSE**

Draft Parcels E and E-2 Shoreline Characterization Technical Memorandum  
Hunters Point Shipyard, San Francisco, California

| Chemical of Potential Ecological Concern | House Mouse        |                   |                    |                   |
|------------------------------------------|--------------------|-------------------|--------------------|-------------------|
|                                          | 0 to 0.5 foot bgs  |                   | 2 to 2.5 feet bgs  |                   |
|                                          | HQ (dose/high TRV) | HQ (dose/low TRV) | HQ (dose/high TRV) | HQ (dose/low TRV) |
| Aluminum                                 | 3.06               | 87.5              | 7.72               | 77.2              |
| Antimony                                 | 1.34               | 13.4              | 5.39               | 53.9              |
| Cadmium                                  | 1.18               | 51.9              | <1.0               | 20.9              |
| Copper                                   | <1.0               | 43.2              | 1.18               | 277               |
| Lead                                     | <1.0               | 5.89              | <1.0               | 18.2              |
| Manganese                                | <1.0               | 1.66              | <1.0               | 1.76              |
| Molybdenum                               | 2.91               | 29.1              | 1.80               | 1.80              |
| Nickel                                   | <1.0               | 18.3              | <1.0               | 15.1              |
| Selenium                                 | <1.0               | 2.74              | <1.0               | 3.02              |
| Vanadium                                 | 1.30               | 13.0              | <1.0               | 8.31              |
| Zinc                                     | <1.0               | 12.3              | 1.04               | 50.0              |
| Total PCBs (congeners)                   | 155                | 555               | NA                 | NA                |
| Total Aroclors                           | 23.3               | 83.2              | 584                | 2,009             |
| Total DDTs                               | <1.0               | <1.0              | <1.0               | 8.44              |
| Alpha-Chlordane                          | <1.0               | <1.0              | <1.0               | 2.12              |
| Gamma-Chlordane                          | <1.0               | 1.13              | <1.0               | 3.81              |
| High-Molecular-Weight PAH                | <1.0               | <1.0              | <1.0               | 1.14              |

Notes: Highlighted cells show HQ<sub>(dose/high)</sub> values that exceed 1.0.

bgs Below ground surface  
DDT Dichlorodiphenyltrichloroethane  
HQ Hazard quotient  
NA Not available  
PCB Polychlorinated biphenyls

|    |                           |               |                                                                                                                                                            |
|----|---------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 29 | Risks to aquatic wildlife | Section 2.5.2 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Section 2.5.2.3, page 2-45; Table 2-14. |
|----|---------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 2.5.2.3. Risk Evaluation of Groundwater

A risk evaluation of aquatic wildlife exposed to potentially contaminated groundwater at Parcel E is provided in [Appendix A](#). The assessment consists of the following general steps:

- Aquatic evaluation criteria were selected based on surface water quality criteria (Basin Plan Table 3-3; California Toxics Rule; National Recommended Water Quality Criteria; and National Ambient Water Quality Criteria). All of these standards apply to surface water; none of them applies to groundwater. Therefore, these potential ARARs for surface water would be applied to the surface water at the interface of the A-aquifer groundwater, but would not be used to set cleanup standards for in-situ A-aquifer groundwater at Parcel E.
- The Navy developed trigger levels for various inland locations to ensure surface water quality criteria are not exceeded if groundwater at Parcel E discharges to the bay. The trigger levels are intended to serve as conservative comparison values for groundwater to indicate when additional evaluation may be necessary. The development of the trigger levels was initially performed in the Parcel D FS, and has also been applied at HPS Parcels B and C. The development of the trigger levels is discussed in Attachment A1 to [Appendix A](#).
- Chemical concentrations in groundwater were screened against the assigned aquatic evaluation criteria, mainly comprising saltwater aquatic criteria, to identify COPECs for surface water quality.
- Site-specific data for select COPECs were then evaluated against trigger levels, where appropriate, to confirm if the COPECs posed a potential risk to aquatic receptors requiring remedial option analysis.

Based on concentrations exceeding trigger levels (as adjusted based on HGALs), the following chemicals (or groups of chemicals) pose a potential threat to aquatic wildlife through exposure to surface water impacted by contaminated groundwater at Parcel E:

- Metals: arsenic, copper, lead, nickel, and zinc;
- PCBs and pesticides: Aroclor-1254, Aroclor-1260, 4,4'-dichlorodiphenyldichloroethene (DDE), and alpha-chlordane; and
- Total TPH: sum of detected concentrations of all TPH ranges (gasoline-range, diesel-range, and motor-oil range).

[Figure 2-9](#) shows the locations where groundwater concentrations exceeded their respective trigger levels. As discussed in [Appendix A](#), chemical concentrations at the IR-05 metals plume and the IR-12 nickel plume do not exceed their respective trigger levels; as a result, these plumes do not require further evaluation in this FS Report. As discussed in [Section 2.3.3.1](#), chemical concentrations at the IR-02 Southeast metals plume have attenuated following the Metal Debris Reef removal action; as a result, this plume also does not require further evaluation in the FS Report. [Table 2-14](#) summarizes the specific COPECs at the locations identified on [Figure 2-9](#).

**Table 2-14. Groundwater COECs for Aquatic Wildlife**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard

| Analytical Group       | COEC            | Aquatic Evaluation Criterion Selected for Aquatic Evaluation (µg/L) <sup>(a)</sup> | Locations Recommended for Further Monitoring and Evaluation | Maximum Concentration (µg/L) | Calculated Trigger Level (µg/L) <sup>(b)</sup> |
|------------------------|-----------------|------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------|------------------------------------------------|
| Metals                 | Arsenic         | 36                                                                                 | IR03MWO-1                                                   | 1,180                        | 36                                             |
|                        |                 |                                                                                    | IR02MW173A                                                  | 75.7                         | 36                                             |
|                        |                 |                                                                                    | PA50MW05A                                                   | 42.7                         | 36                                             |
|                        | Copper          | 28.0 <sup>(c)</sup>                                                                | IR02MW126A                                                  | 1,000                        | 28                                             |
|                        |                 |                                                                                    | IR02MW373A                                                  | 1,300                        | 28                                             |
|                        |                 |                                                                                    | IR03MW226A                                                  | 824                          | 28                                             |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 3,240                        | 28                                             |
|                        | Lead            | 14.4 <sup>(c)</sup>                                                                | IR02MW373A                                                  | 35.2                         | 14.4                                           |
|                        |                 |                                                                                    | IR03MW218A                                                  | 23.4                         | 14.4                                           |
|                        |                 |                                                                                    | IR03MW226A                                                  | 613                          | 14.4                                           |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 65                           | 14.4                                           |
|                        | Mercury         | 0.60 <sup>(c)</sup>                                                                | IR03MW226A                                                  | 0.8                          | 0.60                                           |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 1.2                          | 0.60                                           |
|                        | Nickel          | 96.5 <sup>(c)</sup>                                                                | IR02MWB-2                                                   | 1,720                        | 96.5                                           |
|                        |                 |                                                                                    | IR02MWB-5                                                   | 3,430                        | 96.5                                           |
|                        |                 |                                                                                    | IR02MW373A                                                  | 1,460                        | 96.5                                           |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 1,140                        | 96.5                                           |
|                        | Zinc            | 81                                                                                 | IR02MW126A                                                  | 2,320                        | 81                                             |
|                        |                 |                                                                                    | IR02MW373A                                                  | 9,970                        | 81                                             |
|                        |                 |                                                                                    | IR03MW226A                                                  | 1,180                        | 81                                             |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 2,400                        | 81                                             |
| PCBs and Pesticides    | Aroclor-1254    | 0.03                                                                               | IR02MW372A                                                  | 35                           | 0.06                                           |
|                        |                 |                                                                                    | IR02MW375A <sup>(d)</sup>                                   | 40                           | 0.03                                           |
|                        |                 |                                                                                    | IR02MW146A                                                  | 0.24                         | 0.03                                           |
|                        |                 |                                                                                    | IR03MW225A                                                  | 1.2                          | 0.03                                           |
|                        | Aroclor-1260    | 0.03                                                                               | IR03MW218A1                                                 | 35                           | 0.03                                           |
|                        |                 |                                                                                    | IR03MW225A                                                  | 40                           | 0.03                                           |
|                        |                 |                                                                                    | IR03MW226A                                                  | 0.24                         | 0.03                                           |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 1.2                          | 0.03                                           |
|                        | 4,4'-DDE        | 0.001                                                                              | IR02MW372A                                                  | 1.2                          | 0.002                                          |
|                        | Alpha-Chlordane | 0.004                                                                              | IR02MW372A                                                  | 0.03                         | 0.008                                          |
| Petroleum Hydrocarbons | TPH (Total)     | 4,839 <sup>(e)</sup>                                                               | IR02MW173A                                                  | 6,900                        | 4,839                                          |
|                        |                 | 3,216 <sup>(e)</sup>                                                               | IR03MW218A1                                                 | 83,000                       | 3,216                                          |
|                        |                 | 3,216 <sup>(e)</sup>                                                               | IR03MW218A2                                                 | 19,900                       | 3,216                                          |
|                        |                 | 3,216 <sup>(e)</sup>                                                               | IR03MW225A                                                  | 12,000                       | 3,216                                          |
|                        |                 | 3,216 <sup>(e)</sup>                                                               | IR03MW226A                                                  | 17,670                       | 3,216                                          |
|                        |                 | 1,400 <sup>(e)</sup>                                                               | IR03MW369A                                                  | 13,500                       | 1,400                                          |
|                        |                 | 1,467 <sup>(e)</sup>                                                               | IR03MW370A                                                  | 27,560                       | 1,467                                          |
|                        |                 | 2,092 <sup>(e)</sup>                                                               | IR03MW371A                                                  | 10,890                       | 2,092                                          |
|                        |                 | 12,604 <sup>(e)</sup>                                                              | IR03MWO-1                                                   | 560,000                      | 12,604                                         |



**Table 2-14. Groundwater COECs for Aquatic Wildlife (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard

Notes:

- (a) References for the aquatic evaluation criteria are included in Tables A-1 and A-2.
- (b) Attenuation factor assigned based on nomographs developed specifically for HPS groundwater (see Attachment A-1).
- (c) Value shown has been HGAL-adjusted and is applicable to the A-aquifer.
- (d) Well IR02MWB-3 has been destroyed; new well IR02MW375A is located in approximately the same area.
- (e) Range of values shown; total TPH aquatic criteria assigned as a function of distance from shoreline; the source of these criteria is the "Final New Preliminary Screening Criteria and Petroleum Program Strategy, Hunters Point Shipyard, San Francisco, California" (Shaw Environmental, Inc., 2007)

COEC = chemical of ecological concern

DDE = dichlorodiphenyldichloroethene

HGALs = Hunters Point groundwater ambient levels

HPS = Hunters Point Shipyard

PCBs = polychlorinated biphenyls

TPH = total petroleum hydrocarbons

µg/L = micrograms per liter

|    |                |                 |                                                                                                                                                        |
|----|----------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 30 | Trigger levels | Section 2.5.2.3 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix A, pages A-1 through A-10. |
|----|----------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|

## Section A1. Introduction

This appendix summarizes an aquatic evaluation performed to determine whether chemicals in Parcel E groundwater could affect aquatic organisms in San Francisco Bay. The evaluation consists of two parts:

1. A screening evaluation that is a direct comparison of groundwater data against aquatic evaluation criteria. The screening evaluation is used primarily as a tool in identifying chemicals of potential ecological concern (COPECs) in A-aquifer groundwater that may pose a risk to aquatic organisms in San Francisco Bay.
2. A trigger-level evaluation to determine if chemical concentrations at the groundwater and bay interface pose risk to the aquatic environment. The trigger-level evaluation is a quantitative method used to calculate attenuation of chemicals as they migrate in A-aquifer groundwater, prior to discharging to San Francisco Bay. This trigger-level evaluation method was developed by the Department of the Navy for Hunters Point Shipyard (HPS), and has been used in other parcel evaluations (Parcels C and D) with regulatory agency concurrence.

Although no direct exposure pathway exists from B-aquifer or bedrock water-bearing zone (WBZ) groundwater to aquatic organisms in San Francisco Bay, groundwater data for the B-aquifer and bedrock WBZ were also evaluated to determine which chemicals detected at elevated concentrations at Parcel E could potentially migrate to the bay. This conservative measure was used to address the uncertainty of the lithologic conditions adjacent to and beyond the Parcel E and F boundaries. The available data show that the Bay Mud aquitard is continuous adjacent to and beyond the Parcel E boundary beneath the bay. The aquitard separates the permeable B-aquifer zones and the fractured bedrock WBZ from the surface waters of the bay offshore of Parcel E. Bay Mud deposits range from 5 to 76 feet thick under most of Parcel E; the aquitard is thickest in the southern portion of the parcel, along the shoreline.

The evaluations in this appendix consider both applicable or relevant and appropriate requirement (ARAR)-based surface water quality criteria and non-ARAR-based criteria for screening data at Parcel E. These criteria were considered to provide a comprehensive analysis based on agreements with the regulatory agencies and to maintain consistency with previous aquatic evaluations conducted at HPS (Parcels C and D). However, chemicals of ecological concern (COECs) are identified based on ARARs, as well as on the screening evaluation. Selection of screening criteria and development and evaluation of trigger levels are discussed in detail in [Sections A2.3 and A2.5](#).

This evaluation supplements the “Nature and Extent of Chemicals in Groundwater” screening evaluation presented in the Parcel E Remedial Investigation (RI) Report ([Barajas & Associates, Inc., 2008](#)), which evaluated migration of chemicals off site, in the direction of San Francisco Bay.

This report is organized as follows:

- [Section A1](#): Introduction
- [Section A2](#): Aquatic Evaluation Methodology
- [Section A3](#): Aquatic Evaluation Results
- [Section A4](#): Conclusions and Recommendations
- [Section A5](#): References

Figures and tables are provided following [Section A5](#). Attachments providing supplementary information are presented at the end of this appendix and include:

- [Attachment A1](#). Groundwater Modeling and Calculation of Attenuation Factors (Appendix G of the Final Revised Parcel D Feasibility Study Report; [SulTech, 2007](#))
- [Attachment A2](#). Groundwater Data Summary
- [Attachment A3](#). Aquatic Evaluation Maps

## Section A2. Aquatic Evaluation Methodology

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A thorough analysis of existing groundwater data was conducted to provide the most conservative evaluation of the potential for chemicals in Parcel E groundwater to migrate to San Francisco Bay at concentrations that could affect surface waters. Existing data include data collected during past investigations (i.e., the RI, the groundwater data gaps investigations (GDGI) and during ongoing basewide groundwater monitoring program [BGMP]). The data evaluation included A- and B-aquifers and bedrock WBZ data.

All compiled data were initially screened against aquatic evaluation criteria, mainly comprising saltwater aquatic evaluation criteria. Chemicals detected in groundwater at concentrations exceeding the aquatic evaluation criteria were defined as COPECs. Data for COPECs exhibiting persistent and definable source areas were screened against trigger levels as a secondary evaluation (see [Section A2.5](#) and [Attachment A1](#)) to determine if they should be considered a COEC. The following subsections describe the steps involved in the aquatic evaluation.

### A2.1. COMPILATION OF GROUNDWATER DATA

All groundwater monitoring data collected at Parcel E from 1990 to October 2009 (when the data set was “locked” for the purposes of performing this aquatic evaluation) were compiled and tabulated by the following analytical groups:

- Anions
- Metals
- Volatile organic compounds (VOCs)
- Semivolatile organic compounds (SVOCs)
- Organochlorine pesticides
- Polychlorinated biphenyls (PCBs)
- Petroleum hydrocarbons

Data from wells located in Parcel E-2, along the western boundary of Parcel E, were also compiled for this evaluation because the regional groundwater flow direction in this area is to the southeast (from Parcel E-2 to Parcel E). Therefore, chemicals in groundwater may be migrating across this boundary and

warrant evaluation. [Attachment A2](#) contains the tables that list comprehensive analytical results for samples collected between 1990 and October 2009.

## **A2.2. IDENTIFICATION OF CHEMICAL DETECTIONS IN GROUNDWATER**

All monitoring well data were evaluated to identify all chemical concentrations exceeding reporting limits at Parcel E. Quantitative data, such as the number, location, range of reporting limits, and magnitude and frequency of detections, are presented in the tables in [Attachment A2](#). It should be noted that the laboratory reporting limits for current, routinely used analytical methods are greater than the aquatic evaluation criteria for the following chemicals (or analytical groups):

- Cyanide
- Sulfide
- Organochlorine pesticides
- PCBs

As a result, screening criteria established in the BGMP Sampling and Analysis Plan (Tetra Tech EM Inc. [\[TtEMI\], 2004b](#)) were set at the project-required quantitation limits. Consistent with this approach, all chemicals that were detected at concentrations greater than the laboratory reporting limits and exceeding the aquatic evaluation criteria were included in this aquatic evaluation. As a conservative measure, chemicals that were identified and quantified at concentrations below the laboratory reporting limit, but greater than the aquatic evaluation criterion, were also presented for informational purposes.

## **A2.3. SELECTION OF AQUATIC EVALUATION CRITERIA**

Aquatic evaluation criteria (also identified as surface water criteria) have been identified for other studies conducted at HPS; specifically, the Parcel D Feasibility Study (FS) ([SulTech, 2007](#)), Parcel C FS ([SulTech, 2008](#)), and Parcel E RI ([Barajas & Associates, Inc., 2008](#)). [Table A-1](#) summarizes the aquatic evaluation criteria considered in this evaluation.

The criteria were primarily based on promulgated and recommended values for protection of saltwater aquatic life, derived from the following sources:

1. San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan) (San Francisco Bay Regional Water Quality Control Board [\[SFRWQCB\], 2007](#))
2. California Toxics Rule (CTR) Priority Toxic Pollutants for the State of California (U.S. Environmental Protection Agency [\[EPA\], 2000](#))

3. National Ambient Water Quality Criteria (NAWQC) ([Central Valley Regional Water Quality Control Board, 2007](#))
4. National Recommended Water Quality Criteria (NRWQC) ([EPA, 2006](#))

These criteria were developed to protect the environment, including aquatic organisms, from the negative effects of chemicals in surface water. The beneficial uses of groundwater do not include maintenance of freshwater or marine organisms because these organisms do not live in groundwater. Because no water quality criteria exist for groundwater and surface water quality criteria were deemed inappropriate for comparison with groundwater, the Navy developed alternative water quality criteria to evaluate the potential for chemicals in HPS groundwater to contaminate San Francisco Bay.

The Navy's evaluation of ARARs for water quality concluded that the state standards promulgated in Table 3-3 of the Basin Plan ([SFRWQCB, 2007](#)) and the federal standards promulgated in the CTR ([EPA, 2000](#)) are potential ARARs for the A-aquifer at Parcel E to be met at the interface of groundwater and San Francisco Bay. The Navy has further concluded that the guidelines for NAWQC and NRWQC are not ARARs for A-aquifer groundwater and the bay because other standards are better suited to Parcel E, including state standards in Table 3-3 of the Basin Plan and the federal standards developed for the state of California codified in the CTR. (Refer to [Appendix B, Section B2.2.4](#) for a detailed discussion of ARARs for surface water.) All of these standards apply to surface water; none of them applies to groundwater. Therefore, these potential ARARs for surface water would be applied to surface water at the interface of A-aquifer groundwater and the bay, but would not be used to set cleanup standards for in-situ A-aquifer groundwater at Parcel E.

For the B-aquifer, the Navy identified federal and state maximum contaminant levels as potential ARARs. (Refer to [Appendix B, Section B2.2.3](#) for a detailed discussion of groundwater ARARs.) These ARARs also would be protective of the discharge of B-aquifer groundwater to permeable zones underlying San Francisco Bay. Surface water criteria are not identified as potential ARARs for the interface of B-aquifer groundwater and the bay.

The most conservative (lowest) surface water criterion for each chemical was used in this evaluation, except for metals in A-aquifer groundwater. For metals in A-aquifer groundwater, the appropriate Hunters Point groundwater ambient level (HGAL) ([PRC Environmental Management, Inc., 1996](#)) was selected as the aquatic evaluation criterion, unless a surface water criterion exceeding the HGAL existed. In such a case, the most conservative (lowest) saltwater aquatic evaluation criterion above the HGAL was used as the aquatic evaluation criterion. [Table A-2](#) summarizes the HGALs for the A-aquifer. HGALs are not applicable to the B-aquifer based on its potential beneficial uses (see Appendix F of the RI Report [[Barajas & Associates, Inc., 2008](#)] for the results of the A-aquifer and B-aquifer beneficial use evaluations).

Petroleum hydrocarbons are not classified as a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Title 42 United States Code Section 9601[14]), thus they are excluded from consideration under the CERCLA process unless commingled with hazardous substances regulated under CERCLA. A screening evaluation was conducted to identify areas where petroleum hydrocarbons are commingled with other inorganic and organic chemicals that are regulated under CERCLA. The aquatic evaluation criterion used for petroleum hydrocarbons in this evaluation is based on the HPS-specific methodology established under the petroleum program ([Shaw Environmental, Inc., 2007](#)). This methodology sums all total petroleum hydrocarbon (TPH) categories (diesel-range, gasoline-range, and motor-oil range) and compares the sum against a total TPH criterion, which ranges from 1,400 to 20,000 micrograms per liter ( $\mu\text{g/L}$ ), depending on the distance from the shoreline.

#### A2.4. DATA SCREENING EVALUATION

The purpose of the data screening evaluation is to identify chemicals in groundwater that could migrate to San Francisco Bay at concentrations exceeding aquatic evaluation criteria. Such chemicals are considered COPECs and should be evaluated further.

The data evaluation focused on A-aquifer wells located within the tidal influence zone (TIZ) ([Figure A-1](#)), which is consistent with past requests from [SFRWQCB \(2006\)](#). The TIZ was defined as the area where the maximum tidal fluctuation exceeds 0.10 foot in the A-aquifer based on data collected during the Phase III GDGI ([TtEMI, 2004a](#)). It should be noted that the TIZ, which is defined by groundwater level (pressure) responses to tidal fluctuations in San Francisco Bay, is not the same as the tidal mixing zone (TMZ), where bay water flows in and out during a tidal cycle so that A-aquifer groundwater physically mixes with bay water. Past studies have shown that the TIZ extends farther inland than the TMZ ([TtEMI, 2004a](#)); therefore, the data evaluation presented herein is adequately conservative to assess potential exposure to aquatic organisms in the bay. For completeness, the evaluation also compares concentrations in A-aquifer wells located inland of the TIZ and B-aquifer wells against the corresponding aquatic evaluation criterion.

This evaluation was refined by evaluating the magnitude of the chemical concentrations relative to aquatic evaluation criteria. [Figures A3-1 through A3-30](#) (in [Attachment A3](#)) present data from both the A- and B-aquifers for each chemical—or, in the case of PCBs and petroleum hydrocarbons, summed chemical—that has at least one detected concentration exceeding the corresponding aquatic evaluation criterion. For wells with data that exceeded aquatic evaluation criteria, a data table is included on the figure to display the magnitude and temporal distribution of those exceedances.

The aquatic evaluation was performed for the following analytical groups: anions, metals, VOCs, SVOCs, pesticides, PCBs, and petroleum hydrocarbons. If potential contamination was identified in groundwater, the figures were further used to determine if the potential contamination:

- is short-lived or persistent over time (for example, whether or not the concentrations that exceeded aquatic evaluation criteria were detected during the last four sampling rounds);
- is variable, increasing, or decreasing over time;
- is present over a contiguous area or occurs in scattered or single unrelated locations; or
- significantly exceeds the aquatic evaluation criteria (that is, greater than 10 times the criteria).

Data were evaluated based on the factors listed above and using a weight-of-evidence approach to identify COPECs that warrant further assessment in the trigger-level evaluation.

## **A2.5. TRIGGER-LEVEL EVALUATION**

The trigger-level evaluation identifies COECs that should be addressed by the FS. The nearest surface water body to Parcel E, where CTR is applicable, is San Francisco Bay. Elevated concentrations of chemicals in groundwater at Parcel E could affect surface water quality as contaminated groundwater migrates and discharges to the bay.

To address the potential effects of groundwater contamination on the bay, the Navy developed trigger levels for various inland locations to ensure surface water quality criteria are not exceeded where groundwater at Parcel E discharges to the bay. The trigger levels are intended to serve as conservative comparison values for groundwater to indicate when additional evaluation may be necessary. The development of trigger levels was initially performed for Parcel D evaluations (Parcel D FS; [SulTech, 2007](#)). The trigger-level evaluation methodology has also been applied at Parcel C (Parcel C FS; [SulTech, 2008](#)). The development of the trigger levels is discussed in [Attachment A1](#) (Appendix G from the Parcel D FS; [SulTech, 2007](#)).

Site-specific data for select COPECs were evaluated against trigger levels, where appropriate, to determine which are COECs and thus need to be addressed in the FS and remedial design. The trigger-level evaluation, including the theoretical assumptions behind the evaluation and the evaluation methodology, are described in the following subsections.

### **A2.5.1. Trigger-Level Evaluation Theory**

At HPS, attenuation of chemical and metal concentrations occurs in groundwater as it migrates through three different zones: (1) the area of groundwater transport to the TMZ, (2) the TMZ, and (3) the bay discharge zone.

As chemicals migrate from an inland source area through soil and groundwater, they are subjected to physical, chemical, and biological processes that tend to reduce their concentrations. These processes include sorption of chemicals to soil particles, volatilization, hydrodynamic dispersion and molecular diffusion, and chemical and biological transformations. The magnitudes by which chemical



concentrations are reduced depend on a number of physical, chemical, and biological factors, including groundwater flow gradients, which may vary across Parcel E. For example, as groundwater moves through the TIZ and approaches the TMZ, the tidal influence would be expected to decrease the groundwater flow gradient, and consequently increase the residence time during which chemical concentrations would be reduced through physical, chemical, and biological processes. For simplicity and conservatism, this trigger-level evaluation does not account for potential reductions in groundwater flow gradients within the TIZ and further study would be needed to evaluate its potential effect. Such studies are not needed to support the Parcel E FS, but may be considered during the remedial design.

Additional reduction in chemical concentrations takes place in the TMZ near the shoreline. The TMZ is where bay waters move inland through the aquifer, mixing with groundwater. The net discharge of groundwater may not be changed by tidal influence, but rising tides introduce bay water into the aquifer so that concentrations of chemicals in groundwater that discharge during low tide are reduced by mixing of bay water and groundwater in the aquifer in this zone.

Finally, as groundwater discharges to the bay, concentrations of chemicals are further reduced due to dilution with bay water.

The processes described above needed to be accounted for to compare groundwater concentrations originating from inland source areas with aquatic evaluation criteria protective of bay organisms. To make this comparison, the Navy developed HPS-specific trigger levels. The development of trigger levels takes an extremely conservative approach because it does not account for attenuation in the TMZ or attenuation from discharge to the bay. Hydrodynamic dispersion in the inland contaminant transport zone was the only mechanism used to establish the attenuation factors (AFs), which were used to calculate the trigger levels. Therefore, the trigger levels likely overestimate the potential effects from chemicals and metals migrating in groundwater to San Francisco Bay.

For the purposes of this evaluation, and to maintain consistency with past HPS trigger-level evaluations (Parcels D and C), the AFs for the TMZ and for the bay discharge zone were assumed to be 1 (no attenuation). These assumptions provide a highly conservative approach that conforms to agreements made with regulatory agencies.

As part of the development of the Revised Parcel D FS Report ([SulTech, 2007](#)), the Navy developed a modeling approach to provide conservative estimates of the maximum concentrations in groundwater expected at the point of discharge (San Francisco Bay). The analytical solute transport model BIOSCREEN ([EPA, 1997](#)) was used to predict these maximum discharge concentrations and to then calculate AFs. The summary of the modeling evaluation from the Revised Parcel D FS is included as [Attachment A1](#).

The modeling confirmed that the amount of attenuation caused by hydrodynamic dispersion during groundwater transport can be significant at HPS, and that the greater the travel distance to the ecological receptor, the greater the AF. Results of the groundwater modeling effort were nomographs ([Attachment A1, Figure G-1](#)) that assign specific AFs for any chemical or metal found in HPS groundwater based on plume width and distance to the aquatic organisms in San Francisco Bay. The nomograph information presented in [Attachment A1](#) was used to assign AFs and calculate trigger levels for this evaluation.

### A2.5.2. Trigger-Level Evaluation Methodology

Trigger-level evaluations were only performed for chemicals that have exhibited inland sources of elevated concentrations with the potential to migrate to San Francisco Bay from Parcel E. The approach for assigning AFs and trigger levels and evaluating COPEC against trigger levels for Parcel E is presented below.

1. Wells identified in the screening evaluation as having persistent chemical or metal concentrations exceeding aquatic evaluation criteria were assigned AFs. Chemical data from wells located within the TIZ were not evaluated because the nomographs specify AFs of 1 for small distances from the shoreline, which produces an evaluation corresponding to the initial screening against aquatic evaluation criteria.
2. Source area width for each chemical and metal was estimated using the following methodology:
  - a. If contamination is persistent and limited to a single well, the plume width was assumed to be 40 feet (the narrowest plume width represented by the nomographs). Also, the centerline of the plume was assumed to be perpendicular to the shoreline and passing through the center of the well.
  - b. If contamination is persistent in multiple wells adjacent to each other, and the source area is believed to exceed a width of 360 feet, the plume width was assumed to be 360 feet. This distance corresponds to the widest plume width represented by the nomographs. Also, the center of the plume was assumed to be perpendicular to the shoreline and passing through the well with the highest and most persistent detected concentrations.
  - c. If contamination is present in multiple wells adjacent to each other, but is limited to a source area width of less than 360 feet, then the plume width is assumed to be the distance between the wells at the edges of the contamination, plus an additional 20 feet on either side. Also, the center of the plume was assumed to be perpendicular to the shoreline and passing through the well with the highest and most persistent detected concentrations.
3. The chemical migration distance was measured as the distance from the center of plume to the TMZ, which was conservatively assumed to be located 50 feet inland from the shoreline. As stated above, an AF of 1 was assumed for the area between the TMZ boundary and the bay shoreline; therefore, that distance was not included in the measurement of the transport zone, where attenuation is assumed to occur.

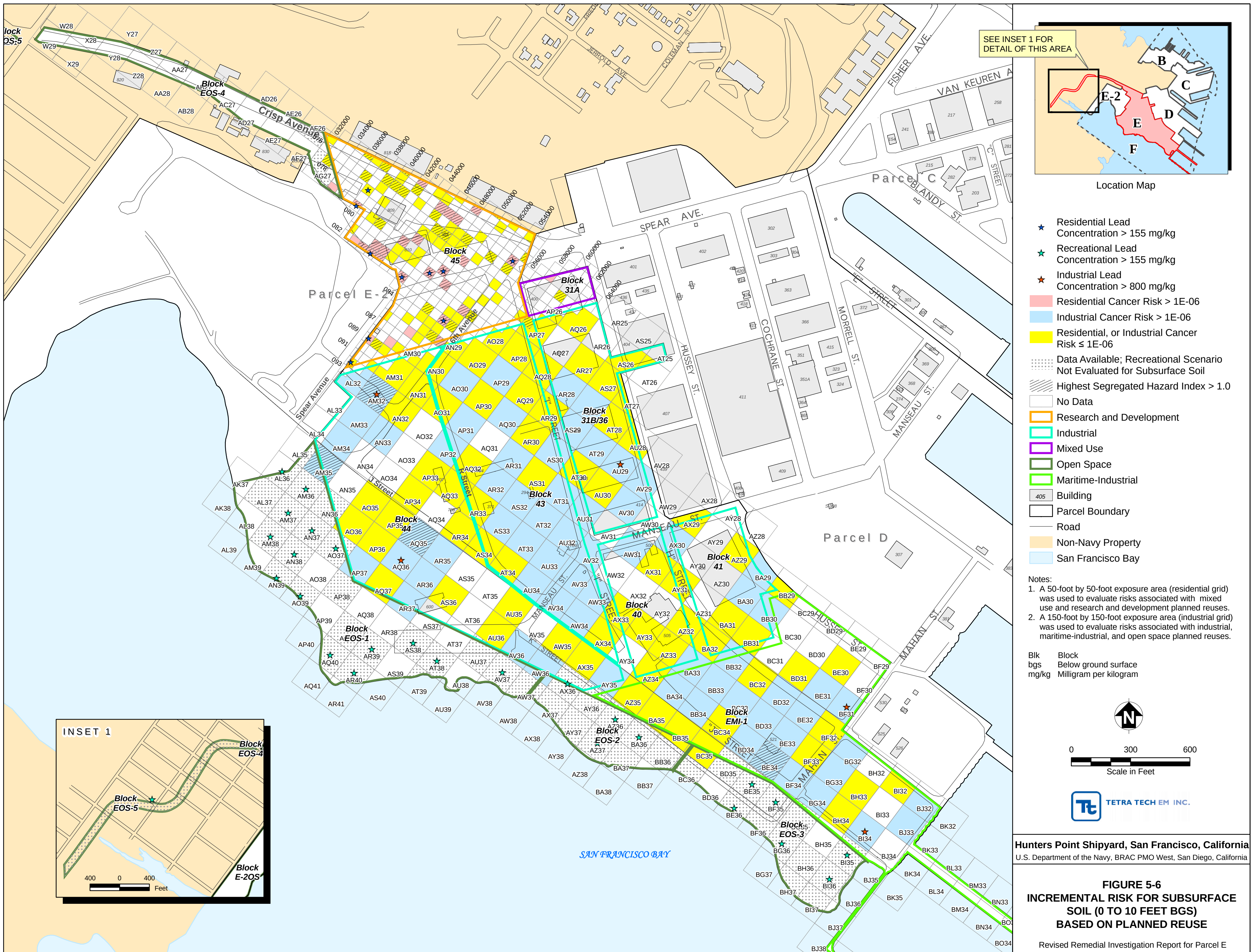
4. Using the nomograph curve for the chosen source area width, the AF was selected by finding the intercept of the migration distance along the curve and reading off the associated AF along the y (vertical) axis.
5. Once the AF was determined, it was rounded down to the nearest whole number to produce a conservative usable AF.
6. The trigger level for each defined chemical or metal source area was then calculated by multiplying the AF by the applicable aquatic evaluation criterion.
7. Groundwater data in the identified source area were then rescreened against the associated trigger level, and results were evaluated to determine if the source area could potentially pose negative effects to surface water quality and aquatic organisms.

The approach for assigning AF described above is consistent with the approach used to evaluate other parcels at HPS. The trigger-level evaluation is considered overly conservative because trigger levels only account for hydrodynamic dispersion in groundwater transport and ignore attenuation in the TMZ or attenuation from discharge to the surface water body. For this reason, trigger levels are only intended to serve as comparison values for groundwater to chemicals and metals in groundwater that may pose a risk to aquatic organisms. During future remedial design efforts for Parcel E, the Navy may choose to perform more quantitative analyses and modeling to refine the identification of COECs and specify risk-based remediation goals for groundwater affecting surface water.

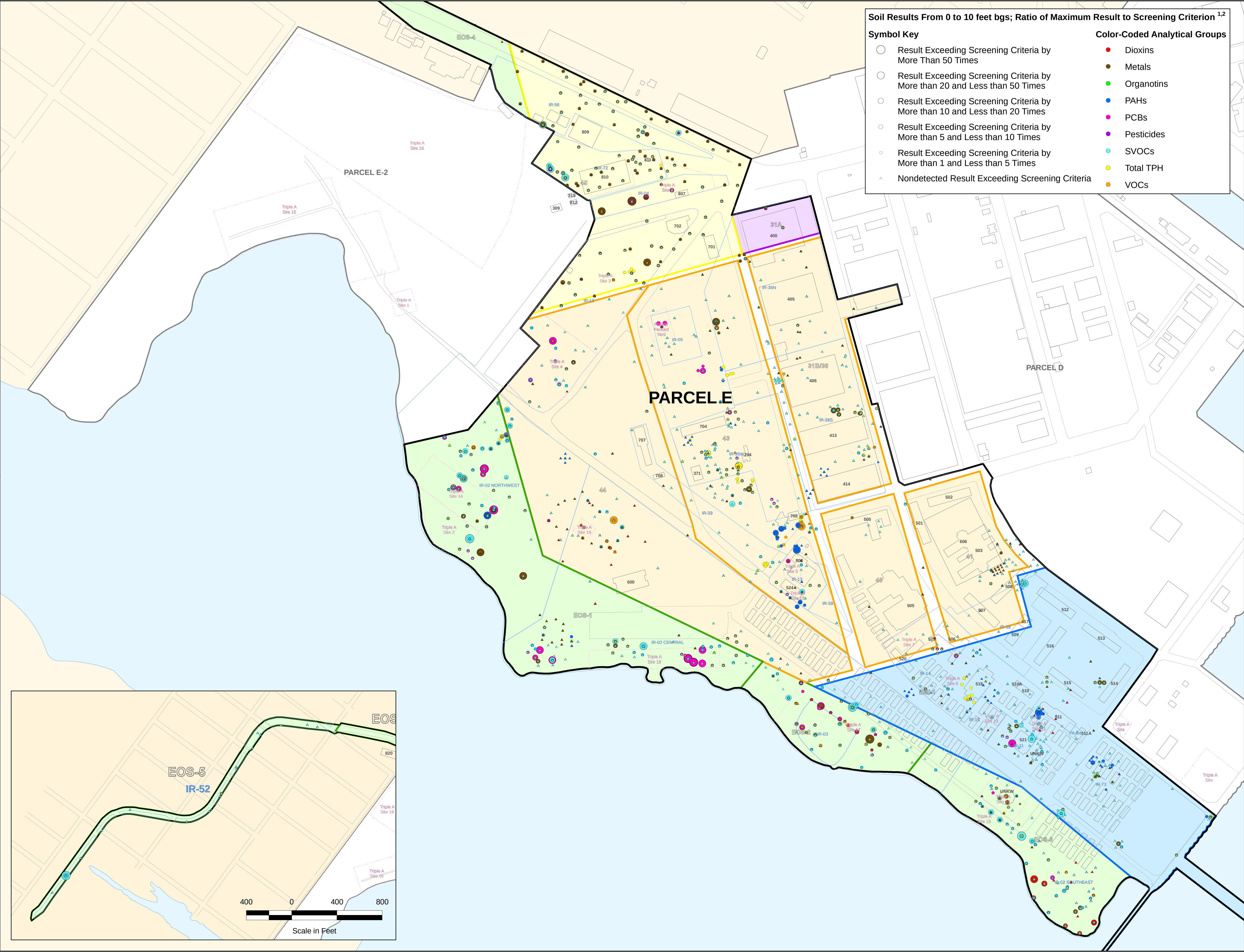












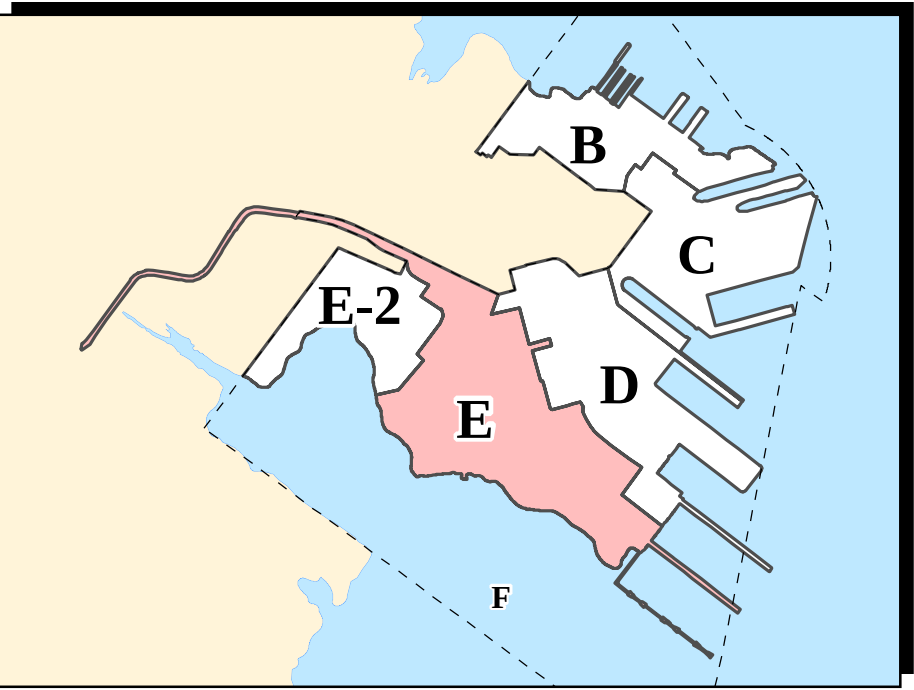
**Soil Results From 0 to 10 feet bgs; Ratio of Maximum Result to Screening Criterion <sup>1,2</sup>**

**Symbol Key**

- Result Exceeding Screening Criteria by More Than 50 Times
- Result Exceeding Screening Criteria by More than 20 and Less than 50 Times
- Result Exceeding Screening Criteria by More than 10 and Less than 20 Times
- Result Exceeding Screening Criteria by More than 5 and Less than 10 Times
- Result Exceeding Screening Criteria by More than 1 and Less than 5 Times
- △ Nondetected Result Exceeding Screening Criteria

**Color-Coded Analytical Groups**

- Dioxins
- Metals
- Organotin
- PAHs
- PCBs
- Pesticides
- SVOCs
- Total TPH
- VOCs



Location Map

**Redevelopment Blocks (RBs) Evaluated as Residential Reuse**

- Mixed Use
- Research and Development

**RBs Evaluated as Industrial Reuse**

- Industrial
- Maritime-Industrial
- Open Space<sup>3</sup>

■ IR Site Boundaries

■ Triple A Sites

■ Parcel Boundaries

■ Other HPS Parcels

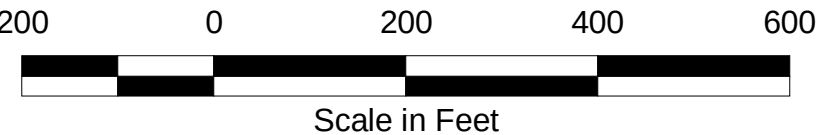
■ Non Navy Property

■ Buildings

■ Roads

- Notes:**
1. See Section 4.1 for discussion of nature and extent (N&E) screening process. Soil results corresponding to each location are presented.
  2. Results depicted in figure represent a compilation of all comparisons between analytes and their respective criteria in order to show areas where criteria were exceeded most.
  3. Open space redevelopment blocks (EOS-1, EOS-2, and EOS-3) were evaluated by applying N&E industrial reuse criteria.

- bgs Below ground surface  
HPS Hunters Point Shipyard  
IR Installation Restoration  
N&E Nature and extent  
RB Redevelopment block



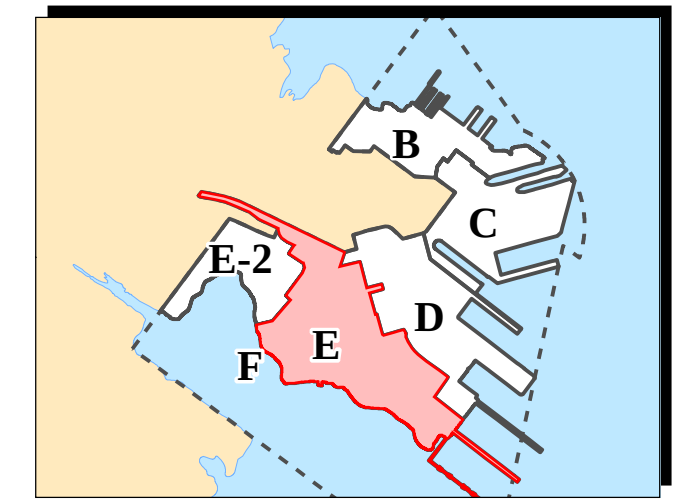
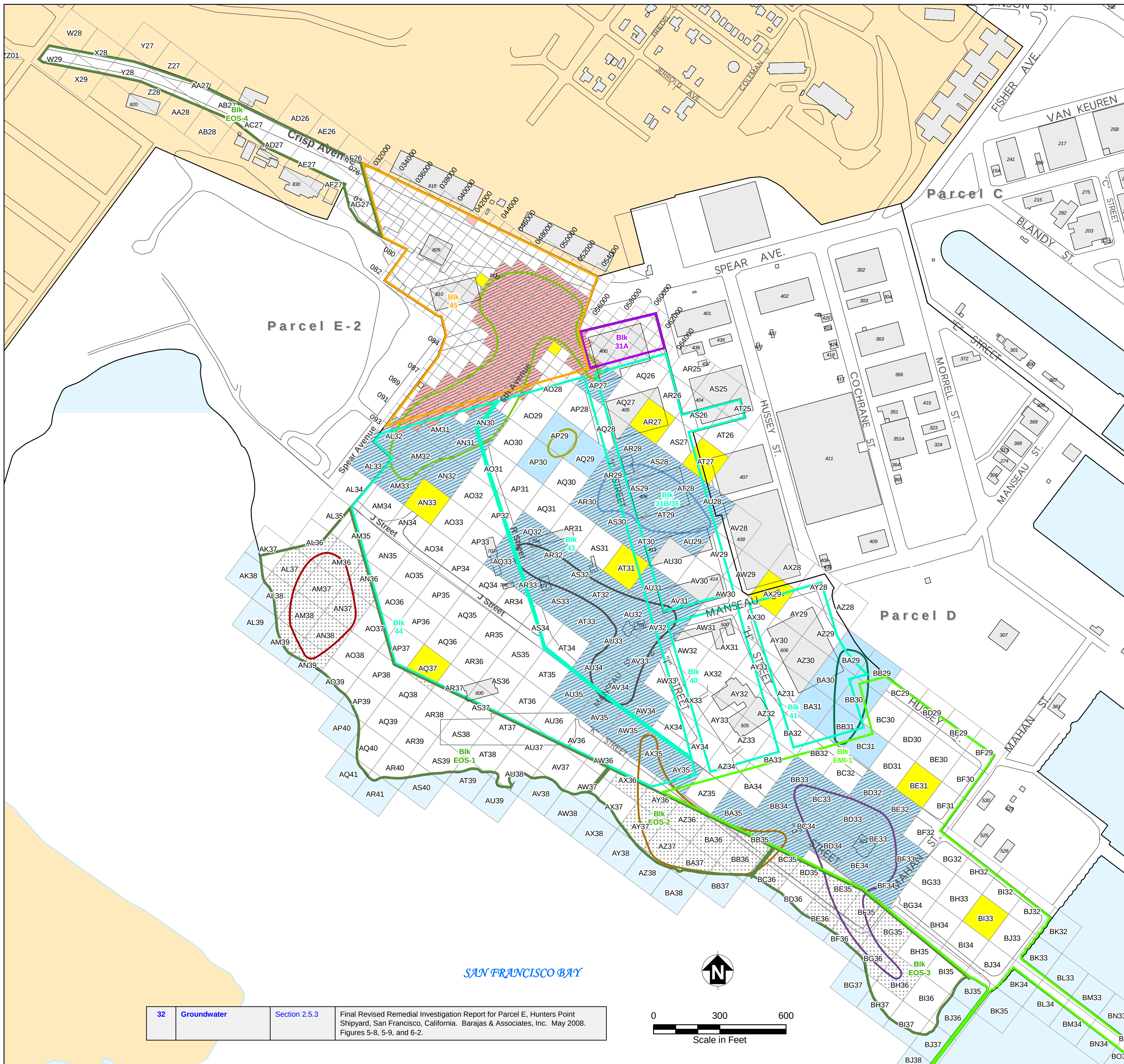
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U.S. Department of the Navy, BRAC PMO West, San Diego, California

**FIGURE 6-1**

**SUMMARY MAP OF ALL SOIL RESULTS EXCEEDING CRITERIA (0 TO 10 FEET BGS)**

Revised Remedial Investigation Report for Parcel E





Location Map

- IR-02 Plume
- IR-03 Plume
- IR-05 Plume
- IR-08 Plume
- IR-12 Plume
- IR-39 Plume
- Building 406 Plume
- Building 521 Plume
- Residential Cancer Risk > 1E-06
- Industrial Cancer Risk > 1E-06
- Cancer Risk ≤ 1E-06
- Highest Segregated Hazard Index > 1.0
- Recreational Scenario
- Not Evaluated for Vapor Intrusion
- No Data
- Research and Development
- Industrial
- Mixed Use
- Open Space
- Maritime-Industrial
- Parcel Boundary
- 405 Building
- Road
- Non-Navy Property
- San Francisco Bay

- Notes:
- Analytical data from the last 12 quarters of monitoring (January 1989 to December 2004) were used to delineate plume boundaries for the HHRA. The plume boundaries were based on delineation of VOCs in the A-aquifer to nondetectable concentrations.
  - Results are based on the reasonable maximum exposure scenario.
  - The railroad right-of-way (IR-52), located in the northwest portion of Parcel E, is not shown in its entirety in order to better display more detailed information for the remainder of Parcel E.

HHRA Human health risk assessment  
IR Installation Restoration  
VOC Volatile organic compound

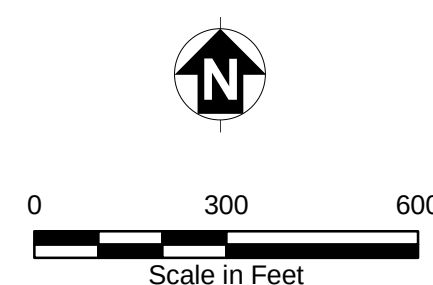


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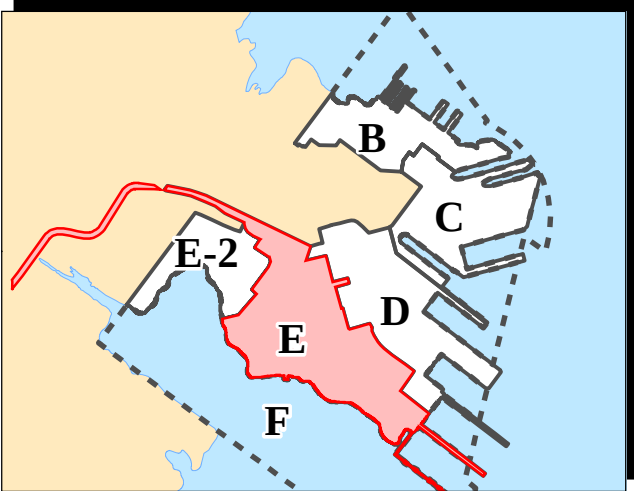
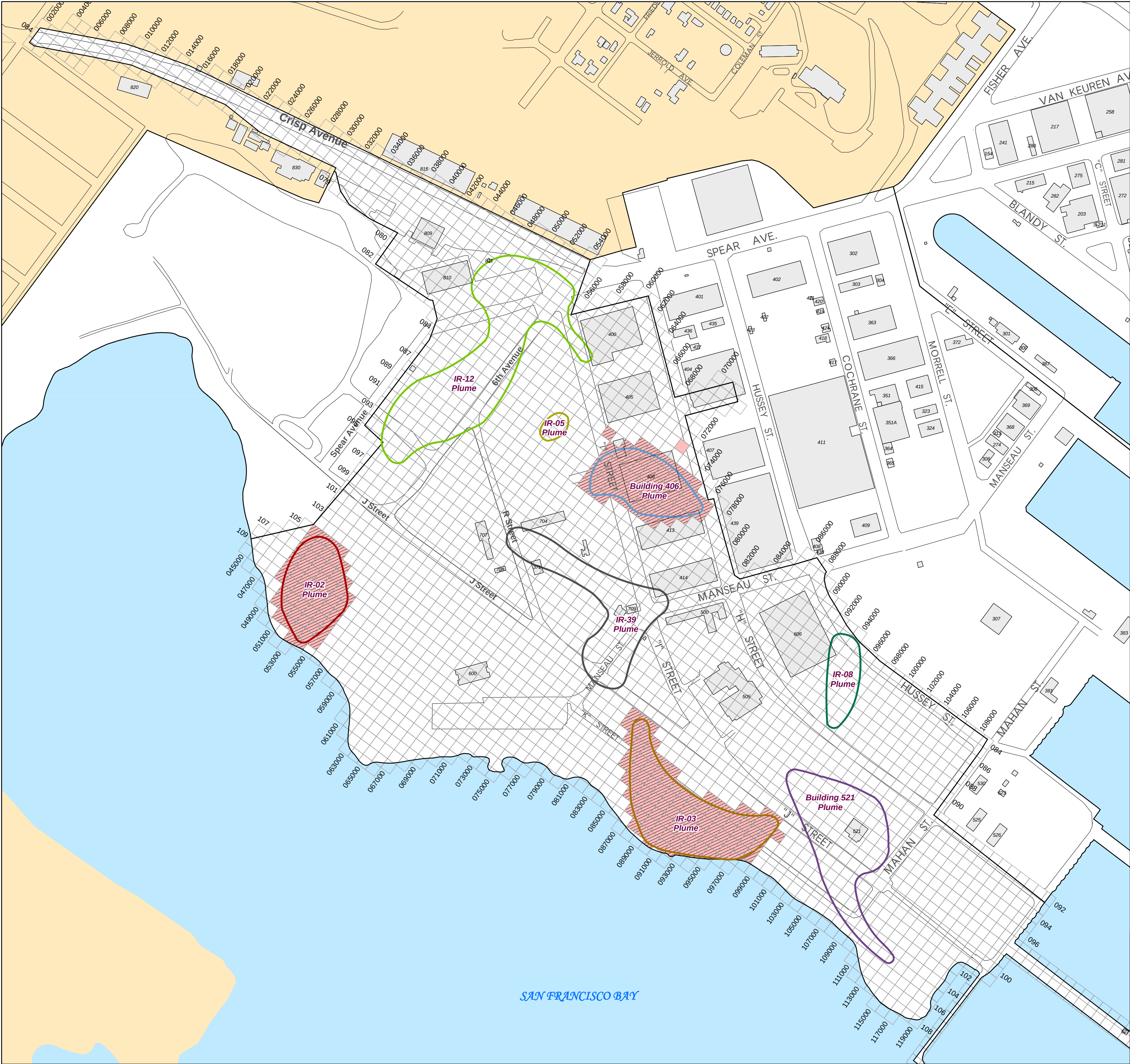
### FIGURE 5-8 GROUNDWATER VAPOR INTRUSION RISKS IN A-AQUIFER BASED ON PLANNED REUSE

Revised Remedial Investigation Report for Parcel E

|    |             |               |                                                                                                                                                                              |
|----|-------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 32 | Groundwater | Section 2.5.3 | Final Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California. Barajas & Associates, Inc. May 2008. Figures 5-8, 5-9, and 6-2. |
|----|-------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|







Location Map

- IR-02 Plume
- IR-03 Plume
- IR-05 Plume
- IR-08 Plume
- IR-12 Plume
- IR-39 Plume
- Building 406 Plume
- Building 521 Plume
- Domestic Use Cancer Risk > 1E-06
- Highest Segregated Hazard Index > 1.0
- No Data
- Parcel Boundary
- Building
- Road
- Non-Navy Property
- San Francisco Bay

- Notes:
- Analytical data from the last 12 quarters of monitoring (January 1989 to December 2004) were used to delineate plume boundaries for the HHRA. The plume boundaries were based on delineation of VOCs in the A-aquifer to nondetectable concentrations.
  - Results are based on the reasonable maximum exposure scenario.
  - The railroad right-of-way (IR-52), located in the northwest portion of Parcel E, is not shown in its entirety in order to better display more detailed information for the remainder of Parcel E.

HHRA Human health risk assessment  
IR Installation Restoration  
VOC Volatile organic compound

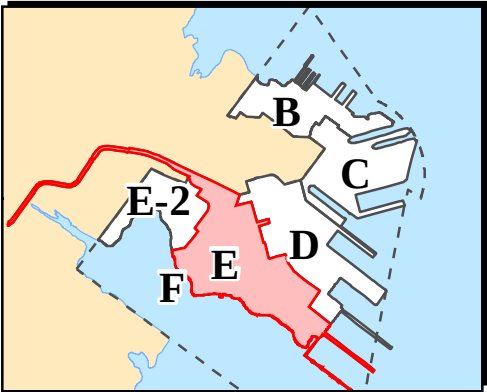
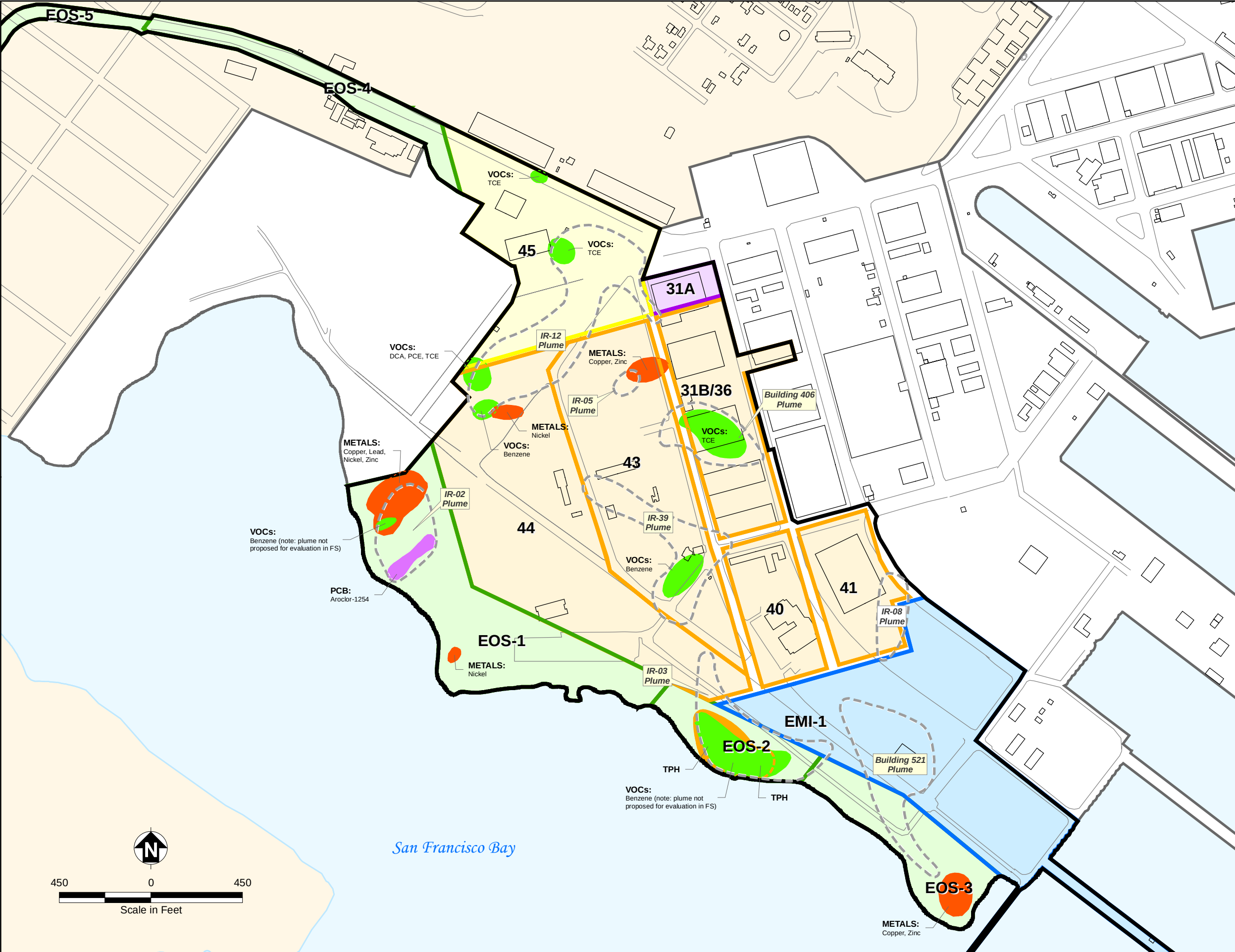


Hunters Point Shipyard, San Francisco, California  
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**FIGURE 5-9  
GROUNDWATER DOMESTIC  
USE RISKS IN B-AQUIFER,  
RESIDENTIAL EXPOSURE SCENARIO**

Revised Remedial Investigation Report for Parcel E





Location Map

2004 Plumes Proposed for Evaluation in the FS<sup>1</sup>

- 2004 Metals Plume
- 2004 PCB Plume
- 2004 TPH Plume for FS
- 2004 VOC Plume<sup>2</sup>

Risk Plume (not proposed for evaluation in the FS)

- Vapor Intrusion Risk Plumes<sup>3</sup>

Parcel E Reuse Areas and Redevelopment Blocks

- Industrial
- Maritime-Industrial
- Mixed Use
- Open Space
- Research and Development
- Parcel E Boundary
- Other HPS Parcels
- Non-Navy Property
- Building
- Road

Notes:

1. Plumes represent more recent conditions based on the last two quarters of data collected from monitoring wells through December 2004 (see Section 4.1.2.3).

2. VOC plume in open space reuse area will be evaluated in the FS for the application of land use controls as remedy.

3. Risk plumes are based on maximum concentrations from multiple quarters (up to 12) of monitoring data, and are for HHRA purposes only.

IR-52, the railroad right-of-way, is not shown in its entirety in order to better display more detailed information for the remainder of Parcel E.

DCA 1,1-Dichloroethane  
 FS Feasibility Study  
 HHRA Human Health Risk Assessment  
 IR Installation Restoration  
 PCB Polychlorinated biphenyl  
 PCE Tetrachloroethene  
 TCE Trichloroethene  
 TPH Total petroleum hydrocarbons  
 VOC Volatile organic chemical

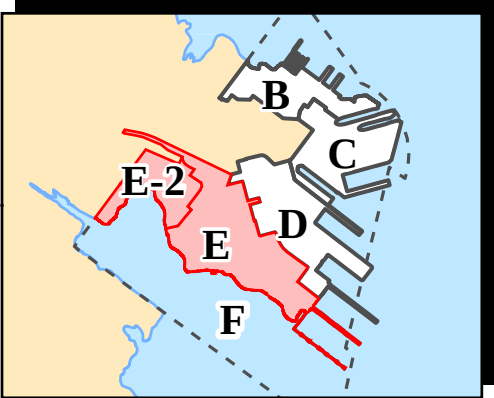
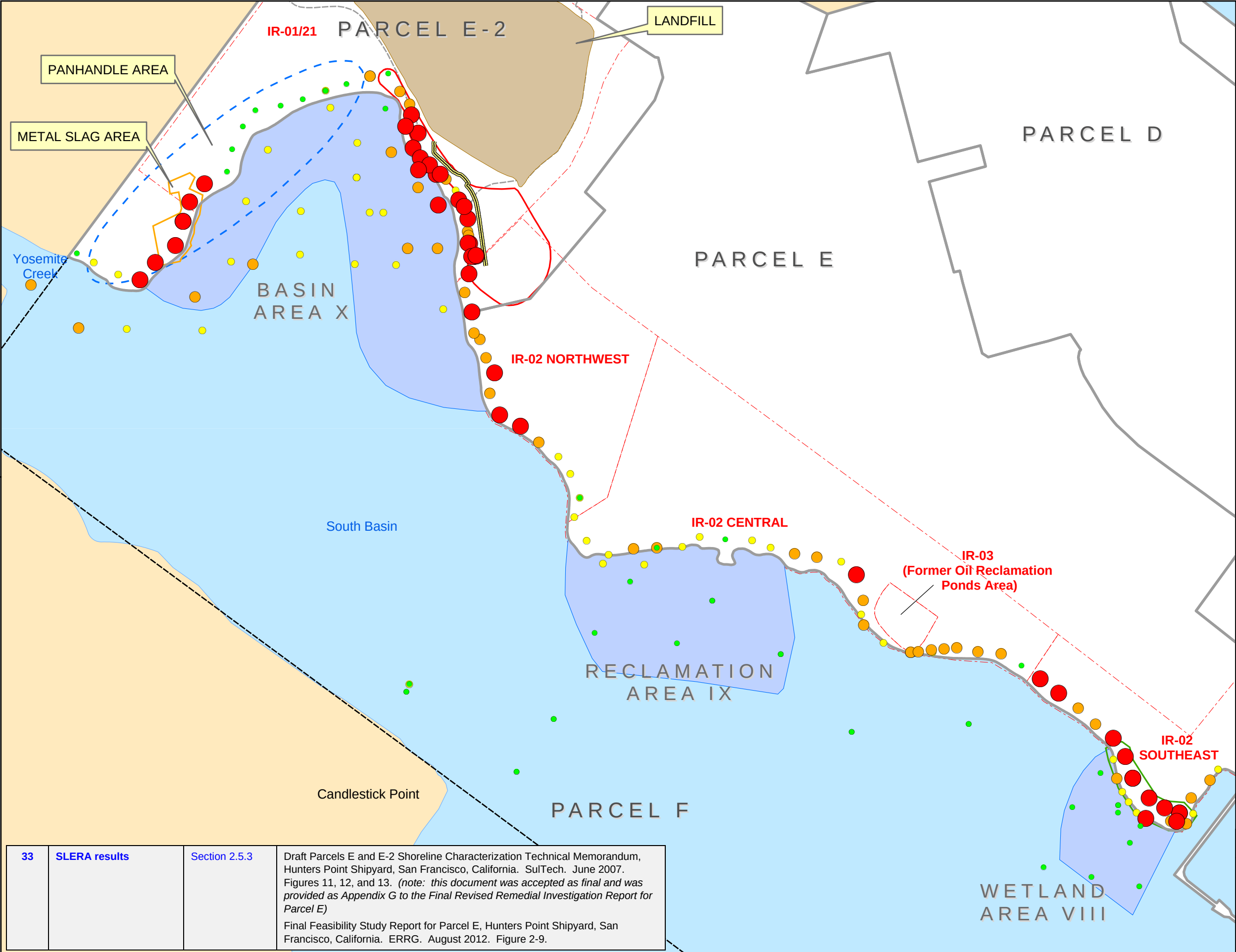


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FIGURE 6-2

A-AQUIFER GROUNDWATER AREAS  
 PROPOSED FOR EVALUATION IN THE  
 FEASIBILITY STUDY

Revised Remedial Investigation Report for Parcel E



Location Map

- Copper Results: 0-2 ft bgs**
- Results Above ER-M
  - Results Above HPAL but Below ER-M ( $\leq 270$  mg/kg)
  - Results Above SF Bay Ambient but Below HPAL ( $\leq 124.0$  mg/kg)
  - Results Below SF Bay Ambient ( $\leq 68.0$  mg/kg)
- PCB Hotspot
  - Metal Slag Area
  - Panhandle Area
  - Metal Debris Reef Area
  - Offshore Areas
  - Landfill Cap Extent
  - Extent of Solid Waste
  - Parcel Boundary
  - Parcel F Boundary
  - IR Site
  - Non-Navy Property
  - Sheet-Pile Wall

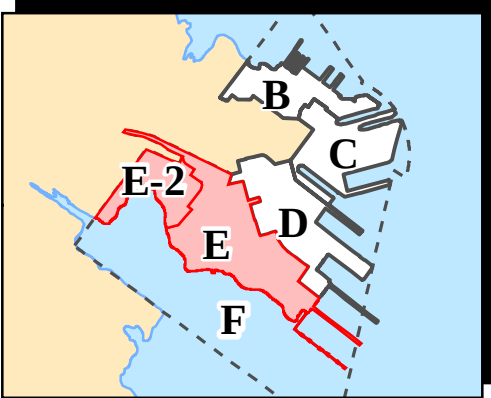
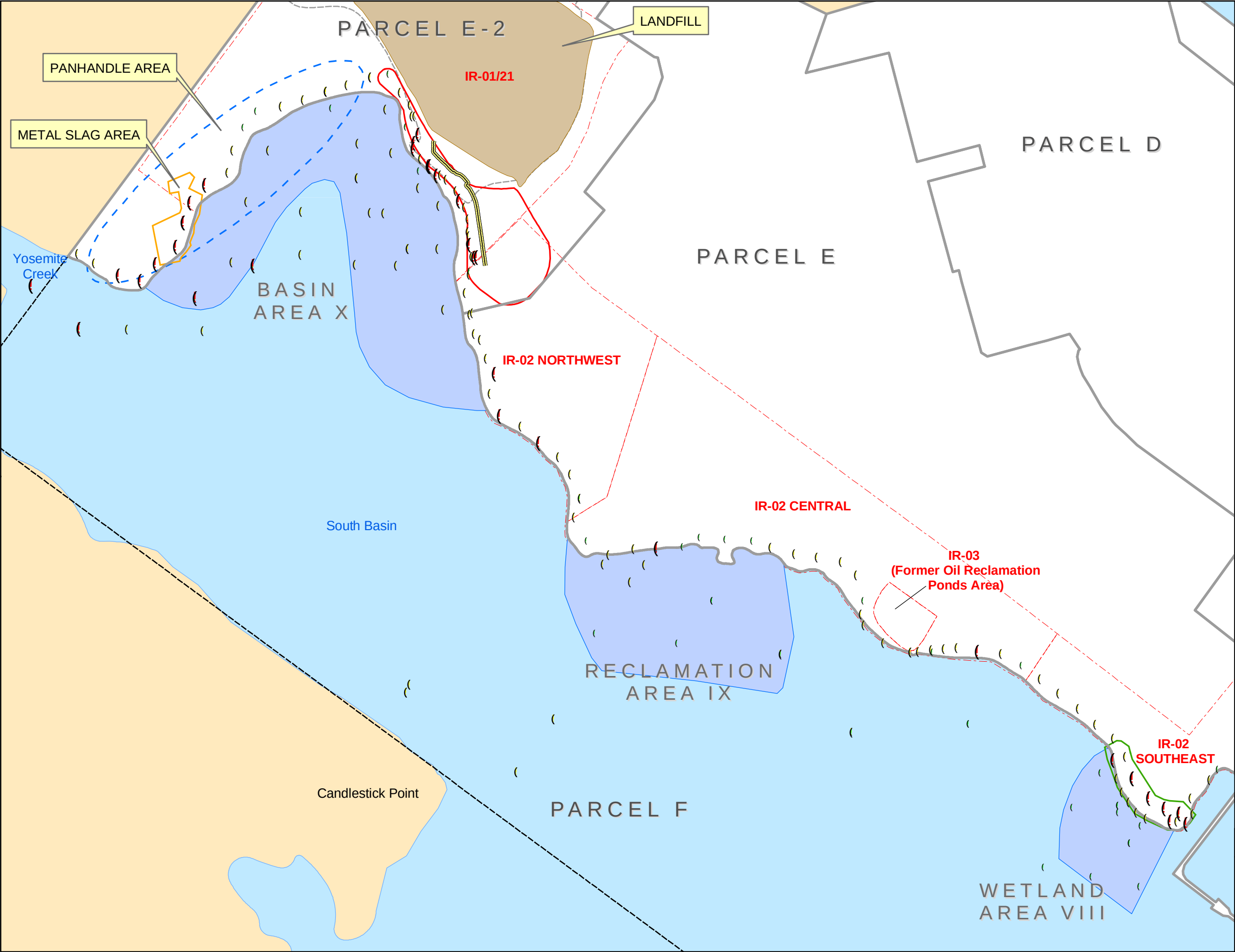


Hunters Point Shipyard, San Francisco, California  
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FIGURE 11

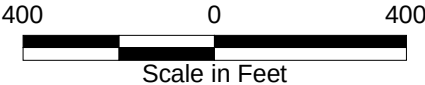
**SHORELINE AND OFFSHORE  
COPPER RESULTS**  
Draft Parcels E and E-2 Shoreline Characterization  
Technical Memorandum

|    |               |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----|---------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 33 | SLERA results | Section 2.5.3 | Draft Parcels E and E-2 Shoreline Characterization Technical Memorandum, Hunters Point Shipyard, San Francisco, California. SulTech. June 2007. Figures 11, 12, and 13. <i>(note: this document was accepted as final and was provided as Appendix G to the Final Revised Remedial Investigation Report for Parcel E)</i><br>Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Figure 2-9. |
|----|---------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



Location Map

- Lead Results: 0-2 ft bgs**
- ( Results Above ER-M
  - ( Results Above SF Bay Ambient but Below ER-M ( $\leq 218.0$  mg/kg)
  - ( Results Below SF Bay Ambient ( $\leq 43.0$  mg/kg)
- PCB Hotspot
  - Metal Slag Area
  - Panhandle Area
  - Metal Debris Reef Area
  - IR Site
  - Offshore Areas
  - Landfill Cap Extent
  - Extent of Solid Waste
  - Parcel Boundary
  - Parcel F Boundary
  - Non-Navy Property
  - Sheet-Pile Wall

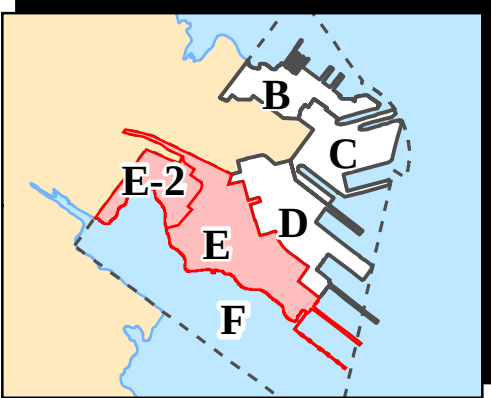
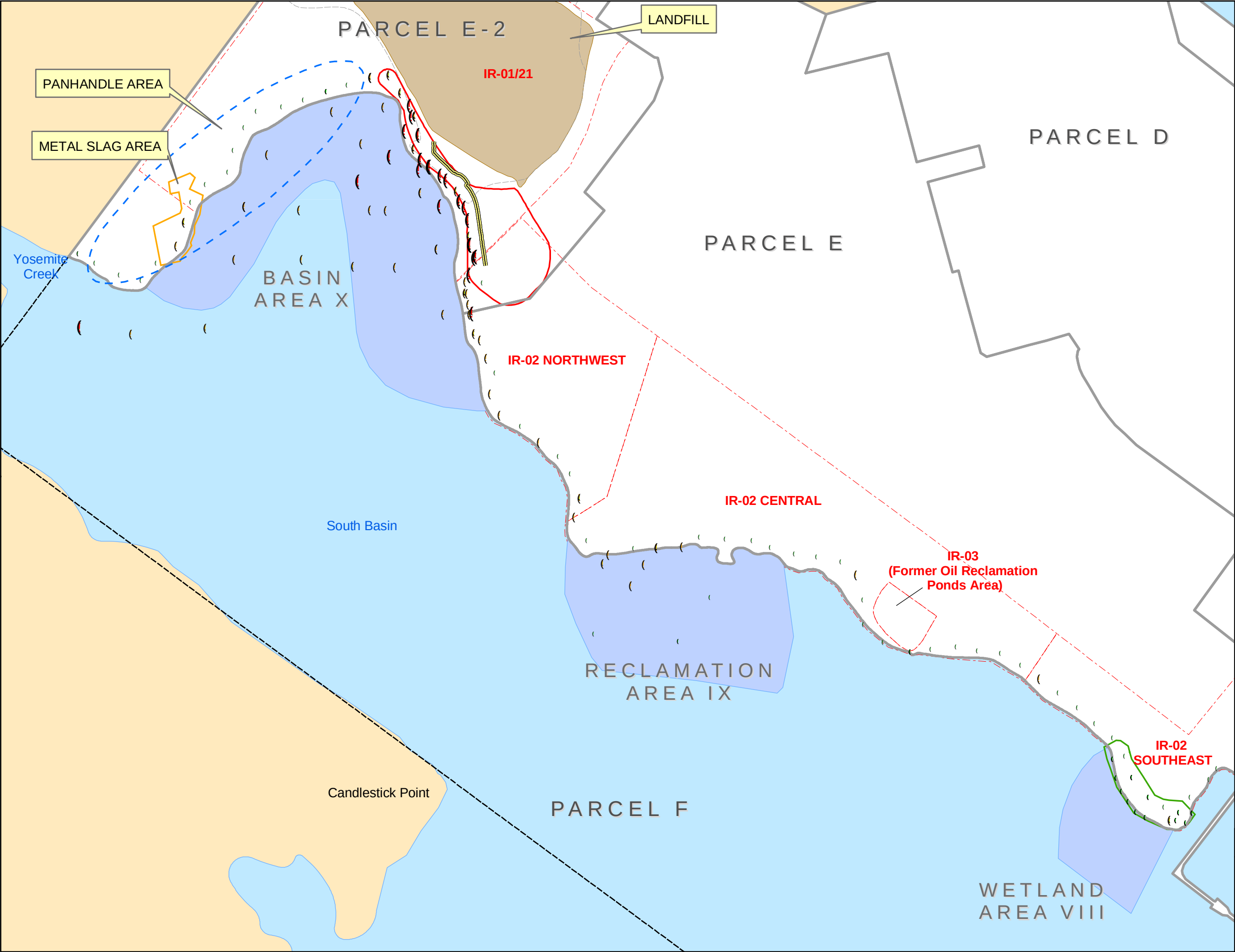


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FIGURE 12

**SHORELINE AND OFFSHORE  
LEAD RESULTS**

Draft Parcels E and E-2 Shoreline Characterization  
Technical Memorandum



Location Map

- PCB Results: 0-2 ft bgs**
- Result**
- Result  $\leq 0.2$  mg/kg or Non-detect
  - $0.2$  mg/kg < Result  $\leq 2.0$  mg/kg
  - Result > 2.0 mg/kg
- PCB Hotspot
  - Metal Slag Area
  - Panhandle Area
  - Metal Debris Reef Area
  - Offshore Areas
  - Landfill Cap Extent
  - Extent of Solid Waste
  - Parcel Boundary
  - Parcel F Boundary
  - IR Sites
  - Non-Navy Property
  - Sheet-Pile Wall



400 0 400  
Scale in Feet

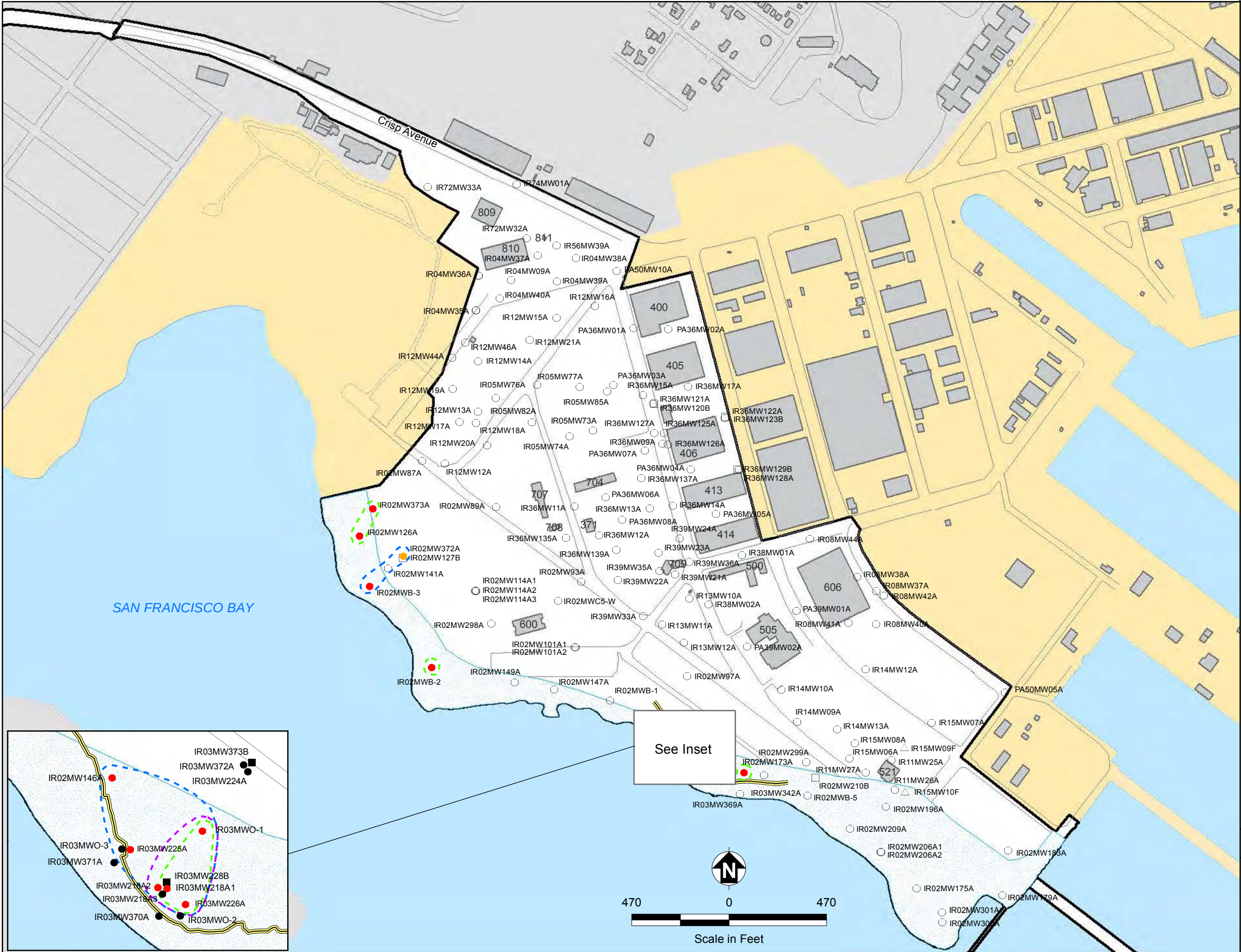


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FIGURE 13

**SHORELINE AND OFFSHORE  
PCB RESULTS**  
Draft Parcels E and E-2 Shoreline Characterization  
Technical Memorandum





**LEGEND**

- A - aquifer nearshore well recommended for further monitoring and evaluation
- B - aquifer nearshore well recommended for further monitoring and evaluation
- A - aquifer inland well recommended for further monitoring and evaluation
- A-aquifer Well
- B-aquifer Well
- △ Bedrock WBZ Well

Tidally Influenced Zone  
(Maximum Tidal Fluctuation  $\geq 0.10$  foot)

Parcel E Boundary

Other HPS Parcel

Non-Navy Property

Building

Road

Gravel Road

**Estimated areas where COECs may be migrating to the bay at concentrations exceeding aquatic evaluation criteria:**

Metals

PCBs and Pesticides

Total TPH

**Notes:**

The tidal influence study was conducted from May 20 to June 3, 2002. (Tetra Tech EM Inc., 2004a.)  
COECs = chemicals of ecological concern  
HPS = Hunters Point Shipyard  
PCBs = polychlorinated biphenyls  
TPH = total petroleum hydrocarbon  
VOCs = volatile organic compounds  
WBZ = Water Bearing Zone

**Reference:**

Tetra Tech EM Inc. 2004a. "Revised Final Parcel E Groundwater Summary Report, Phase III Groundwater Data Gaps Investigation, Hunters Point Shipyard, San Francisco, California." October 17.

**ENGINEERING/REMEDIATION  
RESOURCES GROUP, INC.**

**Hunters Point Shipyard, San Francisco, California**  
U.S. Department of the Navy, BRAC PMO West, San Diego, California

**FIGURE 2-9  
SCREENING- AND TRIGGER-LEVEL  
GROUNDWATER EVALUATION  
FOR AQUATIC LIFE AT PARCEL E**

Feasibility Study Report for Parcel E



- Prevent exposure of humans to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor air inhalation of vapors. The Navy has developed soil gas action levels (SGALs) to guide future vapor mitigation or remediation (ChaduxTt, 2010). A focused soil gas survey is currently being implemented to identify locations where concentrations of COCs in soil gas may exceed SGALs and to evaluate the extent of the VOC area requiring institutional controls (ARIC).

Exposure to VOCs in indoor air through the vapor intrusion pathway under the residential exposure scenario presents a potential unacceptable risk in some areas of Parcel E (Barajas & Associates, Inc., 2008b). Vapor intrusion is not applicable in open space areas (outdoors) because it applies only to indoor air where any discharged vapors cannot rapidly dissipate; open space areas are not likely to have buildings that are continuously occupied. VOCs in soil gas typically result from VOCs present in both soil and groundwater. The volatile COCs identified in the table above are present in soil at concentrations that may affect soil gas. Section 3.1.3 identifies additional volatile COCs in groundwater that may affect soil gas. The identified volatile COCs (in both soil and groundwater) will be further evaluated during the soil gas survey.

#### 3.1.1.2. Soil RAOs for the Protection of the Environment

The BERA concluded that risk to wildlife is not considered significant and does not warrant response actions based only on ecological concerns; therefore, no ecological RAO for soil is proposed. However, ecological benchmarks (Table 3-1) will be considered during any response action undertaken to address risk identified in the HHRA.

#### 3.1.1.3. Preliminary Remediation Goals for Soil

PRGs for soil were developed for COCs identified during the incremental risk evaluation. The PRGs, which will be finalized in the ROD, were developed based on the following approach:

- Soil RBCs for each exposure scenario were calculated based on a target cancer risk level of 1E-06 and target noncancer HI of 1, consistent with the exposure pathways and assumptions used in the HHRA to assess risks (Barajas & Associates, Inc., 2008b).
- PRGs for COCs in soil were selected based on a comparison of the RBC for each COC, the laboratory practical quantitation limit (PQL) based on standard EPA analytical methods, and the HPAL (metals only). For metals, the RBC was compared with the HPAL and, if the HPAL exceeded the RBC, the HPAL was selected. For organic chemicals, the RBC was selected, unless it was below the laboratory PQL. In that case, the laboratory PQL would be selected.
- Table 3-1 lists the PRGs for each COC in soil. The PRGs for use in implementation of the soil remedial action are developed and presented in Section 4, Development of Remedial Alternatives.

**Table 3-1. Preliminary Remediation Goals for COCs in Soil**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Exposure Scenario | COC                        | Redevelopment Block         | Risk-Based Concentration (mg/kg) <sup>a</sup> | HPAL (mg/kg) | Laboratory PQL (mg/kg) | PRG (mg/kg) |
|-------------------|----------------------------|-----------------------------|-----------------------------------------------|--------------|------------------------|-------------|
| Residential       | 3,3'-Dichlorobenzidine     | MU-1                        | 0.008                                         | --           | 0.005                  | 0.008       |
|                   | 4-Nitrophenol              | MU-1                        | 0.29                                          | --           | 0.05                   | 0.29        |
|                   | 4,4'-DDD                   | MU-2                        | 2.1                                           | --           | 0.33                   | 2.1         |
|                   | 4,4'-DDE                   | MU-1 and MU-2               | 1.6                                           | --           | 0.33                   | 1.6         |
|                   | Aldrin                     | MU-1                        | 0.024                                         | --           | 0.008                  | 0.024       |
|                   | alpha-BHC                  | MU-2                        | 0.0019                                        | --           | 0.0034                 | 0.0019      |
|                   | Antimony                   | MU-1, MU-2, and MU-3        | 10                                            | 9.05         | 1                      | 10          |
|                   | Aroclor-1254               | MU-1 and MU-2               | 0.093                                         | --           | 0.03                   | 0.093       |
|                   | Aroclor-1260               | MU-1, MU-2, and MU-3        | 0.21                                          | --           | 0.03                   | 0.21        |
|                   | Arsenic                    | MU-1, MU-2, and MU-3        | 0.038                                         | 11.1         | 1                      | 11.1        |
|                   | Benzene                    | MU-1 and MU-3               | 0.18                                          | --           | 0.005                  | 0.18        |
|                   | Benzo(a)anthracene         | MU-1, MU-2, MU-3, and IR-52 | 0.37                                          | --           | 0.33                   | 0.37        |
|                   | Benzo(a)pyrene             | MU-1, MU-2, MU-3, and IR-52 | 0.037                                         | --           | 0.33                   | 0.33        |
|                   | Benzo(b)fluoranthene       | MU-1, MU-2, MU-3, and IR-52 | 0.34                                          | --           | 0.33                   | 0.34        |
|                   | Benzo(k)fluoranthene       | MU-1, MU-2, MU-3, and IR-52 | 0.34                                          | --           | 0.33                   | 0.34        |
|                   | Bis(2-ethylhexyl)phthalate | MU-1, MU-2, and MU-3        | 1.1                                           | --           | 0.33                   | 1.1         |
|                   | Cadmium                    | MU-1, MU-2, and MU-3        | 3.5                                           | 3.14         | 0.20                   | 3.5         |
|                   | Carbazole                  | MU-1                        | 2.2                                           | --           | 0.05                   | 2.2         |
|                   | Copper                     | MU-1, MU-2, MU-3, and IR-52 | 160                                           | 124.3        | 1.5                    | 160         |
|                   | Dibenz(a,h)anthracene      | MU-1, MU-2, and IR-52       | 0.058                                         | --           | 0.33                   | 0.33        |
|                   | Dieldrin                   | MU-1 and MU-2               | 0.00066                                       | --           | 0.0034                 | 0.0034      |
|                   | gamma-BHC                  | MU-1                        | 0.0026                                        | --           | 0.005                  | 0.005       |
|                   | Heptachlor epoxide         | MU-1 and MU-3               | 0.00054                                       | --           | 0.0034                 | 0.00054     |

**Table 3-1. Preliminary Remediation Goals for COCs in Soil (continued)**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Exposure Scenario          | COC                        | Redevelopment Block         | Risk-Based Concentration (mg/kg) <sup>a</sup> | HPAL (mg/kg) | Laboratory PQL (mg/kg) | PRG (mg/kg) |
|----------------------------|----------------------------|-----------------------------|-----------------------------------------------|--------------|------------------------|-------------|
| Residential<br>(continued) | Indeno(1,2,3-cd)pyrene     | MU-1, MU-2, MU-3, and IR-52 | 0.35                                          | --           | 0.33                   | 0.35        |
|                            | Iron                       | MU-1, MU-2, and MU-3        | 22,000                                        | 58,000       | 10                     | 58,000      |
|                            | Lead                       | MU-1, MU-2, MU-3, and IR-52 | 155                                           | 8.99         | 1                      | 155         |
|                            | Manganese                  | MU-1, MU-2, and MU-3        | 840                                           | 1,431        | 0.5                    | 1,431       |
|                            | Mercury                    | MU-1, MU-2, and MU-3        | 1.6                                           | 2.28         | 0.03                   | 2.28        |
|                            | n-Nitroso-di-n-propylamine | MU-1 and MU-2               | 0.0002                                        | --           | 0.0034                 | 0.0034      |
|                            | n-Nitrosodiphenylamine     | MU-1 and MU-2               | 0.68                                          | --           | 0.0034                 | 0.68        |
|                            | Naphthalene                | MU-1 and MU-2               | 1.7                                           | --           | 0.33                   | 1.7         |
|                            | Pentachlorophenol          | MU-2 and MU-3               | 2.6                                           | --           | 0.68                   | 2.60        |
|                            | Thallium                   | MU-1, MU-2, and MU-3        | 5.0                                           | 0.81         | 1                      | 5.0         |
|                            | Vanadium                   | MU-1, MU-2, and MU-3        | 65                                            | 117          | 0.5                    | 117         |
|                            | Trichloroethene            | MU-2                        | 2.9                                           | --           | 0.005                  | 2.9         |
|                            | Zinc                       | MU-1, MU-2, and MU-3        | 370                                           | 110          | 2.0                    | 370         |
|                            | Xylene                     | MU-3                        | 270                                           | --           | 0.005                  | 270         |
|                            | Total TPH <sup>b</sup>     | MU-3                        | --                                            | --           | --                     | 3,500       |
| Construction Worker        | 1,2,3,7,8-PECDD            | EOS-3                       | 0.00010                                       | --           | 0.00001                | 0.0001      |
|                            | 1,2,4-Trichlorobenzene     | EOS-1                       | 230                                           | --           | 0.05                   | 230         |
|                            | 1,2,4-Trimethylbenzene     | EOS-1 and EOS-2             | 170                                           | --           | 0.05                   | 170         |
|                            | 1,3,5-Trimethylbenzene     | EOS-1                       | 69                                            | --           | 0.05                   | 69          |
|                            | 2,3,4,6,7,8-HXCDF          | EOS-3                       | 0.0010                                        | --           | 0.00001                | 0.001       |
|                            | 2,3,4,7,8-PECDF            | EOS-3                       | 0.00020                                       | --           | 0.00001                | 0.0002      |
|                            | Aldrin                     | EOS-1                       | 0.54                                          | --           | 0.008                  | 0.54        |
|                            | Antimony                   | EOS-1 and EOS-4             | 120                                           | 9.05         | 1                      | 120         |



**Table 3-1. Preliminary Remediation Goals for COCs in Soil (continued)**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Exposure Scenario                  | COC                        | Redevelopment Block                                  | Risk-Based Concentration (mg/kg) <sup>a</sup> | HPAL (mg/kg) | Laboratory PQL (mg/kg) | PRG (mg/kg) |
|------------------------------------|----------------------------|------------------------------------------------------|-----------------------------------------------|--------------|------------------------|-------------|
| Construction Worker<br>(continued) | Aroclor-1248               | EOS-1                                                | 2.1                                           | --           | 0.03                   | 2.1         |
|                                    | Aroclor-1254               | MU-1, MU-2, and EOS-1, and EOS-4                     | 2.1                                           | --           | 0.03                   | 2.1         |
|                                    | Aroclor-1260               | MU-1, MU-2, MU-3, EOS-1, EOS-2,                      | 2.1                                           | --           | 0.03                   | 2.1         |
|                                    | Arsenic                    | MU-1, MU-2, MU-3, EOS-1, EOS-2,                      | 1.6                                           | 11.1         | 1                      | 11.1        |
|                                    | Benzene                    | MU-1                                                 | 9.4                                           | --           | 0.005                  | 9.4         |
|                                    | Benzo(a)anthracene         | MU-1, EOS-1, EOS-2, EOS-3, EOS-4,                    | 6.4                                           | --           | 0.33                   | 6.4         |
|                                    | Benzo(a)pyrene             | MU-1, MU-2, MU-3, EOS-1, EOS-2,                      | 0.65                                          | --           | 0.33                   | 0.65        |
|                                    | Benzo(b)fluoranthene       | EOS-1, EOS-2, EOS-3, EOS-4, and IR-                  | 6.5                                           | --           | 0.33                   | 6.5         |
|                                    | Benzo(k)fluoranthene       | EOS-1, EOS-2, EOS-3, and EOS-4                       | 6.5                                           | --           | 0.33                   | 6.5         |
|                                    | Copper                     | EOS-1 and EOS-4                                      | 11,000                                        | 124.3        | 1.5                    | 11,000      |
|                                    | Dibenz(a,h)anthracene      | MU-1, EOS-1, and IR-52                               | 1.1                                           | --           | 0.33                   | 1.1         |
|                                    | Indeno(1,2,3-cd)pyrene     | EOS-3                                                | 6.5                                           | --           | 0.33                   | 6.5         |
|                                    | Iron                       | MU-1 and EOS-1                                       | 93,000                                        | 58,000       | 10                     | 93,000      |
|                                    | Lead                       | MU-1, MU-2, MU-3, EOS-1, EOS-2,                      | 800                                           | 8.99         | 1                      | 800         |
|                                    | Manganese                  | MU-2 and EOS-4                                       | 6,900                                         | 1,431        | 0.5                    | 6,900       |
|                                    | Mercury                    | MU-1                                                 | 93                                            | 2.28         | 0.03                   | 93          |
|                                    | Naphthalene                | EOS-2                                                | 75                                            | --           | 0.33                   | 75          |
|                                    | Nickel                     | EOS-1                                                | 5,800                                         | --           | 0.5                    | 5,800       |
|                                    | n-Nitroso-di-n-propylamine | EOS-4                                                | 1.3                                           | --           | 0.0034                 | 1.3         |
|                                    | Vanadium                   | MU-1, EOS-1, and EOS-4                               | 310.0                                         | 117.20       | 0.5000                 | 310.0       |
|                                    | Total TPH <sup>b</sup>     | MU-3, EOS-1, EOS-3, EOS-4, and Railroad Right-of-Way | --                                            | --           | --                     | 3,500       |

**Table 3-1. Preliminary Remediation Goals for COCs in Soil (continued)**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Exposure Scenario | COC                        | Redevelopment Block            | Risk-Based Concentration (mg/kg) <sup>a</sup> | HPAL (mg/kg) | Laboratory PQL (mg/kg) | PRG (mg/kg) |
|-------------------|----------------------------|--------------------------------|-----------------------------------------------|--------------|------------------------|-------------|
| Recreational      | Aroclor-1254               | EOS-1, EOS-3, and EOS-4        | 0.74                                          | --           | 0.03                   | 0.74        |
|                   | Aroclor-1260               | EOS-1, EOS-2, EOS-3, and EOS-4 | 0.74                                          | --           | 0.03                   | 0.74        |
|                   | Arsenic                    | EOS-1, EOS-2, EOS-3, and EOS-4 | 0.37                                          | 11.1         | 1                      | 11.1        |
|                   | Benzo(a)anthracene         | EOS-1, EOS-2, EOS-3, and EOS-4 | 1.3                                           | --           | 0.33                   | 1.3         |
|                   | Benzo(a)pyrene             | EOS-1, EOS-2, EOS-3, and EOS-4 | 0.13                                          | --           | 0.33                   | 0.33        |
|                   | Benzo(b)fluoranthene       | EOS-1, EOS-2, EOS-3, and EOS-4 | 1.3                                           | --           | 0.33                   | 1.3         |
|                   | Benzo(k)fluoranthene       | EOS-1, EOS-2, EOS-3, and EOS-4 | 1.3                                           | --           | 0.33                   | 1.3         |
|                   | Chrysene                   | EOS-1 and EOS-3                | 13                                            | --           | 1                      | 13          |
|                   | Dibenz(a,h)anthracene      | EOS-1, EOS-2, EOS-3, and EOS-4 | 0.21                                          | --           | 0.33                   | 0.33        |
|                   | Dieldrin                   | EOS-1 and EOS-4                | 0.12                                          | --           | 0.33                   | 0.12        |
|                   | Heptachlor epoxide         | EOS-1                          | 0.21                                          | --           | 0.0034                 | 0.21        |
|                   | Indeno(1,2,3-cd)pyrene     | EOS-1, EOS-2, EOS-3, and EOS-4 | 1.3                                           | --           | 0.33                   | 1.3         |
|                   | Lead                       | EOS-1, EOS-2, EOS-3, and EOS-4 | 155                                           | 8.99         | 1                      | 155         |
|                   | Manganese                  | EOS-2                          | 2,430                                         | 1,431        | 0.5                    | 2,430       |
|                   | Mercury                    | EOS-4                          | 210                                           | 2.28         | 0.030                  | 210         |
|                   | n-Nitroso-di-n-propylamine | EOS-4                          | 0.27                                          | --           | 0.0034                 | 0.27        |
|                   | Total TPH <sup>b</sup>     | EOS-1 and EOS-4                | --                                            | --           | --                     | 3,500       |
| Industrial        | Arsenic                    | Railroad Right-of-Way          | 0.43                                          | 11.1         | 1                      | 11.1        |
|                   | Benzo(a)anthracene         | Railroad Right-of-Way          | 1.8                                           | --           | 0.33                   | 1.8         |
|                   | Benzo(a)pyrene             | Railroad Right-of-Way          | 0.18                                          | --           | 0.33                   | 0.33        |
|                   | Benzo(b)fluoranthene       | Railroad Right-of-Way          | 1.8                                           | --           | 0.33                   | 1.8         |
|                   | Benzo(k)fluoranthene       | Railroad Right-of-Way          | 1.8                                           | --           | 0.33                   | 1.8         |
|                   | Copper                     | Railroad Right-of-Way          | 76,000                                        | 124.3        | 1.50                   | 76,000      |

**Table 3-1. Preliminary Remediation Goals for COCs in Soil (continued)**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Exposure Scenario               | COC                    | Redevelopment Block   | Risk-Based Concentration (mg/kg) <sup>a</sup> | HPAL (mg/kg) | Laboratory PQL (mg/kg) | PRG (mg/kg) |
|---------------------------------|------------------------|-----------------------|-----------------------------------------------|--------------|------------------------|-------------|
| Industrial<br>(continued)       | Dibenz(a,h)anthracene  | Railroad Right-of-Way | 0.29                                          | --           | 0.33                   | 0.33        |
|                                 | Indeno(1,2,3-cd)pyrene | Railroad Right-of-Way | 1.8                                           | --           | 0.33                   | 1.8         |
|                                 | Lead                   | Railroad Right-of-Way | 800                                           | 8.99         | 1                      | 800         |
|                                 | Total TPH <sup>b</sup> | Railroad Right-of-Way | --                                            | --           | --                     | 3,500       |
| Ecological Pathway <sup>c</sup> | Copper                 | --                    | 470 <sup>d</sup>                              | --           | 1.5                    | 470         |
|                                 | Lead                   | --                    | 197 <sup>d</sup>                              | --           | 1                      | 197         |
|                                 | Total Aroclors         | --                    | 37 <sup>d</sup>                               | --           | 0.01                   | 37          |

## Notes:

a = Unless otherwise noted, risk-based concentration is from HHRA (Appendix I of Revised RI Report for Parcel E [Barajas and Associates, 2008b]). Although the land use presented in the HHRA does not match the 2010 Redevelopment Plan, the above list of COCs was verified by conducting queries of the risk-based concentrations against the Parcel E soil data. Prior to conducting the data query, a comprehensive list of risk-based concentrations was developed for all COCs detected in one or more soil samples using the toxicity factors, exposure parameters, and chemical data used in the HHRA.

b = The TPH PRG is based on the HPS petroleum source criterion (Shaw, 2007)

c = BERA concluded that risk to wildlife does not warrant response actions based only on ecological concerns; however, ecological benchmarks will be considered during response actions to address risk identified in the HHRA

d = Risk-based concentration is from BERA (Appendix J of Revised RI Report for Parcel E [Barajas and Associates, 2008b])

BERA = baseline ecological risk assessment

BHC = benzene hexachloride

COC = chemical of concern

DDD = dichlorodiphenyldichloroethane

DDE = dichlorodiphenyldichloroethene

HHRA = human health risk assessment

HPAL = Hunters Point ambient level

HXCDF = hexachlorodibenzofuran

IR = Installation Restoration

mg/kg = milligrams per kilogram

PECDD = pentachlorodibenzodioxin

PECDF = pentachlorodibenzofuran

PQL = practical quantitation limit

PRG = preliminary remediation goal

RI = Remedial Investigation

TPH = total petroleum hydrocarbons

## J5.0 EVALUATION OF RISK TO BIRDS AND MAMMALS

This section expands on the formulation presented in the Parcel E Validation Study ([Tetra Tech and LFR 2000a](#)) and incorporates comments received from the regulatory agencies and natural resource trustees on the Validation Study. The purpose of the Parcel E Validation Study was to refine the Phase 1 ERA for birds and mammals by using site-specific BAFs in the food chain model.

Available data for evaluating risk to representative birds and mammals included measured concentrations of COPECs in soils and PSCs derived for Parcel E. [Section J5.1](#) presents the derivation of the original set of PSCs following the Validation Study. [Section J5.2](#) describes the selection of additional chemicals for the derivation of PSCs. [Section J5.3](#) discusses special considerations for lead. [Sections J5.4 and J5.5](#) present the risk assessment for birds and mammals, respectively. The summary of risk to birds and mammals is in [Section J5.6](#). Toxicological profiles are presented in [Section J5.7](#).

The Validation Study concluded that cadmium, copper, lead, nickel, selenium, and zinc posed potential risk to birds or mammals at Parcel E. These COPECs were evaluated in the ERA presented in this appendix. In addition, some chemicals that were eliminated as COPECs during the Validation Study but were measured at higher concentrations in the current data set at Parcel E were reevaluated in this ERA, as described in [Section J5.2](#).

### J5.1 CALCULATION OF PROTECTIVE SOIL CONCENTRATIONS

Subsequent to the findings in the Validation Study that birds and mammals may be at risk from several metals in soil at Parcel E, the Navy and the regulatory agencies agreed to calculate site-specific PSCs that would reduce the risk to acceptable levels. In 2000, PSCs were calculated for cadmium, copper (for birds only), lead, nickel, selenium, and zinc using the results for collocated soil and tissue samples collected from Parcel E during the Validation Study.

Since the PSCs were derived, additional soil samples were collected, removal actions were completed, and the boundaries of Parcel E were changed (see [Appendix A](#) of the Revised RI Report for details). The conclusions of the 1997 ERA and the Validation Study are considered valid for the area that was evaluated at that time, and the PSCs that were derived are applicable to all of Parcel E. It is not necessary to reevaluate the conclusions of the 1997 ERA or the Validation Study. However, the Navy was concerned that chemicals that had been eliminated as COPECs during the Validation Study may be elevated above risk-based concentrations in the new data set due to the spatial heterogeneity of soil concentrations. To address this issue, the new data set was evaluated for consistency with the previous data set to identify any additional chemicals that should be included in the BERA.

Surface soil (less than 3 feet bgs) concentrations previously used in calculating PSCs, referred to as “pre-2000 data,” were compared with surface soil concentrations representative of current soil in Parcel E, referred to as “all” data. The all data set excludes data from the following areas: (1) the shoreline of Parcel E that was evaluated in the Shoreline Technical Memorandum (see [Appendix G](#)), (2) areas that are now in Parcel E-2, and (3) samples that were subject to removal action prior to December 2004. The all data set includes soil samples collected both before and after the Validation Study from terrestrial areas that are within the current boundaries of Parcel E.

## **J5.2                   SELECTION OF ADDITIONAL CHEMICALS FOR CALCULATION OF PROTECTIVE SOIL CONCENTRATIONS**

The new soil data did not change any of the original PSCs, which were based on the collocated soil and tissue samples collected during the Parcel E Validation Study.

In the 1997 Parcel E RI Report, UCL<sub>95S</sub> (pre-2000 data) were provided for separate IR sites ([Tetra Tech, LFR, and U&A 1997](#)). The pre-2000 UCL<sub>95S</sub> (maximum and minimum concentrations were not provided) were averaged and then compared with the all data UCL<sub>95S</sub>. Chemicals with at least a 5 percent frequency of detection for the all data set were retained for comparison with the pre-2000 data. If the UCL<sub>95</sub> in the all data set was greater than the UCL<sub>95</sub> in the pre-2000 data set, the chemical was considered elevated with respect to previous sampling and retained for further evaluation using PSCs (see [Table J-5](#)).

Based on the comparison of pre-2000 data with all data, PSCs were calculated for the following chemicals: molybdenum, toluene, trichloroethene (TCE), xylene, DDTs, and total Aroclors. New PSCs were calculated for copper (for mammals only), molybdenum, toluene, TCE, xylene, DDTs, and total Aroclors because none were provided in the PSC Technical Memorandum ([Tetra Tech and LFR 2000b](#)). PSCs for lead in mammals were recalculated because new mammalian TRVs for lead became available after the original PSCs were developed. Risk estimates for mammals based on both the previous TRV (adjusted for bioavailability) and the new TRV (not adjusted for bioavailability) are provided in [Section J5.4](#).

PSC were calculated in accordance with methods established in the PSC Technical Memorandum ([Tetra Tech and LFR 2000b](#)). Navy and BTAG TRVs were used whenever they were available ([Navy 1998](#)). TRVs for molybdenum, toluene (mammals only), TCE (mammals only), and xylene (mammals only) were from papers cited in [Sample, Opresko, and Suter \(1996\)](#). A complete list of PSCs used in this ERA is provided in [Table J-6](#).

## **J5.3                   SPECIAL CONSIDERATION FOR LEAD**

In the PSC Technical Memorandum ([Tetra Tech and LFR 2000b](#)), back-calculated soil concentrations that reflected a lead HQ of 1.0 for the house mouse (adult and juvenile) and the kestrel were lower than the HPAL. In fact, the PSC for lead for the most sensitive receptor, the adult house mouse, was 0.54 mg/kg, which is one order of magnitude below the HPAL of 8.9

mg/kg. Acknowledging the unrealistically low and unachievable PSC for lead, the Navy evaluated a PSC based on the high TRV for lead, which represents an effect level. The back-calculated soil concentration for the house mouse based on the high TRV was five orders of magnitude higher than the back-calculated soil concentration based on the low TRV. The model also predicted that a lead concentration in soil of 0 would result in an adult house mouse upper HQ of 130.77 (see Figure 6a in [Tetra Tech and LFR 2000b](#)). This result is clearly aberrant, indicating that at least one of the values used in the model was incorrect.

In the PSC Technical Memorandum ([Tetra Tech and LFR 2000b](#)), the lead soil concentration back-calculated from the kestrel upper HQ was 8.8 mg/kg, which was roughly equivalent, although less than, the lead HPAL (8.9 mg/kg). Thus, neither the PSC for the house mouse nor the kestrel would be possible to achieve at Parcel E.

Doses calculated for birds and mammals were compared directly with low TRVs in the Parcel E Validation Study and the PSC Technical Memorandum without accounting for bioavailability and relevance of TRVs to site-specific conditions at Parcel E. The low TRV for lead was derived from a study that fed a very soluble form of lead (lead acetate) to rats in drinking water ([Krasovskii, Vasukovich, and Chariev 1979](#)). Use of this study required that several extremely conservative assumptions be incorporated into the back-calculation model, as discussed below.

- The form of lead ingested by birds and mammals at Parcel E is lead acetate, a very soluble and bioavailable form of lead.
- Birds and mammals ingest lead at Parcel E as lead acetate in drinking water (lead acetate is very soluble in water).
- Site-specific soil and chemical conditions at Parcel E affecting the bioavailability of lead in soil are the same as controlled laboratory conditions used to generate the low TRV.

Based on the historical use of Parcel E, however, it is unlikely that lead in Parcel E soil is in a soluble organic form. Instead, the lead found at Parcel E is likely bound within metal fragments and strongly adsorbed to organic matter, soil hydroxides, and clays because of the near-neutral pH conditions at Parcel E ([World Health Organization 1977](#); [Agency for Toxic Substances Disease Registry 1991](#); also see Tables 3a through 3l in the PSC Technical Memorandum, [Tetra Tech and LFR 2000b](#)). Further evidence of the low bioavailability of lead at Parcel E comes from the field tissue samples collected for the Parcel E Validation Study. Lead was not detected at all in plants growing in soil with very high lead concentrations at some locations. For example, at sampling location IR02SS303, lead was detected in soils at 2,153 mg/kg; however, no lead was detected in plant tissue samples (seed, stem, and leaf) collected from the same location. The actual bioavailability of lead at Parcel E is unknown and represents a source of uncertainty in the BERA.

During a 6-month period following review of the PSC Technical Memorandum (March through August 1999), the regulatory agencies worked with the Navy to develop a more appropriate approach to assessing risk from lead to birds and mammals at Parcel E. The regulatory agencies agreed that the best approach would be to reassess exposure parameters used in the back-calculation by incorporating information on the bioavailability of the form of lead known to be present at Parcel E, relative to the bioavailability of the form of lead used in the laboratory studies to derive TRVs. Therefore, additional information on bioavailability of lead to receptors from soils at Parcel E was evaluated because (1) mouse and kestrel PSCs calculated using low TRVs were less than the HPAL, (2) an extremely wide range (five orders of magnitude) existed between PSCs calculated using high and low TRVs, and (3) the chemical characteristics of lead in soil at Parcel E differed substantially from laboratory conditions upon which low TRVs for lead were derived.

Conflicting guidance has been issued since the agreement to evaluate bioavailability of lead at Parcel E. In November 2002, the Region 9 BTAG issued a revised low TRV for mammals exposed to lead (<http://www.dtsc.ca.gov/AssessingRisk>). The revised TRV of 1.0 mg/kg-day is based on a study of chronic low-level toxicity in the rat exposed to lead (Fowler and others 1980). DTSC requires that the new TRVs be substituted for the previous TRV. To satisfy that requirement, the Navy calculated PSCs for small mammals using the revised TRV, with no adjustment for bioavailability. Both the bioavailability-adjusted PSCs using the previous TRV and the unadjusted PSCs using the revised TRV are used in the evaluation of risk to mammals at Parcel E (see Section J5.5). The lead TRV for birds was not adjusted.

#### **J5.4 EVALUATION OF RISK TO BIRDS**

Inorganic chemicals for which the EPC exceeded the HPAL were compared with PSCs for the kestrel and the red-tailed hawk. An HQ greater than 1.0 was interpreted as indicating risk to birds that ingest soil and prey at Parcel E. HQs were calculated for copper, lead, molybdenum, nickel, and zinc. The HQ for lead was 1.19 when the PSC for the kestrel was used as the benchmark. As a result, lead was considered a chemical of ecological concern (COEC). Concentrations of copper, molybdenum, nickel, and zinc were lower than the PSCs for the kestrel, resulting in HQs less than 1.0. As a result, these chemicals were eliminated as COECs for birds. No HQs were greater than 1.0 for the red-tailed hawk.

The Validation Study concluded that no organic compounds posed a risk to birds or mammals at Parcel E (Tetra Tech and LFR 2000a). The comparison of “pre-2000” and “all” data sets revealed that five organic compounds were present in the current data set at concentrations higher than previously measured. Three of these compounds were VOCs (toluene, TCE, and xylene), the fourth compound was total Aroclors, a measure of PCB concentrations. DDT was also elevated (see Table J-5). Because of low toxicity and bioaccumulation potential and high mobility, VOCs were eliminated as COPECs in the 1997 ERA and Validation Study. Toxicity data were unavailable to support calculation of PSCs for birds exposed to VOCs. However, exposure of birds to VOCs in soil is not expected to result in significant risk because (1) VOCs volatilize so readily and (2) neither the kestrel nor the red-tailed hawk spends significant time on the ground. Because no burrowing birds were found to occur in the areas where VOCs were detected in soil, additional evaluation of the VOCs is not warranted. The HQ for total Aroclors,



**TABLE J-6: SUMMARY OF PROTECTIVE SOIL CONCENTRATIONS FOR BIRDS AND MAMMALS DERIVED IN 2000 AND 2005**

Revised Remedial Investigation Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Chemical<br><br>HPAL<br>(mg/kg) |     | Protective Soil Concentrations (mg/kg)                     |                                          |                                                            |                                          |                                                            |                                          |                                                            |                                          |
|---------------------------------|-----|------------------------------------------------------------|------------------------------------------|------------------------------------------------------------|------------------------------------------|------------------------------------------------------------|------------------------------------------|------------------------------------------------------------|------------------------------------------|
|                                 |     | House Mouse                                                |                                          |                                                            |                                          | Birds                                                      |                                          |                                                            |                                          |
|                                 |     | Adult                                                      |                                          | Juvenile                                                   |                                          | American Kestrel                                           |                                          | Red-tailed Hawk                                            |                                          |
|                                 |     | From PSC<br>Technical<br>Memorandum<br>(2000) <sup>a</sup> | Calculated<br>for this<br>BERA<br>(2006) | From PSC<br>Technical<br>Memorandum<br>(2000) <sup>a</sup> | Calculated<br>for this<br>BERA<br>(2006) | From PSC<br>Technical<br>Memorandum<br>(2000) <sup>a</sup> | Calculated<br>for this<br>BERA<br>(2006) | From PSC<br>Technical<br>Memorandum<br>(2000) <sup>a</sup> | Calculated<br>for this<br>BERA<br>(2006) |
| <i>Inorganic Chemicals</i>      |     |                                                            |                                          |                                                            |                                          |                                                            |                                          |                                                            |                                          |
| Copper                          | 124 | NC                                                         | 470                                      | NC                                                         | 598                                      | 1,084                                                      | NC                                       | NC                                                         | 133,137                                  |
| Lead                            | 9   | 808 <sup>b</sup>                                           | 197 <sup>c</sup>                         | 1,365 <sup>b</sup>                                         | 252 <sup>c</sup>                         | 442 <sup>b</sup>                                           | NC                                       | NC                                                         | 1,168                                    |
| Molybdenum                      | 3   | NC                                                         | 46                                       | NC                                                         | 58                                       | NC                                                         | 1,269                                    | NC                                                         | 170,885                                  |
| Nickel                          | SS  | 1,941 <sup>b</sup>                                         | NC                                       | 2,751 <sup>b</sup>                                         | NC                                       | 2,563                                                      | NC                                       | NC                                                         | NC                                       |
| Zinc                            | 110 | 719                                                        | NC                                       | 1,111                                                      | NC                                       | 1,927                                                      | NC                                       | NC                                                         | NC                                       |
| <i>Organic Chemicals</i>        |     |                                                            |                                          |                                                            |                                          |                                                            |                                          |                                                            |                                          |
| Toluene                         | NA  | NC                                                         | 4,577                                    | NC                                                         | 5,811                                    | NC                                                         | NC                                       | NC                                                         | NC                                       |
| Trichloroethene                 | NA  | NC                                                         | 123                                      | NC                                                         | 157                                      | NC                                                         | NC                                       | NC                                                         | NC                                       |
| Xylene                          | NA  | NC                                                         | 369                                      | NC                                                         | 469                                      | NC                                                         | NC                                       | NC                                                         | NC                                       |
| Total Aroclors                  | NA  | NC                                                         | 62                                       | NC                                                         | 37                                       | NC                                                         | 37                                       | NC                                                         | 4,984                                    |
| Total DDTs                      | NA  | NC                                                         | 162                                      | NC                                                         | 206                                      | NC                                                         | 4                                        | NC                                                         | 476                                      |

Notes: Shaded and bolded cells show the lowest PSC.

a As presented in "Draft Final Protective Soil Concentrations Technical Memorandum, Parcel E, Hunters Point Shipyard, San Francisco, California (Tetra Tech and LFR 2000b).

b Presented as PSCs for lead and nickel using bioavailable doses (Tetra Tech and LFR 2000b).

c A revised low TRV of 1 mg/kg-day for mammals was established for lead in 2002 and was used in this BERA. This revised low TRV was obtained from the California Department of Toxic Substances Control, HERD. 2002. "HERD Ecological Risk Assessment, Note 5." November 21.

BERA Baseline ecological risk assessment

DDT Dichlorodiphenyltrichloroethane

HERD Human and Ecological Risk Division

HPAL Hunters Point ambient level (for soil)

LFR Levine-Fricke-Recon

mg/kg Milligram per kilogram

mg/kg-day Milligram per kilogram per day

NA Not applicable

NC PSC not calculated

PSC Protective soil concentration

Tetra Tech Tetra Tech EM Inc.

TRV Toxicity reference value



contamination at Parcel E during these investigations, including former disposal areas in IR-02, the Former Oily Waste Ponds in IR-03, and a TCE spill at Building 406 (Figure 3 on page 4).

The chemicals found in soil and groundwater at Parcel E include metals (such as lead and zinc), VOCs (such as TCE), *semivolatile organic compounds (SVOCs)*, pesticides, *polychlorinated biphenyls (PCBs)*, and petroleum-related compounds (also referred to as total petroleum hydrocarbons [TPH]). In addition, *radioactive chemicals* were found in soil at several locations in Parcel E, but radioactive chemicals were not found in groundwater at levels that could impact people or wildlife in the Bay.

Most of the chemical contamination in soil at Parcel E is present at relatively shallow depths (less than 10 feet below the ground surface). However, deeper soil and groundwater contamination (10 to 20 feet below the ground surface) is found in isolated areas, most notably at the Former Oily Waste Ponds and the TCE plume at Building 406. In addition, the contaminated oil at the Former Oily Waste Ponds and the TCE source at Building 406 may be considered *principal threat wastes* that could require removal or treatment.

is present at relatively shallow depths (less than 10 feet below the ground surface). The chemical contamination in groundwater at Parcel UC-3 is limited to a relatively small area in the eastern portion of Crisp Road.

The Navy identified soil *hot spots* at multiple locations in Parcels E and UC-3, but these contaminant sources are not considered principal threat wastes because the chemicals (primarily metals, SVOCs, and PCBs) do not migrate readily in the environment. The Navy is currently collecting additional data at soil hot spots throughout Parcels E and UC-3 in order to better understand the extent of contamination at these areas. In addition, the Navy is monitoring groundwater plumes at Parcels E and UC-3 to help plan the future cleanup.

## SUMMARY OF SITE RISKS

**"Risk"** is the likelihood or probability that a hazardous chemical, when released to the environment, will cause effects (such as cancer or other illnesses) on exposed humans or wildlife. Chemicals that are spilled onto the ground or released through underground pipes can contaminate soil, air, and groundwater. Figure 5 below shows the most common ways, such as breathing of contaminants from soil, that people may be exposed to contamination (referred to as the *exposure pathway*).

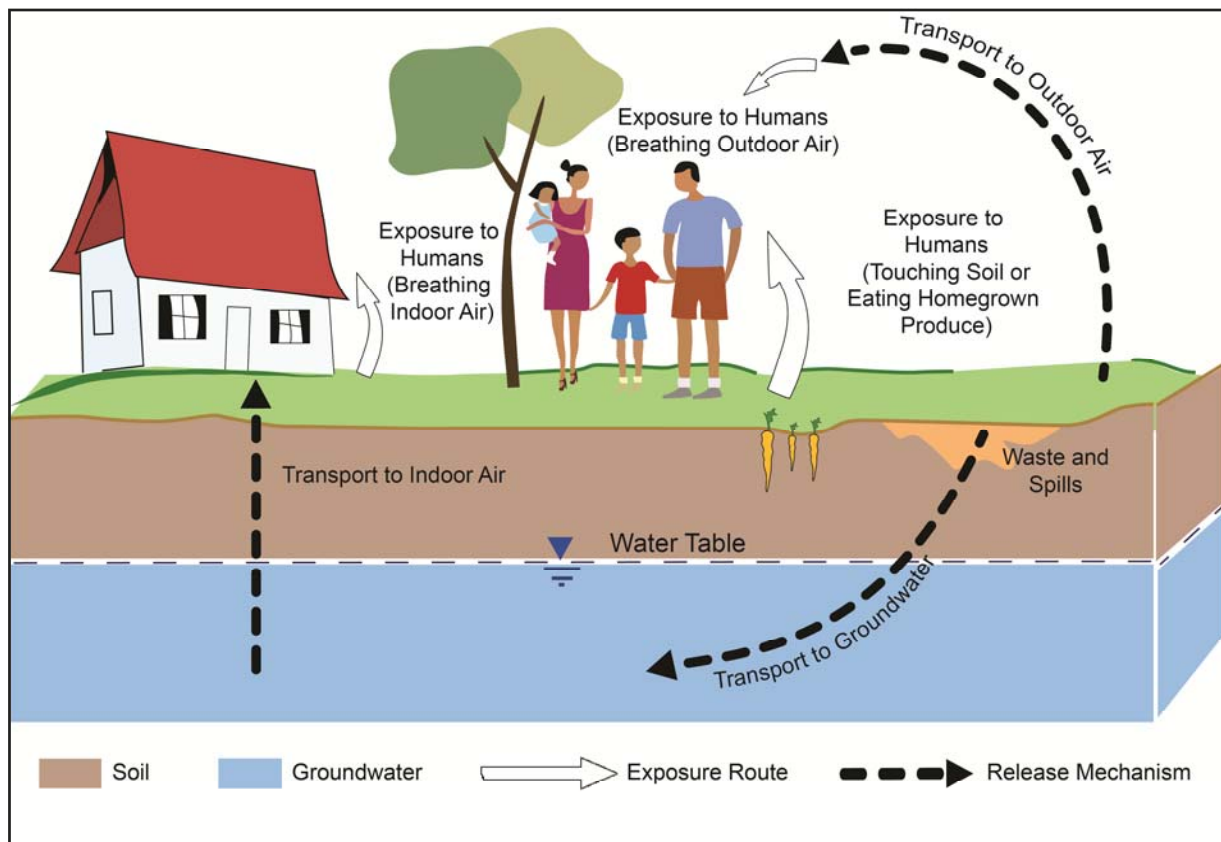


Figure 5. Conceptual Site Model.

## Section 3. Remedial Action Objectives, Applicable or Relevant and Appropriate Requirements, General Response Actions, and Process Options

This section (1) presents the site-specific RAOs, including PRGs, for soil, shoreline sediment, and groundwater at Parcel E based on the COCs and COECs identified in the Revised RI Report and in [Appendix A](#) of this FS Report (see Section 3.1); (2) identifies potential ARARs (see [Section 3.2](#)); and (3) presents a range of GRAs and associated process options that will satisfy the RAOs for soil, shoreline sediment, and groundwater (see [Section 3.3](#)). The GRAs and process options retained through the screening process are used in later sections as the basis for developing remedial alternatives. A separate set of GRAs and process options were developed for NAPL at IR-03, the location of the former oil reclamation ponds. The prevalence of NAPL in the area of IR-03 and the associated site-specific contamination issues in soil and groundwater are addressed in the NAPL evaluation sections.

### 3.1. REMEDIAL ACTION OBJECTIVES

RAOs are medium-specific goals for protecting human health and the environment. Each RAO specifies (1) the COCs (or COECs), (2) the exposure route and receptors, and (3) an acceptable chemical concentration for each medium of concern (such as soil and groundwater). RAOs include both an exposure pathway and a chemical concentration in a given medium because protectiveness may be achieved in two ways: (1) by limiting or eliminating the exposure pathway or (2) by reducing chemical concentrations.

The RAO evaluation for this FS Report is based on (1) the results of the risk assessments presented in the Revised RI Report ([Barajas & Associates, Inc., 2008b](#)), with appropriate adjustments based on the amended redevelopment plan ([SFRA, 2010c](#)), and (2) the risk evaluation conducted to assess potential effects from groundwater discharge to San Francisco Bay ([Appendix A](#) of this FS Report). The NCP details the expectations for remedy selection in Title 40 CFR (40 CFR) § 300.430 (a)(1)(iii). The DoD integrates the NCP expectations with the objectives of the BRAC program for expediting transfer of DoD property for reuse and development. The NCP processes and criteria were used to develop RAOs for Parcel E.

An important component of developing RAOs is the determination of future land use. According to EPA's land use directive ([EPA, 1995](#)), RAOs "should reflect the reasonably anticipated future land use or

uses...,” thereby allowing for the development of “alternatives that would achieve cleanup levels associated with the reasonably anticipated future land use...” of the site. The EPA land use directive states that “in cases where future land use is relatively certain, the remedial action objective generally should reflect this land use...” and “...need not include alternative land use scenarios...” (EPA, 1995). RAOs developed for Parcel E are based on the city’s planned reuse for each redevelopment block, which is considered the reasonable anticipated end use of the property. In accordance with the EPA land use directive (EPA, 1995), this FS Report develops remedial alternatives based on the planned reuse only.

Figure 1-2 shows the redevelopment blocks within Parcel E. The RAOs for each environmental medium of concern are presented in the following sections.

### 3.1.1. RAOs for Soil and Soil Gas

The Revised RI Report evaluated risk from human exposure to soil (residential, industrial, and recreational) associated with each redevelopment block and its planned reuse (Barajas & Associates, Inc., 2008b). Based on the amended redevelopment plan (SFRA, 2010c), the reuses relevant to the Parcel E redevelopment blocks are mixed use and open space, as shown on Figure 1-2. The two exposure scenarios applicable to these planned reuses are residential and recreational, as shown in the table below. The COCs for each exposure scenario are also provided in the table and discussed later in this section.

| Exposure Scenario | Redevelopment Block                   | Planned Reuse | COCs <sup>a</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|---------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Residential       | MU-1, MU-2, and MU-3                  | Mixed Use     | 3,3'-dichlorobenzidine, 4-nitrophenol, 4,4'-DDD, 4,4'-DDE, aldrin, alpha-BHC, antimony, Aroclor-1254, Aroclor-1260, arsenic, benzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, cadmium, carbazole, copper, dibenz(a, h)anthracene, dieldrin, gamma-BHC, heptachlor epoxide, indeno(1,2,3-cd)pyrene, iron, lead, manganese, mercury, n-nitroso-di-n-propylamine, n-nitrosodiphenylamine, naphthalene, pentachlorophenol, thallium, vanadium, trichloroethylene, zinc, and xylene.<br><b>Most common: Metals (arsenic and manganese)</b> |
| Recreational      | EOS-1, EOS-2, EOS-3, EOS-4, and EOS-5 | Open Space    | 1,2,3,4,6,7,8-HPCDD, 1,2,3,7,8-PECDD, 2,3,4,7,8-PECDF, Aroclor-1254, Aroclor-1260, arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenz(a,h)-anthracene, dieldrin, heptachlor epoxide, indeno(1,2,3-cd)pyrene, lead, manganese, mercury, and nitroso-di-n-propylamine.<br><b>Most common: Metals (arsenic and lead), PAHs [benzo(a)pyrene], and PCBs (Aroclor-1260)</b>                                                                                                                                                                                                    |

TABLE 7: PRELIMINARY SOIL GAS ACTION LEVELS  
Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Naval Shipyard

| Chemical                         | CAS Number | Soil Gas RBC<br>(Lowest between Cancer- and Noncancer-Based RBC) |                               |                                     |                                | Soil Gas RBC<br>Based on<br>Surrogate<br>Chemical for<br>Toxicity Data | Soil Gas RBC<br>Based on Oral<br>Route<br>Extrapolated<br>Toxicity Data | Laboratory Reporting Limit |                          | Reporting Limit Less Than Soil Gas<br>RBC?                              |                                                                  | Preliminary Soil Gas Action Level (c) |                               |                                     |                                |          |    |          |    | Revision<br>Code |
|----------------------------------|------------|------------------------------------------------------------------|-------------------------------|-------------------------------------|--------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------|--------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------|-------------------------------|-------------------------------------|--------------------------------|----------|----|----------|----|------------------|
|                                  |            | Residential                                                      |                               | Industrial                          |                                |                                                                        |                                                                         |                            |                          |                                                                         |                                                                  | Residential                           |                               | Industrial                          |                                |          |    |          |    |                  |
|                                  |            | Cal/EPA<br>α <sub>sg</sub> = 0.0009                              | EPA<br>α <sub>sg</sub> = 0.01 | Cal/EPA<br>α <sub>sg</sub> = 0.0004 | EPA<br>α <sub>sg</sub> = 0.001 |                                                                        |                                                                         | Concentration<br>(a)       | Analytical<br>Method (b) | Cal/EPA<br>Res α <sub>sg</sub> = 0.0009<br>Ind α <sub>sg</sub> = 0.0004 | EPA<br>Res α <sub>sg</sub> = 0.01<br>Ind α <sub>sg</sub> = 0.001 | Cal/EPA<br>α <sub>sg</sub> = 0.0009   | EPA<br>α <sub>sg</sub> = 0.01 | Cal/EPA<br>α <sub>sg</sub> = 0.0004 | EPA<br>α <sub>sg</sub> = 0.001 |          |    |          |    |                  |
| Metals                           |            |                                                                  |                               |                                     |                                |                                                                        |                                                                         |                            |                          |                                                                         |                                                                  |                                       |                               |                                     |                                |          |    |          |    |                  |
| MERCURY                          | 7439976    | 3.48E+02                                                         | 3.13E+01                      | 3.29E+03                            | 1.31E+03                       |                                                                        |                                                                         | 1.00E+00                   | NIOSH 6009               | Yes                                                                     | Yes                                                              | 3.48E+02                              | nc                            | 3.13E+01                            | nc                             | 3.29E+03 | nc | 1.31E+03 | nc | --               |
| Polycyclic Aromatic Hydrocarbons |            |                                                                  |                               |                                     |                                |                                                                        |                                                                         |                            |                          |                                                                         |                                                                  |                                       |                               |                                     |                                |          |    |          |    |                  |
| 1-METHYLNAPHTHALENE              | 90120      | 3.26E+02                                                         | 2.94E+01                      | 3.70E+03                            | 1.48E+03                       |                                                                        | X                                                                       | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 3.26E+02                              | ca                            | 2.94E+01                            | ca                             | 3.70E+03 | ca | 1.48E+03 | ca | --               |
| 2-METHYLNAPHTHALENE              | 91576      | 1.62E+04                                                         | 1.46E+03                      | 1.53E+05                            | 6.13E+04                       |                                                                        | X                                                                       | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 1.62E+04                              | nc                            | 1.46E+03                            | nc                             | 1.53E+05 | nc | 6.13E+04 | nc | --               |
| ACENAPHTHENE                     | 83329      | 2.43E+05                                                         | 2.19E+04                      | 2.30E+06                            | 9.20E+05                       |                                                                        | X                                                                       | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 2.43E+05                              | nc                            | 2.19E+04                            | nc                             | 2.30E+06 | nc | 9.20E+05 | nc | --               |
| ACENAPHTHYLENE                   | 208968     | 2.43E+05                                                         | 2.19E+04                      | 2.30E+06                            | 9.20E+05                       | X                                                                      | X                                                                       | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 2.43E+05                              | nc                            | 2.19E+04                            | nc                             | 2.30E+06 | nc | 9.20E+05 | nc | --               |
| BENZO(B)FLUORANTHENE             | 205992     | 2.46E+01                                                         | 2.21E+00                      | 2.79E+02                            | 1.11E+02                       |                                                                        |                                                                         | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 2.46E+01                              | ca                            | 2.21E+00                            | ca                             | 2.79E+02 | ca | 1.11E+02 | ca | --               |
| CHRYSENE                         | 218019     | 2.46E+02                                                         | 2.21E+01                      | 2.79E+03                            | 1.11E+03                       |                                                                        |                                                                         | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 2.46E+02                              | ca                            | 2.21E+01                            | ca                             | 2.79E+03 | ca | 1.11E+03 | ca | --               |
| FLUORENE                         | 86737      | 1.62E+05                                                         | 1.46E+04                      | 1.53E+06                            | 6.13E+05                       |                                                                        | X                                                                       | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 1.62E+05                              | nc                            | 1.46E+04                            | nc                             | 1.53E+06 | nc | 6.13E+05 | nc | --               |
| NAPHTHALENE                      | 91203      | 7.95E+01                                                         | 7.16E+00                      | 9.02E+02                            | 3.61E+02                       |                                                                        |                                                                         | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 7.95E+01                              | ca                            | 7.16E+00                            | ca                             | 9.02E+02 | ca | 3.61E+02 | ca | --               |
| 1,6,7-TRIMETHYL-NAPHTHALENE      | 2245387    | 1.62E+04                                                         | 1.46E+03                      | 1.53E+05                            | 6.13E+04                       | X                                                                      | X                                                                       | NE                         | --                       | --                                                                      | --                                                               | NE                                    | --                            | NE                                  | --                             | NE       | -- | NE       | -- | --               |
| 2,6-DIMETHYL-NAPHTHALENE         | 581420     | 1.62E+04                                                         | 1.46E+03                      | 1.53E+05                            | 6.13E+04                       | X                                                                      | X                                                                       | NE                         | --                       | --                                                                      | --                                                               | NE                                    | --                            | NE                                  | --                             | NE       | -- | NE       | -- | --               |
| PHENANTHRENE                     | 85018      | 1.22E+06                                                         | 1.10E+05                      | 1.15E+07                            | 4.60E+06                       | X                                                                      | X                                                                       | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 1.22E+06                              | nc                            | 1.10E+05                            | nc                             | 1.15E+07 | nc | 4.60E+06 | nc | --               |
| PYRENE                           | 129000     | 1.22E+05                                                         | 1.10E+04                      | 1.15E+06                            | 4.60E+05                       |                                                                        | X                                                                       | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 1.22E+05                              | nc                            | 1.10E+04                            | nc                             | 1.15E+06 | nc | 4.60E+05 | nc | --               |
| Pesticides                       |            |                                                                  |                               |                                     |                                |                                                                        |                                                                         |                            |                          |                                                                         |                                                                  |                                       |                               |                                     |                                |          |    |          |    |                  |
| 2,4'-DDE                         | 3424826    | 2.79E+01                                                         | 2.51E+00                      | 3.16E+02                            | 1.26E+02                       | X                                                                      |                                                                         | NE                         | --                       | --                                                                      | --                                                               | NE                                    | --                            | NE                                  | --                             | NE       | -- | NE       | -- | --               |
| 4,4'-DDE                         | 72559      | 2.79E+01                                                         | 2.51E+00                      | 3.16E+02                            | 1.26E+02                       |                                                                        |                                                                         | 1.60E-01                   | TO-10A                   | Yes                                                                     | Yes                                                              | 2.79E+01                              | ca                            | 2.51E+00                            | ca                             | 3.16E+02 | ca | 1.26E+02 | ca | --               |
| ALDRIN                           | 309002     | 5.52E-01                                                         | 4.97E-02                      | 6.26E+00                            | 2.50E+00                       |                                                                        |                                                                         | 1.60E-01                   | TO-10A                   | Yes                                                                     | No (> Res)                                                       | 5.52E-01                              | ca                            | 1.60E-01                            | RL                             | 6.26E+00 | ca | 2.50E+00 | ca | --               |
| ALPHA-BHC                        | 319846     | 1.50E+00                                                         | 1.35E-01                      | 1.70E+01                            | 6.81E+00                       |                                                                        |                                                                         | 1.60E-01                   | TO-10A                   | Yes                                                                     | No (> Res)                                                       | 1.50E+00                              | ca                            | 1.60E-01                            | RL                             | 1.70E+01 | ca | 6.81E+00 | ca | --               |
| ALPHA-CHLORDANE                  | 5103719    | 2.70E+01                                                         | 2.43E+00                      | 3.07E+02                            | 1.23E+02                       | X                                                                      |                                                                         | 1.60E-01                   | TO-10A                   | Yes                                                                     | Yes                                                              | 2.70E+01                              | ca                            | 2.43E+00                            | ca                             | 3.07E+02 | ca | 1.23E+02 | ca | --               |
| BETA-BHC                         | 319857     | 5.10E+00                                                         | 4.59E-01                      | 5.78E+01                            | 2.31E+01                       |                                                                        |                                                                         | 1.60E-01                   | TO-10A                   | Yes                                                                     | Yes                                                              | 5.10E+00                              | ca                            | 4.59E-01                            | ca                             | 5.78E+01 | ca | 2.31E+01 | ca | --               |
| DELTA-BHC                        | 319868     | 5.10E+00                                                         | 4.59E-01                      | 5.78E+01                            | 2.31E+01                       | X                                                                      |                                                                         | 1.60E-01                   | TO-10A                   | Yes                                                                     | Yes                                                              | 5.10E+00                              | ca                            | 4.59E-01                            | ca                             | 5.78E+01 | ca | 2.31E+01 | ca | --               |
| DIELDRIN                         | 60571      | 5.88E-01                                                         | 5.29E-02                      | 6.67E+00                            | 2.67E+00                       |                                                                        |                                                                         | 1.60E-01                   | TO-10A                   | Yes                                                                     | No (> Res)                                                       | 5.88E-01                              | ca                            | 1.60E-01                            | RL                             | 6.67E+00 | ca | 2.67E+00 | ca | --               |
| ENDOSULFAN I                     | 959988     | 2.43E+04                                                         | 2.19E+03                      | 2.30E+05                            | 9.20E+04                       | X                                                                      | X                                                                       | 1.60E-01                   | TO-10A                   | Yes                                                                     | Yes                                                              | 2.43E+04                              | nc                            | 2.19E+03                            | nc                             | 2.30E+05 | nc | 9.20E+04 | nc | --               |
| ENDOSULFAN II                    | 33213659   | 2.43E+04                                                         | 2.19E+03                      | 2.30E+05                            | 9.20E+04                       | X                                                                      | X                                                                       | 1.60E-01                   | TO-10A                   | Yes                                                                     | Yes                                                              | 2.43E+04                              | nc                            | 2.19E+03                            | nc                             | 2.30E+05 | nc | 9.20E+04 | nc | --               |
| GAMMA-BHC (LINDANE)              | 58899      | 8.72E+00                                                         | 7.85E-01                      | 9.89E+01                            | 3.96E+01                       |                                                                        |                                                                         | 1.60E-01                   | TO-10A                   | Yes                                                                     | Yes                                                              | 8.72E+00                              | ca                            | 7.85E-01                            | ca                             | 9.89E+01 | ca | 3.96E+01 | ca | --               |
| GAMMA-CHLORDANE                  | 5103742    | 2.70E+01                                                         | 2.43E+00                      | 3.07E+02                            | 1.23E+02                       | X                                                                      |                                                                         | 1.60E-01                   | TO-10A                   | Yes                                                                     | Yes                                                              | 2.70E+01                              | ca                            | 2.43E+00                            | ca                             | 3.07E+02 | ca | 1.23E+02 | ca | --               |
| HEPTACHLOR                       | 76448      | 2.08E+00                                                         | 1.87E-01                      | 2.36E+01                            | 9.43E+00                       |                                                                        |                                                                         | 1.60E-01                   | TO-10A                   | Yes                                                                     | Yes                                                              | 2.08E+00                              | ca                            | 1.87E-01                            | ca                             | 2.36E+01 | ca | 9.43E+00 | ca | --               |
| METHOXYCHLOR                     | 72435      | 2.03E+04                                                         | 1.83E+03                      | 1.92E+05                            | 7.67E+04                       |                                                                        | X                                                                       | NE                         | --                       | --                                                                      | --                                                               | NE                                    | --                            | NE                                  | --                             | NE       | -- | NE       | -- | --               |
| Semivolatile Organic Compounds   |            |                                                                  |                               |                                     |                                |                                                                        |                                                                         |                            |                          |                                                                         |                                                                  |                                       |                               |                                     |                                |          |    |          |    |                  |
| 2-CHLORONAPHTHALENE              | 91587      | 3.24E+05                                                         | 2.92E+04                      | 3.07E+06                            | 1.23E+06                       |                                                                        | X                                                                       | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 3.24E+05                              | nc                            | 2.92E+04                            | nc                             | 3.07E+06 | nc | 1.23E+06 | nc | --               |
| 2-CHLOROPHENOL                   | 95578      | 2.03E+04                                                         | 1.83E+03                      | 1.92E+05                            | 7.67E+04                       |                                                                        | X                                                                       | 8.00E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 2.03E+04                              | nc                            | 1.83E+03                            | nc                             | 1.92E+05 | nc | 7.67E+04 | nc | --               |
| ACETOPHENONE                     | 98862      | 4.06E+05                                                         | 3.65E+04                      | 3.83E+06                            | 1.53E+06                       |                                                                        | X                                                                       | NE                         | --                       | --                                                                      | --                                                               | NE                                    | --                            | NE                                  | --                             | NE       | -- | NE       | -- | --               |
| AZOBENZENE                       | 103333     | 8.72E+01                                                         | 7.85E+00                      | 9.89E+02                            | 3.96E+02                       |                                                                        |                                                                         | NE                         | --                       | --                                                                      | --                                                               | NE                                    | --                            | NE                                  | --                             | NE       | -- | NE       | -- | --               |
| BIPHENYL                         | 92524      | 4.63E+02                                                         | 4.17E+01                      | 4.38E+03                            | 1.75E+03                       |                                                                        |                                                                         | NE                         | --                       | --                                                                      | --                                                               | NE                                    | --                            | NE                                  | --                             | NE       | -- | NE       | -- | 2                |
| DIBENZOFURAN                     | 132649     | 4.06E+03                                                         | 3.65E+02                      | 3.83E+04                            | 1.53E+04                       |                                                                        | X                                                                       | 1.60E+00                   | TO-13A                   | Yes                                                                     | Yes                                                              | 4.06E+03                              | nc                            | 3.65E+02                            | nc                             | 3.83E+04 | nc | 1.53E+04 | nc | --               |
| HEXACHLORO BENZENE               | 118741     | 5.30E+00                                                         | 4.77E-01                      | 6.01E+01                            | 2.40E+01                       |                                                                        |                                                                         | 1.60E+00                   | TO-13A                   | Yes                                                                     | No (> Res)                                                       | 5.30E+00                              | ca                            | 1.60E+00                            | RL                             | 6.01E+01 | ca | 2.40E+01 | ca | 1A               |

TABLE 7: PRELIMINARY SOIL GAS ACTION LEVELS  
Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Naval Shipyard

| Chemical                              | CAS Number | Soil Gas RBC<br>(Lowest between Cancer- and Noncancer-Based RBC) |                               |                                     |                                | Soil Gas RBC<br>Based on<br>Surrogate<br>Chemical for<br>Toxicity Data | Soil Gas RBC<br>Based on Oral<br>Route<br>Extrapolated<br>Toxicity Data | Laboratory Reporting Limit |                          | Reporting Limit Less Than Soil Gas<br>RBC?                   |                                                                  | Preliminary Soil Gas Action Level (c) |                               |                                     |                                |       |  | Revision<br>Code |
|---------------------------------------|------------|------------------------------------------------------------------|-------------------------------|-------------------------------------|--------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------|--------------------------|--------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------|-------------------------------|-------------------------------------|--------------------------------|-------|--|------------------|
|                                       |            | Residential                                                      |                               | Industrial                          |                                |                                                                        |                                                                         |                            |                          | Residential                                                  |                                                                  | Industrial                            |                               |                                     |                                |       |  |                  |
|                                       |            | Cal/EPA<br>α <sub>sg</sub> = 0.0009                              | EPA<br>α <sub>sg</sub> = 0.01 | Cal/EPA<br>α <sub>sg</sub> = 0.0004 | EPA<br>α <sub>sg</sub> = 0.001 |                                                                        |                                                                         | Concentration<br>(a)       | Analytical<br>Method (b) | Res α <sub>sg</sub> = 0.0009<br>Ind α <sub>sg</sub> = 0.0004 | EPA<br>Res α <sub>sg</sub> = 0.01<br>Ind α <sub>sg</sub> = 0.001 | Cal/EPA<br>α <sub>sg</sub> = 0.0009   | EPA<br>α <sub>sg</sub> = 0.01 | Cal/EPA<br>α <sub>sg</sub> = 0.0004 | EPA<br>α <sub>sg</sub> = 0.001 |       |  |                  |
| Volatile Organic Compounds            |            |                                                                  |                               |                                     |                                |                                                                        |                                                                         |                            |                          |                                                              |                                                                  |                                       |                               |                                     |                                |       |  |                  |
| 1,1,1-TRICHLOROETHANE                 | 71556      | 5.79E+06                                                         | 5.21E+05                      | 5.48E+07                            | 2.19E+07                       |                                                                        |                                                                         | 1.76E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 5.79E+06 nc                           | 5.21E+05 nc                   | 5.48E+07 nc                         | 2.19E+07 nc                    | --    |  |                  |
| 1,1,2,2-TETRACHLOROETHANE             | 79345      | 4.66E+01                                                         | 4.20E+00                      | 5.29E+02                            | 2.11E+02                       |                                                                        |                                                                         | 2.24E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 4.66E+01 ca                           | 4.20E+00 ca                   | 5.29E+02 ca                         | 2.11E+02 ca                    | 2     |  |                  |
| 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE | 76131      | 3.48E+07                                                         | 3.13E+06                      | 3.29E+08                            | 1.31E+08                       |                                                                        |                                                                         | 1.23E+00                   | TO-15                    | Yes                                                          | Yes                                                              | 3.48E+07 nc                           | 3.13E+06 nc                   | 3.29E+08 nc                         | 1.31E+08 nc                    | --    |  |                  |
| 1,1,2-TRICHLOROETHANE                 | 79005      | 1.69E+02                                                         | 1.52E+01                      | 1.92E+03                            | 7.67E+02                       |                                                                        |                                                                         | 1.76E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 1.69E+02 ca                           | 1.52E+01 ca                   | 1.92E+03 ca                         | 7.67E+02 ca                    | 2     |  |                  |
| 1,1-DICHLOROETHANE                    | 75343      | 1.69E+03                                                         | 1.52E+02                      | 1.92E+04                            | 7.67E+03                       |                                                                        |                                                                         | 1.30E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 1.69E+03 ca                           | 1.52E+02 ca                   | 1.92E+04 ca                         | 7.67E+03 ca                    | --    |  |                  |
| 1,1-DICHLOROETHENE                    | 75354      | 2.32E+05                                                         | 2.09E+04                      | 2.19E+06                            | 8.76E+05                       |                                                                        |                                                                         | 6.40E-02                   | TO-15                    | Yes                                                          | Yes                                                              | 2.32E+05 nc                           | 2.09E+04 nc                   | 2.19E+06 nc                         | 8.76E+05 nc                    | --    |  |                  |
| 1,1-DICHLOROPROPENE                   | 542756     | 1.69E+02                                                         | 1.52E+01                      | 1.92E+03                            | 7.67E+02                       |                                                                        |                                                                         | NA - NS                    | TO-15 (NS)               | ND                                                           | ND                                                               | ND --                                 | ND --                         | ND --                               | ND --                          | 1A    |  |                  |
| 1,2,3-TRICHLOROBENZENE                | 87616      | 3.24E+03                                                         | 2.92E+02                      | 3.07E+04                            | 1.23E+04                       |                                                                        | X                                                                       | NA - NS                    | TO-15 (NS)               | ND                                                           | ND                                                               | ND --                                 | ND --                         | ND --                               | ND --                          | --    |  |                  |
| 1,2,3-TRICHLOROPROPANE                | 96184      | 3.15E-01                                                         | 2.84E-02                      | 3.58E+00                            | 1.43E+00                       |                                                                        | X                                                                       | NA - NS                    | TO-15 (NS)               | ND                                                           | ND                                                               | ND --                                 | ND --                         | ND --                               | ND --                          | --    |  |                  |
| 1,2,4-TRICHLOROBENZENE                | 120821     | 3.26E+02                                                         | 2.94E+01                      | 3.70E+03                            | 1.48E+03                       |                                                                        | X                                                                       | 5.92E+00                   | TO-15                    | Yes                                                          | Yes                                                              | 3.26E+02 ca                           | 2.94E+01 ca                   | 3.70E+03 ca                         | 1.48E+03 ca                    | --    |  |                  |
| 1,2,4-TRIMETHYLBENZENE                | 95636      | 8.11E+03                                                         | 7.30E+02                      | 7.67E+04                            | 3.07E+04                       |                                                                        |                                                                         | 7.84E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 8.11E+03 nc                           | 7.30E+02 nc                   | 7.67E+04 nc                         | 3.07E+04 nc                    | --    |  |                  |
| 1,2-DICHLOROBENZENE                   | 95501      | 2.32E+05                                                         | 2.09E+04                      | 2.19E+06                            | 8.76E+05                       |                                                                        |                                                                         | 9.60E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 2.32E+05 nc                           | 2.09E+04 nc                   | 2.19E+06 nc                         | 8.76E+05 nc                    | --    |  |                  |
| 1,2-DICHLOROETHANE                    | 107062     | 1.04E+02                                                         | 9.36E+00                      | 1.18E+03                            | 4.72E+02                       |                                                                        |                                                                         | 1.30E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 1.04E+02 ca                           | 9.36E+00 ca                   | 1.18E+03 ca                         | 4.72E+02 ca                    | 2     |  |                  |
| 1,2-DICHLOROETHENE (TOTAL)            | 540590     | 3.65E+04                                                         | 3.29E+03                      | 3.45E+05                            | 1.38E+05                       |                                                                        | X                                                                       | 4.79E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 3.65E+04 nc                           | 3.29E+03 nc                   | 3.45E+05 nc                         | 1.38E+05 nc                    | --    |  |                  |
| 1,2-DICHLOROPROPANE                   | 78875      | 2.70E+02                                                         | 2.43E+01                      | 3.07E+03                            | 1.23E+03                       |                                                                        |                                                                         | 7.36E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 2.70E+02 ca                           | 2.43E+01 ca                   | 3.07E+03 ca                         | 1.23E+03 ca                    | --    |  |                  |
| 1,3,5-TRIMETHYLBENZENE                | 108678     | 4.06E+04                                                         | 3.65E+03                      | 3.83E+05                            | 1.53E+05                       |                                                                        | X                                                                       | 7.84E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 4.06E+04 nc                           | 3.65E+03 nc                   | 3.83E+05 nc                         | 1.53E+05 nc                    | --    |  |                  |
| 1,3-DICHLOROBENZENE                   | 541731     | 2.32E+05                                                         | 2.09E+04                      | 2.19E+06                            | 8.76E+05                       | X                                                                      |                                                                         | 9.60E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 2.32E+05 nc                           | 2.09E+04 nc                   | 2.19E+06 nc                         | 8.76E+05 nc                    | --    |  |                  |
| 1,4-DICHLOROBENZENE                   | 106467     | 2.46E+02                                                         | 2.21E+01                      | 2.79E+03                            | 1.11E+03                       |                                                                        |                                                                         | 9.60E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 2.46E+02 ca                           | 2.21E+01 ca                   | 2.79E+03 ca                         | 1.11E+03 ca                    | --    |  |                  |
| 1,4-DIOXANE                           | 123911     | 3.51E+02                                                         | 3.16E+01                      | 3.98E+03                            | 1.59E+03                       |                                                                        |                                                                         | 8.00E+00                   | TO-15                    | Yes                                                          | Yes                                                              | 3.51E+02 ca                           | 3.16E+01 ca                   | 3.98E+03 ca                         | 1.59E+03 ca                    | --    |  |                  |
| 2-BUTANONE                            | 78933      | 5.79E+06                                                         | 5.21E+05                      | 5.48E+07                            | 2.19E+07                       |                                                                        |                                                                         | 4.64E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 5.79E+06 nc                           | 5.21E+05 nc                   | 5.48E+07 nc                         | 2.19E+07 nc                    | --    |  |                  |
| 2-HEXANONE                            | 591786     | 3.48E+04                                                         | 3.13E+03                      | 3.29E+05                            | 1.31E+05                       |                                                                        |                                                                         | 3.20E+00                   | TO-15                    | Yes                                                          | Yes                                                              | 3.48E+04 nc                           | 3.13E+03 nc                   | 3.29E+05 nc                         | 1.31E+05 nc                    | --    |  |                  |
| 4-METHYL-2-PENTANONE                  | 108101     | 3.48E+06                                                         | 3.13E+05                      | 3.29E+07                            | 1.31E+07                       |                                                                        |                                                                         | 6.56E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 3.48E+06 nc                           | 3.13E+05 nc                   | 3.29E+07 nc                         | 1.31E+07 nc                    | --    |  |                  |
| ACETONE                               | 67641      | 3.59E+07                                                         | 3.23E+06                      | 3.39E+08                            | 1.36E+08                       |                                                                        |                                                                         | 1.92E+00                   | TO-15                    | Yes                                                          | Yes                                                              | 3.59E+07 nc                           | 3.23E+06 nc                   | 3.39E+08 nc                         | 1.36E+08 nc                    | --    |  |                  |
| BENZALDEHYDE                          | 100527     | 4.06E+05                                                         | 3.65E+04                      | 3.83E+06                            | 1.53E+06                       |                                                                        | X                                                                       | NE                         | --                       | --                                                           | --                                                               | NE --                                 | NE --                         | NE --                               | NE --                          | --    |  |                  |
| BENZENE                               | 71432      | 9.32E+01                                                         | 8.39E+00                      | 1.06E+03                            | 4.23E+02                       |                                                                        |                                                                         | 2.56E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 9.32E+01 ca                           | 8.39E+00 ca                   | 1.06E+03 ca                         | 4.23E+02 ca                    | 1A    |  |                  |
| BROMODICHLOROMETHANE                  | 75274      | 7.31E+01                                                         | 6.58E+00                      | 8.29E+02                            | 3.31E+02                       |                                                                        |                                                                         | 1.07E+00                   | TO-15                    | Yes                                                          | Yes                                                              | 7.31E+01 ca                           | 6.58E+00 ca                   | 8.29E+02 ca                         | 3.31E+02 ca                    | --    |  |                  |
| BROMOFORM                             | 75252      | 2.46E+03                                                         | 2.21E+02                      | 2.79E+04                            | 1.11E+04                       |                                                                        |                                                                         | 1.60E+00                   | TO-15                    | Yes                                                          | Yes                                                              | 2.46E+03 ca                           | 2.21E+02 ca                   | 2.79E+04 ca                         | 1.11E+04 ca                    | --    |  |                  |
| BROMOMETHANE                          | 74839      | 5.79E+03                                                         | 5.21E+02                      | 5.48E+04                            | 2.19E+04                       |                                                                        |                                                                         | 6.24E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 5.79E+03 nc                           | 5.21E+02 nc                   | 5.48E+04 nc                         | 2.19E+04 nc                    | --    |  |                  |
| CARBON DISULFIDE                      | 75150      | 8.11E+05                                                         | 7.30E+04                      | 7.67E+06                            | 3.07E+06                       |                                                                        |                                                                         | 2.56E+00                   | TO-15                    | Yes                                                          | Yes                                                              | 8.11E+05 nc                           | 7.30E+04 nc                   | 7.67E+06 nc                         | 3.07E+06 nc                    | --    |  |                  |
| CARBON TETRACHLORIDE                  | 56235      | 6.44E+01                                                         | 5.79E+00                      | 7.30E+02                            | 2.92E+02                       |                                                                        |                                                                         | 1.01E+00                   | TO-15                    | Yes                                                          | Yes                                                              | 6.44E+01 ca                           | 5.79E+00 ca                   | 7.30E+02 ca                         | 2.92E+02 ca                    | 1A, 2 |  |                  |
| CHLOROBENZENE                         | 108907     | 5.79E+04                                                         | 5.21E+03                      | 5.48E+05                            | 2.19E+05                       |                                                                        |                                                                         | 7.36E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 5.79E+04 nc                           | 5.21E+03 nc                   | 5.48E+05 nc                         | 2.19E+05 nc                    | --    |  |                  |
| CHLOROETHANE                          | 75003      | 1.16E+07                                                         | 1.04E+06                      | 1.10E+08                            | 4.38E+07                       |                                                                        |                                                                         | 4.16E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 1.16E+07 nc                           | 1.04E+06 nc                   | 1.10E+08 nc                         | 4.38E+07 nc                    | --    |  |                  |
| CHLOROFORM                            | 67663      | 1.18E+02                                                         | 1.06E+01                      | 1.33E+03                            | 5.33E+02                       |                                                                        |                                                                         | 7.84E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 1.18E+02 ca                           | 1.06E+01 ca                   | 1.33E+03 ca                         | 5.33E+02 ca                    | --    |  |                  |
| CHLOROMETHANE                         | 74873      | 1.04E+05                                                         | 9.39E+03                      | 9.86E+05                            | 3.94E+05                       |                                                                        |                                                                         | 3.36E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 1.04E+05 nc                           | 9.39E+03 nc                   | 9.86E+05 nc                         | 3.94E+05 nc                    | --    |  |                  |
| CIS-1,2-DICHLOROETHENE                | 156592     | 8.11E+03                                                         | 7.30E+02                      | 7.67E+04                            | 3.07E+04                       |                                                                        | X                                                                       | 1.26E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 8.11E+03 nc                           | 7.30E+02 nc                   | 7.67E+04 nc                         | 3.07E+04 nc                    | 2     |  |                  |
| CIS-1,3-DICHLOROPROPENE               | 10061015   | 1.69E+02                                                         | 1.52E+01                      | 1.92E+03                            | 7.67E+02                       | X                                                                      |                                                                         | 7.20E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 1.69E+02 ca                           | 1.52E+01 ca                   | 1.92E+03 ca                         | 7.67E+02 ca                    | 1A    |  |                  |
| CYCLOHEXANE                           | 110827     | 6.95E+06                                                         | 6.26E+05                      | 6.57E+07                            | 2.63E+07                       |                                                                        |                                                                         | 5.44E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 6.95E+06 nc                           | 6.26E+05 nc                   | 6.57E+07 nc                         | 2.63E+07 nc                    | --    |  |                  |
| DIBROMOCHLOROMETHANE                  | 124481     | 1.00E+02                                                         | 9.01E+00                      | 1.14E+03                            | 4.54E+02                       |                                                                        |                                                                         | 1.36E+00                   | TO-15                    | Yes                                                          | Yes                                                              | 1.00E+02 ca                           | 9.01E+00 ca                   | 1.14E+03 ca                         | 4.54E+02 ca                    | --    |  |                  |
| DICHLORODIFLUOROMETHANE               | 75718      | 1.16E+05                                                         | 1.04E+04                      | 1.10E+06                            | 4.38E+05                       |                                                                        |                                                                         | 7.84E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 1.16E+05 nc                           | 1.04E+04 nc                   | 1.10E+06 nc                         | 4.38E+05 nc                    | 2     |  |                  |
| ETHYLBENZENE                          | 100414     | 1.08E+03                                                         | 9.73E+01                      | 1.23E+04                            | 4.91E+03                       |                                                                        |                                                                         | 1.39E-01                   | TO-15                    | Yes                                                          | Yes                                                              | 1.08E+03 ca                           | 9.73E+01 ca                   | 1.23E+04 ca                         | 4.91E+03 ca                    | --    |  |                  |
| HEXACHLOROETHANE                      | 67721      | 2.46E+02                                                         | 2.21E+01                      | 2.79E+03                            | 1.11E+03                       |                                                                        |                                                                         | 1.60E+00                   | TO-13A                   | Yes                                                          | Yes                                                              | 2.46E+02 ca                           | 2.21E+01 ca                   | 2.79E+03 ca                         | 1.11E+03 ca                    | 1A, 2 |  |                  |

TABLE 7: PRELIMINARY SOIL GAS ACTION LEVELS  
Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Naval Shipyard

| Chemical                  | CAS Number     | Soil Gas RBC<br>(Lowest between Cancer- and Noncancer-Based RBC) |                             |                                   |                              | Soil Gas RBC<br>Based on<br>Surrogate<br>Chemical for<br>Toxicity Data | Soil Gas RBC<br>Based on Oral<br>Route<br>Extrapolated<br>Toxicity Data | Laboratory Reporting Limit |                          | Reporting Limit Less Than Soil Gas<br>RBC?                          |                                                              | Preliminary Soil Gas Action Level (c) |                             |                                   |                              |          |    | Revision<br>Code |    |    |
|---------------------------|----------------|------------------------------------------------------------------|-----------------------------|-----------------------------------|------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------|--------------------------|---------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------|-----------------------------|-----------------------------------|------------------------------|----------|----|------------------|----|----|
|                           |                | Residential                                                      |                             | Industrial                        |                              |                                                                        |                                                                         |                            |                          | Cal/EPA<br>Res $\alpha_{sg} = 0.0009$<br>Ind $\alpha_{sg} = 0.0004$ | EPA<br>Res $\alpha_{sg} = 0.01$<br>Ind $\alpha_{sg} = 0.001$ | Residential                           |                             | Industrial                        |                              |          |    |                  |    |    |
|                           |                | Cal/EPA<br>$\alpha_{sg} = 0.0009$                                | EPA<br>$\alpha_{sg} = 0.01$ | Cal/EPA<br>$\alpha_{sg} = 0.0004$ | EPA<br>$\alpha_{sg} = 0.001$ |                                                                        |                                                                         | Concentration<br>(a)       | Analytical<br>Method (b) |                                                                     |                                                              | Cal/EPA<br>$\alpha_{sg} = 0.0009$     | EPA<br>$\alpha_{sg} = 0.01$ | Cal/EPA<br>$\alpha_{sg} = 0.0004$ | EPA<br>$\alpha_{sg} = 0.001$ |          |    |                  |    |    |
| ISOPROPYLBENZENE          | 98828          | 4.63E+05                                                         | 4.17E+04                    | 4.38E+06                          | 1.75E+06                     |                                                                        |                                                                         | NA - NS                    | TO-15 (NS)               | ND                                                                  | ND                                                           | ND                                    | --                          | ND                                | --                           | ND       | -- | --               |    |    |
| M,P-XYLENES               | 108383, 106423 | 1.16E+05                                                         | 1.04E+04                    | 1.10E+06                          | 4.38E+05                     | X                                                                      |                                                                         | 2.72E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 1.16E+05                              | nc                          | 1.04E+04                          | nc                           | 1.10E+06 | nc | 4.38E+05         | nc | 1B |
| METHYL ACETATE            | 79209          | 4.06E+06                                                         | 3.65E+05                    | 3.83E+07                          | 1.53E+07                     |                                                                        | X                                                                       | NA - NS                    | TO-15 (NS)               | ND                                                                  | ND                                                           | ND                                    | --                          | ND                                | --                           | ND       | -- | ND               | -- | -- |
| METHYLCYCLOHEXANE         | 108872         | 6.95E+06                                                         | 6.26E+05                    | 6.57E+07                          | 2.63E+07                     | X                                                                      |                                                                         | 3.20E+00                   | TO-15                    | Yes                                                                 | Yes                                                          | 6.95E+06                              | nc                          | 6.26E+05                          | nc                           | 6.57E+07 | nc | 2.63E+07         | nc | -- |
| METHYLENE CHLORIDE        | 75092          | 2.70E+03                                                         | 2.43E+02                    | 3.07E+04                          | 1.23E+04                     |                                                                        |                                                                         | 1.10E+00                   | TO-15                    | Yes                                                                 | Yes                                                          | 2.70E+03                              | ca                          | 2.43E+02                          | ca                           | 3.07E+04 | ca | 1.23E+04         | ca | 1A |
| N-BUTYLBENZENE            | 104518         | 2.03E+05                                                         | 1.83E+04                    | 1.92E+06                          | 7.67E+05                     |                                                                        | X                                                                       | 4.32E+00                   | TO-15                    | Yes                                                                 | Yes                                                          | 2.03E+05                              | nc                          | 1.83E+04                          | nc                           | 1.92E+06 | nc | 7.67E+05         | nc | 2  |
| O-XYLENE                  | 95476          | 1.16E+05                                                         | 1.04E+04                    | 1.10E+06                          | 4.38E+05                     | X                                                                      |                                                                         | 1.39E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 1.16E+05                              | nc                          | 1.04E+04                          | nc                           | 1.10E+06 | nc | 4.38E+05         | nc | 1B |
| PARA-ISOPROPYL TOLUENE    | 99876          | 4.63E+05                                                         | 4.17E+04                    | 4.38E+06                          | 1.75E+06                     | X                                                                      |                                                                         | NE                         | --                       | --                                                                  | --                                                           | NE                                    | --                          | NE                                | --                           | NE       | -- | NE               | -- | -- |
| PROPYLBENZENE             | 103651         | 1.16E+06                                                         | 1.04E+05                    | 1.10E+07                          | 4.38E+06                     |                                                                        |                                                                         | 7.84E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 1.16E+06                              | nc                          | 1.04E+05                          | nc                           | 1.10E+07 | nc | 4.38E+06         | nc | -- |
| SEC-BUTYLBENZENE          | 135988         | 4.63E+05                                                         | 4.17E+04                    | 4.38E+06                          | 1.75E+06                     | X                                                                      |                                                                         | NA - NS                    | TO-15 (NS)               | ND                                                                  | ND                                                           | ND                                    | --                          | ND                                | --                           | ND       | -- | ND               | -- | -- |
| STYRENE                   | 100425         | 1.16E+06                                                         | 1.04E+05                    | 1.10E+07                          | 4.38E+06                     |                                                                        |                                                                         | 6.72E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 1.16E+06                              | nc                          | 1.04E+05                          | nc                           | 1.10E+07 | nc | 4.38E+06         | nc | -- |
| TERT-BUTYL METHYL ETHER   | 1634044        | 1.04E+04                                                         | 9.36E+02                    | 1.18E+05                          | 4.72E+04                     |                                                                        |                                                                         | NE                         | --                       | --                                                                  | --                                                           | NE                                    | --                          | NE                                | --                           | NE       | -- | NE               | -- | -- |
| TERT-BUTYLBENZENE         | 98066          | 4.63E+05                                                         | 4.17E+04                    | 4.38E+06                          | 1.75E+06                     | X                                                                      |                                                                         | NA - NS                    | TO-15 (NS)               | ND                                                                  | ND                                                           | ND                                    | --                          | ND                                | --                           | ND       | -- | ND               | -- | -- |
| TETRACHLOROETHENE         | 127184         | 4.58E+02                                                         | 4.12E+01                    | 5.20E+03                          | 2.08E+03                     |                                                                        |                                                                         | 2.24E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 4.58E+02                              | ca                          | 4.12E+01                          | ca                           | 5.20E+03 | ca | 2.08E+03         | ca | -- |
| TOLUENE                   | 108883         | 5.79E+06                                                         | 5.21E+05                    | 5.48E+07                          | 2.19E+07                     |                                                                        |                                                                         | 1.20E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 5.79E+06                              | nc                          | 5.21E+05                          | nc                           | 5.48E+07 | nc | 2.19E+07         | nc | -- |
| TRANS-1,2-DICHLOROETHENE  | 156605         | 6.95E+04                                                         | 6.26E+03                    | 6.57E+05                          | 2.63E+05                     |                                                                        |                                                                         | 6.40E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 6.95E+04                              | nc                          | 6.26E+03                          | nc                           | 6.57E+05 | nc | 2.63E+05         | nc | -- |
| TRANS-1,3-DICHLOROPROPENE | 10061026       | 1.69E+02                                                         | 1.52E+01                    | 1.92E+03                          | 7.67E+02                     | X                                                                      |                                                                         | 7.20E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 1.69E+02                              | ca                          | 1.52E+01                          | ca                           | 1.92E+03 | ca | 7.67E+02         | ca | 1A |
| TRICHLOROETHENE           | 79016          | 6.59E+02                                                         | 5.93E+01                    | 7.48E+03                          | 2.99E+03                     |                                                                        |                                                                         | 1.76E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 6.59E+02                              | ca                          | 5.93E+01                          | ca                           | 7.48E+03 | ca | 2.99E+03         | ca | 2  |
| TRICHLOROFLUOROMETHANE    | 75694          | 8.11E+05                                                         | 7.30E+04                    | 7.67E+06                          | 3.07E+06                     |                                                                        |                                                                         | 8.96E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 8.11E+05                              | nc                          | 7.30E+04                          | nc                           | 7.67E+06 | nc | 3.07E+06         | nc | -- |
| VINYL ACETATE             | 108054         | 2.32E+05                                                         | 2.09E+04                    | 2.19E+06                          | 8.76E+05                     |                                                                        |                                                                         | 2.88E+00                   | TO-15                    | Yes                                                                 | Yes                                                          | 2.32E+05                              | nc                          | 2.09E+04                          | nc                           | 2.19E+06 | nc | 8.76E+05         | nc | -- |
| VINYL CHLORIDE            | 75014          | 3.47E+01                                                         | 3.12E+00                    | 3.93E+02                          | 1.57E+02                     |                                                                        |                                                                         | 4.16E-02                   | TO-15                    | Yes                                                                 | Yes                                                          | 3.47E+01                              | ca                          | 3.12E+00                          | ca                           | 3.93E+02 | ca | 1.57E+02         | ca | 1A |
| XYLENE (TOTAL)            | 1330207        | 1.16E+05                                                         | 1.04E+04                    | 1.10E+06                          | 4.38E+05                     |                                                                        |                                                                         | 2.57E-01                   | TO-15                    | Yes                                                                 | Yes                                                          | 1.16E+05                              | nc                          | 1.04E+04                          | nc                           | 1.10E+06 | nc | 4.38E+05         | nc | -- |

**Notes:**  
All concentrations are in microgram per cubic meter.

a Reporting limits were adjusted by a factor of 1.6 to account for dilution from pressurization of a 6-liter Summa canister

b The analytical methods listed are a few among several possible methods for soil gas analysis; final analytical methods will be identified in the sampling and analysis plan.

c The preliminary SGAL is based on the lowest concentration between the cancer- and noncancer-based soil gas RBC. If the soil gas RBC is less than the laboratory RL, then the laboratory RL is used as the SGAL.

|               |                                            |     |                                                                   |      |                          |
|---------------|--------------------------------------------|-----|-------------------------------------------------------------------|------|--------------------------|
| --            | Not applicable                             | DDE | Dichlorodiphenyldichloroethene                                    | NS   | Non-standard analysis    |
| $\alpha_{sg}$ | Soil gas-to-indoor air attenuation factor  | EPA | U.S. Environmental Protection Agency                              | RBC  | Risk-based concentration |
| >Res          | Exceeds residential soil gas RBC           | Ind | Industrial                                                        | Res  | Residential              |
| BHC           | Benzene hexachloride                       | NA  | Not available                                                     | RL   | Reporting limit          |
| ca            | Cancer risk                                | nc  | Noncancer effects                                                 | SGAL | Soil gas action level    |
| Cal/EPA       | California Environmental Protection Agency | ND  | Not determined                                                    |      |                          |
| CAS           | Chemical Abstract Service                  | NE  | Not evaluated; analysis not available for analytical method shown |      |                          |

| Revision 1, Final Technical Memorandum |                                                      |
|----------------------------------------|------------------------------------------------------|
| Revision Code                          | Description                                          |
| 1A                                     | Correction to most conservative inhalation unit risk |
| 1B                                     | Correction to higher-tier reference concentration    |
| 2                                      | New toxicity value available                         |
| --                                     | No change                                            |



Table A-1. Surface Water Screening Criteria  
Feasibility Study Report for Parcel E, Hunters Point Shipyard

| Analyte Monitored Under Hunters Point Shipyard Groundwater Program | San Francisco Bay Basin Plan <sup>a</sup> (µg/L) |           | California Toxics Rule Criteria for Enclosed Bays and Estuaries <sup>a</sup> (µg/L) |               |                    |                                   |           |                       |                                   |           |               | National Recommended Water Quality Criteria <sup>k</sup> (µg/L) |               |                                   |             |               | National Ambient Water Quality Criteria (AWQC) for Protection of Saltwater Aquatic Life <sup>i</sup> (µg/L) |               |                                   |           |               |                    |          |           |    |        | Other Criteria (footnotes indicate source) (µg/L) |  | Surface Water Criteria Selected for Aquatic Evaluation (µg/L) |
|--------------------------------------------------------------------|--------------------------------------------------|-----------|-------------------------------------------------------------------------------------|---------------|--------------------|-----------------------------------|-----------|-----------------------|-----------------------------------|-----------|---------------|-----------------------------------------------------------------|---------------|-----------------------------------|-------------|---------------|-------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------|-----------|---------------|--------------------|----------|-----------|----|--------|---------------------------------------------------|--|---------------------------------------------------------------|
|                                                                    |                                                  |           |                                                                                     |               |                    |                                   |           |                       |                                   |           |               | Saltwater Aquatic Life                                          |               |                                   |             |               | Lowest Observed Effect Level (LOEL)                                                                         |               |                                   |           |               |                    |          |           |    |        |                                                   |  |                                                               |
|                                                                    |                                                  |           | Chronic <sup>g</sup>                                                                |               | Acute <sup>g</sup> |                                   |           | Instantaneous Maximum |                                   |           |               | Chronic <sup>g</sup>                                            |               | Acute <sup>g</sup>                |             |               | Chronic <sup>h</sup>                                                                                        |               | Acute <sup>i</sup>                |           |               | Other <sup>i</sup> |          |           |    |        |                                                   |  |                                                               |
|                                                                    | Concentration                                    | Footnotes | Concentration                                                                       | Footnotes     | Concentration      | 20% of Concentration <sup>f</sup> | Footnotes | Concentration         | 10% of Concentration <sup>f</sup> | Footnotes | Concentration | Footnotes                                                       | Concentration | 20% of Concentration <sup>f</sup> | Footnotes   | Concentration | Footnotes                                                                                                   | Concentration | 20% of Concentration <sup>f</sup> | Footnotes | Concentration | Footnotes          | Other    | Footnotes |    |        |                                                   |  |                                                               |
| 1,1,1-Trichloroethane                                              | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 31,200        | 6,240                             | --        | --            | --                 | --       | --        | -- | 6,240  |                                                   |  |                                                               |
| 1,1,2,2-Tetrachloroethane                                          | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 9,020         | 1,804                             | --        | --            | --                 | --       | --        | -- | 1,804  |                                                   |  |                                                               |
| 1,1-Dichloroethene                                                 | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 224,000       | 44,800                            | (27)      | --            | --                 | --       | --        | -- | 44,800 |                                                   |  |                                                               |
| 1,2,4,5-Tetrachlorobenzene                                         | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | 129           | (22)                                                                                                        | 160           | --                                | (22)      | --            | --                 | --       | --        | -- | 129    |                                                   |  |                                                               |
| 1,2,4-Trichlorobenzene                                             | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | 129           | (22)                                                                                                        | 160           | --                                | (22)      | --            | --                 | --       | --        | -- | 129    |                                                   |  |                                                               |
| 1,2-Dichlorobenzene                                                | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | 129           | (22)                                                                                                        | 1,970         | --                                | (24)      | --            | --                 | --       | --        | -- | 129    |                                                   |  |                                                               |
| 1,2-Dichloroethane                                                 | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 113,000       | 22,600                            | --        | --            | --                 | --       | --        | -- | 22,600 |                                                   |  |                                                               |
| 1,2-Dichloroethene (total)                                         | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 224,000       | 44,800                            | (27)      | --            | --                 | --       | --        | -- | 44,800 |                                                   |  |                                                               |
| 1,2-Dichloropropane                                                | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | 3,040         | (28)                                                                                                        | 10,300        | --                                | (28)      | --            | --                 | --       | --        | -- | 3,040  |                                                   |  |                                                               |
| 1,3-Dichlorobenzene                                                | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | 129           | (22)                                                                                                        | 1,970         | --                                | (24)      | --            | --                 | --       | --        | -- | 129    |                                                   |  |                                                               |
| 1,3-Dichloropropene (total)                                        | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 790           | 158                               | (29)      | --            | --                 | --       | --        | -- | 158    |                                                   |  |                                                               |
| 1,4-Dichlorobenzene                                                | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | 129           | (22)                                                                                                        | 1,970         | --                                | (24)      | --            | --                 | --       | --        | -- | 129    |                                                   |  |                                                               |
| 2,4-Dinitrophenol                                                  | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 4,850         | 970                               | (88)      | --            | --                 | --       | --        | -- | 970    |                                                   |  |                                                               |
| 2,4-Dinitrotoluene                                                 | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 590           | 118                               | (53)      | 370           | (53, 82)           | --       | --        | -- | 118    |                                                   |  |                                                               |
| 2,6-Dinitrotoluene                                                 | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 590           | 118                               | (53)      | 370           | (53, 82)           | --       | --        | -- | 118    |                                                   |  |                                                               |
| 2-Chloronaphthalene                                                | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 7.5           | 1.5                               | (48)      | --            | --                 | --       | --        | -- | 1.5    |                                                   |  |                                                               |
| 2-Nitrophenol                                                      | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 4,850         | 970                               | (88)      | --            | --                 | --       | --        | -- | 970    |                                                   |  |                                                               |
| 4,4'-DDD                                                           | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | 0.001         | (114,172)                                                       | --            | --                                | --          | --            | --                                                                                                          | 3.6           | 0.72                              | --        | --            | --                 | --       | --        | -- | 0.001  |                                                   |  |                                                               |
| 4,4'-DDE                                                           | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | 0.001         | (114,172)                                                       | --            | --                                | --          | --            | --                                                                                                          | 14            | 2.8                               | --        | --            | --                 | --       | --        | -- | 0.001  |                                                   |  |                                                               |
| 4,4'-DDT                                                           | --                                               | --        | 0.001                                                                               | (114)         | --                 | --                                | --        | 0.13                  | --                                | --        | 0.001         | aa,ii,(114, 17                                                  | 0.13          | --                                | G,ii        | --            | --                                                                                                          | --            | --                                | --        | --            | --                 | --       | --        | -- | 0.001  |                                                   |  |                                                               |
| 4,6-Dinitro-2-methylpheno                                          | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 4,850         | 970                               | (88)      | --            | --                 | --       | --        | -- | 970    |                                                   |  |                                                               |
| 4-Amino-2,6-dinitrotoluene                                         | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 590           | 118                               | --        | 370           | (82)               | --       | --        | -- | 118    |                                                   |  |                                                               |
| 4-Nitrophenol                                                      | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 4,850         | 970                               | (88)      | --            | --                 | --       | --        | -- | 970    |                                                   |  |                                                               |
| Acenaphthene                                                       | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | 710           | --                                                                                                          | 970           | --                                | --        | --            | --                 | --       | --        | -- | 710    |                                                   |  |                                                               |
| Acenaphthylene                                                     | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 300           | 60                                | (52)      | --            | --                 | --       | --        | -- | 60     |                                                   |  |                                                               |
| Aldrin                                                             | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | 1.3                   | --                                | II        | --            | --                                                              | 1.3           | 0.26                              | G           | --            | --                                                                                                          | --            | --                                | --        | --            | --                 | --       | --        | -- | 0.26   |                                                   |  |                                                               |
| Alpha-chlordane                                                    | --                                               | --        | 0.004                                                                               | (114)         | --                 | --                                | --        | 0.09                  | --                                | --        | 0.004         | G,aa,o                                                          | 0.09          | --                                | G,o         | --            | --                                                                                                          | --            | --                                | --        | --            | --                 | --       | --        | -- | 0.004  |                                                   |  |                                                               |
| Ammonia (un-ionized)                                               | 25                                               | s         | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | 35            | (112)                                                           | 223           | --                                | (112)       | --            | --                                                                                                          | --            | --                                | --        | --            | --                 | 400      | t         | -- | 25     |                                                   |  |                                                               |
| Anthracene                                                         | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 300           | 60                                | (52)      | --            | --                 | --       | --        | -- | 60     |                                                   |  |                                                               |
| Aroclor-1016                                                       | --                                               | --        | 0.03                                                                                | (114, 116) rr | --                 | --                                | --        | --                    | --                                | --        | 0.03          | (114,173)                                                       | --            | --                                | --          | --            | --                                                                                                          | 10            | 2                                 | --        | --            | --                 | --       | --        | -- | 0.03   |                                                   |  |                                                               |
| Aroclor-1221                                                       | --                                               | --        | 0.03                                                                                | (114, 116) rr | --                 | --                                | --        | --                    | --                                | --        | 0.03          | (114,173)                                                       | --            | --                                | --          | --            | --                                                                                                          | 10            | 2                                 | --        | --            | --                 | --       | --        | -- | 0.03   |                                                   |  |                                                               |
| Aroclor-1232                                                       | --                                               | --        | 0.03                                                                                | (114, 116) rr | --                 | --                                | --        | --                    | --                                | --        | 0.03          | (114,173)                                                       | --            | --                                | --          | --            | --                                                                                                          | 10            | 2                                 | --        | --            | --                 | --       | --        | -- | 0.03   |                                                   |  |                                                               |
| Aroclor-1242                                                       | --                                               | --        | 0.03                                                                                | (114, 116) rr | --                 | --                                | --        | --                    | --                                | --        | 0.03          | (114,173)                                                       | --            | --                                | --          | --            | --                                                                                                          | 10            | 2                                 | --        | --            | --                 | --       | --        | -- | 0.03   |                                                   |  |                                                               |
| Aroclor-1248                                                       | --                                               | --        | 0.03                                                                                | (114, 116) rr | --                 | --                                | --        | --                    | --                                | --        | 0.03          | (114,173)                                                       | --            | --                                | --          | --            | --                                                                                                          | 10            | 2                                 | --        | --            | --                 | --       | --        | -- | 0.03   |                                                   |  |                                                               |
| Aroclor-1254                                                       | --                                               | --        | 0.03                                                                                | (114, 116) rr | --                 | --                                | --        | --                    | --                                | --        | 0.03          | (114,173)                                                       | --            | --                                | --          | --            | --                                                                                                          | 10            | 2                                 | --        | --            | --                 | --       | --        | -- | 0.03   |                                                   |  |                                                               |
| Aroclor-1260                                                       | --                                               | --        | 0.03                                                                                | (114, 116) rr | --                 | --                                | --        | --                    | --                                | --        | 0.03          | (114,173)                                                       | --            | --                                | --          | --            | --                                                                                                          | 10            | 2                                 | --        | --            | --                 | --       | --        | -- | 0.03   |                                                   |  |                                                               |
| Arsenic                                                            | 36                                               | b         | 36                                                                                  | (142, 1) oo   | 69                 | --                                | oo        | --                    | --                                | --        | 36            | (1) A,D,bb                                                      | 69            | --                                | (1) A,D,bb  | --            | --                                                                                                          | --            | --                                | --        | --            | --                 | --       | --        | -- | 36     |                                                   |  |                                                               |
| Atrazine                                                           | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | 17            | r,(68, 179)                                                     | 760           | --                                | r,(68, 179) | --            | --                                                                                                          | --            | --                                | --        | --            | --                 | --       | --        | -- | 17     |                                                   |  |                                                               |
| Benzone                                                            | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 5,100         | 1,020                             | --        | 700           | (83)               | --       | --        | -- | 700    |                                                   |  |                                                               |
| Benzo(a)anthracene                                                 | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 300           | 60                                | (52)      | --            | --                 | --       | --        | -- | 60     |                                                   |  |                                                               |
| Benzo(a)pyrene                                                     | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 300           | 60                                | (52)      | --            | --                 | --       | --        | -- | 60     |                                                   |  |                                                               |
| Benzo(b)fluoranthene                                               | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 300           | 60                                | (52)      | --            | --                 | --       | --        | -- | 60     |                                                   |  |                                                               |
| Benzo(g,h,i)perylene                                               | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 300           | 60                                | (52)      | --            | --                 | --       | --        | -- | 60     |                                                   |  |                                                               |
| Benzo(k)fluoranthene                                               | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | --            | --                                                                                                          | 300           | 60                                | (52)      | --            | --                 | --       | --        | -- | 60     |                                                   |  |                                                               |
| Bromochloromethane                                                 | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | 6,400         | (20)                                                                                                        | 12,000        | --                                | (20)      | --            | --                 | --       | --        | -- | 6,400  |                                                   |  |                                                               |
| Bromodichloromethane                                               | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | 6,400         | (20)                                                                                                        | 12,000        | --                                | (20)      | --            | --                 | --       | --        | -- | 6,400  |                                                   |  |                                                               |
| Bromoform                                                          | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        | --            | --                                                              | --            | --                                | --          | 6,400         | (20)                                                                                                        | 12,000        | --                                | (20)      | --            | --                 | (20, 82) | --        | -- | 6,400  |                                                   |  |                                                               |
| Bromomethane                                                       | --                                               | --        | --                                                                                  | --            | --                 | --                                | --        | --                    | --                                | --        |               |                                                                 |               |                                   |             |               |                                                                                                             |               |                                   |           |               |                    |          |           |    |        |                                                   |  |                                                               |

Table A-1. Surface Water Screening Criteria (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard

| Analyte Monitored Under<br>Hunters Point Shipyard<br>Groundwater Program | San Francisco Bay<br>Basin Plan <sup>a</sup> (µg/L) |           | California Toxics Rule Criteria for Enclosed Bays and Estuaries <sup>e</sup> (µg/L) |              |                    |                                      |              |                       |                                      |           |                      | National Recommended Water Quality Criteria <sup>k</sup> (µg/L) |                    |                                      |               |                      | National Ambient Water Quality Criteria (AWQC) for Protection of Saltwater Aquatic Life <sup>i</sup> (µg/L) |                    |                                      |           |                    |           |                |           |                |  | Other Criteria (footnotes<br>indicate source) (µg/L) |  | Surface Water<br>Criteria Selected<br>for Aquatic<br>Evaluation<br>(µg/L) |
|--------------------------------------------------------------------------|-----------------------------------------------------|-----------|-------------------------------------------------------------------------------------|--------------|--------------------|--------------------------------------|--------------|-----------------------|--------------------------------------|-----------|----------------------|-----------------------------------------------------------------|--------------------|--------------------------------------|---------------|----------------------|-------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------|-----------|--------------------|-----------|----------------|-----------|----------------|--|------------------------------------------------------|--|---------------------------------------------------------------------------|
|                                                                          |                                                     |           |                                                                                     |              |                    |                                      |              |                       |                                      |           |                      | Saltwater Aquatic Life                                          |                    |                                      |               |                      | Lowest Observed Effect Level (LOEL)                                                                         |                    |                                      |           |                    |           |                |           |                |  |                                                      |  |                                                                           |
|                                                                          |                                                     |           | Chronic <sup>g</sup>                                                                |              | Acute <sup>g</sup> |                                      |              | Instantaneous Maximum |                                      |           | Chronic <sup>g</sup> |                                                                 | Acute <sup>g</sup> |                                      |               | Chronic <sup>h</sup> |                                                                                                             | Acute <sup>i</sup> |                                      |           | Other <sup>i</sup> |           |                |           |                |  |                                                      |  |                                                                           |
|                                                                          | Concentration                                       | Footnotes | Concentration                                                                       | Footnotes    | Concentration      | 20% of<br>Concentration <sup>f</sup> | Footnotes    | Concentration         | 10% of<br>Concentration <sup>f</sup> | Footnotes | Concentration        | Footnotes                                                       | Concentration      | 20% of<br>Concentration <sup>f</sup> | Footnotes     | Concentration        | Footnotes                                                                                                   | Concentration      | 20% of<br>Concentration <sup>f</sup> | Footnotes | Concentration      | Footnotes | Other          | Footnotes |                |  |                                                      |  |                                                                           |
| Fluorene                                                                 | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 300                | 60                                   | (52)      | --                 | --        | --             | --        | 60             |  |                                                      |  |                                                                           |
| Gamma-BHC (lindane)                                                      | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | 0.16                  | 0.016                                | II        | --                   | --                                                              | 0.16               | 0.032                                | G             | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 0.032          |  |                                                      |  |                                                                           |
| Gamma-chlordane                                                          | --                                                  | --        | 0.004                                                                               | (114)        | --                 | --                                   | --           | 0.09                  | 0.009                                | --        | 0.004                | G,aa,o                                                          | 0.09               | --                                   | G,o           | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 0.004          |  |                                                      |  |                                                                           |
| Heptachlor                                                               | --                                                  | --        | 0.0036                                                                              | (114)        | II                 | --                                   | --           | 0.053                 | 0.005                                | II        | 0.0036               | (114) G,aa                                                      | --                 | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 0.0036         |  |                                                      |  |                                                                           |
| Heptachlor epoxide                                                       | --                                                  | --        | 0.0036                                                                              | (114)        | II                 | --                                   | --           | 0.053                 | 0.005                                | II        | 0.0036               | (114) G,V,aa                                                    | --                 | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 0.0036         |  |                                                      |  |                                                                           |
| Hexachlorobenzene                                                        | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | 129                  | (22)                                                                                                        | 160                | --                                   | (22)      | --                 | --        | --             | --        | 129            |  |                                                      |  |                                                                           |
| Hexachlorobutadiene                                                      | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 32                 | 6.4                                  | --        | --                 | --        | --             | --        | 6.4            |  |                                                      |  |                                                                           |
| Hexachlorocyclopentadiene                                                | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 7.0                | 1.4                                  | --        | --                 | --        | --             | --        | 1.4            |  |                                                      |  |                                                                           |
| Hexachloroethane                                                         | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 940                | 188                                  | --        | --                 | --        | --             | --        | 188            |  |                                                      |  |                                                                           |
| Indeno(1,2,3-cd)pyrene                                                   | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 300                | 60                                   | (52)      | --                 | --        | --             | --        | 60             |  |                                                      |  |                                                                           |
| Isophorone                                                               | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 12,900             | 2,580                                | --        | --                 | --        | --             | --        | 2,580          |  |                                                      |  |                                                                           |
| Lead                                                                     | 8.1                                                 | b         | 8.1                                                                                 | (1, 142), m  | 210                | --                                   | (1, 142), m  | --                    | --                                   | --        | 8.1                  | (1) D,bb                                                        | 210                | --                                   | (1) D,bb      | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 8.1            |  |                                                      |  |                                                                           |
| Mercury                                                                  | 0.025                                               | b         | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | 0.94                 | D,ee,hh                                                         | 1.8                | --                                   | D,ee,hh       | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 0.025          |  |                                                      |  |                                                                           |
| Methoxychlor                                                             | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | 0.03                 | F                                                               | --                 | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 0.03           |  |                                                      |  |                                                                           |
| Methyl-tert-butyl-ether                                                  | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | 18,000               | --                                                              | 53,000             | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | 8,000          | p         | 8,000          |  |                                                      |  |                                                                           |
| Methylene chloride                                                       | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | 6,400                | (20)                                                                                                        | 12,000             | --                                   | (20)      | 11,500             | (20, 82)  | --             | --        | 6,400          |  |                                                      |  |                                                                           |
| Mirex                                                                    | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | 0.001                | F                                                               | --                 | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 0.001          |  |                                                      |  |                                                                           |
| Naphthalene                                                              | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 2,350              | 470                                  | --        | --                 | --        | --             | --        | 470            |  |                                                      |  |                                                                           |
| Nickel                                                                   | 8.2                                                 | b         | 8.2                                                                                 | (2, 142), oo | 74                 | --                                   | (1, 142), oo | --                    | --                                   | --        | 8.2                  | (1, 142) D,bb                                                   | 74                 | --                                   | (1, 142) D,bb | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 8.2            |  |                                                      |  |                                                                           |
| Nitrobenzene                                                             | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 6,680              | 1,336                                | --        | --                 | --        | --             | --        | 1,336          |  |                                                      |  |                                                                           |
| N-Nitroso-di-methylamine                                                 | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 3,300,000          | 660,000                              | (56)      | --                 | --        | --             | --        | 660,000        |  |                                                      |  |                                                                           |
| N-Nitroso-di-n-propylamine                                               | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 3,300,000          | 660,000                              | (56)      | --                 | --        | --             | --        | 660,000        |  |                                                      |  |                                                                           |
| N-nitrosodiphenylamine                                                   | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 3,300,000          | 660,000                              | (56)      | --                 | --        | --             | --        | 660,000        |  |                                                      |  |                                                                           |
| Pentachlorophenol                                                        | --                                                  | --        | 7.9                                                                                 | --           | 13                 | --                                   | --           | --                    | --                                   | --        | 7.9                  | bb                                                              | 13                 | --                                   | bb            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 7.9            |  |                                                      |  |                                                                           |
| Phenanthrene                                                             | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 300                | 60                                   | (52)      | --                 | --        | --             | --        | 60             |  |                                                      |  |                                                                           |
| Phenol                                                                   | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 5,800              | 1,160                                | --        | --                 | --        | --             | --        | 1,160          |  |                                                      |  |                                                                           |
| Pyrene                                                                   | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 300                | 60                                   | (52)      | --                 | --        | --             | --        | 60             |  |                                                      |  |                                                                           |
| Selenium                                                                 | --                                                  | --        | 71                                                                                  | (1, 142)     | 290                | --                                   | (1, 142)     | --                    | --                                   | --        | 71                   | 1, 136) D,bb,d                                                  | 290                | --                                   | (1) D,bb,dd   | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 71             |  |                                                      |  |                                                                           |
| Silver                                                                   | 1.9                                                 | c         | --                                                                                  | --           | 1.9                | 0.38                                 | (1, 142)     | --                    | --                                   | --        | --                   | --                                                              | 1.9                | 0.38                                 | D,G           | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 0.38           |  |                                                      |  |                                                                           |
| Sulfide-Hydrogen sulfide                                                 | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | 2              | (51)      | 2              |  |                                                      |  |                                                                           |
| Tetrachloroethene                                                        | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | 450                  | --                                                                                                          | 10,200             | --                                   | --        | --                 | --        | --             | --        | 450            |  |                                                      |  |                                                                           |
| Thallium                                                                 | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 2,130              | 426                                  | --        | --                 | --        | --             | --        | 426            |  |                                                      |  |                                                                           |
| Toluene                                                                  | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | 5,000                | --                                                                                                          | 6,300              | --                                   | --        | --                 | --        | --             | --        | 5,000          |  |                                                      |  |                                                                           |
| Toxaphene                                                                | --                                                  | --        | 0.0002                                                                              | --           | 0.21               | --                                   | --           | --                    | --                                   | --        | 0.0002               | aa                                                              | 0.21               | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 0.0002         |  |                                                      |  |                                                                           |
| TPH-Diesel                                                               | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | 1,400 - 20,000 | q,v       | 1,400 - 20,000 |  |                                                      |  |                                                                           |
| TPH-Gasoline                                                             | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | 1,400 - 20,000 | q,v       | 1,400 - 20,000 |  |                                                      |  |                                                                           |
| TPH-Motor Oil                                                            | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | 1,400 - 20,000 | q,v       | 1,400 - 20,000 |  |                                                      |  |                                                                           |
| trans-1,2-Dichloroethene                                                 | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 224,000            | 44,800                               | (27)      | --                 | --        | --             | --        | 44,800         |  |                                                      |  |                                                                           |
| Tributyl Tin                                                             | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | 0.0047               | --                                                              | 0.42               | --                                   | --            | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 0.0047         |  |                                                      |  |                                                                           |
| Trichloroethene                                                          | --                                                  | --        | --                                                                                  | --           | --                 | --                                   | --           | --                    | --                                   | --        | --                   | --                                                              | --                 | --                                   | --            | --                   | --                                                                                                          | 2,000              | 400                                  | --        | --                 | --        | --             | --        | 400            |  |                                                      |  |                                                                           |
| Zinc                                                                     | 81                                                  | b         | 81                                                                                  | mm, oo       | 90                 | --                                   | mm, oo       | --                    | --                                   | --        | 81                   | (1) D,bb                                                        | 90                 | --                                   | (1) D,bb      | --                   | --                                                                                                          | --                 | --                                   | --        | --                 | --        | --             | --        | 81             |  |                                                      |  |                                                                           |

Notes:

|      |                             |     |                                      |         |                                                         |
|------|-----------------------------|-----|--------------------------------------|---------|---------------------------------------------------------|
| --   | No criterion available      | DDD | Dichlorodiphenyldichloroethane       | Fed Reg | Federal Register                                        |
| µg/L | Microgram per liter         | DDE | Dichlorodiphenyldichloroethene       | RWQCB   | Regional Water Quality Control Board, San Francisco Bay |
| CFR  | Code of Federal Regulations | DDT | Dichlorodiphenyltrichloroethane      | TPH     | Total petroleum hydrocarbons                            |
| BHC  | Hexachlorocyclohexane       | EPA | U.S. Environmental Protection Agency | TiEMI   | Tetra Tech EM, Inc.                                     |

Footnotes:

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a | California Environmental Protection Agency, Regional Water Quality Control Board, San Francisco Bay Area Region (RWQCB). 2007. "San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)." January. Table 3-3 Marine Water Quality Objectives for Toxic Pollutants for Surface Waters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| b | From RWQCB "Basin Plan" 4-Day Average (Chronic)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| c | From RWQCB "Basin Plan" 24-Hour and 1-Hour Average (Acute)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| d | From RWQCB "Basin Plan" Instantaneous Maximum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| e | From "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California" (CTR) (EPA 2000) and "Water Quality Control Plan, San Francisco Bay Basin Region" (RWQCB 2007a). The most appropriate criteria were used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| f | Criterion made more suitably protective by means of standard convention of lowering acute values by 80 percent and instantaneous values by 90 percent to make them more appropriate for use under chronic exposure scenarios.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| g | An acute criterion (EPA identified as Criteria Maximum Concentration [CMC]) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The chronic concentration (EPA identified as Criterion Continuous Concentration [CCC]) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The CMC and CCC are just two of the six parts of an aquatic life criterion; the other four parts are the acute averaging period, chronic averaging period, acute frequency of allowed exceedence, and chronic frequency of allowed exceedence. Because 304(a) aquatic life criteria are national guidance, they are intended to be protective of the vast majority of the aquatic communities in the United States. |
| h | EPA National "AWQC Lowest Observed Effect Level (Chronic)" (RWQCB 2007b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| i | EPA National "AWQC Lowest Observed Effect Level (Acute)" (RWQCB 2007b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| j | EPA National "AWQC Lowest Observed Effect Level (Other)" (RWQCB 2007b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| k | From "National Recommended Water Quality Criteria" (EPA 2006), unless otherwise noted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| l | From "Final Technical Memorandum Estimation of Ambient Concentrations of Metals in Groundwater" (TiEMI 2001)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| m | In instances where criteria from "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California" (EPA 2000) refer to the "Water Quality Control Plan, San Francisco Bay Basin Region" (RWQCB 2006), RWQCB 2006 criteria were used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| o | Detailed application of this toxicity criterion may require the review and/or summation of analyte isomer, congener, or speciation results, as applicable. Please see applicable regulatory agency source document for additional detail.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| p | RWQCB 1998                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| q | TiEMI 1999                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| r | RWQCB 2007b                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| s | From RWQCB 2007a, "Basin Plan" Annual Median                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| t | From RWQCB 2007a "Basin Plan" Maximum, Lower Bay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| u | EPA National "AWQC for Saltwater Aquatic Life Protection, Recommended Criteria, Continuous Concentration (4-Day Average)" (RWQCB 2007b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| v | Total TPH aquatic criteria assigned as a function of distance from shoreline; the source of these criteria is the "Final New Preliminary Screening Criteria and Petroleum Program Strategy, Hunters Point Shipyard, San Francisco, California." December 21. (Shaw Environmental, Inc. 2007)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |



Table A-1. Surface Water Screening Criteria (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard

|                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Footnotes (Continued):                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| The following lettered footnotes are derived from EPA "National Recommended Water Quality Criteria" (EPA 2006), Table 1 - Priority Toxic Pollutants (unless otherwise noted): |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| A                                                                                                                                                                             | This recommended water quality criterion was derived from data for arsenic (III), but is applied here to total arsenic, which might imply that arsenic (III) and arsenic (V) are equally toxic to aquatic life and that their toxicities are additive. In the arsenic criteria document (EPA 440/5-84-033, January 1985), Species Mean Acute Values are given for both arsenic (III) and arsenic (V) for five species and the ratios of the SMAVs for each species range from 0.6 to 1.7. Chronic values are available for both arsenic (III) and arsenic (V) for one species; for the fathead minnow, the chronic value for arsenic (V) is 0.29 times the chronic value for arsenic (III). No data are known to be available concerning whether the toxicities of the forms of arsenic to aquatic organisms are additive.                                                                                                                                                                                                                                                                                                                                                                                                       |
| B                                                                                                                                                                             | This criterion has been revised to reflect The Environmental Protection Agency's q1* or RID (Reference Dose), as contained in the Integrated Risk Information System (IRIS) as of May 17, 2002. The fish tissue bioconcentration factor (BCF) from the 1980 Am                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| C                                                                                                                                                                             | This criterion is based on carcinogenicity of 10 <sup>-6</sup> risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10 <sup>-5</sup> , move the decimal point in the recommended criterion one place to the right).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| D                                                                                                                                                                             | Freshwater and saltwater criteria for metals are expressed in terms of the dissolved metal in the water column. The recommended water quality criteria value was calculated by using the previous 304(a) aquatic life criteria expressed in terms of total recoverable metal, and multiplying it by a conversion factor (CF). The term "Conversion Factor" (CF) represents the recommended conversion factor for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column. (Conversion Factors for saltwater CCCs are not currently available. Conversion factors derived for saltwater CMCs have been used for both saltwater CMCs and CCCs). See "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria.@ October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available from the Water Resource center, USEPA, 401 M St., SW, mail code RC4100, Washington, DC 20460; and 40CFR131.36(b)(1). Conversion Factors applied in the table can be found in Appendix A to the Preamble- Conversion Factors for Dissolved Metals. |
| F                                                                                                                                                                             | Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: CMC = exp(1.005(pH)-4.869); CCC = exp(1.005(pH)-5.134). Values displayed in table correspond to a pH of 7.8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| G                                                                                                                                                                             | This Criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80- 019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endosulfan (EPA 440/5-80-046), Endrin (EPA 440/5-80-047), Heptachlor (EPA 440/5-80-052), Hexachlorocyclohexane (EPA 440/5-80-054), Silver (EPA 440/5-80-071). The Minimum Data Requirements and derivation procedures were different in the 1980 Guidelines than in the 1985 Guidelines. For example, a CMC derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| N                                                                                                                                                                             | This criterion applies to total polychlorinated biphenyls (e.g. the sum of all congener or all isomer or homolog or Aroclor analyses.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Q                                                                                                                                                                             | This recommended water quality criterion is expressed as mg free cyanide (as CN)/L.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| S                                                                                                                                                                             | This recommended water quality criterion for arsenic refers to the inorganic form only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| U                                                                                                                                                                             | The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| V                                                                                                                                                                             | This value was derived from data for heptachlor, and the criteria document provides insufficient data to estimate the relative toxicities of heptachlor and heptachlor epoxide.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Y                                                                                                                                                                             | This value was derived from data for endosulfan and is most appropriately applied to the sum of alpha-endosulfan and beta-endosulfan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| aa                                                                                                                                                                            | This criterion is based on a 304(a) aquatic life criterion issued in 1980 or 1986, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endrin (EPA 440/5-80-047), Heptachlor (EPA 440/5-80-052), Polychlorinated biphenyls (EPA 440/5-80-068), Toxaphene (EPA 440/5-86-006). This CCC is currently based on the Final Residue Value (FRV) procedure. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60FR15393-15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria. Therefore, the Agency anticipates that future revisions of this CCC will not be based on the FRV procedure.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| bb                                                                                                                                                                            | This water quality criterion is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses, PB85-227049, January 1985) and was issued in one of the following criteria documents: Arsenic (EPA 440/5-84-033), Cadmium (EPA-822-R-01-001), Chromium (EPA 440/5-84-029), Copper (EPA 440/5-84-031), Cyanide (EPA 440/5- 84-028), Lead (EPA 440/5-84-027), Nickel (EPA 440/5-86-004), Pentachlorophenol (EPA 440/5-86-009), Toxaphene, (EPA 440/5-86-006), Zinc (EPA 440/5-87- 003).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| cc                                                                                                                                                                            | When the concentration of dissolved organic carbon is elevated, copper is substantially less toxic, and use of Water-Effect Ratios might be appropriate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| dd                                                                                                                                                                            | The selenium criteria document (EPA 440/5-87-006, September 1987) provides that if selenium is as toxic to saltwater fishes in the field as it is to freshwater fishes in the field, the status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 Fg/L in salt water because the saltwater CCC does not take into account uptake via the food chain.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| ee                                                                                                                                                                            | This recommended water quality criterion was derived on page 43 of the mercury criteria document (EPA 440/5-84-026, January 1985). The saltwater CCC of 0.025 ug/L given on page 23 of the criteria document is based on the Final Residue Value procedure in the 1985 Guidelines. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60FR15393-15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ff                                                                                                                                                                            | This recommended water quality criterion was derived in <i>Ambient Water Quality Criteria Saltwater Copper Addendum</i> (draft, April 14, 1995) and was promulgated in the Interim final National Toxics Rule (60 FR 22228-222237, May 4, 1995).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| gg                                                                                                                                                                            | EPA is actively working on this criterion, and so this recommended water quality criterion may change substantially in the near future.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| hh                                                                                                                                                                            | This recommended water quality criterion was derived from data for inorganic mercury (II), but is applied here to total mercury. If a substantial portion of the mercury in the water column is methylmercury, this criterion will probably be under protective. In addition, even though inorganic mercury is converted to methylmercury and methylmercury bioaccumulates to a great extent, this criterion does not account for uptake via the food chain because sufficient data were not available when the criterion was derived.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ii                                                                                                                                                                            | This criterion applies to DDT and its metabolites (that is, the total concentration of DDT and its metabolites should not exceed this value.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| The following lettered footnotes are derived from EPA "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California" (EPA 2000).               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| jj                                                                                                                                                                            | Criteria revised to reflect the EPA q1* or RID, as contained in the Integrated Risk of RID, as contained in the IRIS as of October 1, 1996. The fish tissue bioconcentration factor (BCF) from the 1980 documents was retained in each case (originally footno                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| kk                                                                                                                                                                            | Criteria are based on carcinogenicity of 10 <sup>-6</sup> risk. (Originally footnote c in CTR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| ll                                                                                                                                                                            | This criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5–80–019), Chlordane (EPA 440/5–80–027), DDT (EPA 440/5–80–038), Endosulfan (EPA 440/5–80–046), Endrin (EPA 440/5–80–047), Heptachlor (440/5–80–052), Hexachlorocyclohexane (EPA 440/5–80–054), Silver (EPA 440/5–80–071). The Minimum Data Requirements and derivation procedures were different in the 1980 Guidelines than in the 1985 Guidelines. For example, a "CMC" derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines (originally footnote g in the CTR).                                                                                                                                                                                                                                                                                                                                                                                     |
| mm                                                                                                                                                                            | Criteria for these metals are expressed as a function of the water-effect ratio (WER) (originally footnote i in the CTR).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| nn                                                                                                                                                                            | No criterion for protection of human health from consumption of aquatic organisms (excluding water) was presented in the 1980 criteria document or in the 1986 Quality Criteria for Water. Nevertheless, sufficient information was presented in the 1980 document to allow a calculation of a criterion, even though the results of such a calculation were not shown in the document (originally footnote j in the CTR).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| oo                                                                                                                                                                            | These freshwater and saltwater criteria for metals are expressed in terms of the dissolved fraction of the metal in the water column. Criterion values were calculated by using EPA's Clean Water Act 304(a) guidance values (described in the total recoverable fraction) and then applying the conversion factors in § 131.36(b)(1) and (2) (originally footnote m in the CTR).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| pp                                                                                                                                                                            | These criteria were promulgated for specific waters in California in the National Toxics Rule ("NTR"), at § 131.36. The specific waters to which the NTR criteria apply include: Waters of the State defined as bays or estuaries and waters of the State defined as inland, i.e., all surface waters of the State not ocean waters. These waters specifically include the San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta. This section does not apply instead of the NTR for this criterion (originally footnote o in the CTR).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| qq                                                                                                                                                                            | These criteria were promulgated for specific waters in California in the NTR. The specific waters to which the NTR criteria apply included: Waters of the State defined as bays or estuaries including the San Francisco Bay upstream to and including Suisun                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| rr                                                                                                                                                                            | PCBs are a class of chemicals that include Aroclors 1242,1254,1221,1232,1248,1260, and 1016. The aquatic life criteria apply to the sum of this set of seven Aroclors (originally footnote u in the CTR).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| ss                                                                                                                                                                            | This criterion has been recalculated pursuant of all congener or isomer or homolog or Aroclor analyses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| The following numbered footnotes are derived from "A Compilation of Water Quality Goals" (RWQCB 2007b). These footnotes directly correlate with the source document.          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1                                                                                                                                                                             | Expressed as dissolved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2                                                                                                                                                                             | Expressed as total recoverable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2                                                                                                                                                                             | Expressed as total recoverable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 6                                                                                                                                                                             | Pentavalent arsenic [As(V)] effects on plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 18                                                                                                                                                                            | Applies separately to Endrin and Endrin aldehyde.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 20                                                                                                                                                                            | For halomethanes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 22                                                                                                                                                                            | For chlorinated benzenes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 23                                                                                                                                                                            | Toxicity to a fish species exposed for 7.5 days                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 24                                                                                                                                                                            | For dichlorobenzenes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 27                                                                                                                                                                            | For dichloroethylenes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 28                                                                                                                                                                            | For dichloropropanes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 29                                                                                                                                                                            | For dichloropropenes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 38                                                                                                                                                                            | Toxicity to algae occurs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 45                                                                                                                                                                            | For sum of phthalate esters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 48                                                                                                                                                                            | For chlorinated naphthalenes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 51                                                                                                                                                                            | From U.S. Environmental Protection Agency, <i>Quality Criteria for Water</i> (1976) "The Red Book," and also appears in current list of recommended criteria.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 52                                                                                                                                                                            | For polynuclear aromatic hydrocarbons                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 53                                                                                                                                                                            | For dinitrotoluenes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 56                                                                                                                                                                            | For nitrosamines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 68                                                                                                                                                                            | Draft / tentative / provisional; applies only to second value if two separate values are listed; applies to range if a range of values is listed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 82                                                                                                                                                                            | A decrease in the number of algal cells occurs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 83                                                                                                                                                                            | Adverse effects on a fish species exposed for 168 days.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 88                                                                                                                                                                            | For nitrophenols                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 95                                                                                                                                                                            | For the pentavalent form                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 113                                                                                                                                                                           | Based on carcinogenicity at 1-in-a-million risk level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 114                                                                                                                                                                           | Developed as 24-hour average using 1980 EPA guidelines, but applied as 4-day average in the National Toxics Rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

Table A-1. Surface Water Screening Criteria (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Footnotes (Continued):                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                         |
| 115                                                                                                                                                                                                        | Criterion most appropriately applied to the sum of alpha-endosulfan and beta-endosulfan.                                                                                                                                                                                                                                                                |
| 116                                                                                                                                                                                                        | Applies separately to Aroclors 1242, 1254, 1221, 1232, 1248, 1260, and 1016; based on carcinogenicity at 1-in-a-million risk level.                                                                                                                                                                                                                     |
| 136                                                                                                                                                                                                        | Draft Chronic Criterion: The concentration of selenium in whole-body fish tissue should not exceed 7.91 ug/g dw (dry weight). In addition, if whole-body fish tissue concentrations exceed 5.85 ug/g dw during summer or fall, fish tissue should be monitored during the winter to determine whether the selenium concentration exceeds 7.91 ug/g dw.  |
| 137                                                                                                                                                                                                        | Expressed as free cyanide (as CN).                                                                                                                                                                                                                                                                                                                      |
| 140                                                                                                                                                                                                        | Criterion derived from data for inorganic mercury (II), but is applied to total mercury. It will probably be underprotective if a substantial portion of mercury in the water column is methylmercury. Derivation of criterion did not consider exposure through the diet, which is probably important for aquatic life occupying upper trophic levels. |
| 142                                                                                                                                                                                                        | Criteria do not apply to waters subject to water quality objectives in Tables III-2A and III-2B of the San Francisco Bay Regional Water Quality Control Board's 1986 Basin Plan.                                                                                                                                                                        |
| 143                                                                                                                                                                                                        | These criteria were promulgated for specific California waters in the National Toxics Rule.                                                                                                                                                                                                                                                             |
| 144                                                                                                                                                                                                        | The ambient level was set at or below the minimum reported detection limit.                                                                                                                                                                                                                                                                             |
| 145                                                                                                                                                                                                        | The ambient concentration represents the 95th percentile of the distribution. Additionally, the 95th percentile of the distribution was calculated using distribution dependent formulae. For normal and lognormal distributions, the 95th percentile calcula                                                                                           |
| References:                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                         |
| Gilbert, R.O. 1987 Statistical Methods for Environmental Pollution Monitoring . Van Nostrand Reinhold, New York.                                                                                           |                                                                                                                                                                                                                                                                                                                                                         |
| Regional Water Quality Control Board (RWQCB). 1998. "Recommended Interim Water Quality Objectives (or Aquatic Life Criteria) for Methyl Tertiary-Butyl Ether (MTBE)." San Francisco Bay Region. October 1. |                                                                                                                                                                                                                                                                                                                                                         |
| RWQCB. 2007a. "San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)." San Francisco Bay Region. January.                                                                             |                                                                                                                                                                                                                                                                                                                                                         |
| RWQCB. 2007b. "A Compilation of Water Quality Goals." Prepared by Jon B. Marshack, Central Valley Region. August.                                                                                          |                                                                                                                                                                                                                                                                                                                                                         |
| Shaw Environmental, Inc. 2007. "Final New Preliminary Screening Criteria and Petroleum Program Strategy, Hunters Point Shipyard, San Francisco, California." December 21.                                  |                                                                                                                                                                                                                                                                                                                                                         |
| TtEMI 1999. "Draft Remedial Investigation Report, Site 12 Operable Unit, Naval Station Treasure Island, San Francisco, California." June 1.                                                                |                                                                                                                                                                                                                                                                                                                                                         |
| TtEMI 2001. "Final Technical Memorandum Estimation of Ambient Concentrations of Metals in Groundwater, Naval Station Treasure Island, San Francisco, California." March 30.                                |                                                                                                                                                                                                                                                                                                                                                         |
| U.S. Environmental Protection Agency (EPA). 2000. "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California." 40 CFR Part 131, RIN 2040-AC44. May 18.                   |                                                                                                                                                                                                                                                                                                                                                         |
| EPA. 2006. "National Recommended Water Quality Criteria."                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                         |

**Table A-2. Hunters Point Groundwater Ambient Levels**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard

| <b>Metal</b> | <b>HGAL<sup>(1)</sup><br/>(µg/L)</b> |
|--------------|--------------------------------------|
| Aluminum     | NA                                   |
| Antimony     | 43.3                                 |
| Arsenic      | 27.3                                 |
| Barium       | 504                                  |
| Beryllium    | 1.40                                 |
| Cadmium      | 5.08                                 |
| Calcium      | NA                                   |
| Chromium     | 15.7                                 |
| Chromium VI  | NA                                   |
| Cobalt       | 20.8                                 |
| Copper       | 28                                   |
| Iron         | 2,380                                |
| Lead         | 14.4                                 |
| Mangesium    | 1,440,000                            |
| Manganese    | 8,140                                |
| Mercury      | 0.60                                 |
| Molybdenum   | 61.9                                 |
| Nickel       | 96.5                                 |
| Potassium    | 448,000                              |
| Selenium     | 14.5                                 |
| Silver       | 7.43                                 |
| Sodium       | 9,240,000                            |
| Thallium     | 13                                   |
| Vanadium     | 26.6                                 |
| Zinc         | 75.7                                 |

Notes:

µg/L micrograms per liter

HGAL Hunters Point groundwater ambient level

NA Not available

- 1 PRC Environmental Management, Inc. 1996. "Estimation of Hunters Point Shipyard Groundwater Ambient Levels Technical Memorandum." September 16.

**Table A-3. Groundwater COECs for Aquatic Wildlife**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard

| Analytical Group       | COEC            | Aquatic Evaluation Criterion Selected for Aquatic Evaluation (µg/L) <sup>(a)</sup> | Locations Recommended for Further Monitoring and Evaluation | Maximum Concentration (µg/L) | Calculated Trigger Level (µg/L) <sup>(b)</sup> |
|------------------------|-----------------|------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------|------------------------------------------------|
| Metals                 | Arsenic         | 36                                                                                 | IR03MWO-1                                                   | 1,180                        | 36                                             |
|                        |                 |                                                                                    | IR02MW173A                                                  | 75.7                         | 36                                             |
|                        |                 |                                                                                    | PA50MW05A                                                   | 42.7                         | 36                                             |
|                        | Copper          | 28.0 <sup>(c)</sup>                                                                | IR02MW126A                                                  | 1,000                        | 28                                             |
|                        |                 |                                                                                    | IR02MW373A                                                  | 1,300                        | 28                                             |
|                        |                 |                                                                                    | IR03MW226A                                                  | 824                          | 28                                             |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 3,240                        | 28                                             |
|                        | Lead            | 14.4 <sup>(c)</sup>                                                                | IR02MW373A                                                  | 35.2                         | 14.4                                           |
|                        |                 |                                                                                    | IR03MW218A                                                  | 23.4                         | 14.4                                           |
|                        |                 |                                                                                    | IR03MW226A                                                  | 613                          | 14.4                                           |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 65                           | 14.4                                           |
|                        | Mercury         | 0.60 <sup>(c)</sup>                                                                | IR03MW226A                                                  | 0.8                          | 0.60                                           |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 1.2                          | 0.60                                           |
|                        | Nickel          | 96.5 <sup>(c)</sup>                                                                | IR02MWB-2                                                   | 1,720                        | 96.5                                           |
|                        |                 |                                                                                    | IR02MWB-5                                                   | 3,430                        | 96.5                                           |
|                        |                 |                                                                                    | IR02MW373A                                                  | 1,460                        | 96.5                                           |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 1,140                        | 96.5                                           |
|                        | Zinc            | 81                                                                                 | IR02MW126A                                                  | 2,320                        | 81                                             |
|                        |                 |                                                                                    | IR02MW373A                                                  | 9,970                        | 81                                             |
|                        |                 |                                                                                    | IR03MW226A                                                  | 1,180                        | 81                                             |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 2,400                        | 81                                             |
| PCBs and Pesticides    | Aroclor-1254    | 0.03                                                                               | IR02MW372A                                                  | 35                           | 0.06                                           |
|                        |                 |                                                                                    | IR02MW375A <sup>(d)</sup>                                   | 40                           | 0.03                                           |
|                        |                 |                                                                                    | IR02MW146A                                                  | 0.24                         | 0.03                                           |
|                        |                 |                                                                                    | IR03MW225A                                                  | 1.2                          | 0.03                                           |
|                        | Aroclor-1260    | 0.03                                                                               | IR03MW218A1                                                 | 35                           | 0.03                                           |
|                        |                 |                                                                                    | IR03MW225A                                                  | 40                           | 0.03                                           |
|                        |                 |                                                                                    | IR03MW226A                                                  | 0.24                         | 0.03                                           |
|                        |                 |                                                                                    | IR03MWO-1                                                   | 1.2                          | 0.03                                           |
|                        | 4,4'-DDE        | 0.001                                                                              | IR02MW372A                                                  | 1.2                          | 0.002                                          |
|                        | Alpha-Chlordane | 0.004                                                                              | IR02MW372A                                                  | 0.03                         | 0.008                                          |
| Petroleum Hydrocarbons | TPH (Total)     | 4,839 <sup>(e)</sup>                                                               | IR02MW173A                                                  | 6,900                        | 4,839                                          |
|                        |                 | 3,216 <sup>(e)</sup>                                                               | IR03MW218A1                                                 | 83,000                       | 3,216                                          |
|                        |                 | 3,216 <sup>(e)</sup>                                                               | IR03MW218A2                                                 | 19,900                       | 3,216                                          |
|                        |                 | 3,216 <sup>(e)</sup>                                                               | IR03MW225A                                                  | 12,000                       | 3,216                                          |
|                        |                 | 3,216 <sup>(e)</sup>                                                               | IR03MW226A                                                  | 17,670                       | 3,216                                          |
|                        |                 | 1,400 <sup>(e)</sup>                                                               | IR03MW369A                                                  | 13,500                       | 1,400                                          |
|                        |                 | 1,467 <sup>(e)</sup>                                                               | IR03MW370A                                                  | 27,560                       | 1,467                                          |
|                        |                 | 2,092 <sup>(e)</sup>                                                               | IR03MW371A                                                  | 10,890                       | 2,092                                          |
|                        |                 | 12,604 <sup>(e)</sup>                                                              | IR03MWO-1                                                   | 560,000                      | 12,604                                         |

**Table A-3. Groundwater COECs for Aquatic Wildlife** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard

Notes:

- (a) References for the aquatic evaluation criteria are included in Tables A-1 and A-2.
- (b) Attenuation factor assigned based on nomographs developed specifically for HPS groundwater (see Attachment A-1).
- (c) Value shown has been HGAL-adjusted and is applicable to the A-aquifer.
- (d) Well IR02MWB-3 has been destroyed; new well IR02MW375A is located in approximately the same area.
- (e) Range of values shown; total TPH aquatic criteria assigned as a function of distance from shoreline; the source of these criteria is the "Final New Preliminary Screening Criteria and Petroleum Program Strategy, Hunters Point Shipyard, San Francisco, California" (Shaw Environmental, Inc., 2007)

|       |                                          |
|-------|------------------------------------------|
| µg/L  | micrograms per liter                     |
| COEC  | chemical of ecological concern           |
| DDE   | dichlorodiphenyldichloroethene           |
| HGALs | Hunters Point groundwater ambient levels |
| HPS   | Hunters Point Shipyard                   |
| PCBs  | polychlorinated biphenyls                |
| TPH   | total petroleum hydrocarbons             |

### 3.3. ANALYSIS OF GENERAL RESPONSE ACTIONS AND PROCESS OPTIONS

GRAs are categories of actions that are made up of technologies. Multiple process options may be available for each technology. These GRAs are responses or remedies that would meet the RAOs to protect human health and the environment from known contamination at Parcel E. Process options are specific technologies used to carry out a GRA.

Section 3.3.1 describes the development of GRAs for Parcel E soil, shoreline sediment, groundwater, and NAPL. NAPL is evaluated separately to address the unique nature and extent of the NAPL (see [Section 3.1.4](#)). [Section 3.3.2](#) presents the results of the analysis of the proposed GRAs and associated process options.

#### 3.3.1. Development of GRAs

GRAs were developed based on professional engineering judgment and experience with response actions proven successful for the COCs at Parcel E and elsewhere at HPS. Because the RAOs were developed based on the planned future land use, the GRAs were also developed based on the planned future land use of each redevelopment block. [Table 3-6](#) presents the GRAs and the process options for soil and shoreline sediment. [Table 3-7](#) presents the GRAs and process options for groundwater. A separate analysis is presented for NAPL to address IR-03, the site of the former oil reclamation ponds. [Table 3-8](#) presents the GRAs and process options for NAPL.

The following GRAs were identified to ensure that the RAOs for all media are achieved.

##### *Soil and Shoreline Sediment*

- No action – Required GRA for CERCLA evaluation
- Institutional controls – Includes land use and access restrictions implemented through legal and administrative mechanisms (such as restrictive covenants and deed restrictions) to mitigate potential unacceptable exposure to chemicals in soil and shoreline sediment
- Engineering controls – Includes fencing, barriers, and signs to restrict access and potential unacceptable exposure to contaminated soil and shoreline sediment
- Monitoring – Includes soil gas monitoring to evaluate the potential for vapor intrusion
- Removal – Includes excavation and off-site disposal of contaminated soil and shoreline sediment
- Treatment – Includes in-situ and ex-situ treatment of soil or shoreline sediment to reduce the toxicity, mobility, and volume of chemicals
- Containment – Includes covering (1) contaminated soil to prevent direct exposure of humans through dermal contact, inhalation, or ingestion; and (2) contaminated shoreline sediment to prevent direct contact with humans or wildlife

**Groundwater**

- No action – Required GRA for CERCLA evaluation
- Institutional controls – Includes land use and access restrictions implemented through legal and administrative mechanisms (such as restrictive covenants and deed restrictions) to mitigate potential unacceptable exposure to chemicals in soil gas or groundwater
- Engineering controls – Includes vapor barriers, sub-slab depressurization, and epoxy coatings to mitigate potential unacceptable vapor intrusion risk from VOCs in soil gas or groundwater
- Monitoring – Includes groundwater monitoring to assess changes in the concentrations of chemicals in groundwater
- Treatment – Includes in-situ and on-site ex-situ treatment of contaminated groundwater
- Removal – Includes pumping to remove contaminated groundwater and off-site treatment or disposal
- Containment – Includes installing (1) vertical barriers to control groundwater flow and limit migration of contaminated groundwater and (2) barriers or covers to prevent vapor intrusion or limit infiltration

**NAPL (IR-03)**

- No action – Required GRA for CERCLA evaluation
- Institutional controls – Includes land use and access restrictions implemented through legal and administrative mechanisms (such as restrictive covenants and deed restrictions) to mitigate potential unacceptable exposure to contaminated media at IR-03
- Engineering controls – Includes fencing, barriers, and signs to restrict access and potential unacceptable exposure to contaminated media at IR-03
- Monitoring – Includes groundwater monitoring to assess the adequacy of remediation
- Removal – Includes pumping or excavation to remove NAPL and associated contaminated soil and groundwater for off-site treatment or disposal
- Treatment – Includes in-situ and on-site ex-situ treatment of NAPL and associated contaminated soil and groundwater
- Containment – Includes (1) installing vertical barriers to control NAPL and limit migration of contaminated groundwater and (2) covering contaminated soil to limit infiltration and prevent direct exposure of humans through the dermal contact, inhalation, and ingestion exposure pathways

**3.3.2. Analysis of GRAs and Process Options**

Technologies and process options for each of the GRAs selected for this FS Report underwent an initial screening. The goal of screening process options is to provide a “toolbox” of available technologies that can be applied as needed in the selected remedial alternative presented in the ROD to best achieve the

RAOs. The language in the ROD needs to be flexible enough to allow application of appropriate technologies based on results of treatability studies and other design-related studies for various sites across Parcel E.

During the initial screening, a range of technology types and process options were evaluated in terms of technical implementability, site conditions, waste characteristics, chemical properties, and the ability to meet NCP requirements and RAOs. [Tables 3-6, 3-7, and 3-8](#) summarize the initial screening results for soil and shoreline sediment, groundwater, and NAPL, respectively. Those GRAs and process options that were carried forward from the initial screening were then analyzed with respect to effectiveness, implementability, and cost. [Section 3.3.2.1](#) presents the analysis for the applicable process options for soil and shoreline sediment, and [Section 3.3.2.2](#) presents the analysis for the applicable process options for groundwater. [Section 3.3.2.3](#) presents the analysis of the applicable process options for NAPL and associated soil and groundwater. [Tables 3-9, 3-10, and 3-11](#) summarize the results of the detailed analysis for soil and shoreline sediment, groundwater, and NAPL, respectively.

#### **3.3.2.1. Screening and Detailed Analysis of GRAs and Process Options for Soil and Shoreline Sediment**

Potentially applicable GRAs identified for soil and shoreline sediment at Parcel E consist of (1) no action, (2) institutional controls, (3) engineering controls, (4) monitoring, (5) removal, (6) treatment, and (7) containment. [Table 3-6](#) presents the initial screening of technologies and process options for these GRAs. This table includes the various technology types, process options, and results of the screening analysis for each GRA for soil and shoreline sediment. The rationale for those options eliminated from further evaluation is presented in [Table 3-6](#); these eliminated technologies and process options are not discussed further.

All seven GRAs were retained for further evaluation, including no action. Removal process options were considered effective and implementable for many COCs, but were not considered implementable for the ubiquitous metals that are present in fill at Parcel E at concentrations greater than PRGs. Containment process options, supplemented with institutional controls, were considered effective and implementable for the ubiquitous metals at Parcel E. Most of the technologies and process options for treatment were eliminated during the initial screening for soil and shoreline sediment at Parcel E; only SVE was retained for evaluation. Treatment is not cost effective or as implementable as removal and containment process options.

Those technologies and process options retained during the initial screening were evaluated for effectiveness, implementability, and cost, in accordance with the NCP (specifically 40 CFR § 300.430 [e][7]) and EPA RI/FS guidance ([EPA, 1988](#); Section 4.2.5). [Table 3-9](#) summarizes the results of the detailed analysis. The analysis of GRAs and process options focuses primarily on soil because site-specific conditions at Parcel E (including the volume of contaminated soil and the range of chemical



**Table 3-6. Screening of GRAs and Process Options for Soil and Shoreline Sediment at Parcel E**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology Type  | Process Option                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                    | Comments                                                                                                                                           |
|-------------------------|---------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| No Action               | Not Applicable            | Not Applicable                                                             | No Action                                                                                                                                                                                                                                                                                                                                                                                      | Retained<br>Required by NCP.                                                                                                                       |
| Institutional Controls  | Legal Mechanisms          | Covenants to Restrict Use of Property and Deed Restrictions                | Restricts use of parcel through environmental restrictive covenants that will run with the land; allows only designated land use in accordance with the proposed redevelopment plan (EPA, 2000a); includes criteria during and after future development to ensure mitigated exposure conditions are maintained, such as covers, barriers, or other engineering controls (Navy and DTSC, 2000). | Retained<br>Easily implemented and effective; usually required to restrict activity based on land use.                                             |
|                         | Administrative Mechanisms | Land Use Plans and Soil and Groundwater Management Procedures and Policies | Manage and prevent exposure to humans during future site activities.                                                                                                                                                                                                                                                                                                                           | Eliminated<br>Covenants to Restrict Use of Property and Deed Restrictions are sufficient to enforce land use and activity restrictions.            |
| Engineering Controls    | Physical Barriers         | Fencing, Barriers, and Signs                                               | Restrict land use where there is exposure to potentially contaminated soil using fencing, barriers, and posting signs (EPA, 2000a).                                                                                                                                                                                                                                                            | Retained<br>Easily implemented and effective; usually required to restrict activity based on land use. Not applicable for use in open space areas. |
| Monitoring              | Soil Gas Monitoring       | Periodic Soil Gas Monitoring                                               | Collect and analyze soil gas samples periodically to evaluate the potential for vapor intrusion.                                                                                                                                                                                                                                                                                               | Retained<br>Easily implemented; required to evaluate effectiveness of other process options; low cost.                                             |

**Table 3-6. Screening of GRAs and Process Options for Soil and Shoreline Sediment at Parcel E** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology Type                   | Process Option                                                                                                | Description                                                                                                                                                                                                                                                                            | Comments                                                                                                                                                                                                                                                |
|-------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Removal <sup>1</sup>    | Excavation and Off-Site Treatment/Disposal | Conventional Excavation and Disposal at Licensed Treatment/Disposal Facility (e.g., RCRA, non-RCRA, and LLRW) | Excavate soil containing chemicals using conventional mechanical equipment; limit to depths of less than 10 feet bgs. Transport and dispose of soils at a permitted treatment and disposal facility.                                                                                   | Retained for some COCs<br>Effective for non-ubiquitous metals and PAHs; easily and quickly implemented; permanent remedy; and moderate cost.<br>Eliminated for ubiquitous metals<br>Not implementable or cost-effective for entire redevelopment blocks |
| Treatment <sup>1</sup>  | Physical/Chemical Treatment                | Soil Vapor Extraction (with or without thermally enhanced recovery)                                           | Extract VOCs from unsaturated zone with vacuum pumps; extraction performance can be enhanced with active volatilization of VOCs in groundwater (EPA, 1997b). May be used with thermal enhancement (e.g., six-phase heating or steam injection) to enhance volatilization of chemicals. | Retained for some COCs<br>Effective in treating VOCs; effectiveness enhanced when implemented with active volatilization                                                                                                                                |
|                         |                                            | Mechano-Chemical Destruction                                                                                  | Treat chemicals with a proprietary reagent in a high-intensity ball mill; includes pretreatment (drying/sieving) and solidification/stabilization of treated soil. Offgas treatment required.                                                                                          | Eliminated<br>High risks to workers associated with on-site treatment, high cost, stringent regulatory requirements.                                                                                                                                    |
|                         |                                            | Thermal Treatment: Thermal Desorption or Incineration                                                         | Volatilize chemicals in soil. Thermal desorption raises temperature to levels just below oxidation (destruction) temperatures. Incineration raises temperature to combustion temperatures (FRTR, 2005).                                                                                | Eliminated<br>Effective for organic chemicals; however, not effective for metals. Can volatilize metals, creating additional environmental concerns from potential air emissions. High cost, stringent regulatory requirements                          |

**Table 3-6. Screening of GRAs and Process Options for Soil and Shoreline Sediment at Parcel E (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology Type             | Process Option               | Description                                                                                                                                                                                                                                                                | Comments                                                                                                                                                               |
|-------------------------|--------------------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Treatment (cont.)       | Physical/ Chemical Treatment (cont.) | Soil Washing                 | Remove chemicals in soil using an aqueous-based wash solution. Usually combined with mechanical screening methods to remove debris.                                                                                                                                        | Eliminated<br>Limited effectiveness with hydrophobic compounds such as PCBs and PAHs; high O&M cost.                                                                   |
|                         |                                      | Solidification/Stabilization | Reduce chemical mobility through physical or chemical reaction with stabilizing agents (EPA, 1998b).                                                                                                                                                                       | Eliminated<br>Limited effectiveness for treatment of PAHs.                                                                                                             |
|                         |                                      | Solvated Electron Process    | Treat soil by first mixing with liquid ammonia to form a soil/ammonia slurry, adding elemental calcium or sodium to the slurry; then separate ammonia from soil as a liquid until most of the ammonia is removed; and finally as a vapor by warming the soil (FRTR, 2005). | Eliminated<br>Not applicable for metals; highly exothermic reaction with health and safety concerns; not cost-effective for small volumes of PAHs.                     |
|                         |                                      | Chemical Oxidation           | Convert inorganic chemicals to nonhazardous compounds using an oxidizing agent (EPA 1998a). Typical oxidants include hydrogen peroxide, potassium permanganate, and sodium persulfate                                                                                      | Eliminated<br>Low effectiveness for treatment of low-level VOCs in soils; high cost. Also, difficult to effectively deliver to nonaqueous phase (e.g., soil and NAPL). |
|                         | Biological Treatment                 | Phytoremediation             | Use plants to remediate contamination in soil. Phytoremediation can be used for various chemicals, including metals, solvents, PAHs, pesticides, petroleum hydrocarbons, and explosives.                                                                                   | Eliminated<br>Low implementability and high cost per unit area                                                                                                         |

**Table 3-6. Screening of GRAs and Process Options for Soil and Shoreline Sediment at Parcel E (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action  | Remedial Technology Type     | Process Option              | Description                                                                                                                                                                                                                                                              | Comments                                                                                                                                                                                       |
|--------------------------|------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Treatment (cont.)        | Biological Treatment (cont.) | Bioremediation              | Reduce chemicals in soil by metabolizing organic chemicals with biological amendments (FRTR, 2005)                                                                                                                                                                       | Eliminated<br>Not effective for metals; not efficient for small volumes of soils containing low-level PAHs.                                                                                    |
| Containment <sup>1</sup> | Covers                       | Soil Covers                 | Place soil cover over contaminated soil; prevents direct contact with contaminated soil.                                                                                                                                                                                 | Retained for areas that are not paved or do not require paving to achieve planned land uses.<br>Effective for metals and PAHs; easily and quickly implemented; moderate cost per unit area.    |
|                          |                              | Asphalt or Concrete Covers  | Place an asphalt or concrete cover over contaminated soil; prevents direct contact with contaminated soil.                                                                                                                                                               | Retained for areas that are paved or require paving to achieve planned land uses.<br>Effective for metals and PAHs; moderate cost per unit area.                                               |
|                          |                              | Engineered Alternative Caps | Place a soil cover with a geomembrane liner that is made of an impermeable, synthetic material; prevents direct contact with contaminated soil and minimizes migration of contamination. Can also include engineered soil caps using clay instead of synthetic material. | Retained for areas with elevated concentrations of mobile chemicals that are not paved or do not require paving to achieve planned land uses.<br>Effective; easy to moderate implementability. |
|                          |                              | Maintained Landscaping      | Maintain a vegetative cover over soil over contaminated areas to eliminate the direct exposure pathway.                                                                                                                                                                  | Eliminated<br>Not considered applicable to bare soil areas at Parcel E with organic chemical concentrations exceeding RBCs.<br>Would not be an effective method for eliminating exposure.      |

**Table 3-6. Screening of GRAs and Process Options for Soil and Shoreline Sediment at Parcel E (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action             | Remedial Technology Type                          | Process Option                     | Description                                                                                                                                                                 | Comments                                                                                                                                             |
|-------------------------------------|---------------------------------------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Containment <sup>1</sup><br>(cont.) | Shoreline Armoring <sup>2</sup>                   | Protective Revetments <sup>2</sup> | Install an erosion control structure consisting of riprap, large armor units, gabions, articulating concrete mats, or engineered concrete structures along the shoreline.   | Retained for detailed evaluation. Rock revetment successfully implemented along HPS shoreline in the past.                                           |
|                                     |                                                   | Seawalls <sup>2</sup>              | Install a massive concrete structure with its weight providing its stability. Prevents inland flooding from major storm events accompanied by large, powerful waves.        | Eliminated<br>High implementation cost. However, maintenance of existing seawalls may be incorporated as part of a shoreline protection alternative. |
|                                     |                                                   | Bulkheads <sup>2</sup>             | Install vertical retaining walls to hold or prevent soil from sliding seaward. Reduces land erosion and loss to the sea; does not mitigate coastal flooding or wave damage. | Eliminated<br>Would not fully contain shoreline sediment from potential wave-induced erosion and would not satisfy RAOs.                             |
|                                     | Shoreline Stabilization (Structural) <sup>2</sup> | Breakwaters <sup>2</sup>           | Install rock structure offshore or adjacent to headlands with crest above MHHW. Protects shore from large, powerful waves from major storm events.                          | Eliminated<br>Would not fully contain shoreline sediment from potential wave-induced erosion and would not satisfy RAOs.                             |
|                                     |                                                   | Groins <sup>2</sup>                | Install narrow rock or timber structure(s) perpendicular to shoreline. Reduces erosion associated with longshore currents.                                                  | Eliminated<br>Would not fully contain shoreline sediment from potential wave-induced erosion and would not satisfy RAOs.                             |

**Table 3-6. Screening of GRAs and Process Options for Soil and Shoreline Sediment at Parcel E (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action             | Remedial Technology Type                                     | Process Option                                                                        | Description                                                                                                                                                                                                                           | Comments                                                                                                                                                                                    |
|-------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Containment <sup>1</sup><br>(cont.) | Shoreline Stabilization (Structural) <sup>2</sup><br>(cont.) | Nearshore Sills <sup>2</sup>                                                          | Install narrow rock structure(s) parallel to shoreline with crest at or below MHHW. Rock may be substituted with natural material (such as oyster shells) and be combined with vegetation to reduce erosion from wave action.         | Eliminated as stand-alone option <sup>3</sup><br>Would not fully contain shoreline sediment from potential wave-induced erosion and would not satisfy RAOs.                                 |
|                                     |                                                              | Offshore Reefs <sup>2</sup>                                                           | Install rock structure offshore with crest at or below MHHW. Rock may be substituted with natural material (such as oyster shells) and be combined with vegetation to reduce erosion from wave action.                                | Eliminated as stand-alone option <sup>3</sup><br>Would not fully contain shoreline sediment from potential wave-induced erosion and would not satisfy RAOs.                                 |
|                                     | Shoreline Stabilization (Nonstructural) <sup>2</sup>         | Aquatic Vegetation (submerged or intertidal) <sup>2</sup>                             | Plant aquatic vegetation either offshore or within intertidal zone. Reduces erosion from wave action.                                                                                                                                 | Eliminated as stand-alone option <sup>3</sup><br>Would not fully contain shoreline sediment from potential wave-induced erosion and would not satisfy RAOs.                                 |
|                                     |                                                              | Sand Fill (or other clean, imported soil type meeting design objectives) <sup>2</sup> | Place soil to prevent direct exposure to contaminated shoreline sediment. May be combined with aquatic vegetation offshore and within intertidal zone to reduce erosion from wave action.                                             | Eliminated as stand-alone option <sup>3</sup><br>Would not fully contain shoreline sediment from potential wave-induced erosion and would not satisfy RAOs.                                 |
|                                     |                                                              | Natural Shoreline Materials with Offshore Reef <sup>2</sup>                           | Place soil to prevent direct exposure to contaminated shoreline sediment. Install rock structure offshore <sup>4</sup> , with crest at or below MHHW to reduce wave energy, and plant aquatic vegetation to reduce erosion potential. | Retained for detailed evaluation. Assumes that offshore reef and aquatic vegetation could be developed in a manner that adequately controls erosion potential in intertidal shoreline zone. |

**Table 3-6. Screening of GRAs and Process Options for Soil and Shoreline Sediment at Parcel E** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action                      | Remedial Technology Type                      | Process Option                                                      | Description                                                                                                                                                           | Comments                                                                                                                                                                                                                 |
|----------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Containment <sup>1</sup><br>( <i>cont.</i> ) | Shoreline Stabilization (Hybrid) <sup>2</sup> | Natural Shoreline Materials with Underlying Rock Armor <sup>2</sup> | Place soil to prevent direct exposure to contaminated shoreline sediment. Install rock armoring layer under soil if wave action causes erosion of soil.               | Retained for detailed evaluation. Stabilization options successfully implemented following removal action at Metal Debris Reef in 2007.                                                                                  |
|                                              | Shoreline Nourishment <sup>2</sup>            | Berms or Dunes <sup>2</sup>                                         | Place additional sand (in a berm or dune) at higher tidal elevations to protect onshore property and provide stabilizing soil source following storm-related erosion. | Eliminated<br>Would not fully contain shoreline sediment from potential wave-induced erosion and would not satisfy RAOs. Difficult to implement at narrow Parcel E shoreline (substantial excavation would be required). |
|                                              |                                               | Feeder Beach <sup>2</sup>                                           | Construct a wider beach to protect onshore property and provide stabilizing soil source following storm-related erosion.                                              | Eliminated<br>Would not fully contain shoreline sediment from potential wave-induced erosion and would not satisfy RAOs. Difficult to implement at narrow Parcel E shoreline (substantial excavation would be required). |

**Table 3-6. Screening of GRAs and Process Options for Soil and Shoreline Sediment at Parcel E (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

Notes: Shaded process options are eliminated for further evaluation as a remedial alternative. Eliminated technologies are not presented in text.

1. GRA applies to soil only.
2. Shoreline protection technologies and process options are evaluated in Appendix D.
3. Eliminated as stand-alone stabilization option but may be incorporated with hybrid stabilization option.
4. Offshore reef consisting of rocks is identified as a representative structural element for this hybrid stabilization option; however, alternative structural elements may be proposed that meet the design objectives and provide equal (or superior) performance relative to effectiveness, implementability, and cost. Alternative structural elements may use natural materials (such as oyster shells) or may involve placing the structure closer to the shore (such as a nearshore sill). See Table 3-9 for a more detailed evaluation of this option.

bgs = below ground surface

DTSC = Department of Toxic Substances Control

EPA = U.S. Environmental Protection Agency

FRTR = Federal Remediation Technologies Roundtable

GRAs = general response actions

HPS = Hunters Point Shipyard

IR = Installation Restoration

LLRW = low-level radioactive waste

MHHW = mean higher high water

NAPL = non-aqueous-phase liquid

Navy = Department of the Navy

NCP = National Oil and Hazardous Substances Pollution Contingency Plan

O&M = operation and maintenance

PAHs = polycyclic aromatic hydrocarbons

PCBs = polychlorinated biphenyls

RAOs = remedial action objectives

RBCs = risk-based concentrations

RCRA = Resource Conservation and Recovery Act

VOCs = volatile organic compounds

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**Table 3-7. Screening of GRAs and Process Options for Groundwater**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology Type  | Process Option                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                | Comments                                                                                                                                |
|-------------------------|---------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| No Action               | Not Applicable            | Not Applicable                                                             | No Action                                                                                                                                                                                                                                                                                                                                                                                                                  | Retained<br>Required by NCP.                                                                                                            |
| Institutional Controls  | Legal Mechanisms          | Covenants to Restrict Use of Property and Deed Restrictions                | Restricts the use of the parcel using environmental restrictive covenants on the land. Includes criteria during and after future development to ensure mitigated exposure conditions are maintained, such as vapor barriers or other engineering controls (Navy and DTSC, 2000). Also restricts subsurface intrusive activities that might result in or aid the movement of contaminated groundwater.                      | Retained<br>Easily implemented and effective; prevents exposure to COCs and COECs.                                                      |
|                         | Administrative Mechanisms | Land Use Plans and Soil and Groundwater Management Procedures and Policies | Manage and prevent exposure to humans during future site activities.                                                                                                                                                                                                                                                                                                                                                       | Eliminated<br>Covenants to Restrict Use of Property and Deed Restrictions are sufficient to enforce land use and activity restrictions. |
| Engineering Controls    | Physical Barriers         | Security Features and Signs                                                | Prohibits activities that could spread groundwater contamination by requiring locked well caps and secured utility access covers, and identifying and securing any additional conduit where humans or wildlife could potentially be exposed to groundwater. Requires posted signs and locked doors to prohibit occupancy of buildings or other enclosures where unacceptable risk exists from the vapor intrusion pathway. | Retained<br>Easily implemented and effective; prevents exposure to COCs and COECs.                                                      |
|                         | Vapor Barrier             | Sub-Slab Depressurization                                                  | Install blowers and vapor collection points below a building to maintain a negative pressure gradient and prevent vapor intrusion.                                                                                                                                                                                                                                                                                         | Retained for new construction<br>Effective and low-cost method to minimize vapor intrusion only.                                        |

**Table 3-7. Screening of GRAs and Process Options for Groundwater** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action                | Remedial Technology Type        | Process Option                  | Description                                                                                                                                                                                                                         | Comments                                                                                                                                                                                                                                 |
|----------------------------------------|---------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Engineering Controls<br><i>(cont.)</i> | Vapor Barrier<br><i>(cont.)</i> | Sub-Slab Depressurization       | Install blowers and vapor collection points below a building to maintain a negative pressure gradient and prevent vapor intrusion.                                                                                                  | Eliminated for existing buildings<br>Extensive investigation into conditions under the building would be necessary to ensure the systems cover the entire foundation and utility conduits or other preferential pathways are not present |
|                                        |                                 | Epoxy Coating                   | Seal the floor of a building with an epoxy-based sealant, providing a physical barrier to vapor migration into buildings.                                                                                                           | Eliminated as a stand-alone technology.<br>May be used in conjunction with sub-slab depressurization to improve effectiveness.                                                                                                           |
|                                        |                                 | Raised-Floor System             | Install a new floor above the building slab foundation and a depressurization system between the floors to maintain a negative pressure gradient and prevent vapor intrusion.                                                       | Eliminated<br>High cost; reduces the functionality of the structure.                                                                                                                                                                     |
| Monitoring                             | Groundwater Monitoring          | Periodic Groundwater Monitoring | Collect and analyze groundwater samples periodically to monitor aquifer hydraulics and chemistry and variations in groundwater contamination. Chemicals are identified for detection monitoring and evaluation monitoring programs. | Retained<br>Easily implemented; required to evaluate effectiveness of other process options; low cost.                                                                                                                                   |
| Treatment                              | Passive                         | Monitored Natural Attenuation   | Allow chemicals to naturally attenuate via biodegradation, dispersion, dilution, or adsorption. Requires monitoring to assess recovery rates and success.                                                                           | Retained for use as a component of remedial alternatives<br>Periodic monitoring is easily implemented; low cost.                                                                                                                         |

**Table 3-7. Screening of GRAs and Process Options for Groundwater** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology Type     | Process Option                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                | Comments                                                                                                                                                                                                                            |
|-------------------------|------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Treatment<br>(cont.)    | In-Situ Physical Treatment   | Air Sparging with SVE                | Inject air into the bottom of a saturated zone to strip VOCs from groundwater. Extract VOCs from the unsaturated zone with SVE.                                                                                                                                                                                                                                                                                                            | Retained<br>Easily implemented in conjunction with SVE; improves effectiveness of SVE at reducing VOC mass in groundwater.                                                                                                          |
|                         |                              | Pneumatic/ Hydraulic Fracturing      | Inject air and water under pressure into soil to enhance permeability by developing cracks in low-permeability and consolidated sediments to increase removal efficiency. Used as part of injection processes (e.g., in-situ bioremediation, ZVI).                                                                                                                                                                                         | Retained<br>Effective at enhancing distribution of reagents; demonstrated to be implementable in treatment studies at HPS; low cost.                                                                                                |
|                         | In-Situ Biological Treatment | Anaerobic and Aerobic Bioremediation | Introduce amendments to groundwater in areas where chlorinated solvents are present to enhance biodegradation of chlorinated VOCs. Amendments include electron donors, electron receptors, nutrients, and microorganisms, if necessary. Requires monitoring to assess program (FRTR, 2005).                                                                                                                                                | Retained<br>Effective for VOCs at moderate to low concentrations; easily implemented; moderate cost; no O&M costs; requires monitoring, but treatment should reduce long-term monitoring effort.                                    |
|                         |                              | Phytoremediation                     | Allow plants to uptake water (including dissolved chemicals in water) and release it to the atmosphere through transpiration. Plant uptake is used to remove, transfer, stabilize, and destroy inorganic and organic chemicals in groundwater; requires monitoring to assess remedial progress. Note that phytoremediation may also be used to provide hydraulic control by uptake of contaminated groundwater (known as phytohydraulics). | Eliminated<br>Effective for organic COCs and COECs at low concentrations; may not be implementable with planned reuse; moderate implementation cost; moderate to low O&M cost; requires monitoring; lengthy treatment period likely |

**Table 3-7. Screening of GRAs and Process Options for Groundwater** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology Type                | Process Option                    | Description                                                                                                                                                                                                           | Comments                                                                                                                                                                                                                                                                                           |
|-------------------------|-----------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Treatment<br>(cont.)    | In-Situ Biological Treatment<br>(cont.) | Biosparging                       | Add oxygen and nutrients to the injected air stream to enhance air sparging; enhances growth of naturally occurring microbes and accelerates bioremediation.                                                          | Eliminated<br>Low effectiveness (unlikely to meet RAOs within a reasonable time frame). Other more effective oxidation processes are available.                                                                                                                                                    |
|                         | In-Situ Chemical Groundwater Treatment  | Chemical Reduction: ZVI Injection | Inject ZVI into an aquifer to encourage enhanced reductive dechlorination of chlorinated VOCs.                                                                                                                        | Retained<br>Highly effective for VOCs; most efficient at high concentrations; implementable as a fast-reacting remedy; moderate to high success in pilot tests at HPS; high implementation costs with low O&M costs; requires monitoring, but treatment should reduce long-term monitoring effort. |
|                         |                                         | In-Situ Chemical Oxidation        | Inject chemical oxidants into the vadose zone and groundwater to oxidize site chemicals, leaving water and carbon dioxide. Typical oxidants include hydrogen peroxide, potassium permanganate, and sodium persulfate. | Eliminated<br>Not effective for low-level VOC contamination in groundwater; challenges posed by heterogeneous fill (preferential flowpaths), and availability of other relevant and effective technologies                                                                                         |

**Table 3-7. Screening of GRAs and Process Options for Groundwater** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action     | Remedial Technology Type                                 | Process Option              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------|----------------------------------------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Treatment<br><i>(cont.)</i> | In-Situ Chemical Groundwater Treatment<br><i>(cont.)</i> | Electrokinetic Separation   | Induce acidic (low pH) conditions through electronic current, creating an acid front at the anode and a base front (high pH) at the cathode. Acidic conditions mobilize metals for transport and collection at the cathode. Requires monitoring to assess remedial progress (Ground-Water Remediation Technology Analysis Center, 1997).                                                                                                                                                          | Eliminated<br>Highly effective for metals but less effective for VOCs; requires subsequent disposal of collected COCs and COECs that may need additional treatment prior to disposal; reactions may form undesirable byproducts; high implementation and O&M cost.                                                                                                                                                                                                                               |
|                             |                                                          | Ozone Sparging with SVE     | Inject ozone into the aquifer to mobilize and react with VOCs into unsaturated vadose zone soil and create a highly oxygenized environment; oxygenized groundwater chemically degrades VOCs (EPA, 1998b).                                                                                                                                                                                                                                                                                         | Eliminated<br>Possibility that ozone may follow preferential pathways or accumulate under or in buildings.                                                                                                                                                                                                                                                                                                                                                                                       |
|                             |                                                          | Permeable Reactive Barriers | Install passive or reactive treatment walls across the flow path of a contaminant plume, allowing the plume groundwater to passively move through walls while prohibiting movement of chemicals by using agents such as zero-valent metals, chelators (ligands selected for their specificity for a metal), sorbents, microbes, or others. The chemicals will either degrade or be retained in a concentrated form by the barrier material; requires monitoring to assess remedial effectiveness. | Eliminated<br>High level of effort to implement; only treats water that moves through the wall, not the source area; may have slow results based on groundwater gradients at HPS; ineffective where preferential pathways exist; implementation may conflict with planned reuse; limited field data concerning the longevity of wall reactivity or loss or permeability through precipitation (EPA, 2000b); would not reduce the vapor intrusion pathway risk; high implementation and O&M cost. |

**Table 3-7. Screening of GRAs and Process Options for Groundwater** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology Type        | Process Option                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Comments                                                                                                                                                                                                 |
|-------------------------|---------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Removal                 | Extract and Dispose             | Pump and Treat                                                              | Remove groundwater from the subsurface for ex-situ treatment. Treatment of extracted groundwater would be required or discharge to the POTW.                                                                                                                                                                                                                                                                                                                                                                               | Eliminated<br>Not effective for low-level contamination in groundwater; challenges posed by heterogeneous fill (preferential flow paths), and availability of other relevant and effective technologies. |
|                         |                                 | Surfactant Enhanced In-Situ Flushing                                        | Inject surfactants or cosolvents into the source area to enhance groundwater pump-and-treat process and solubilize DNAPL. Accomplish dissolved-phase capture through a series of extraction wells.                                                                                                                                                                                                                                                                                                                         | Eliminated<br>Difficult to implement; risk of mobilizing NAPL beyond site boundary.                                                                                                                      |
| Containment             | Physical and Hydraulic Barriers | Slurry or Sheet-Pile Wall (with groundwater extraction wells, if necessary) | Install slurry or sheet-pile walls below ground to contain, capture, or redirect groundwater flow. Can be used to decrease the groundwater flow gradient and consequently increase the residence time during which chemical concentrations would be reduced through physical, chemical, and biological processes. Where needed, groundwater extraction wells might be used behind a wall to further mitigate migration (e.g., at a landfill where landfill leachate poses an unacceptable risk to downgradient receptors). | Retained<br>Effective in containing chemicals in groundwater; implemented successfully at HPS in the past, low to moderate cost.                                                                         |

**Table 3-7. Screening of GRAs and Process Options for Groundwater (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

Notes: Shaded process options are eliminated for further evaluation as a remedial alternative.

COCs = chemicals of concern

COECs = chemicals of ecological concern

DNAPL = dense nonaqueous-phase liquid

EPA = U.S. Environmental Protection Agency

FRTR = Federal Remediation Technologies Roundtable

FS = Feasibility Study

GRAs = general response actions

HPS = Hunters Point Shipyard

IR = Installation Restoration

NAPL = nonaqueous-phase liquid

NCP = National Oil and Hazardous Substances Pollution Contingency Plan

O&M = operation and maintenance

POTW = publicly owned treatment works

RAOs = remediation action objectives

SVE = soil vapor extraction

TtEMI = Tetra Tech EM Inc.

VOCs = volatile organic compounds

ZVI = zero-valent iron

Sources:

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EPA. 2000a. The Office of Solid Waste and Emergency Response Publication on Land Use Controls. Available Online at: <<http://www.epa.gov/oerrpage/superfund/action/ic/guide/index.htm>>.

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Navy and DTSC, 2000. "Memorandum of Agreement Between the United States Department of the Navy and the California [Environmental Protection Agency] Department of Toxic Substances Control." Signed March 10.

**Table 3-8. Screening of GRAs and Process Options for NAPL at IR-03**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action     | Remedial Technology       | Process Option                                                             | Description                                                                                                                                                                                                                                                | Conclusion                                                                                                                              |
|-----------------------------|---------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAPL PROCESS OPTIONS</b> |                           |                                                                            |                                                                                                                                                                                                                                                            |                                                                                                                                         |
| No Action                   | None                      | None                                                                       | No further response actions.                                                                                                                                                                                                                               | Retained<br>No action as required by NCP.                                                                                               |
| Institutional Controls      | Legal Mechanisms          | Covenants to Restrict Use of Property and Deed Restrictions                | Restrictions placed on the use of land or activities that may take place in a given area. Complete description provided in Tables 3-5 and 3-6.                                                                                                             | Retained<br>Easily implemented and effective; prevents exposure to COCs and COECs.                                                      |
|                             | Administrative Mechanisms | Land Use Plans and Soil and Groundwater Management Procedures and Policies | Manage and prevent exposure to humans during future site activities.                                                                                                                                                                                       | Eliminated<br>Covenants to Restrict Use of Property and Deed Restrictions are sufficient to enforce land use and activity restrictions. |
| Engineering Controls        | Physical Barriers         | Security Features and Signs                                                | Prohibits activities that could spread groundwater contamination by requiring locked well caps and secured utility access covers, and identifying and securing any additional conduit where potential humans and wildlife could be exposed to groundwater. | Retained<br>Easily implemented and effective; prevents exposure to COCs and COECs; low cost.                                            |
| Monitoring                  | Groundwater Monitoring    | Periodic Groundwater Monitoring                                            | Collect and analyze groundwater samples periodically to monitor variations in aquifer chemistry and hydraulics and changes in groundwater contamination.                                                                                                   | Retained<br>Easily implemented; effective for all COCs; low cost.                                                                       |
| Removal                     | Physical Extraction       | Liquid-Phase Pumping                                                       | Recover NAPL to the maximum extent practicable through either traditional pumping techniques.                                                                                                                                                              | Retained<br>Potential high effectiveness when combined with thermal treatment.                                                          |
|                             |                           | Dual-Phase Extraction                                                      | Use vacuum pumps to remove various combinations of contaminated groundwater; separate phase petroleum product and hydrocarbon vapor from the subsurface. Extracted liquids and vapor are collected and treated.                                            | Retained<br>Potential high effectiveness when combined with thermal treatment.                                                          |



**Table 3-8. Screening of GRAs and Process Options for NAPL at IR-03 (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action                 | Remedial Technology         | Process Option                                                                                                                       | Description                                                                                                                                                                                                                                                                                                           | Conclusion                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAPL PROCESS OPTIONS (continued)</b> |                             |                                                                                                                                      |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                    |
| Removal (cont.)                         | Physical Extraction (cont.) | Thermally Enhanced Extraction by Hot Water Circulation, Electrical Resistive Heating, Thermal Conductive Heating, or Steam Injection | Use hot water circulation, electrical resistive heating, thermal conductive heating, or steam injection to decrease viscosity in NAPL, mobilizing it for extraction. May need to be implemented in conjunction with containment action (to retain heat within treatment zone and prevent off-site migration of NAPL). | Retained<br>Significantly improves effectiveness in recovering viscous NAPL source areas using standard extraction techniques. Extraction not feasible without enhancement; moderate capital cost; moderate to high operational cost due to power consumption. Capital cost can be partially offset if equipment is used for thermal treatment upon completion of NAPL extraction. |
|                                         |                             | Treatment and Off-Site Disposal of Extracted NAPL/ Groundwater                                                                       | Treat extracted NAPL, groundwater, and vapor prior to disposal. Depending on the POTW facility pretreatment requirements and other potential regulatory issues, extracted groundwater can be conveyed and discharged to a POTW facility.                                                                              | Retained for further evaluation as a component of remedial alternatives. High effectiveness and implementability.                                                                                                                                                                                                                                                                  |
|                                         |                             | Excavation                                                                                                                           | Remove contaminated material with heavy equipment. Excavated soil can be stockpiled on site for treatment or transported to a permitted off-site treatment and disposal facility.                                                                                                                                     | Retained for consideration of ex-situ treatment or off-site disposal scenarios.                                                                                                                                                                                                                                                                                                    |
|                                         |                             | Off-Site Disposal of Excavated NAPL/ Soil                                                                                            | Collect and transport soil to an appropriate treatment, storage, or disposal facility. Disposal of soil would involve constructing on-site staging area from which soil would be transferred to trucks and transported to an off-site facility.                                                                       | Retained<br>Highly effective; off-site disposal could be used for (1) disposal of small volumes of process residuals or (2) sitewide cleanup of soil from IR-03.                                                                                                                                                                                                                   |

**Table 3-8. Screening of GRAs and Process Options for NAPL at IR-03 (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action                 | Remedial Technology          | Process Option                           | Description                                                                                                                                                                                                      | Conclusion                                                                                                                                                                                                         |
|-----------------------------------------|------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAPL PROCESS OPTIONS (continued)</b> |                              |                                          |                                                                                                                                                                                                                  |                                                                                                                                                                                                                    |
| Containment                             | Covering and Capping         | Soil Cover or Engineered Alternative Cap | Isolate contaminated soil and buried debris from potential humans or wildlife at the site using a soil cover or engineered alternative cap.                                                                      | Retained<br>Easily implemented; a low-permeability geosynthetic clay cap was installed over the surface of IR-03 in 1997; effective in eliminating exposure; low to moderate cost.                                 |
|                                         | Hydraulic Barriers           | Slurry or Sheet-Pile Wall                | Install slurry or sheet-pile walls below the ground to contain, capture, or redirect groundwater flow in the vicinity of IR-03.                                                                                  | Retained<br>Effective in containing NAPL and groundwater contaminants. Easy to moderate implementability; may be difficult to implement close to shoreline because large debris is present; moderate to high cost. |
| In-Situ Treatment                       | Solidification/Stabilization | In-Situ Mixing                           | Mix one or more reagents directly into contaminated soil/NAPL with mechanical equipment. Reagents may include stabilizing agents (such as cement or bentonite) and reactive agents (such as a chemical oxidant). | Retained<br>Effective in stabilizing NAPL if homogeneous mixing is achieved; may be difficult to implement close to shoreline because large debris is present. Moderate to high capital cost; low O&M cost.        |
|                                         |                              | Ex-Situ Mixing                           | Excavate contaminated soil and NAPL, transport to on-site location, and spread in layers. Mix a binding reagent into soil/NAPL with mechanical equipment and transport/place stabilized material in excavation.  | Retained<br>Effective in stabilizing NAPL with homogeneous mixing process; implementation may be limited by available on-site area. High capital cost; low O&M cost.                                               |

**Table 3-8. Screening of GRAs and Process Options for NAPL at IR-03 (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action                                     | Remedial Technology  | Process Option                                                                                    | Description                                                                                                                                                                                                                                                                                                                                                         | Conclusion                                                                                                                                                                                                             |
|-------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAPL PROCESS OPTIONS (continued)</b>                     |                      |                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                        |
| In-Situ Treatment                                           | Biological Treatment | Anaerobic and Aerobic Bioremediation                                                              | Introduce amendments to subsurface to enhance biodegradation of NAPL. Amendments include electron donors/receptors, nutrients, and microorganisms.                                                                                                                                                                                                                  | Eliminated as stand-alone option for NAPL treatment, but may be considered to address associated groundwater contamination.                                                                                            |
|                                                             | Chemical Treatment   | In-Situ Chemical Oxidation                                                                        | Inject chemical oxidants into subsurface to oxidize NAPL. Typical oxidants include hydrogen peroxide, potassium permanganate, and sodium persulfate.                                                                                                                                                                                                                | Thick, viscous nature of NAPL would limit effectiveness of in-situ biodegradation and chemical oxidation.                                                                                                              |
| <b>ADDITIONAL OPTIONS TO ADDRESS ASSOCIATED GROUNDWATER</b> |                      |                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                        |
| In-Situ Treatment                                           | Thermal Treatment    | Thermal Treatment by Electrical Resistive Heating, Thermal Conductive Heating, or Steam Injection | Use electrical resistive heating, thermal conductive heating, or steam injection to vaporize VOCs and SVOCs in groundwater. The vaporized chemicals are subsequently captured using vacuum extraction (e.g., SVE). May need to be implemented in conjunction with containment action (to retain heat within treatment zone and prevent off-site migration of NAPL). | Retained<br>Easily implemented as a follow-up step to thermally-enhanced extraction; effective at treating organic compounds in groundwater, short treatment duration; high operational cost due to power consumption. |
|                                                             | Biological Treatment | Anaerobic and Aerobic Bioremediation                                                              | Introduce amendments to groundwater to enhance biodegradation of organic chemicals. Amendments include electron donors, electron receptors, nutrients, and microorganisms, if necessary. Requires monitoring to assess program.                                                                                                                                     | Retained<br>Effective at moderate to low concentrations; easily implemented at moderate cost; no O&M cost; requires monitoring, but treatment should reduce long-term monitoring effort.                               |
|                                                             | Passive              | Monitored Natural Attenuation                                                                     | Allow chemicals to attenuate naturally via biodegradation, dispersion, dilution, or adsorption. Requires monitoring to assess reduction rates.                                                                                                                                                                                                                      | Retained<br>Periodic monitoring is easily implemented; low cost.                                                                                                                                                       |

**Table 3-8. Screening of GRAs and Process Options for NAPL at IR-03 (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action                                                 | Remedial Technology | Process Option             | Description                                                                                                                                                                                                 | Conclusion                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------|---------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ADDITIONAL OPTIONS TO ADDRESS ASSOCIATED GROUNDWATER (continued)</b> |                     |                            |                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                       |
| In-Situ Treatment                                                       | Chemical Treatment  | Treatment Barrier          | Integrate reactive components into a hydraulic barrier to mediate contaminant destruction using "funnel and gate" approach.                                                                                 | Eliminated<br>Low effectiveness and high cost due to long treatment period.                                                                                                                                                                                                                           |
|                                                                         |                     | In-Situ Chemical Oxidation | Inject chemical oxidants into vadose zone and groundwater to oxidize site chemicals to water and carbon dioxide. Typical oxidants include hydrogen peroxide, potassium permanganate, and sodium persulfate. | Eliminated<br>Low effectiveness due to difficulty achieving contact of injected agent with low-level, widespread residual contamination. Pilot tests using chemical oxidation with permanganate at Parcel C were found to be difficult to implement because of unanticipated preferential flow paths. |

Notes: Shaded process options are eliminated for further evaluation as a remedial alternative.

COCs = chemicals of concern

COECs = chemicals of ecological concern

DPE = dual-phase extraction

IR = Installation Restoration

NAPL = nonaqueous-phase liquid

NCP = National Oil and Hazardous Substances Pollution Contingency Plan

O&M = operation and maintenance

POTW = publicly owned treatment works

SVE = soil vapor extraction

VOCs = volatile organic compounds

**Table 3-9. Detailed Evaluation of GRAs and Process Options for Soil and Shoreline Sediment**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology Type                    | Process Option                                                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                    | Effectiveness                                                                                                                                                                                                                                                                | Implementability                                                                                                                                                                                                                                                   | Cost                                                                                                | Comments                                                                                                                                           |
|-------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| No Action               | Not Applicable                              | Not Applicable                                                                                             | No Action                                                                                                                                                                                                                                                                                                                                                                                      | Does not achieve RAOs.                                                                                                                                                                                                                                                       | Not acceptable to local government or public.                                                                                                                                                                                                                      | None                                                                                                | Retained<br>Required by NCP.                                                                                                                       |
| Institutional Controls  | Legal Mechanisms                            | Covenants to Restrict Use of Property and Deed Restrictions                                                | Restricts use of parcel through environmental restrictive covenants that will run with the land; allows only designated land use in accordance with the proposed redevelopment plan (EPA, 2000a); includes criteria during and after future development to ensure mitigated exposure conditions are maintained, such as covers, barriers, or other engineering controls (Navy and DTSC, 2000). | Ineffective in reducing contamination. Effective at limiting or preventing exposure of humans to contamination, especially when used in combination with other options. Does not prevent exposure of wildlife.                                                               | Easily implemented. Requires legal documents and authority to enforce restrictions.                                                                                                                                                                                | Low                                                                                                 | Retained<br>Easily implemented and effective, usually required to restrict activity based on land use.                                             |
| Engineering Controls    | Physical Barriers                           | Fencing, Barriers, and Signs                                                                               | Restrict land use where there is exposure to potentially contaminated soil using fencing, barriers, and posting signs.                                                                                                                                                                                                                                                                         | Effectively prevents exposure of humans to contamination, especially when used in combination with other options. Does not reduce volume or toxicity of contamination (EPA, 2000a). Conflicts with land use of open space areas.                                             | Easily implemented. Requires legal documents and authority to enforce restrictions.                                                                                                                                                                                | Low                                                                                                 | Retained<br>Easily implemented and effective; usually required to restrict activity based on land use. Not applicable for use in open space areas. |
| Monitoring              | Soil Gas Monitoring                         | Periodic Soil Gas Monitoring                                                                               | Collect and analyze soil gas samples periodically to evaluate the potential for vapor intrusion.                                                                                                                                                                                                                                                                                               | Does not achieve RAOs; does not reduce the toxicity or volume of contamination. However, it would be effective as a means of monitoring effectiveness of groundwater remediation actions.                                                                                    | Easily implemented.                                                                                                                                                                                                                                                | Moderate                                                                                            | Retained<br>Easily implemented; required to evaluate effectiveness of other process options; moderate cost.                                        |
| Removal <sup>1</sup>    | Excavation and Off-Site Treatment/ Disposal | Conventional Excavation and Disposal at Licensed Treatment/ Disposal Facility (e.g., RCRA, non-RCRA, LLRW) | Excavate soil containing chemicals using conventional mechanical equipment; limit to depths of less than 10 feet bgs. Transport and dispose of soils at a permitted treatment and disposal facility.                                                                                                                                                                                           | Effectively removes contamination and prevents long-term exposure to contamination. May expose workers and environment to chemicals during implementation. Uses conventional construction methods and is a proven technology. Does not reduce total amount of contamination. | Easily implemented. Requires appropriate permits and waste characterization.<br><br>Groundwater inflow control for excavations below the water table, radiological screening, and required large volumes of clean backfill material could reduce implementability. | Moderate to high, depending on characterization and off-site disposal of large volumes of material. | Retained for some COCs<br>Effective for non-ubiquitous metals and PAHs; easily implemented, permanent remedy; and moderate to high cost.           |
| Treatment <sup>1</sup>  | Physical/ Chemical Treatment                | Soil Vapor Extraction (with or without thermally enhanced recovery)                                        | Extract VOCs from unsaturated zone with vacuum pumps; extraction performance can be enhanced with active volatilization of VOCs in groundwater (EPA, 1997b). May be used with thermal enhancement (e.g., six-phase heating or steam injection) to enhance volatilization of chemicals.                                                                                                         | Effective in reducing the toxicity, mobility, and volume of contaminated material. EPA presumptive remedy for VOCs in unsaturated zone. Pilot tests at Building 406 indicated SVE is effective for reducing mass of VOCs in soil.                                            | Moderately implementable. Off-gas treatment likely required by regulatory agencies for soil vapor. Must meet local and state requirements for off-gas release and related factors.                                                                                 | Moderate                                                                                            | Retained for some COCs<br>Effective in treating VOCs; effectiveness enhanced when implemented with active volatilization                           |

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**Table 3-9. Detailed Evaluation of GRAs and Process Options for Soil and Shoreline Sediment** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action  | Remedial Technology Type | Process Option              | Description                                                                                                                                                                                                                                                              | Effectiveness                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Implementability                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cost     | Comments                                                                                                                                                                                             |
|--------------------------|--------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Containment <sup>1</sup> | Covers                   | Soil Covers                 | Place soil cover over contaminated soil; prevents direct contact with contaminated soil.                                                                                                                                                                                 | Effectively prevents direct exposure of humans to contamination.<br><br>It is possible this remedy could begin to fail over time, but monitoring, regular maintenance, and other safeguards would minimize this potential risk and thereby improve effectiveness.<br><br>Institutional controls would be needed with each containment option to protect the remedy                                                                                                                                                                                                                 | Easily implemented. Planned land use prohibits the placement of a soil cover over the entire site; could be used in conjunction with asphalt covers.                                                                                                                                                                                                                                                                                                              | Moderate | Retained for areas that are not paved or do not require paving to achieve planned land uses.<br><br>Effective for metals and PAHs; easily and quickly implemented; moderate cost per area.           |
|                          |                          | Asphalt or Concrete Covers  | Place an asphalt or concrete cover over contaminated soil; prevents direct contact with contaminated soil.                                                                                                                                                               | Effectively prevents direct exposure of humans to contamination.<br><br>It is possible this remedy could weather and crack over time, but monitoring, regular maintenance, and other safeguards would minimize this potential risk and thereby improve effectiveness.<br><br>Institutional controls would be needed with each containment option to protect the remedy                                                                                                                                                                                                             | Easily implemented. Planned land use prohibits the placement of an asphalt cover over the entire site; could be used in conjunction with soil covers.                                                                                                                                                                                                                                                                                                             | Moderate | Retained for areas that are paved or require paving to achieve planned land uses<br><br>Effective for metals and PAHs; moderate cost per area.                                                       |
|                          |                          | Engineered Alternative Caps | Place a soil cover with a geomembrane liner that is made of an impermeable, synthetic material; prevents direct contact with contaminated soil and minimizes migration of contamination. Can also include engineered soil caps using clay instead of synthetic material. | Effectively prevents direct exposure of humans to contamination.<br><br>An engineered alternative cap would incorporate a low-permeability layer that would minimize water infiltration to the contaminated zone. It is possible this remedy could begin to fail over time, but monitoring, regular maintenance, and other safeguards would minimize this potential risk and thereby improve effectiveness.<br><br>A clay cap swells and fills any voids or holes when saturated.<br><br>Institutional controls would be needed with each containment option to protect the remedy | Technology required to implement engineered alternative caps are readily available and implementable.<br><br>An engineered alternative cap would be characterized by low to moderate degree of implementability because of the need to promote adequate surface drainage by excavating certain amounts of soil and debris at the site or placing sub-cap fill material in other areas, and the likelihood that the liner would need to be replaced in the future. | Moderate | Retained for areas with elevated concentrations of mobile chemicals that are not paved or do not require paving to achieve planned land uses.<br><br>Effective; easy to moderate implementability. . |



Table 3-9. Detailed Evaluation of GRAs and Process Options for Soil and Shoreline Sediment (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action  | Remedial Technology Type                      | Process Option                                                      | Description                                                                                                                                                                                                                           | Effectiveness                                                                                                                                                                                                                                                        | Implementability                                                                                                                                                           | Cost     | Comments                                                                                                                                                                                                                                                                                               |
|--------------------------|-----------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Containment <sup>1</sup> | Shoreline Armoring <sup>2</sup>               | Rock Revetment <sup>2</sup>                                         | Install an erosion control structure consisting of riprap, large armor units, gabions, articulating concrete mats, or engineered concrete structures along the shoreline.                                                             | Provides a robust containment structure to control shoreline erosion<br>Short-term effects could be managed through proper construction techniques<br>Inhibits pedestrian access and limits shoreline recreation<br>Not visually appealing                           | Readily implementable<br>Would comply with ARARs<br>Minor long-term O&M                                                                                                    | Moderate | Viable protection option for steep and narrow shoreline areas. Successfully implemented at similar shoreline area at HPS Parcel B (IR Site 07). Revetment design may be adjusted to incorporate localized, low-profile areas where soil and vegetation could be placed (for aesthetic considerations). |
|                          | Shoreline Stabilization (Hybrid) <sup>2</sup> | Natural Shoreline Materials with Offshore Reef <sup>2</sup>         | Place soil to prevent direct exposure to contaminated shoreline sediment. Install rock structure offshore <sup>3</sup> , with crest at or below MHHW to reduce wave energy, and plant aquatic vegetation to reduce erosion potential. | Uncertain effectiveness in reducing the offshore wave energy and controlling erosion<br>Construction of offshore reef would impact existing aquatic habitat<br>Limits access for shoreline recreation<br>Provides habitat for aquatic wildlife<br>Visually appealing | Construction of offshore reef requires specialized labor and equipment<br>Construction of offshore reef may not comply with ARARs<br>Potentially significant long-term O&M | High     | Not a viable protection option because of (1) uncertain effectiveness in controlling erosion potential in intertidal shoreline zone, and (2) significant implementation issues related to constructing the offshore reef.                                                                              |
|                          |                                               | Natural Shoreline Materials with Underlying Rock Armor <sup>2</sup> | Place soil to prevent direct exposure to contaminated shoreline sediment. Install rock armoring layer under soil if wave action causes erosion of soil.                                                                               | Provides a robust protective structure to prevent unacceptable shoreline erosion<br>Short-term effects could be managed through proper construction techniques<br>Does not inhibit pedestrian access or limit shoreline recreation<br>Visually appealing             | Readily implementable<br>Would comply with ARARs<br>Potentially significant long-term O&M                                                                                  | High     | Viable protection option for gradually sloped and wide shoreline areas. Stabilization option successfully implemented following removal action at Metal Debris Reef in 2007.                                                                                                                           |

Notes: Only processes and technologies retained for further consideration are included in this table.

1. GRA applies to soil only.

2. Shoreline protection technologies and process options are evaluated in Appendix D.

3. Offshore reef consisting of rocks is identified as a representative structural element for this hybrid stabilization option; however, alternative structural elements may be proposed that meet the design objectives and provide equal (or superior) performance relative to effectiveness, implementability, and cost. Alternative structural elements may use natural materials (such as oyster shells) or may involve placing the structure closer to the shore (such as a near-shore sill). This option was determined to not be a viable protection option for reasons unrelated to the material type and offshore location of the reef.

ARARs = applicable or relevant and appropriate requirements  
bgs = below ground surface  
DTSC = Department of Toxic Substances Control  
EPA = U.S. Environmental Protection Agency  
GRAs = general response actions  
HPS = Hunters Point Shipyard

LLRW = low-level radioactive waste  
MHHW = mean higher high water  
Navy = Department of the Navy  
NCP = National Oil and Hazardous Substances Pollution Contingency Plan  
O&M = operation and maintenance  
PAHs = polycyclic aromatic hydrocarbons

RAOs = remedial action objectives  
RCRA = Resource Conservation and Recovery Act  
SVE = soil vapor extraction  
VOCs = volatile organic compounds

Sources:

EPA. 1997b. "Analysis of Selected Enhancements for Soil Vapor Extraction." EPA 542-R-97-007. September.

EPA. 2000a. The Office of Solid Waste and Emergency Response Publication on Land Use Controls. Available Online at: <<http://www.epa.gov/oerrpage/superfund/action/ic/guide/index.htm>>.

Navy and DTSC. 2000. "Memorandum of Agreement Between the United States Department of the Navy and the California Department of Toxic Substances Control." Use of model "Covenant to Restrict Use of Property" at installations being closed and transferred by the Navy.



**Table 3-10. Detailed Evaluation of GRAs and Process Options for Groundwater**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology Type | Process Option                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                              | Effectiveness                                                                                                                                                                                                            | Implementability                                                                                                                                                                                                                                                                                      | Cost                      | Comments                                                                                               |
|-------------------------|--------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------|
| No Action               | Not Applicable           | Not Applicable                                              | No Action                                                                                                                                                                                                                                                                                                                                                                                                                                                | Does not achieve RAOs.                                                                                                                                                                                                   | Not acceptable to local government or public.                                                                                                                                                                                                                                                         | None                      | Retained<br>Required by NCP.                                                                           |
| Institutional Controls  | Legal Mechanisms         | Covenants to Restrict Use of Property and Deed Restrictions | Restricts use of parcel through environmental restrictive covenants that will run with the land; allows only designated land use in accordance with the proposed redevelopment plan (EPA, 2000a); includes criteria during and after future development to restrict extraction of groundwater, installation of new groundwater wells, and restrict subsurface intrusive activities that might result in or aid the movement of contaminated groundwater. | Ineffective in reducing contamination. Effective at limiting or preventing exposure of humans to contamination, especially when used in combination with other options. Does not prevent exposure of marine organisms.   | Easily implemented. Requires legal documents and authority to enforce restrictions.                                                                                                                                                                                                                   | Low                       | Retained<br>Easily implemented and effective; usually required to restrict activity based on land use. |
| Engineering Controls    | Physical Barriers        | Security Features and Signs                                 | Prohibits activities that could spread groundwater contamination by requiring locked well caps and secured utility access covers, and identifying and securing any additional conduit where humans or wildlife could potentially be exposed to groundwater. Requires posted signs and locked doors to prohibit occupancy of buildings or other enclosures where unacceptable risk exists from the vapor intrusion pathway.                               | Effective at preventing exposure of humans to contamination, especially when used in combination with other options. Does not prevent exposure of marine organisms; does not reduce toxicity or volume of contamination. | Easily implemented. Maintenance and implementation of engineering controls during future land use are controlled through land use restrictions (below).                                                                                                                                               | Low                       | Retained<br>Easily implemented and effective; prevents exposure to COCs and COECs.                     |
|                         | Vapor Barrier            | Sub-Slab Depressurization                                   | Install blowers and vapor collection points below a building to maintain a negative pressure gradient and prevent vapor intrusion.                                                                                                                                                                                                                                                                                                                       | Effective at preventing vapor intrusion when properly installed and operated with new construction.                                                                                                                      | Easily implementable as part of new construction.<br><br>However, for existing construction, extensive investigation into conditions under the building would be necessary to ensure the systems are covering the entire foundation and to evaluate utility conduits and other preferential pathways. | Low for new construction. | Retained for new construction<br><br>Effective and low-cost method to minimize vapor intrusion only.   |





**Table 3-10. Detailed Evaluation of GRAs and Process Options for Groundwater** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology Type     | Process Option                       | Description                                                                                                                                                                                                                                                                                 | Effectiveness                                                                                                                                                                                                                                                                                                                                                                       | Implementability                                                                                                                                                                                                                     | Cost                                                                                                                                                                                                                          | Comments                                                                                                                                                                                          |
|-------------------------|------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monitoring              | Groundwater Monitoring       | Periodic Groundwater Monitoring      | Collect and analyze groundwater samples periodically to monitor aquifer hydraulics and chemistry and variations in groundwater contamination. Chemicals are identified for detection monitoring and evaluation monitoring programs.                                                         | Does not achieve RAOs; does not reduce the toxicity or volume of contamination. However, it would be effective as a means of monitoring effectiveness of groundwater remediation actions.                                                                                                                                                                                           | Easily implemented.                                                                                                                                                                                                                  | Moderate                                                                                                                                                                                                                      | Retained<br>Easily implemented; required to evaluate effectiveness of other process options; moderate cost.                                                                                       |
| Treatment               | Passive                      | Monitored Natural Attenuation        | Allow chemicals to naturally attenuate via biodegradation, dispersion, dilution, or adsorption. Requires monitoring to assess recovery rates and success.                                                                                                                                   | Effective as a polishing step following in-situ treatment at source areas. Not likely to be effective without remediation at source areas. Would reduce toxicity and volume of chemicals over time.                                                                                                                                                                                 | Readily implementable; however, this option usually requires modeling and evaluation of chemical degradation rates and pathways, identifying plume behavior, and predicting chemical concentrations at downgradient receptor points. | Low capital cost. O&M costs could be high depending on frequency and duration of monitoring period.                                                                                                                           | Retained for use as a component of remedial alternatives<br>Periodic monitoring can be readily implemented; low capital cost.                                                                     |
|                         | In-Situ Physical Treatment   | Air Sparging with SVE                | Inject air into the bottom of a saturated zone to strip VOCs from groundwater. Extract VOCs from the unsaturated zone with SVE.                                                                                                                                                             | Would require pilot testing to verify effectiveness. Stratification of fill material could be an issue. Vapors must be extracted and treated. May cause aerobic subsurface conditions that could limit the natural degradation of chemicals. Generally more applicable to the lighter gasoline constituents, because they readily transfer from the dissolved to the gaseous phase. | Easily implementable. An extended timeframe could be required to meet RAOs. Would require implementation of associated vapor extraction and treatment system.                                                                        | Moderate capital cost. Moderate O&M cost assuming effectiveness in a reasonable timeframe (i.e., approximately 5 years).                                                                                                      | Retained<br>Easily implemented in conjunction with SVE; improves effectiveness of SVE at reducing VOC mass in groundwater.                                                                        |
|                         |                              | Pneumatic/Hydraulic Fracturing       | Inject air and water under pressure into soil to enhance permeability by developing cracks in low-permeability and consolidated sediments to increase removal efficiency. Used as part of injection processes (e.g., in situ bioremediation, ZVI).                                          | Fracturing of the subsurface to increase permeability, enhances the distribution of treatment solutions.                                                                                                                                                                                                                                                                            | Implementability demonstrated by treatability studies at Parcel C.                                                                                                                                                                   | Low. Injection equipment required by retained technologies.                                                                                                                                                                   | Retained<br>Effective at enhancing distribution of reagents; low cost.                                                                                                                            |
|                         | In-Situ Biological Treatment | Anaerobic and Aerobic Bioremediation | Introduce amendments to groundwater in areas where chlorinated solvents are present to enhance biodegradation of chlorinated VOCs. Amendments include electron donors, electron receptors, nutrients, and microorganisms, if necessary. Requires monitoring to assess program (FRTR, 2005). | Effective for reduction of volume, mobility, and toxicity of some fuel hydrocarbons and VOCs. Not effective for extremely high concentrations.                                                                                                                                                                                                                                      | Easily implemented.                                                                                                                                                                                                                  | Moderate capital cost. Extensive contamination at Parcel E drive costs a little higher, than they would be at a site with a less complex contaminant distribution. Low O&M cost. No removal or handling of groundwater costs. | Retained<br>Effective for VOCs at moderate to low concentrations; easily implemented; moderate cost; low O&M costs; requires monitoring, but treatment should reduce long-term monitoring effort. |

Table 3-10. Detailed Evaluation of GRAs and Process Options for Groundwater (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action  | Remedial Technology Type               | Process Option                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Effectiveness                                                                                                                                                                                                                                                                                                                      | Implementability                                                                                                                                                                                                                          | Cost                                           | Comments                                                                                                                                                                                                                                                                                           |
|--------------------------|----------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Treatment<br>(continued) | In-Situ Chemical Groundwater Treatment | Chemical Reduction: ZVI Injection                                           | Inject ZVI into an aquifer to encourage enhanced reductive dechlorination of chlorinated VOCs.                                                                                                                                                                                                                                                                                                                                                                                                                             | Effective for reduction of volume, mobility, and toxicity of VOCs. Proven technology. Treatability study of ZVI injection at Parcel C resulted in mass reduction of about 99.2 percent of chlorinated VOCs within the treatment zone. Effective, if reducing agent is delivered successfully in tight soil.                        | Easily implementable.                                                                                                                                                                                                                     | Moderate to high capital cost. Low O&M cost, . | Retained<br>Highly effective for VOCs; most efficient at high concentrations; implementable as a fast-reacting remedy; moderate to high success in pilot tests at HPS; high implementation costs with low O&M costs; requires monitoring, but treatment should reduce long-term monitoring effort. |
| Containment              | Physical and Hydraulic Barriers        | Slurry or Sheet-Pile Wall (with groundwater extraction wells, if necessary) | Install slurry or sheet-pile walls below ground to contain, capture, or redirect groundwater flow. Can be used to decrease the groundwater flow gradient and consequently increase the residence time during which chemical concentrations would be reduced through physical, chemical, and biological processes. Where needed, groundwater extraction wells might be used behind a wall to further mitigate migration (e.g., at a landfill where landfill leachate poses an unacceptable risk to downgradient receptors). | Vertical barriers can effectively control migration of contaminated groundwater. The effectiveness of steel sheet-pile walls may be affected by corrosion; these effects can be mitigated through installation and use of a cathodic protection system. Vertical barriers do not reduce exposure from the vapor intrusion pathway. | Installing a new slurry or sheet-pile wall in Parcel E would be challenging to implement due to subsurface conditions; however, pre-design investigations to identify subsurface obstructions in advance would increase implementability. | Moderate to high.                              | Retained<br>Effective in containing chemicals in groundwater; implemented successfully at HPS in the past, moderate to high cost.                                                                                                                                                                  |

Notes: Only processes and technologies retained for further consideration are included in this table.

FRTR = Federal Remediation Technologies Roundtable

GRAs = general response actions

HPS = Hunters Point Shipyard

IR = Installation Restoration

NAPL = nonaqueous-phase liquid

NCP = National Oil and Hazardous Substances Pollution Contingency Plan

Sources:

FRTR. 2005. Federal Remediation Technologies Roundtable Website. Accessed in January 2008. Available Online at: <<http://www.frtr.gov>>.

Shaw and others. 2005. "In Situ Anaerobic and Aerobic Bioremediation of a Mixed Chlorinated Organic Plume at the Hunters Point Shipyard." D. Leigh, B. Porter, W. Schaal, G. Christensen, G.P. Brooks. *In Situ and On Site Bioremediation. The 8th International Symposium*. Baltimore, Maryland. June.



**Table 3-11. Detailed Evaluation of GRAs and Process Options for NAPL at IR-03**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action | Remedial Technology    | Process Option                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                              | Effectiveness                                                                                                                                                                                                                                                                | Implementability                                                                                                                                        | Cost                                                                                                                                                                                                | Conclusion                                                                                                                                                                   |
|-------------------------|------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NAPL PROCESS OPTIONS    |                        |                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                              |                                                                                                                                                         |                                                                                                                                                                                                     |                                                                                                                                                                              |
| No action               | None                   | None                                                        | No further response actions.                                                                                                                                                                                                                                                                                                                                                                                                                             | Ineffective in reducing contamination. Would not prevent public access or exposure to site contaminants.                                                                                                                                                                     | No action required.                                                                                                                                     | No direct costs.                                                                                                                                                                                    | Retained<br>No action as required by NCP.                                                                                                                                    |
| Institutional Controls  | Legal Mechanisms       | Covenants to Restrict Use of Property and Deed Restrictions | Restricts use of parcel through environmental restrictive covenants that will run with the land; allows only designated land use in accordance with the proposed redevelopment plan (EPA, 2000a); includes criteria during and after future development to restrict extraction of groundwater, installation of new groundwater wells, and restrict subsurface intrusive activities that might result in or aid the movement of contaminated groundwater. | Ineffective in reducing contamination. Effective at limiting or preventing exposure of humans to contamination, especially when used in combination with other options. Does not prevent exposure of aquatic wildlife.                                                       | Easily implemented. Requires legal documents and authority to enforce restrictions.                                                                     | Low                                                                                                                                                                                                 | Retained<br>Easily implemented and effective; usually required to restrict activity based on land use.                                                                       |
| Engineering Controls    | Physical Barriers      | Security Features and Signs                                 | Prohibits activities that could spread groundwater contamination by requiring locked well caps and secured utility access covers, and identifying and securing any additional conduit where potential humans and wildlife could be exposed to groundwater and NAPL.                                                                                                                                                                                      | Effective at preventing exposure of humans to contamination, especially when used in combination with other options. Does not prevent exposure of marine organisms; does not reduce toxicity or volume of contamination.                                                     | Easily implemented. Maintenance and implementation of engineering controls during future land use are controlled through land use restrictions (below). | Low                                                                                                                                                                                                 | Retained<br>Easily implemented and effective; prevents exposure to COCs and COECs; low cost.                                                                                 |
| Monitoring              | Groundwater Monitoring | Periodic Groundwater Monitoring                             | Collect and analyze groundwater samples periodically to monitor variations in aquifer chemistry and hydraulics and changes in groundwater contamination.                                                                                                                                                                                                                                                                                                 | As a stand-alone technology, groundwater sampling and analysis would not be effective at reducing the mass, volume, or toxicity of groundwater contamination. However, it is an effective means of monitoring the effectiveness of groundwater remediation actions.          | Readily implementable as demonstrated by previous and current monitoring programs.                                                                      | Low capital cost. Moderate annual O&M cost.                                                                                                                                                         | Retained<br>Easily implemented; effective for all COCs; low cost.                                                                                                            |
| Removal                 | Physical Extraction    | Liquid-Phase Pumping                                        | Recover NAPL to the maximum extent practicable through either traditional pumping techniques.                                                                                                                                                                                                                                                                                                                                                            | Prior efforts to remove NAPL through pumping were largely unsuccessful due to the high viscosity of the NAPL material. Combining this approach with thermal treatment may increase the effectiveness of this technology but could create vapors not captured by the pumping. | Extraction by traditional pumping is implementable, but may result in large volumes of groundwater requiring treatment.                                 | Moderate capital and O&M costs. The need to treat excessive amounts of groundwater could result in high O&M costs. Combining this approach with thermal treatment significantly increases the cost. | Eliminated<br>Potentially effective only when combined with thermal treatment, but liquid-phase pumping would not effectively capture vapors created during heating process. |

**Table 3-11. Detailed Evaluation of GRAs and Process Options for NAPL at IR-03** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action                        | Remedial Technology                | Process Option                                                                                                                     | Description                                                                                                                                                                                                                              | Effectiveness                                                                                                                                                                                                                                                                                                           | Implementability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Cost                                                                                                                                                                                                                                                                                                                                                                                                                                                | Conclusion                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAPL PROCESS OPTIONS</b> <i>(continued)</i> |                                    |                                                                                                                                    |                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                         |
| Removal <i>(cont.)</i>                         | Physical Extraction <i>(cont.)</i> | Dual-Phase Extraction                                                                                                              | Use vacuum pumps to remove various combinations of contaminated groundwater, separate phase petroleum product, and hydrocarbon vapor from the subsurface. Extracted liquids and vapor are collected and treated.                         | DPE can be effective in removing NAPL from the subsurface, and can also stimulate biodegradation of petroleum constituents in the unsaturated zone by increasing the supply of oxygen. Combining this approach with thermal treatment may increase the effectiveness of this technology.                                | Extraction by DPE is implementable, but may result in large volumes of groundwater and vapor requiring treatment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Moderate capital and O&M costs. The need to treat excessive amounts of groundwater and vapor could result in high O&M costs. Combining this approach with thermal treatment significantly increases the cost.                                                                                                                                                                                                                                       | Retained<br>Potentially effective when combined with thermal treatment.                                                                                                                                                                                                                                                 |
|                                                |                                    | Thermally Enhanced Extraction by Hot Water Injection, Electrical Resistive Heating, Thermal Conductive Heating, or Steam Injection | Use hot water injection, electrical resistive heating, thermal conductive heating, or steam injection to decrease viscosity of NAPL, potentially increasing its mobility for removal (via extraction).                                   | Thermally enhanced extraction is a proven technology used in the treatment of NAPL. The site-specific conditions at IR-03 (most notably the thick viscous product) may limit the effectiveness of this technology. Bench-scale or pilot-scale studies would be needed to better understand its potential effectiveness. | Implementation would be moderately difficult because of specialized equipment and significant power demand required for these options. Bench-scale or pilot-scale studies would be needed to better understand the implementability of these technologies.                                                                                                                                                                                                                                                                                                                                                                                               | High. These technologies are generally considered to be capital- and energy-intensive.                                                                                                                                                                                                                                                                                                                                                              | Retained<br>May improve effectiveness in recovering viscous NAPL source areas using standard extraction techniques. Bench-scale or pilot-scale studies would be needed to better understand its effectiveness and implementability. Moderate capital cost; moderate to high operational cost due to energy consumption. |
|                                                |                                    | Treatment and Off-Site Disposal of Extracted NAPL/ Groundwater                                                                     | Treat extracted NAPL, groundwater, and vapor prior to disposal. Depending on the POTW facility pretreatment requirements and other potential regulatory issues, extracted groundwater can be conveyed and discharged to a POTW facility. | Filtration, precipitation, and adsorption could effectively remove some of the groundwater chemicals present at IR-03. Discharge to a POTW facility is an effective means of disposing untreated groundwater. A permit fee would likely be required from the local POTW facility for discharge of the extracted water.  | These treatment technologies are commonly used in groundwater treatment and would be readily implementable.<br><br>Filtration and precipitation would create a sludge material containing the chemicals, which would need to be disposed of in an off-site disposal facility. Adsorption would also generate spent activated carbon media, which would need to be either regenerated or disposed.<br><br>Discharge to a POTW facility would be feasible if concentrations in the waste stream from extracted groundwater are below RCRA criteria, and if a connection to a POTW facility that is capable of treating COCs at IR-03 is identified nearby. | These ex-situ technologies would have relatively high annual O&M costs. In addition, groundwater extraction for hydraulic containment could be required for a long duration, making this option less cost-effective compared with other options.<br><br>Conveyance structures would need to be constructed and administrative requirements would need to be met for a discharge to a POTW facility. Capital and O&M costs would be low to moderate. | Retained<br>High effectiveness and implementability.                                                                                                                                                                                                                                                                    |



**Table 3-11. Detailed Evaluation of GRAs and Process Options for NAPL at IR-03** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action                        | Remedial Technology                   | Process Option                            | Description                                                                                                                                                                                                                                     | Effectiveness                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Implementability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Cost                                                                                                                                                                                                                                                                | Conclusion                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------|---------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAPL PROCESS OPTIONS</b> <i>(continued)</i> |                                       |                                           |                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                    |
| Removal<br><i>(cont.)</i>                      | Physical Extraction<br><i>(cont.)</i> | Excavation                                | Remove contaminated material with heavy equipment. Excavated soil could be stockpiled on site for treatment, or transported to a permitted off-site treatment and disposal facility.                                                            | Excavation would be applicable to the complete range of chemical groups, with no particular target group. However, excavation must be performed in conjunction with either off-site disposal or ex-situ treatment to prevent exposure to humans and wildlife.                                                                                                                                                                                                                                          | Implementability would be limited by (1) the generation of fugitive emissions during operations and (2) depth and composition of the media requiring excavation. Excavations below the water table would be less implementable than shallower excavations due to the added complexities of dewatering and water treatment.                                                                                                                                                                                                                                                                                                                                                                                                                | Excavation costs would include equipment and labor. Additional costs could include on-site storage facilities and soil characterization. Overall capital costs would be high.                                                                                       | Retained<br>Effective if used in combination with ex-situ treatment or off-site disposal options.                                                                                                                                                                                                                                                                                  |
|                                                |                                       | Off-Site Disposal of Excavated NAPL/ Soil | Collect and transport soil to an appropriate treatment, storage, or disposal facility. Disposal of soil would involve constructing on-site staging area from which soil would be transferred to trucks and transported to an off-site facility. | Off-site disposal would be applicable to the complete range of chemical groups, with no particular target group. The effectiveness would be moderate, as excavation will be performed in conjunction with off-site disposal, where the effectiveness of the facility to prevent exposure to humans and wildlife cannot be directly controlled or monitored.                                                                                                                                            | Excavation and off-site disposal are commonly used in soil treatment and would be readily implementable for small to moderate volumes. Soil saturated with either water or NAPL would require processing (phase separation or stabilization) prior to off-site disposal. May be difficult to implement for large treatment volumes because of limited on-site area available for material staging and characterization.                                                                                                                                                                                                                                                                                                                   | Costs for off-site disposal could range from moderate to very high, depending on the volume of soil required for disposal and its chemical characteristics.                                                                                                         | Retained<br>Highly effective; off-site disposal could be used for disposal of small volumes of process residuals or areas with extensive NAPL. May not be practical for large treatment volumes because of implementation challenges (limited on-site area for staging) and high capital cost; these constraints may be less significant if ex-situ treatment volume is minimized. |
| Treatment                                      | Solidification/Stabilization          | In-Situ Mixing                            | Mix one or more reagents directly into the contaminated soil/NAPL with mechanical equipment. Reagents include stabilizing agents (such as cement or bentonite), and reactive agents (such as chemical oxidants).                                | Effectiveness relies on homogenous mixing of reagents with the contaminated soil and NAPL; homogeneous mixing may be difficult to achieve in shoreline areas containing large debris. Bench-scale or pilot-scale studies would be required to identify the appropriate reagent(s) to solidify and stabilize the contaminated soil and NAPL. If designed and implemented appropriately, technology would be capable of preventing migration of NAPL to San Francisco Bay (in accordance with the RAOs). | Mechanical equipment for in-situ mixing is readily available. Mixing process would require controls (including capture, treatment, and disposal) for air and liquid residuals; these controls may be moderately difficult to implement given the range of organic, inorganic, and radiological contaminants at the site. Mixing process may be difficult to implement in shoreline areas containing large debris. Administrative implementability may be challenging if technology is not implemented in combination with other technologies that seek to remove the NAPL source to the extent practicable (consistent with Water Board guidance for closure of low-risk fuel sites in the San Francisco Bay Region [Water Board, 1996]). | Capital costs for in-situ mixing would be moderate to high, depending on the treatment volume. O&M costs would be low because minimal long-term management of groundwater would be needed for the stabilized waste (which would have a low hydraulic conductivity). | Retained<br>Capable of reliably achieving RAOs with readily available equipment. Bench-scale or pilot-scale studies would be needed to identify the appropriate reagent(s). Moderate to high capital cost; low O&M costs.                                                                                                                                                          |

**Table 3-11. Detailed Evaluation of GRAs and Process Options for NAPL at IR-03** *(continued)*  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action                        | Remedial Technology                         | Process Option                           | Description                                                                                                                                                                                                                                                                           | Effectiveness                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Implementability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Cost                                                                                                                                                                                                                                                                                                                                                                                                                 | Conclusion                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------|---------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAPL PROCESS OPTIONS</b> <i>(continued)</i> |                                             |                                          |                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                |
| Treatment <i>(cont.)</i>                       | Solidification/Stabilization <i>(cont.)</i> | Ex-Situ Mixing                           | Excavate contaminated soil and NAPL, transport to on-site location, and spread in layers. Mix a binding reagent into the soil/NAPL with mechanical equipment and transport/place stabilized material in excavation.                                                                   | Ex-situ mixing would be effective because homogenous mixing could be controlled and monitored. Bench-scale or pilot-scale studies would be required to identify the appropriate reagent(s) to solidify and stabilize the contaminated soil and NAPL. If designed and implemented appropriately, technology would be capable of preventing migration of NAPL to San Francisco Bay (in accordance with the RAOs).                                                                                                                                                          | Mechanical equipment for excavation and ex-situ mixing is readily available. Mixing process would require controls for liquid residuals; these controls may be moderately difficult to implement given the range of organic, inorganic, and radiological contaminants at the site. Air emissions would require monitoring but could not be effectively captured and treated. May be difficult to implement for large treatment volumes because of limited on-site area available for material processing. Administrative implementability may be challenging if technology is not implemented in combination with other technologies that seek to remove the NAPL source to the extent practicable. | Capital costs for ex-situ solidification and stabilization would be high because of the labor intensive process of excavation, transportation, mixing, and backfilling. High costs could be moderated if ex-situ treatment volume is minimized. O&M costs would be low because minimal long-term management of groundwater would be needed for the stabilized waste (which would have a low hydraulic conductivity). | Retained<br>Capable of reliably achieving RAOs with readily available equipment. Bench-scale or pilot-scale studies would be needed to identify the appropriate reagent(s). May not be practical for large treatment volumes because of implementation challenges (limited on-site area for mixing) and high capital cost; these constraints may be less significant if ex-situ treatment volume is minimized. |
| Containment                                    | Covering and Capping                        | Soil Cover or Engineered Alternative Cap | Isolate contaminated soil and buried debris from potential humans or wildlife at the site using a soil cover or engineered alternative cap. An engineered alternative cap would incorporate a low-permeability layer that would minimize water infiltration to the contaminated zone. | Cover/cap of suitable thickness would be effective to prevent direct exposure to underlying contaminated soil or debris. Monitoring, regular maintenance, and institutional controls would be performed to ensure its effectiveness.                                                                                                                                                                                                                                                                                                                                     | Technology required to implement soil covers and engineered alternative caps are readily available and easily implementable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Low to moderate capital and O&M costs                                                                                                                                                                                                                                                                                                                                                                                | Retained<br>Easily implemented; a low-permeability geosynthetic clay cap was installed over the surface of IR-03 in 1997; effective in eliminating exposure; low to moderate cost.                                                                                                                                                                                                                             |
|                                                | Hydraulic Barriers                          | Slurry or Sheet-Pile Wall                | Install slurry or sheet-pile walls below the ground to contain, capture, or redirect groundwater flow in the vicinity of IR-03.                                                                                                                                                       | Vertical barriers can effectively control migration of NAPL and associated contaminated groundwater. Hydraulic gradient between the wall would need to be monitored and managed to remain within acceptable limits; water management could include extraction and treatment, or installation of an upgradient flow diversion structure. A sheet-pile wall was installed (in 1998) along the southern edge of the former oil reclamation ponds; the existing wall does not have cathodic protection, and would not be an effective component of a future remedial action. | Installing a new slurry or sheet-pile wall at this site would be challenging to implement due to the subsurface conditions at IR-03 and short distance from the shoreline; however, pre-design investigations to identify subsurface obstructions in advance could improve implementation.                                                                                                                                                                                                                                                                                                                                                                                                          | Moderate to High                                                                                                                                                                                                                                                                                                                                                                                                     | Retained<br>Effective in containing NAPL and groundwater contaminants. May be difficult to implement close to shoreline and may require pre-design investigations; moderate to high cost.                                                                                                                                                                                                                      |

Table 3-11. Detailed Evaluation of GRAs and Process Options for NAPL at IR-03 (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| General Response Action                                        | Remedial Technology  | Process Option                                                                                    | Description                                                                                                                                                                                                                                                                                 | Effectiveness                                                                                                                                                                                                                                                                                                                                                                                               | Implementability                                                                                                                                                                                                                                                                                                                                                            | Cost                                                                                                                                                                                                                                                                 | Conclusion                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ADDITIONAL OPTIONS TO ADDRESS GROUNDWATER ASSOCIATED WITH NAPL |                      |                                                                                                   |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                     |
| In-Situ Treatment                                              | Thermal Treatment    | Thermal Treatment by Electrical Resistive Heating, Thermal Conductive Heating, or Steam Injection | Use electrical resistive heating, thermal conductive heating, or steam injection to vaporize VOCs and SVOCs in groundwater. The vaporized chemicals are subsequently captured using vacuum extraction (e.g., SVE).                                                                          | Potentially effective but site-specific treatability studies would be necessary to determine the viability of ERH, TCH, and steam injection to cost-effectively achieve the necessary temperatures to vaporize VOCs and SVOCs in groundwater (following NAPL removal). Heat loss through high groundwater flow velocities would need to be controlled through some form of containment (slurry wall, etc.). | Implementation would be moderately difficult because of specialized equipment and significant power demand required for these options. Bench-scale or pilot-scale studies would be needed to better understand the implementability of these technologies. Implementation challenges also include the effective capture and treatment of potentially high volumes of vapor. | High. These technologies are generally considered to be capital- and energy-intensive. Additional capital cost of heating to temperatures capable of volatilizing chemicals would be moderate if implemented in conjunction with thermally-enhanced NAPL extraction. | Retained<br>Potentially effective at treating organic compounds in groundwater. Bench-scale or pilot-scale studies would be needed to better understand its effectiveness and implementability. Moderate capital cost; moderate to high operational cost due to energy consumption. |
|                                                                | Biological Treatment | Anaerobic and Aerobic Bioremediation                                                              | Introduce amendments to groundwater in areas where chlorinated solvents are present to enhance biodegradation of chlorinated VOCs. Amendments include electron donors, electron receptors, nutrients, and microorganisms, if necessary. Requires monitoring to assess program (FRTR, 2005). | Potentially effective for treating residual fuel hydrocarbons and VOCs following NAPL source removal/treatment.                                                                                                                                                                                                                                                                                             | Easily implemented.                                                                                                                                                                                                                                                                                                                                                         | Moderate capital cost. Low O&M cost.                                                                                                                                                                                                                                 | Retained<br>Potentially effective for treating residual fuel hydrocarbons and VOCs following NAPL source removal/treatment; easily implemented at moderate cost..                                                                                                                   |
|                                                                | Passive              | Monitored Natural Attenuation                                                                     | Allow chemicals to naturally attenuate via biodegradation, dispersion, dilution, or adsorption. Requires monitoring to assess recovery rates and success.                                                                                                                                   | Effective as a polishing step following in-situ treatment at high concentration areas. Not likely to be effective without remediation of high concentration areas.                                                                                                                                                                                                                                          | Readily implementable; option would require evaluation of chemical degradation rates and pathways.                                                                                                                                                                                                                                                                          | Low capital cost. Low O&M costs.                                                                                                                                                                                                                                     | Retained<br>Effective as a polishing step; readily implementable and low cost.                                                                                                                                                                                                      |

Notes:  
COCs = chemicals of concern  
DPE = dual-phase extraction  
ERH = electrical resistive heating  
IR = Installation Restoration  
ISCO = in-situ chemical oxidation  
NAPL = nonaqueous-phase liquid  
Navy = Department of the Navy  
NCP = National Oil and Hazardous Substances Pollution Contingency Plan  
O&M = operation and maintenance

POTW = publicly owned treatment works  
RAOs = remedial action objectives  
RCRA = Resource Conservation and Recovery Act  
SVE = soil vapor extraction  
SVOCs = semivolatile organic compounds  
TCH = thermal conductive heating  
VOCs = volatile organic compounds  
Water Board = San Francisco Regional Water Quality Control Board

Sources:

FRTR. 2005. Federal Remediation Technologies Roundtable Website. Accessed in January 2008. Available Online at: <<http://www.frtr.gov>>.

Shaw Environmental, Inc. and others. 2005. "In Situ Anaerobic and Aerobic Bioremediation of a Mixed Chlorinated Organic Plume at the Hunters Point Shipyard." D. Leigh, B. Porter, W. Schaal, G. Christensen, G.P. Brooks. *In Situ and On Site Bioremediation. The 8th International Symposium.* Baltimore, Maryland. June.

San Francisco Regional Water Quality Control Board (Water Board), 1996, "Regional Board Supplemental Instruction to State Water Board, December 8, 1995, Interim Guidance on Required Cleanup at Low-Risk Fuel Sites." January 5.

|    |                       |         |                                                                                                                                                                            |
|----|-----------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 41 | Capital Cost: \$24.6M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-1, E-5, E-9, E-10, E-11, and E-12. |
|----|-----------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-1. Soil and Sediment Alternatives Cost Estimate Summary**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Present Value <sup>(4)</sup> |
|----------------------|--------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------|
| S-1                  | \$ -               | \$ -           | \$ -                | 32 years                          | \$ -                      | \$ -                         |
| S-2                  | \$ 24,549,979      | \$ 2,841,789   | \$ 5,568,652        | 32 years                          | \$ 39,552,503             | \$ 35,184,308                |
| S-3                  | \$ 36,066,261      | \$ 2,841,789   | \$ 5,471,677        | 32 years                          | \$ 53,255,671             | \$ 48,719,497                |
| S-4                  | \$ 37,311,751      | \$ 2,841,789   | \$ 5,471,677        | 32 years                          | \$ 54,750,260             | \$ 50,190,697                |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)



Table E-5. Alternative S-2 - Capital Cost Detail

|                                                                                                 |          |                                               |              |              |                                                                                                                 |
|-------------------------------------------------------------------------------------------------|----------|-----------------------------------------------|--------------|--------------|-----------------------------------------------------------------------------------------------------------------|
| Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California        |          |                                               |              |              |                                                                                                                 |
| <u>San Francisco Location Factors</u>                                                           |          | Means 2009                                    |              |              |                                                                                                                 |
| Material                                                                                        |          | 111.2%                                        |              |              |                                                                                                                 |
| Labor & Equipment                                                                               |          | 141.3%                                        |              |              |                                                                                                                 |
| Assemblies                                                                                      |          | 123.8%                                        |              |              |                                                                                                                 |
| Construction Project Duration:                                                                  |          | 230                                           | working days |              |                                                                                                                 |
|                                                                                                 |          | 12                                            | months       |              |                                                                                                                 |
| Operations and Maintenance / Monitoring Period:                                                 |          | 7965                                          | days         |              |                                                                                                                 |
|                                                                                                 |          | 360                                           | months       |              |                                                                                                                 |
|                                                                                                 |          |                                               |              |              |                                                                                                                 |
| Description                                                                                     | Quantity | Unit                                          | Unit Price   | Cost         | Comments                                                                                                        |
| DISTRIBUTIVE COSTS                                                                              |          | DISTRIBUTIVE COSTS SUBTOTAL = \$              |              | 3,315,207    | Includes labor and temporary facilities                                                                         |
| Labor                                                                                           |          | Labor Subtotal = \$                           |              | 3,187,552    |                                                                                                                 |
| Total project professional/technical labor cost                                                 |          |                                               |              | \$ 2,200,640 | See backup worksheet "LABOR"                                                                                    |
| Total project field/construction operations labor cost                                          |          |                                               |              | \$ 489,808   | See backup worksheet "LABOR"                                                                                    |
| Total project radiological screening labor cost                                                 |          |                                               |              | \$ 173,264   | See backup worksheet "LABOR"                                                                                    |
| Total project clerical administrative labor cost                                                |          |                                               |              | \$ 323,840   | See backup worksheet "LABOR"                                                                                    |
| Temporary Facilities                                                                            |          | Temporary Facilities Subtotal = \$            |              | 127,655      |                                                                                                                 |
| Furnished Field Office Trailer (50' x 10' w/ air conditioning)                                  |          | 12 mo                                         | \$ 767.56    | \$ 9,211     | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0450                                                        |
| Office Equipment Rental                                                                         |          | 12 mo                                         | \$ 802.12    | \$ 9,625     | Dell (http://www.dell.com), March 2009.                                                                         |
| Office Supplies                                                                                 |          | 12 mo                                         | \$ 115.75    | \$ 1,389     | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0120                                                        |
| City Water Supply                                                                               |          | 12 mo                                         | \$ 84.18     | \$ 1,010     | Means 2009 Heavy Construction. Page 14, 01 51 13.80 0700                                                        |
| Telephone Bill                                                                                  |          | 12 mo                                         | \$ 108.94    | \$ 1,307     | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0140                                                        |
| Field Office Electrical Bill                                                                    |          | 12 mo                                         | \$ 204.27    | \$ 2,451     | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0160                                                        |
| Portable Toilets (6)                                                                            |          | 12 mo                                         | \$ 635.09    | \$ 7,621     | Means 2009 Heavy Construction. Page 472. 01 54 33 6410                                                          |
| Rental Trucks (8) (for supervisory staff)                                                       |          | 12 mo                                         | \$ 7,920.00  | \$ 95,040    | Hertz Equipment Rental (http://www.hertzequip.com), March 2009.                                                 |
| CAPITAL COSTS                                                                                   |          | CAPITAL COSTS SUBTOTAL = \$                   |              | 21,234,772   | Includes mob/demob, construction activites, design, and intitutional controls                                   |
| Mobilization and Demobilization                                                                 |          | Mobilization and Demobilization Subtotal = \$ |              | 27,632       |                                                                                                                 |
| Excavator, 0.5 CY capacity                                                                      |          | 1 ea                                          | \$ 562.05    | \$ 562       | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Excavator, 1.5 CY capacity                                                                      |          | 2 ea                                          | \$ 1,039.92  | \$ 2,080     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Conveyer system with misters and radialogical detectors                                         |          | 6 ea                                          | \$ 562.05    | \$ 3,372     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dump truck, 8 CY (12 ton payload)                                                               |          | 6 ea                                          | \$ 562.05    | \$ 3,372     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dozer, 200 H.P.                                                                                 |          | 2 ea                                          | \$ 1,039.92  | \$ 2,080     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Grader, self-propelled, 30,000 lb.                                                              |          | 2 ea                                          | \$ 562.05    | \$ 1,124     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dozer, 300 H.P.                                                                                 |          | 2 ea                                          | \$ 1,039.92  | \$ 2,080     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Roller, Vibratory, 25 Ton                                                                       |          | 2 ea                                          | \$ 562.05    | \$ 1,124     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Truck Tractor, 6x4, 450 H.P.                                                                    |          | 2 ea                                          | \$ 1,039.92  | \$ 2,080     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Water Tanker, 5000 gal                                                                          |          | 2 ea                                          | \$ 562.05    | \$ 1,124     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Asphalt Paver, 130 H.P.                                                                         |          | 2 ea                                          | \$ 562.05    | \$ 1,124     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Tandem Rollers, 10 Ton                                                                          |          | 4 ea                                          | \$ 562.05    | \$ 2,248     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Roller, Pneum. Whl, 12 Ton                                                                      |          | 2 ea                                          | \$ 562.05    | \$ 1,124     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Sheepsfoot Roller, 240 H.P.                                                                     |          | 2 ea                                          | \$ 562.05    | \$ 1,124     | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Office Trailers (assumed 100 mile haul) (2)                                                     |          | 2 ea                                          | \$ 1,225.62  | \$ 2,451     | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0800 (unit cost multiplied by 2 to account for mob & demob) |
| Water truck for dust suppression, 6,000 gallon capacity (1)                                     |          | 1 ea                                          | \$ 562.05    | \$ 562       | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Health & Safety Equipment                                                                       |          | Health and Safety Equipment Subtotal = \$     |              | 333,249      |                                                                                                                 |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment            |          | 20 ea                                         | \$ 11,500.00 | \$ 230,000   | Assumed \$50 per field worker per day                                                                           |
| Water truck for dust suppression, 6,000 gallon capacity (1)                                     |          | 12 mo                                         | \$ 8,604.10  | \$ 103,249   | Means 2009 Heavy Construction. Page 472. 01 54 33.40 6950                                                       |
| Site Preparation                                                                                |          | Site Preparation Subtotal = \$                |              | 910,906      |                                                                                                                 |
| Grade soil staging area (3 acres)                                                               |          | 14,520 sy                                     | \$ 0.92      | \$ 13,302    | Means 2009 Heavy Construction. Page 211. 31 22 16.10 0100                                                       |
| Install soil staging area liner (3 acre, 80 mil HDPE, for rad screening and stockpiling areas ) |          | 130,680 sf                                    | \$ 4.18      | \$ 546,557   | Means 2005 Environmental Remediation - Assemblies. Pg 3-90. 33 08 0573                                          |
| Grade laydown area (200 ft x 100 ft)                                                            |          | 2,222 sy                                      | \$ 0.92      | \$ 2,036     | Means 2009 Heavy Construction. Page 211. 31 22 16.10 0100                                                       |
| Cover over laydown area with crushed stone (6" thick)                                           |          | 2,222 sy                                      | \$ 13.37     | \$ 29,709    | Means 2009 Heavy Construction. Page 275. 32 11 23.23 0100                                                       |
| Site security (24-hours uniformed watchman at entrance)                                         |          | 8,640 hr                                      | \$ 33.55     | \$ 289,872   | Means 2009 Heavy Construction. Page 20. 01 56 32.50 0020                                                        |
| Aerial survey (2' contours)                                                                     |          | 128 ac                                        | \$ 117.61    | \$ 15,031    | Means 2009 Heavy Construction. Pg 22. 02 21 13.16 1850                                                          |
| Subsurface utility surveying                                                                    |          | 12 day                                        | \$ 1,200.00  | \$ 14,400    | Quote from Subtronic Surveying (800) 998-3463, March 2009.                                                      |
| Construction SWPPP implementation                                                               |          | 1 ea                                          | \$ 30,000.00 | \$ 30,000    |                                                                                                                 |



Table E-5. Alternative S-2 - Capital Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| San Francisco Location Factors                                                                                   |                                   | Means 2009   |                 |               |                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Material                                                                                                         |                                   | 111.2%       |                 |               |                                                                                                                                                                                   |
| Labor & Equipment                                                                                                |                                   | 141.3%       |                 |               |                                                                                                                                                                                   |
| Assemblies                                                                                                       |                                   | 123.8%       |                 |               |                                                                                                                                                                                   |
| Construction Project Duration:                                                                                   | 230                               | working days |                 |               |                                                                                                                                                                                   |
|                                                                                                                  | 12                                | months       |                 |               |                                                                                                                                                                                   |
| Operations and Maintenance / Monitoring Period:                                                                  | 7965                              | days         |                 |               |                                                                                                                                                                                   |
|                                                                                                                  | 360                               | months       |                 |               |                                                                                                                                                                                   |
| Description                                                                                                      | Quantity                          | Unit         | Unit Price      | Cost          | Comments                                                                                                                                                                          |
| CAPITAL COSTS (continued)                                                                                        | CAPITAL COSTS SUBTOTAL =          |              |                 | \$ 21,234,772 | Includes mob/demob, construction activites, design, and intitutional controls                                                                                                     |
| Air Monitoring                                                                                                   | Air Monitoring Subtotal =         |              |                 | \$ 236,698    |                                                                                                                                                                                   |
| Ambient air monitor rental (12 total -placement frequency biased towards prevailing winds and residential areas) | 12                                | mo           | \$ 12,169.55    | \$ 146,035    | Means 2005 Environmental Remediation - Unit Price. Pg 9-10. 33 02 0315                                                                                                            |
| Analysis - principal organic hazardous constituents (1 per monitor per week)                                     | 99                                | ea           | \$ 362.29       | \$ 35,711     | Means 2005 Environmental Remediation - Unit Price. Pg 9-38. 33 02 1802                                                                                                            |
| Analysis - hydrocarbons (1 per monitor per week)                                                                 | 99                                | ea           | \$ 125.89       | \$ 12,409     | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1811                                                                                                            |
| Analysis - mercury (1 per monitor per week)                                                                      | 99                                | ea           | \$ 42.66        | \$ 4,205      | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1815                                                                                                            |
| Analysis - cyanide (1 per monitor per week)                                                                      | 99                                | ea           | \$ 51.76        | \$ 5,102      | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1816                                                                                                            |
| Portable ambient air analyzer rental                                                                             | 12                                | mo           | \$ 2,238.08     | \$ 26,857     | Means 2005 Environmental Remediation - Unit Price. Pg 9-11. 33 02 0328                                                                                                            |
| Portable combustible gas/oxygen indicator rental                                                                 | 12                                | mo           | \$ 531.54       | \$ 6,379      | Means 2005 Environmental Remediation - Unit Price. Pg 9-11. 33 02 0330                                                                                                            |
| Decontamination                                                                                                  | Decontamination Subtotal =        |              |                 | \$ 34,819     |                                                                                                                                                                                   |
| Pressure washer (1,800 psi, 5gpm)                                                                                | 12                                | mo           | \$ 1,150.00     | \$ 13,800     | Hertz Equipment Rental (http://www.hertzequip.com)                                                                                                                                |
| Pressure washer operation (assume 2 hr/day)                                                                      | 460                               | hr           | \$ 45.69        | \$ 21,019     | Means 2005 Environmental Remediation - Unit Price. Pg 9-168. 33 17 0823                                                                                                           |
| Steam Lines                                                                                                      | Steam Lines Subtotal =            |              |                 | \$ 1,023,148  |                                                                                                                                                                                   |
| Steam Line Closure and Removal                                                                                   | 1.00                              | ea           | \$ 1,023,148.21 | \$ 1,023,148  | See Backup Worksheet "STEAM LINE"                                                                                                                                                 |
| Fuel Lines                                                                                                       | Fuel Lines Subtotal =             |              |                 | \$ 315,678    |                                                                                                                                                                                   |
| Fuel Line Removal                                                                                                | 1.00                              | ea           | \$ 315,677.71   | \$ 315,678    | See Backup Worksheet "FUEL LINE"                                                                                                                                                  |
| Shoreline Protection                                                                                             | Shoreline Protection Subtotal =   |              |                 | \$ 8,158,992  |                                                                                                                                                                                   |
| Shoreline protection                                                                                             | 1.00                              | ea           | \$ 8,158,992.22 | \$ 8,158,992  | See Backup Worksheet "SHORELINE PROTECTION"                                                                                                                                       |
| Asphalt Covers                                                                                                   | Asphalt Covers Subtotal =         |              |                 | \$ 2,947,988  |                                                                                                                                                                                   |
| Install 6" Aggregate Base Course                                                                                 | 127,000                           | sy           | \$ 13.37        | \$ 1,698,041  | Means 2009 Heavy Construction. Page 275. 32 11 23.23 0100                                                                                                                         |
| Install 2" Asphalt Cover                                                                                         | 127,000                           | sy           | \$ 9.84         | \$ 1,249,947  | Means 2009 Heavy Construction. Page 276. 32 12 16.13 0120                                                                                                                         |
| Asphalt Repair Covers                                                                                            | Asphalt Repair Covers Subtotal =  |              |                 | \$ 818,835    |                                                                                                                                                                                   |
| Install 1" Asphalt Repair Cover                                                                                  | 159,378                           | sy           | \$ 5.14         | \$ 818,835    | Means 2009 Heavy Construction. Page 276. 32 12 16.13 0300                                                                                                                         |
| HDPE Liner                                                                                                       | HDPE Liner Subtotal =             |              |                 | \$ 955,104    |                                                                                                                                                                                   |
| Install 60-mil HDPE liner in IR-02                                                                               | 326,700                           | sf           | \$ 2.92         | \$ 955,104    | Means 2005 Environmental Remediation - Unit Price. Pg 9-85. 33 08 0572                                                                                                            |
| Soil Covers                                                                                                      | Soil Covers Subtotal =            |              |                 | \$ 2,384,154  |                                                                                                                                                                                   |
| Soil analysis (1 per 1000 CY)                                                                                    | 189                               | ea           | \$ 539.00       | \$ 101,619    | See "LAB COST" Worksheet for Detail                                                                                                                                               |
| Fill material, delivered from off-site                                                                           | 188,533                           | CY           | \$ 8.39         | \$ 1,582,321  | Means 2005 Environmental Remediation - Unit Price; Pg 4-23. 17 03 0424                                                                                                            |
| Spread dumped material                                                                                           | 188,533                           | CY           | \$ 2.33         | \$ 438,800    | Means 2009 Heavy Construction. Page 229. 31 23 23.17 0020                                                                                                                         |
| Compact soil cover, 12" lifts, 3 passes                                                                          | 188,533                           | CY           | \$ 1.39         | \$ 261,413    | Means 2009 Heavy Construction. Page 247. 31 23 23.23 5620                                                                                                                         |
| Landscaping                                                                                                      | Landscaping Subtotal =            |              |                 | \$ 63,461     |                                                                                                                                                                                   |
| Seeding and vegetative cover                                                                                     | 58                                | ac           | \$ 806.25       | \$ 47,109     | Means 2005 Environmental Remediation - Unit Price. Pg 5-18. 18 05 0401                                                                                                            |
| Hydrofertilizer                                                                                                  | 2,545,200                         | sf           | \$ 0.004        | \$ 11,148     | Means 2009 Heavy Construction. Page 272. 32 01 90.13 0180                                                                                                                         |
| Watering                                                                                                         | 58                                | ac           | \$ 89.06        | \$ 5,204      | Means 2005 Environmental Remediation - Unit Price. Pg 4-9; 18 05 0413                                                                                                             |
| Site Restoration                                                                                                 | As-Built Survey Subtotal =        |              |                 | \$ 288,309    |                                                                                                                                                                                   |
| Soil staging area liner removal                                                                                  | 130,680                           | sf           | \$ 2.09         | \$ 273,279    | Assumed that removal cost would be half of the installation cost                                                                                                                  |
| As-built aerial survey (2' contours)                                                                             | 128                               | ac           | \$ 117.61       | \$ 15,031     | Means 2009 Heavy Construction. Pg 22. 02 21 13.16 1850                                                                                                                            |
| Design                                                                                                           | Design Subtotal =                 |              |                 | \$ 2,617,702  |                                                                                                                                                                                   |
| Design assumed to be 12% of construction cost (including permitting)                                             |                                   |              |                 | \$ 2,617,702  | Includes: Remedial Design, Design Basis Report, Safety and Health Plan, Contingency Plan, QA/QC Plan, QAPP, and Cost Estmates; consistent with EPA guidance (pp. 5-13, EPA, 2000) |
| Institutional Contols                                                                                            | Institutional Controls Subtotal = |              |                 | \$ 118,097    |                                                                                                                                                                                   |
| Total institutional contols cost                                                                                 |                                   |              |                 | \$ 118,097    | See Backup Worksheet "INSTITUTIONAL CONTROLS"                                                                                                                                     |
| TOTAL PROJECT CAPITAL COST                                                                                       | TOTAL PROJECT CAPITAL COST =      |              |                 | \$ 24,549,979 | Includes Distributive Costs                                                                                                                                                       |
| Total Construction Cost                                                                                          |                                   |              |                 | \$ 21,814,180 |                                                                                                                                                                                   |
| Total Design Cost                                                                                                |                                   |              |                 | \$ 2,617,702  |                                                                                                                                                                                   |
| Total Institutional Controls Cost                                                                                |                                   |              |                 | \$ 118,097    |                                                                                                                                                                                   |
| TOTAL COST PER SQFT OF PARCEL =                                                                                  |                                   |              |                 | \$ 4.41       |                                                                                                                                                                                   |

General Assumptions:  
Work will be performed in Level D PPE  
Values from the "Means 2005 Environmental Remediation - Unit Price" and "Means 2005 Environmental Remediation - Assemblies" were multiplied by a factor of = 113% to account for an inflation rate of 3.1 percent per annum.



**Table E-9. Soil Alternatives - Maintained Landscaping Area Estimates**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Area Name                                  | Area (ac) | Area (sf) | Remarks                                                                                                       |
|--------------------------------------------|-----------|-----------|---------------------------------------------------------------------------------------------------------------|
| <b>Estimated Covers Areas</b>              |           |           |                                                                                                               |
| Soil Covers Area                           | 58.4      | 2,545,200 | 2-foot soil cover, general fill                                                                               |
| HDPE Liner                                 | 7.5       | 326,700   | Behind slurry wall in IR-02, included in soils cover area (2-foot soil cover will be placed above HDPE Liner) |
| IR-03 Covers                               | 1.2       | 52,700    | Not included in soil cover area, area addressed in NAPL alternatives                                          |
| New Asphalt Covers Area                    | 24.9      | 1,086,400 | 6" aggregate base course with 2" asphalt cover                                                                |
| New Asphalt Cover in Railroad-Right-of-Way | 1.3       | 56,600    | Applies to Alternative S-2 only                                                                               |
| Repair Existing Asphalt Covers Area        | 32.9      | 1,434,400 | 1-1/2" asphalt cover                                                                                          |
| Shoreline Area                             | 0.0       | 0         | See Appendix C for evaluation of shoreline protection options                                                 |
| No Treatment                               | 9.0       | 391,600   | Building footprints                                                                                           |
| Total Areas to be Covered =                | 128       | 5,566,900 |                                                                                                               |

**Table E-10. Soil Alternatives - Steam Line Closure and Removal Cost Detail**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                     | Quantity | Unit  | Unit Price  | Cost                | Remarks                                                                                                                                 |
|-------------------------------------------------|----------|-------|-------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Sample pipe casing for asbestos                 | 805      | each  | \$ 14.00    | \$ 11,264           | Quote fom Asbestos TEM Laboratories, Berkeley, CA (March 2009); assume three samples per access point                                   |
| Access point asbestos abatement                 |          |       |             |                     | Assume that all steam lines at access points is covered with ACM                                                                        |
| Cover surfaces with 6 mil polyethylene sheeting | 26,820   | SF    | \$ 0.29     | \$ 7,778            | Means 2005 Environmental Remediation - Unit Price. Pg 8-4. 25 01 0210; assume 100 SF of surface area to be covered at each access point |
| Remove pipe insulation with glove bag           | 1,341    | LF    | \$ 25.26    | \$ 33,877           | Means 2005 Environmental Remediation - Unit Price. Pg 8-7. 25 01 0419; assume 5 LF of pipe exposed at each access point                 |
| HEPA vacuum cleaner, 55 gal                     | 1        | each  | \$ 3,713.81 | \$ 3,714            | Means 2005 Environmental Remediation - Unit Price. Pg 8-2. 25 01 0118; assume 5 LF of pipe exposed at each access point                 |
| Sample interior of steam lines                  | 805      | each  | \$ 539.00   | \$ 433,677          | See "LAB COST" Worksheet for detail; assume three samples per access point                                                              |
| Close lines in place with grout                 | 16,809   | CF    | \$ 12.44    | \$ 209,138          | Means 2009 Heavy Construction. Pg 81. 04 05 16.30 2000; assume that 90% of the lines meet in place closure requirements                 |
| Remove failed lines                             | 5,364    | LF    | \$ 11.14    | \$ 59,765           | Means 2009 Heavy Construction. Pg 24. 02 41 13.33 2900; assume that 10% of the lines will be removed                                    |
| Collect and bag removed lines                   | 24,138   | CF    | \$ 4.11     | \$ 99,266           | Means 2005 Environmental Remediation - Unit Price. Pg 8-8. 25 01 0502; assume 1 CY of material for every 6 LF of pipe removed           |
| Dispose of pipe covered with ACM                | 894      | CY    | \$ 166.70   | \$ 149,031          | Means 2005 Environmental Remediation - Unit Price. Pg 8-8. 25 01 0506 and Pg 8-9. 25 01 0507 (average)                                  |
| Transport pipe to disposal site                 | 715      | miles | \$ 6.98     | \$ 4,989            | Means 2009 Heavy Construction. Pg 38. 02 81 20.10 1260 and 1270 (average); assume a 20-mile roundtrip to disposal facility              |
| Dispose of oily water in vacuum truck           | 44       | hour  | \$ 242.03   | \$ 10,649           | Means 2009 Heavy Construction. Pg 39. 02 81 20.10 3120; Assume each load take 4 hours total, 5,000-gallon truck                         |
| <b>TOTAL</b>                                    |          |       |             | <b>\$ 1,023,148</b> |                                                                                                                                         |

## Notes:

ACM = asbestos-containing material

Values from the "Means 2005 Environmental Remediation - Unit Price" and "Means 2005 Environmental Remediation - Assemblies" were multiplied by an inflation factor (see "BACKUP" Worksheet)

Assume costs for Level C are included in Health &amp; Safety line item in "BACKUP" Worksheet

Assume that no excess soil will be excavated and that rad screening will not be performed

Assume that all steam lines are an average of 8" in diameter

Estimated quantities based on steam line removal closeout reports for Parcel C and Parcel D.

## Steam Line Info:

Number of access points 268 each

Assume 1 access point every 200 feet

Length of steam lines 53,640 LF

**Table E-11. Soil Alternatives - Fuel Line Removal Cost Detail**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                              | Quantity | Unit   | Unit Price   | Cost       | Remarks                                                                                                                                 |
|--------------------------------------------------------------------------|----------|--------|--------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Excavate 2' deep trench along fuel line alignment with 1/2 CY excavator  | 754      | CY     | \$ 7.86      | \$ 5,926   | Means 2009 Heavy Construction. Pg 211. 31 23 16.13 0050                                                                                 |
| Remove failed lines                                                      | 2,827    | LF     | \$ 11.14     | \$ 31,498  | Means 2009 Heavy Construction. Pg 24. 02 41 13.33 2900                                                                                  |
| Collect and bag removed lines                                            | 12,722   | CF     | \$ 4.11      | \$ 52,317  | Means 2005 Environmental Remediation - Unit Price. Pg 8-8. 25 01 0502; assume 1 CY of material for every 6 LF of pipe removed (average) |
| Dispose of pipe covered with ACM                                         | 471      | CY     | \$ 166.70    | \$ 78,544  | Means 2005 Environmental Remediation - Unit Price. Pg 8-8. 25 01 0506 and Pg 8-9. 25 01 0507 (average)                                  |
| Transport pipe to disposal site                                          | 377      | miles  | \$ 6.98      | \$ 2,630   | Means 2009 Heavy Construction. Pg 38. 02 81 20.10 1260 and 1270 (average); assume a 20-mile roundtrip to disposal facility              |
| Confirmation sample collection (direct push)                             | 62       | each   | \$ 81.83     | \$ 5,089   | Assume one sample per 50 feet of line + 10% QC samples, Means 2005 Environmental Remediation - Unit Price. Pg 9-24. 33 02 0648          |
| Confirmation sample analysis                                             | 62       | each   | \$ 539.00    | \$ 33,523  | Assume one sample per 50 feet of line + 10% QC samples; see "LAB COST" Worksheet                                                        |
| Over excavate contaminated soils (20% contingency)                       | 151      | CY     | \$ 7.86      | \$ 1,185   | Means 2009 Heavy Construction. Pg 211. 31 23 16.13 0050                                                                                 |
| Conveyer system rental with misters and radiological detectors           | 0.2      | months | \$ 8,170.80  | \$ 1,634   | Means 2009 Heavy Construction. Pg 466. 01 54 33.10 0800 (x6)                                                                            |
| Radiological monitoring equipment for pre-excavation screening           | 0.2      | months | \$ 8,913.60  | \$ 1,783   | Ludlum Model 44-2 1"x 1" NaI GAMMA Scintillator (unit rental cost provided by Suntrac Services, 1-800-579-4513, March 2009) (x16)       |
| Haul soil to secondary screening area with 8 CY trucks                   | 754      | CY     | \$ 4.16      | \$ 3,136   | Means 2009 Heavy Construction. Pg 230. 31 23 23.20 0114                                                                                 |
| Radiological monitoring equipment for post-excavation conveyor screening | 0.2      | months | \$ 33,426.00 | \$ 6,685   | Assumed to be 10 times the cost of the portable scintillator (x6)                                                                       |
| Soil analysis for disposal (1 per 500 CY) (4 pt. composite samples)      | 2        | each   | \$ 539.00    | \$ 813     | See "LAB COST" Worksheet for Detail                                                                                                     |
| Transport and disposal of excavated material                             |          |        |              |            |                                                                                                                                         |
| Class II Beneficial Reuse Soil to Altamont                               | 0        | ton    | \$ 38.82     | \$ -       | Assumed Fraction of Total Waste: 0%                                                                                                     |
| Class II Soil to Altamont                                                | 1,131    | ton    | \$ 72.42     | \$ 81,893  | Assumed Fraction of Total Waste: 100%                                                                                                   |
| Soil analysis for import soil (1 per 1000 CY) (4 pt. composite samples)  | 1        | each   | \$ 539.00    | \$ 539     | See "LAB COST" Worksheet for Detail                                                                                                     |
| Fill material, delivered from off-site                                   | 754      | CY     | \$ 8.39      | \$ 6,327   | Means 2005 Environmental Remediation - Unit Price; Pg 4-23. 17 03 0424                                                                  |
| Compact backfill                                                         | 754      | CY     | \$ 2.86      | \$ 2,156   | Means 2009 Heavy Construction. Pg 248. 31 23 23.23 7020                                                                                 |
| <b>TOTAL</b>                                                             |          |        |              | \$ 315,678 |                                                                                                                                         |

**Notes:**

Values from the "Means 2005 Environmental Remediation - Unit Price" and "Means 2005 Environmental Remediation - Assemblies" were multiplied by an inflation factor (see "BACKUP" Worksheet)

Assume costs for Level C are included in Health &amp; Safety line item in "BACKUP" Worksheet

Estimated quantities based on steam line removal closeout reports for Parcel C and Parcel D.

**Fuel Line Volumes and Areas:**

|                                                             |       |                    |  |                                                    |
|-------------------------------------------------------------|-------|--------------------|--|----------------------------------------------------|
| Length of fuel lines                                        | 2,827 | LF                 |  |                                                    |
| Area requiring excavation and backfill                      | 8,481 | SF                 |  | Assumed 3-foot-wide trench                         |
| Volume requiring excavation and backfill + 20% fluff factor | 754   | CY                 |  | Assumed 2-foot-deep trench + 20% soil fluff factor |
| Excavated material tonnage                                  | 1,131 | TN                 |  | Assumed unit weight of 1.5 TN/CY                   |
| Total number of 50'x50' grid surfaces estimated             |       | 3 surface grids    |  | See Backup Worksheet "RAD SCREENING"               |
| Total number of estimated equivalent grids                  |       | 6 equivalent grids |  | See Backup Worksheet "RAD SCREENING"               |

**Table E-12. Soil Alternatives - Shoreline Protection Cost Detail**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                           | Quantity  | Unit |       |    | Unit Price  | Cost         | Remarks                                                                                                                                            |
|-----------------------------------------------------------------------|-----------|------|-------|----|-------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Excavate shoreline area to 2.5 feet bgs (excavator) in wet conditions | 40,560    | bcy  | 1,000 | 41 | \$ 3.65     | \$ 147,890   | Means 2010 Heavy Construction: 31 23 16.42 0250, plus 50% for work in water (Means 2009 Heavy Construction: 31 23 16.42 4250)                      |
| Load excavated material (track loader) in wet conditions              | 40,560    | bcy  | 1,190 | 35 | \$ 2.58     | \$ 104,815   | Means 2010 Heavy Construction: 31 23 23.15 6070 (w/o material), plus 50% for work in water (Means 2009 Heavy Construction: 31 23 16.42 4250)       |
| Haul soil to secondary screening area (22 cy off-road hauler)         | 52,728    | lcy  | 1,190 | 45 | \$ 3.58     | \$ 188,524   | Means 2010 Heavy Construction: 31 23 23.20 5060                                                                                                    |
| Debris handling to facilitate radiological screening (track loader)   | 4,056     | bcy  | 75    | 55 | \$ 8.61     | \$ 34,938    | Means 2010 Heavy Construction: 31 23 23.15 6070 (assumes debris is 10% of excavation volume, unit rate adjusted to reflect slower production rate) |
| Radiological screening                                                | 1,095,120 | sf   |       |    | \$ 0.30     | \$ 328,536   | Consistent with cost estimate from Parcel E Radiological Addendum (Appendix D)                                                                     |
| Soil analysis for disposal (4-point composite sample - 1 per 500 bcy) | 82        | each |       |    | \$ 1,042.00 | \$ 85,444    | Consistent with cost estimate from Parcel E Radiological Addendum (Appendix D); includes additional costs for radiological analyses                |
| Load material for disposal (track loader)                             | 40,560    | bcy  | 1,190 | 35 | \$ 1.72     | \$ 69,877    | Means 2010 Heavy Construction: 31 23 23.15 6070 (w/o material)                                                                                     |
| Transport and disposal of excavated material                          |           |      |       |    |             |              |                                                                                                                                                    |
| Class II Beneficial Reuse Soil to Altamont                            | 19,165    | ton  |       |    | \$ 38.82    | \$ 743,970   | Assumed Fraction of Total Waste: 35%                                                                                                               |
| Class II Soil to Altamont                                             | 13,689    | ton  |       |    | \$ 72.42    | \$ 991,357   | Assumed Fraction of Total Waste: 25%                                                                                                               |
| Class I Non-RCRA Soil to Kettleman Hills                              | 8,213     | ton  |       |    | \$ 81.15    | \$ 666,517   | Assumed Fraction of Total Waste: 15%                                                                                                               |
| Class I RCRA Direct Landfill Soil to Kettleman Hills                  | 5,476     | ton  |       |    | \$ 130.04   | \$ 712,047   | Assumed Fraction of Total Waste: 10%                                                                                                               |
| Class I RCRA Stabilization Soil to Kettleman Hills                    | 5,476     | ton  |       |    | \$ 172.24   | \$ 943,117   | Assumed Fraction of Total Waste: 10%                                                                                                               |
| Disposal of radiologically impacted waste                             | 2,738     | ton  |       |    | \$ 120.00   | \$ 328,536   | Assumed Fraction of Total Waste: 5%                                                                                                                |
| Furnish and install crushed gravel                                    | 3,048     | bcy  | 1,190 | 3  | \$ 23.05    | \$ 70,269    | Means 2010 Heavy Construction: 31 23 23.15 6070 (w/ material + \$5.25/bcy for granular, plus 25% for work in water)                                |
| Furnish and install geofabric                                         | 42,000    | sy   | 2,400 | 18 | \$ 4.30     | \$ 180,646   | Means 2010 Heavy Construction: 31 32 19.16 1510, plus 50% for work in water                                                                        |
| Furnish and install riprap armor <sup>(1)</sup>                       | 15,360    | lcy  | 248   | 62 | \$ 89.98    | \$ 1,382,016 | Means 2010 Heavy Construction: 31 37 13.10 010, plus 25% for work in water                                                                         |
| Furnish and install (spread) coarse sand                              | 18,000    | bcy  | 1,190 | 16 | \$ 23.05    | \$ 414,977   | Means 2010 Heavy Construction: 31 23 23.15 6070 (w/ material + \$5.25/bcy for granular, plus 25% for work in water)                                |
| Compact coarse sand                                                   | 18,000    | bcy  | 2,300 | 8  | \$ 1.32     | \$ 23,789    | Means 2010 Heavy Construction: 31 23 23.23 5020, plus 100% for work in water                                                                       |
| Mobilization and demobilization                                       | 1         | ls   |       |    |             | \$ 741,727   | 10% of costs                                                                                                                                       |
| <b>TOTAL</b>                                                          |           |      |       |    |             | \$ 8,158,992 |                                                                                                                                                    |

Notes:

<sup>(1)</sup> The required weight for an individual armor unit (for 2.3-foot design wave) is 72 pounds on a 3:1 slope and 22 pounds on a 10:1 slope (Hudson Formula, U.S. Army Corps of Engineers, 1977. "Shore Protection Manual").

bcy = bank cubic yards

lcy = loose cubic yards

ls = lump sum

sf = square feet

sy = square yard

**Table E-12. Soil Alternatives - Shoreline Protection Cost Detail** *(continued)*

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

Notes (continued):

Shoreline Protection Quantities (Rock Revetment):

|                                |           |           |                                                                   |
|--------------------------------|-----------|-----------|-------------------------------------------------------------------|
| Length of Protection           | 2,400 ft  | 2,400 ft  | total length for rock revetment                                   |
| Width of Protection (average)  | 48 ft     | 48 ft     | 48' wide strip                                                    |
| Volume of excavation (average) | 4.4 cy/lf | 10,560 cy | 4.4 cy/lf @ 2.5'depth                                             |
| Crushed gravel backfill        | 0.4 cy/lf | 1,056 cy  | 3" thick                                                          |
| Geotextile fabric              | 6.4 sy/lf | 15,360 sy | 5' additional each end for anchorage                              |
| Riprap (2 layers, 72 # units)  | 2.9 cy/lf | 6,960 cy  | 165 pcf rock weight, 38% voids, 1.6' layer thickness              |
| Sand                           | 2.2 cy/lf | 5,280 cy  | 0.65' layer thickness plus fill voids in rock layer (38% of 1.6') |
| Disposal quantity              | 5.9 T/lf  | 14,256 T  | assume 100 pcf = 1.35 t/cy                                        |

Overburden Removal Quantities:

|                                |           |           |                                                                 |
|--------------------------------|-----------|-----------|-----------------------------------------------------------------|
| Length of Protection           | 3,360 ft  | 3,360 ft  | assumes 70% of shoreline protection requires overburden removal |
| Volume of excavation (average) | 3.0 cy/lf | 10,080 cy | (to achieve design slope; 3:1 in existing narrow/steep areas;   |
| Disposal quantity (average)    | 4.1 T/lf  | 13,608 T  | 10:1 in gradually sloped/wide areas)                            |

Shoreline Protection Quantities (Natural Materials with Underlying Rock Armor):

|                                |            |           |                                                                  |
|--------------------------------|------------|-----------|------------------------------------------------------------------|
| Length of Protection           | 2,400 ft   | 2,400 ft  | total length for hybrid stabilization                            |
| Width of Protection (average)  | 90 ft      | 90 ft     | 90' wide strip                                                   |
| Volume of excavation (average) | 8.3 cy/lf  | 19,920 cy | 4.4 cy/lf @ 2.5'depth                                            |
| Crushed gravel backfill        | 0.8 cy/lf  | 1,992 cy  | 3" thick                                                         |
| Geotextile fabric              | 11.1 sy/lf | 26,640 sy | 5' additional each end for anchorage                             |
| Riprap (2 layers, 22 # units)  | 3.5 cy/lf  | 8,400 cy  | 165 pcf rock weight, 38% voids, 1.05' layer thickness            |
| Sand                           | 5.3 cy/lf  | 12,720 cy | 1.2' layer thickness plus fill voids in rock layer (38% of 1.6') |
| Disposal quantity              | 11.2 T/lf  | 26,892 T  | assume 100 pcf = 1.35 t/cy                                       |



|    |                       |         |                                                                                                                                                                 |
|----|-----------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 42 | Capital Cost: \$36.1M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-1, E-6, E-18, and E-19. |
|----|-----------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-1. Soil and Sediment Alternatives Cost Estimate Summary**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Present Value <sup>(4)</sup> |
|----------------------|--------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------|
| S-1                  | \$ -               | \$ -           | \$ -                | 32 years                          | \$ -                      | \$ -                         |
| S-2                  | \$ 24,549,979      | \$ 2,841,789   | \$ 5,568,652        | 32 years                          | \$ 39,552,503             | \$ 35,184,308                |
| S-3                  | \$ 36,066,261      | \$ 2,841,789   | \$ 5,471,677        | 32 years                          | \$ 53,255,671             | \$ 48,719,497                |
| S-4                  | \$ 37,311,751      | \$ 2,841,789   | \$ 5,471,677        | 32 years                          | \$ 54,750,260             | \$ 50,190,697                |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)



Table E-6. Alternative S-3 - Capital Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                 |      |              |
|-------------------------------------------------|------|--------------|
| San Francisco Location Factors                  |      | Means 2009   |
| Material                                        |      | 111.2%       |
| Labor & Equipment                               |      | 141.3%       |
| Assemblies                                      |      | 123.8%       |
| Construction Project Duration:                  | 266  | working days |
|                                                 | 14   | months       |
| Operations and Maintenance / Monitoring Period: | 7965 | days         |
|                                                 | 360  | months       |

| Description                                                                                     | Quantity                                          | Unit | Unit Price   | Cost                 | Comments                                                                                                        |
|-------------------------------------------------------------------------------------------------|---------------------------------------------------|------|--------------|----------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>DISTRIBUTIVE COSTS</b>                                                                       | <b>DISTRIBUTIVE COSTS SUBTOTAL =</b>              |      |              | <b>\$ 4,699,357</b>  | <b>Includes labor and temporary facilities</b>                                                                  |
| <b>Labor</b>                                                                                    | <b>Labor Subtotal =</b>                           |      |              | <b>\$ 4,550,426</b>  |                                                                                                                 |
| Total project professional/technical labor cost                                                 |                                                   |      |              | \$ 2,545,088         | See backup worksheet "LABOR"                                                                                    |
| Total project field/construction operations labor cost                                          |                                                   |      |              | \$ 566,474           | See backup worksheet "LABOR"                                                                                    |
| Total project radiological screening labor cost                                                 |                                                   |      |              | \$ 1,064,336         | See backup worksheet "LABOR"                                                                                    |
| Total project clerical administrative labor cost                                                |                                                   |      |              | \$ 374,528           | See backup worksheet "LABOR"                                                                                    |
| <b>Temporary Facilities</b>                                                                     | <b>Temporary Facilities Subtotal =</b>            |      |              | <b>\$ 148,931</b>    |                                                                                                                 |
| Furnished Field Office Trailer (50' x 10' w/ air conditioning)                                  | 14                                                | mo   | \$ 767.56    | \$ 10,746            | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0450                                                        |
| Office Equipment Rental                                                                         | 14                                                | mo   | \$ 802.12    | \$ 11,230            | Dell (http://www.dell.com), March 2009.                                                                         |
| Office Supplies                                                                                 | 14                                                | mo   | \$ 115.75    | \$ 1,621             | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0120                                                        |
| City Water Supply                                                                               | 14                                                | mo   | \$ 84.18     | \$ 1,179             | Means 2009 Heavy Construction. Page 14. 01 51 13.80 0700                                                        |
| Telephone Bill                                                                                  | 14                                                | mo   | \$ 108.94    | \$ 1,525             | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0140                                                        |
| Field Office Electrical Bill                                                                    | 14                                                | mo   | \$ 204.27    | \$ 2,860             | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0160                                                        |
| Portable Toilets (6)                                                                            | 14                                                | mo   | \$ 635.09    | \$ 8,891             | Means 2009 Heavy Construction. Page 472. 01 54 33 6410                                                          |
| Rental Trucks (8) (for supervisory staff)                                                       | 14                                                | mo   | \$ 7,920.00  | \$ 110,880           | Hertz Equipment Rental (http://www.hertzequip.com), March 2009.                                                 |
| <b>CAPITAL COSTS</b>                                                                            | <b>CAPITAL COSTS SUBTOTAL =</b>                   |      |              | <b>\$ 30,411,800</b> | <b>Includes mob/demob, construction activites, design, and intitutional controls</b>                            |
| <b>Mobilization and Demobilization</b>                                                          | <b>Mobilization and Demobilization Subtotal =</b> |      |              | <b>\$ 27,632</b>     |                                                                                                                 |
| Excavator, 0.5 CY capacity                                                                      | 1                                                 | ea   | \$ 562.05    | \$ 562               | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Excavator, 1.5 CY capacity                                                                      | 2                                                 | ea   | \$ 1,039.92  | \$ 2,080             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Conveyer system with misters and radiological detectors                                         | 6                                                 | ea   | \$ 562.05    | \$ 3,372             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dump truck, 8 CY (12 ton payload)                                                               | 6                                                 | ea   | \$ 562.05    | \$ 3,372             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dozer, 200 H.P.                                                                                 | 2                                                 | ea   | \$ 1,039.92  | \$ 2,080             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Grader, self-propelled, 30,000 lb.                                                              | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dozer, 300 H.P.                                                                                 | 2                                                 | ea   | \$ 1,039.92  | \$ 2,080             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Roller, Vibratory, 25 Ton                                                                       | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Truck Tractor, 6x4, 450 H.P.                                                                    | 2                                                 | ea   | \$ 1,039.92  | \$ 2,080             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Water Tanker, 5000 gal                                                                          | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Asphalt Paver, 130 H.P.                                                                         | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Tandem Rollers, 10 Ton                                                                          | 4                                                 | ea   | \$ 562.05    | \$ 2,248             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Roller, Pneum. Whl, 12 Ton                                                                      | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Sheepsfoot Roller, 240 H.P.                                                                     | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Office Trailers (assumed 100 mile haul) (2)                                                     | 2                                                 | ea   | \$ 1,225.62  | \$ 2,451             | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0800 (unit cost multiplied by 2 to account for mob & demob) |
| Water truck for dust suppression, 6,000 gallon capacity (1)                                     | 1                                                 | ea   | \$ 562.05    | \$ 562               | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| <b>Health and Safety Equipment</b>                                                              | <b>Health and Safety Equipment Subtotal =</b>     |      |              | <b>\$ 386,457</b>    |                                                                                                                 |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment            | 20                                                | ea   | \$ 13,300.00 | \$ 266,000           | Assumed \$50 per field worker per day                                                                           |
| Water truck for dust suppression, 6,000 gallon capacity (1)                                     | 14                                                | mo   | \$ 8,604.10  | \$ 120,457           | Means 2009 Heavy Construction. Page 472. 01 54 33.40 6950                                                       |
| <b>Pre-Construction Demolition</b>                                                              | <b>Pre-Construction Demolition Subtotal =</b>     |      |              | <b>\$ 9,034</b>      |                                                                                                                 |
| Monitoring well abandonment                                                                     | 1.00                                              | ea   | \$ 9,033.60  | \$ 9,034             | See Backup Worksheet "WELL ABANDONMENT"                                                                         |
| <b>Site Preparation</b>                                                                         | <b>Site Preparation Subtotal =</b>                |      |              | <b>\$ 944,696</b>    |                                                                                                                 |
| Grade soil staging area (3 acres)                                                               | 14,520                                            | sy   | \$ 0.92      | \$ 13,302            | Means 2009 Heavy Construction. Page 211. 31 22 16.10 0100                                                       |
| Install soil staging area liner (3 acre, 80 mil HDPE, for rad screening and stockpiling areas ) | 130,680                                           | sf   | \$ 4.18      | \$ 546,557           | Means 2005 Environmental Remediation - Assemblies. Pg 3-90. 33 08 0573                                          |
| Grade laydown area (200 ft x 100 ft)                                                            | 2,222                                             | sy   | \$ 0.92      | \$ 2,036             | Means 2009 Heavy Construction. Page 211. 31 22 16.10 0100                                                       |
| Cover over laydown area with crushed stone (6" thick)                                           | 2,222                                             | sy   | \$ 13.37     | \$ 29,709            | Means 2009 Heavy Construction. Page 275. 32 11 23.23 0100                                                       |
| Site security (24-hours uniformed watchman at entrance)                                         | 10,080                                            | hr   | \$ 33.55     | \$ 338,184           | Means 2009 Heavy Construction. Page 20. 01 56 32.50 0020                                                        |
| Aerial survey (2' contours)                                                                     | 4                                                 | ac   | \$ 117.61    | \$ 508               | Means 2009 Heavy Construction. Pg 22. 02 21 13.16 1850                                                          |
| Subsurface utility surveying                                                                    | 12                                                | day  | \$ 1,200.00  | \$ 14,400            | Quote from Subtronic Surveying (800) 998-3463, March 2009.                                                      |
| Construction SWPPP implementation                                                               | 1                                                 | ea   | \$ 30,000.00 | \$ 30,000            |                                                                                                                 |



Table E-6. Alternative S-3 - Capital Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                 |      |              |
|-------------------------------------------------|------|--------------|
| San Francisco Location Factors                  |      | Means 2009   |
| Material                                        |      | 111.2%       |
| Labor & Equipment                               |      | 141.3%       |
| Assemblies                                      |      | 123.8%       |
| Construction Project Duration:                  | 266  | working days |
|                                                 | 14   | months       |
| Operations and Maintenance / Monitoring Period: | 7965 | days         |
|                                                 | 360  | months       |

| Description                                                                                                      | Quantity                                   | Unit | Unit Price      | Cost              | Comments                                                                             |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------|-----------------|-------------------|--------------------------------------------------------------------------------------|
| <b>CAPITAL COSTS (continued)</b>                                                                                 | <b>CAPITAL COSTS SUBTOTAL = \$</b>         |      |                 | <b>30,411,800</b> | <b>Includes mob/demob, construction activites, design, and intitutional controls</b> |
| <b>Air Monitoring</b>                                                                                            | <b>Air Monitoring Subtotal = \$</b>        |      |                 | <b>275,565</b>    |                                                                                      |
| Ambient air monitor rental (12 total -placement frequency biased towards prevailing winds and residential areas) | 14                                         | mo   | \$ 12,169.55    | \$ 170,374        | Means 2005 Environmental Remediation - Unit Price. Pg 9-10. 33 02 0315               |
| Analysis - principal organic hazardous constituents (1 per monitor per week)                                     | 114                                        | ea   | \$ 362.29       | \$ 41,301         | Means 2005 Environmental Remediation - Unit Price. Pg 9-38. 33 02 1802               |
| Analysis - hydrocarbons (1 per monitor per week)                                                                 | 114                                        | ea   | \$ 125.89       | \$ 14,352         | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1811               |
| Analysis - mercury (1 per monitor per week)                                                                      | 114                                        | ea   | \$ 42.66        | \$ 4,864          | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1815               |
| Analysis - cyanide (1 per monitor per week)                                                                      | 114                                        | ea   | \$ 51.76        | \$ 5,900          | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1816               |
| Portable ambient air analyzer rental                                                                             | 14                                         | mo   | \$ 2,238.08     | \$ 31,333         | Means 2005 Environmental Remediation - Unit Price. Pg 9-11. 33 02 0328               |
| Portable combustible gas/oxygen indicator rental                                                                 | 14                                         | mo   | \$ 531.54       | \$ 7,442          | Means 2005 Environmental Remediation - Unit Price. Pg 9-11. 33 02 0330               |
| <b>Decontamination</b>                                                                                           | <b>Decontamination Subtotal = \$</b>       |      |                 | <b>40,408</b>     |                                                                                      |
| Pressure washer (1,800 psi, 5gpm)                                                                                | 14                                         | mo   | \$ 1,150.00     | \$ 16,100         | Hertz Equipment Rental (http://www.hertzequip.com)                                   |
| Pressure washer operation (assume 2 hr/day)                                                                      | 532                                        | hr   | \$ 45.69        | \$ 24,308         | Means 2005 Environmental Remediation - Unit Price. Pg 9-168. 33 17 0823              |
| <b>Excavations</b>                                                                                               | <b>Excavations Subtotal = \$</b>           |      |                 | <b>8,794,334</b>  |                                                                                      |
| Excavation of Tier 1 Locations                                                                                   | 1.00                                       | ea   | \$ 8,794,334.40 | \$ 8,794,334      | See Backup Worksheet "TIER 1 EXCAVATIONS"                                            |
| <b>Water Treatment</b>                                                                                           | <b>Water Treatment Subtotal = \$</b>       |      |                 | <b>117,563</b>    |                                                                                      |
| Water Treatment System                                                                                           | 1.00                                       | ea   | \$ 60,005.90    | \$ 60,006         | See Backup Worksheet "WATER TREATMENT"                                               |
| Metals wastewater analysis (1 sample per day + 10% QC samples)                                                   | 72                                         | ea   | \$ 130.00       | \$ 9,295          | STL Laboratories, San Francisco, CA (March 2009)                                     |
| PCBs/Pesticides wastewater analysis (1 sample per day + 10% QC samples)                                          | 72                                         | ea   | \$ 205.00       | \$ 14,658         | STL Laboratories, San Francisco, CA (March 2009)                                     |
| PAHs wastewater analysis (1 sample per day + 10% QC samples)                                                     | 72                                         | ea   | \$ 150.00       | \$ 10,725         | STL Laboratories, San Francisco, CA (March 2009)                                     |
| VOCs wastewater analysis (1 sample per day + 10% QC samples)                                                     | 72                                         | ea   | \$ 130.00       | \$ 9,295          | STL Laboratories, San Francisco, CA (March 2009)                                     |
| SVOCs wastewater analysis (1 sample per day + 10% QC samples)                                                    | 72                                         | ea   | \$ 190.00       | \$ 13,585         | STL Laboratories, San Francisco, CA (March 2009)                                     |
| <b>Steam Lines</b>                                                                                               | <b>Steam Lines Subtotal = \$</b>           |      |                 | <b>1,023,148</b>  |                                                                                      |
| Steam Line Closure and Removal                                                                                   | 1.00                                       | ea   | \$ 1,023,148.21 | \$ 1,023,148      | See Backup Worksheet "STEAM LINE"                                                    |
| <b>Fuel Lines</b>                                                                                                | <b>Fuel Lines Subtotal = \$</b>            |      |                 | <b>315,678</b>    |                                                                                      |
| Fuel Line Removal                                                                                                | 1.00                                       | ea   | \$ 315,677.71   | \$ 315,678        | See Backup Worksheet "FUEL LINE"                                                     |
| <b>Shoreline Protection</b>                                                                                      | <b>Shoreline Protection Subtotal = \$</b>  |      |                 | <b>8,158,992</b>  |                                                                                      |
| Shoreline protection                                                                                             | 1.00                                       | ea   | \$ 8,158,992.22 | \$ 8,158,992      | See Backup Worksheet "SHORELINE PROTECTION"                                          |
| <b>Asphalt Covers</b>                                                                                            | <b>Asphalt Covers Subtotal = \$</b>        |      |                 | <b>2,802,007</b>  |                                                                                      |
| Install 6" Aggregate Base Course                                                                                 | 120,711                                    | sy   | \$ 13.37        | \$ 1,613,956      | Means 2009 Heavy Construction. Page 275. 32 11 23.23 0100                            |
| Install 2" Asphalt Cover                                                                                         | 120,711                                    | sy   | \$ 9.84         | \$ 1,188,051      | Means 2009 Heavy Construction. Page 276. 32 12 16.13 0120                            |
| <b>Asphalt Repair Covers</b>                                                                                     | <b>Asphalt Repair Covers Subtotal = \$</b> |      |                 | <b>818,835</b>    |                                                                                      |
| Install 1" Asphalt Repair Cover                                                                                  | 159,378                                    | sy   | \$ 5.14         | \$ 818,835        | Means 2009 Heavy Construction. Page 276. 32 12 16.13 0300                            |
| <b>HDPE Liner</b>                                                                                                | <b>HDPE Liner Subtotal = \$</b>            |      |                 | <b>955,104</b>    |                                                                                      |
| Install 60-mil HDPE liner in IR-02                                                                               | 326,700                                    | sf   | \$ 2.92         | \$ 955,104        | Means 2005 Environmental Remediation - Unit Price. Pg 9-85. 33 08 0572               |
| <b>Soil Covers</b>                                                                                               | <b>Soil Covers Subtotal = \$</b>           |      |                 | <b>2,384,154</b>  |                                                                                      |
| Soil analysis (1 per 1000 CY)                                                                                    | 189                                        | ea   | \$ 539.00       | \$ 101,619        | See "LAB COST" Worksheet for Detail                                                  |
| Fill material, delivered from off-site                                                                           | 188,533                                    | CY   | \$ 8.39         | \$ 1,582,321      | Means 2005 Environmental Remediation - Unit Price; Pg 4-23. 17 03 0424               |
| Spread dumped material                                                                                           | 188,533                                    | CY   | \$ 2.33         | \$ 438,800        | Means 2009 Heavy Construction. Page 229. 31 23 23.17 0020                            |
| Compact soil cover, 12" lifts, 3 passes                                                                          | 188,533                                    | CY   | \$ 1.39         | \$ 261,413        | Means 2009 Heavy Construction. Page 247. 31 23 23.23 5620                            |
| <b>Landscaping</b>                                                                                               | <b>Landscaping Subtotal = \$</b>           |      |                 | <b>63,461</b>     |                                                                                      |
| Seeding and vegetative cover                                                                                     | 58                                         | ac   | \$ 806.25       | \$ 47,109         | Means 2005 Environmental Remediation - Unit Price. Pg 5-18. 18 05 0401               |
| Hydrofertilizer                                                                                                  | 2,545,200                                  | sf   | \$ 0.004        | \$ 11,148         | Means 2009 Heavy Construction. Page 272. 32 01 90.13 0180                            |
| Watering                                                                                                         | 58                                         | ac   | \$ 89.06        | \$ 5,204          | Means 2005 Environmental Remediation - Unit Price. Pg 4-9; 18 05 0413                |
| <b>Site Restoration</b>                                                                                          | <b>As-Built Survey Subtotal = \$</b>       |      |                 | <b>289,182</b>    |                                                                                      |
| Soil staging area liner removal                                                                                  | 130,680                                    | sf   | \$ 2.09         | \$ 273,279        | Assumed that removal cost would be half of the installation cost                     |
| As-built aerial survey (2' contours)                                                                             | 135                                        | ac   | \$ 117.61       | \$ 15,904         | Means 2009 Heavy Construction. Pg 22. 02 21 13.16 1850                               |

Table E-6. Alternative S-3 - Capital Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                 |      |              |
|-------------------------------------------------|------|--------------|
| <u>San Francisco Location Factors</u>           |      | Means 2009   |
| Material                                        |      | 111.2%       |
| Labor & Equipment                               |      | 141.3%       |
| Assemblies                                      |      | 123.8%       |
| Construction Project Duration:                  | 266  | working days |
|                                                 | 14   | months       |
| Operations and Maintenance / Monitoring Period: | 7965 | days         |
|                                                 | 360  | months       |

| Description                                                          | Quantity                                 | Unit | Unit Price | Cost                 | Comments                                                                                                                                                                          |
|----------------------------------------------------------------------|------------------------------------------|------|------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CAPITAL COSTS</b> <i>(continued)</i>                              | <b>CAPITAL COSTS SUBTOTAL =</b>          |      |            | <b>\$ 30,411,800</b> | <b>Includes mob/demob, construction activites, design, and intitutional controls</b>                                                                                              |
| <b>Design</b>                                                        | <b>Design Subtotal =</b>                 |      |            | <b>\$ 3,851,589</b>  |                                                                                                                                                                                   |
| Design assumed to be 12% of construction cost (including permitting) |                                          |      |            | \$ 3,851,589         | Includes: Remedial Design, Design Basis Report, Safety and Health Plan, Contingency Plan, QA/QC Plan, QAPP, and Cost Estmates; consistent with EPA guidance (pp. 5-13, EPA, 2000) |
| <b>Institutional Contols</b>                                         | <b>Institutional Controls Subtotal =</b> |      |            | <b>\$ 118,097</b>    |                                                                                                                                                                                   |
| Total institutional contols cost                                     |                                          |      |            | \$ 118,097           | See Backup Worksheet "INSTITUTIONAL CONTROLS"                                                                                                                                     |
|                                                                      |                                          |      |            |                      |                                                                                                                                                                                   |
| <b>TOTAL PROJECT CAPITAL COST</b>                                    | <b>TOTAL PROJECT CAPITAL COST =</b>      |      |            | <b>\$ 36,066,261</b> | <b>Includes Distributive Costs</b>                                                                                                                                                |
| Total Construction Cost                                              |                                          |      |            | \$ 32,096,575        |                                                                                                                                                                                   |
| Total Design Cost                                                    |                                          |      |            | \$ 3,851,589         |                                                                                                                                                                                   |
| Total Institutional Controls Cost                                    |                                          |      |            | \$ 118,097           |                                                                                                                                                                                   |
|                                                                      | <b>TOTAL COST PER SQFT OF PARCEL =</b>   |      |            | <b>\$ 191.59</b>     |                                                                                                                                                                                   |

|                                                                                                                                                              |      |                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------|
| General Assumptions:                                                                                                                                         |      |                                                            |
| Work will be performed in Level D PPE                                                                                                                        |      |                                                            |
| Values from the "Means 2005 Environmental Remediation - Unit Price" and "Means 2005 Environmental Remediation - Assemblies" were multiplied by a factor of = | 113% | to account for an inflation rate of 3.1 percent per annum. |

**Table E-18. Alternative S-3 - Excavation Volume Estimates**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Excavation Name                                           | Length (feet) | Width (feet) | Area (feet) | Average Depth (feet) | Volume (ft <sup>3</sup> ) | Volume (CY) | Over Excavation Volume (CY) | Total Volume with 20% Fluff Factor (CY) | Excavation Perimeter | Quantity of Samples <sup>(1)</sup> | Location Type <sup>(2)</sup> |
|-----------------------------------------------------------|---------------|--------------|-------------|----------------------|---------------------------|-------------|-----------------------------|-----------------------------------------|----------------------|------------------------------------|------------------------------|
| <b>BLOCK EOS-1 (SHORELINE OPEN SPACE WESTERN PORTION)</b> |               |              |             |                      |                           |             |                             |                                         |                      |                                    |                              |
| EX02B122                                                  | 60            | 50           | 3,000       | 10                   | 30,000                    | 1,111       | 167                         | 1,533                                   | 220                  | 43                                 | Tier 1 Location              |
| EX02B250                                                  | 20            | 20           | 400         | 6                    | 2,400                     | 89          | 13                          | 123                                     | 80                   | 12                                 | TPH Location                 |
| EX02B256                                                  | 50            | 40           | 2,000       | 9                    | 18,000                    | 667         | 100                         | 920                                     | 180                  | 33                                 | Tier 1 Location              |
| EX02B288                                                  | 65            | 50           | 3,250       | 6                    | 19,500                    | 722         | 108                         | 997                                     | 230                  | 45                                 | Tier 1 Location              |
| EX02B412                                                  | 115           | 40           | 4,600       | 4                    | 18,400                    | 681         | 102                         | 940                                     | 310                  | 62                                 | Tier 1 Location              |
| EX02B428                                                  | 40            | 20           | 800         | 5                    | 4,000                     | 148         | 22                          | 204                                     | 120                  | 20                                 | TPH Location                 |
| EX02B456                                                  | 50            | 50           | 2,500       | 8.5                  | 21,250                    | 787         | 118                         | 1,086                                   | 200                  | 38                                 | Tier 1 Location              |
| EX02B524                                                  | 85            | 50           | 4,250       | 5.5                  | 23,375                    | 866         | 130                         | 1,195                                   | 270                  | 55                                 | Tier 1 Location              |
| EX02B525                                                  | 40            | 40           | 1,600       | 5                    | 8,000                     | 296         | 44                          | 409                                     | 160                  | 28                                 | Tier 1 Location              |
| EX02GR73SW                                                | 40            | 40           | 1,600       | 3                    | 4,800                     | 178         | 27                          | 245                                     | 160                  | 28                                 | Tier 1 Location              |
| EX02GR93SW                                                | 40            | 40           | 1,600       | 9                    | 14,400                    | 533         | 80                          | 736                                     | 160                  | 28                                 | Tier 1 Location              |
| EX02GR117SW                                               | 40            | 40           | 1,600       | 7                    | 11,200                    | 415         | 62                          | 572                                     | 160                  | 28                                 | TPH Location                 |
| EX02GR131SW                                               | 20            | 20           | 400         | 9                    | 3,600                     | 133         | 20                          | 184                                     | 80                   | 12                                 | TPH Location                 |
| EX02GR132BT                                               | 50            | 20           | 1,000       | 8.5                  | 8,500                     | 315         | 47                          | 434                                     | 140                  | 23                                 | TPH Location                 |
| EX02GR179SW                                               | 40            | 40           | 1,600       | 7                    | 11,200                    | 415         | 62                          | 572                                     | 160                  | 28                                 | Tier 1 Location              |
| EX02GR184SW                                               | 40            | 40           | 1,600       | 7                    | 11,200                    | 415         | 62                          | 572                                     | 160                  | 28                                 | Tier 1 Location              |
| Block EOS-1 Subtotals =                                   |               |              | 31,800      | -                    | 209,825                   | 7,771       | 1,166                       | 10,724                                  | -                    | 513                                |                              |
| <b>BLOCK EOS-2 (SHORELINE OPEN SPACE CENTRAL PORTION)</b> |               |              |             |                      |                           |             |                             |                                         |                      |                                    |                              |
| EX02B100                                                  | 40            | 40           | 1,600       | 3.5                  | 5,600                     | 207         | 31                          | 286                                     | 160                  | 28                                 | Tier 1 Location              |
| EX02B398                                                  | 40            | 40           | 1,600       | 5                    | 8,000                     | 296         | 44                          | 409                                     | 160                  | 28                                 | Tier 1 Location              |
| EX02B401                                                  | 100           | 60           | 6,000       | 5                    | 30,000                    | 1,111       | 167                         | 1,533                                   | 320                  | 69                                 | Tier 1 Location              |
| EX02B403                                                  | 40            | 40           | 1,600       | 5                    | 8,000                     | 296         | 44                          | 409                                     | 160                  | 28                                 | Tier 1 Location              |
| EX02B415                                                  | 80            | 55           | 4,400       | 5                    | 22,000                    | 815         | 122                         | 1,124                                   | 270                  | 56                                 | Tier 1 Location              |
| EX02B461                                                  | 40            | 40           | 1,600       | 5                    | 8,000                     | 296         | 44                          | 409                                     | 160                  | 28                                 | Tier 1 Location              |
| EX02SS320                                                 | 40            | 40           | 1,600       | 2.5                  | 4,000                     | 148         | 22                          | 204                                     | 160                  | 28                                 | Tier 1 Location              |
| Block EOS-2 Subtotals =                                   |               |              | 18,400      | -                    | 85,600                    | 3,170       | 476                         | 4,375                                   | -                    | 267                                |                              |
| <b>BLOCK EOS-3 (SHORELINE OPEN SPACE - IR03)</b>          |               |              |             |                      |                           |             |                             |                                         |                      |                                    |                              |
| EX02GP002                                                 | 20            | 20           | 400         | 10                   | 4,000                     | 148         | 22                          | 204                                     | 80                   | 12                                 | TPH Location                 |
| EX02GP008                                                 | 20            | 20           | 400         | 10                   | 4,000                     | 148         | 22                          | 204                                     | 80                   | 12                                 | TPH Location                 |
| EX02GP016A                                                | 20            | 20           | 400         | 16                   | 6,400                     | 237         | 36                          | 327                                     | 80                   | 12                                 | TPH Location                 |
| EX02GP038                                                 | 20            | 20           | 400         | 10                   | 4,000                     | 148         | 22                          | 204                                     | 80                   | 12                                 | TPH Location                 |
| EX02GP040                                                 | 75            | 60           | 4500        | 16                   | 72,000                    | 2,667       | 400                         | 3,680                                   | 270                  | 56                                 | TPH Location                 |
| EX02GP050                                                 | 20            | 20           | 400         | 16                   | 6,400                     | 237         | 36                          | 327                                     | 80                   | 12                                 | TPH Location                 |
| EX02GP051A                                                | 20            | 20           | 400         | 16                   | 6,400                     | 237         | 36                          | 327                                     | 80                   | 12                                 | TPH Location                 |
| EX02MW146                                                 | 20            | 20           | 400         | 10                   | 4,000                     | 148         | 22                          | 204                                     | 80                   | 12                                 | TPH Location                 |
| EX02MW173A                                                | 20            | 20           | 400         | 10                   | 4,000                     | 148         | 22                          | 204                                     | 80                   | 12                                 | TPH Location                 |
| EX03SS368                                                 | 40            | 40           | 1,600       | 2                    | 3,200                     | 119         | 18                          | 164                                     | 160                  | 28                                 | Tier 1 Location              |

**Table E-18. Alternative S-3 - Excavation Volume Estimates (continued)**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Excavation Name                                               | Length (feet) | Width (feet) | Area (feet) | Average Depth (feet) | Volume (ft <sup>3</sup> ) | Volume (CY) | Over Excavation Volume (CY) | Total Volume with 20% Fluff Factor (CY) | Excavation Perimeter | Quantity of Samples <sup>(1)</sup> | Location Type <sup>(2)</sup> |
|---------------------------------------------------------------|---------------|--------------|-------------|----------------------|---------------------------|-------------|-----------------------------|-----------------------------------------|----------------------|------------------------------------|------------------------------|
| <b>BLOCK EOS-3 (SHORELINE OPEN SPACE - IR03) (continued)</b>  |               |              |             |                      |                           |             |                             |                                         |                      |                                    |                              |
| EX03TA40B                                                     | 40            | 40           | 1,600       | 3                    | 4,800                     | 178         | 27                          | 245                                     | 160                  | 28                                 | Tier 1 Location              |
| Block EOS-3 Subtotals =                                       |               |              | 10,900      | -                    | 119,200                   | 4,415       | 662                         | 6,092                                   | -                    | 212                                |                              |
| <b>BLOCK EOS-4 (SHORELINE OPEN SPACE SOUTHERN PORTION)</b>    |               |              |             |                      |                           |             |                             |                                         |                      |                                    |                              |
| EX02B355                                                      | 20            | 20           | 400         | 8.5                  | 3,400                     | 126         | 19                          | 174                                     | 80                   | 12                                 | TPH Location                 |
| EX02B369                                                      | 75            | 40           | 3,000       | 3.5                  | 10,500                    | 389         | 58                          | 537                                     | 230                  | 44                                 | Tier 1 Location              |
| EX02B464                                                      | 80            | 50           | 4,000       | 5                    | 20,000                    | 741         | 111                         | 1,022                                   | 260                  | 52                                 | Tier 1 Location              |
| EX02B468                                                      | 20            | 20           | 400         | 3                    | 1,200                     | 44          | 7                           | 61                                      | 80                   | 12                                 | TPH Location                 |
| EX02B497                                                      | 70            | 40           | 2,800       | 4                    | 11,200                    | 415         | 62                          | 572                                     | 220                  | 42                                 | Tier 1 Location              |
| EX02B505                                                      | 40            | 40           | 1,600       | 5                    | 8,000                     | 296         | 44                          | 409                                     | 160                  | 28                                 | Tier 1 Location              |
| EX11B023 <sup>(3)</sup>                                       | -             | -            | 1,157       | 3.5                  | 4,050                     | 150         | 23                          | 207                                     | 160                  | 26                                 | Tier 1 Location              |
| EX15B027                                                      | 40            | 40           | 1,600       | 4                    | 6,400                     | 237         | 36                          | 327                                     | 160                  | 28                                 | Tier 1 Location              |
| EX380803                                                      | 40            | 40           | 1,600       | 3                    | 4,800                     | 178         | 27                          | 245                                     | 160                  | 28                                 | Tier 1 Location              |
| Block EOS-4 Subtotals =                                       |               |              | 16,557      | -                    | 69,550                    | 2,576       | 386                         | 3,555                                   | -                    | 275                                |                              |
| <b>BLOCK MU-1 (SHIPYARD SOUTH MULTI-USE WESTERN PORTION)</b>  |               |              |             |                      |                           |             |                             |                                         |                      |                                    |                              |
| EX01SS349                                                     | 40            | 40           | 1,600       | 2.5                  | 4,000                     | 148         | 22                          | 204                                     | 160                  | 28                                 | Tier 1 Location              |
| EX05B094                                                      | 60            | 40           | 2,400       | 10                   | 24,000                    | 889         | 133                         | 1,227                                   | 200                  | 37                                 | Tier 1 Location              |
| EX05B104                                                      | 80            | 80           | 6,400       | 4                    | 25,600                    | 948         | 142                         | 1,308                                   | 320                  | 71                                 | Tier 1 Location              |
| EX05MW85A                                                     | 80            | 80           | 6,400       | 5.5                  | 35,200                    | 1,304       | 196                         | 1,799                                   | 320                  | 71                                 | Tier 1 Location              |
| EX12MW17A                                                     | 40            | 40           | 1,600       | 8.5                  | 13,600                    | 504         | 76                          | 695                                     | 160                  | 28                                 | Tier 1 Location              |
| EX12MW18A                                                     | 40            | 40           | 1,600       | 8.5                  | 13,600                    | 504         | 76                          | 695                                     | 160                  | 28                                 | Tier 1 Location              |
| EX12SS16                                                      | 60            | 40           | 2,400       | 2                    | 4,800                     | 178         | 27                          | 245                                     | 200                  | 37                                 | Tier 1 Location              |
| EX12SS17                                                      | 40            | 40           | 1,600       | 2                    | 3,200                     | 119         | 18                          | 164                                     | 160                  | 28                                 | Tier 1 Location              |
| EX12TA08                                                      | 40            | 40           | 1,600       | 10                   | 16,000                    | 593         | 89                          | 818                                     | 160                  | 28                                 | Tier 1 Location              |
| EX12TA10                                                      | 40            | 40           | 1,600       | 5                    | 8,000                     | 296         | 44                          | 409                                     | 160                  | 28                                 | Tier 1 Location              |
| EX13B003B                                                     | 60            | 40           | 2,400       | 4                    | 9,600                     | 356         | 53                          | 491                                     | 200                  | 37                                 | Tier 1 Location              |
| EX13B004                                                      | 40            | 40           | 1,600       | 4.5                  | 7,200                     | 267         | 40                          | 368                                     | 160                  | 28                                 | Tier 1 Location              |
| EX13B007                                                      | 40            | 40           | 1,600       | 4.5                  | 7,200                     | 267         | 40                          | 368                                     | 160                  | 28                                 | Tier 1 Location              |
| EX13B010                                                      | 40            | 40           | 1,600       | 4                    | 6,400                     | 237         | 36                          | 327                                     | 160                  | 28                                 | Tier 1 Location              |
| EX13B023                                                      | 80            | 40           | 3,200       | 4                    | 12,800                    | 474         | 71                          | 654                                     | 240                  | 46                                 | Tier 1 Location              |
| EX36B027                                                      | 40            | 40           | 1,600       | 4.5                  | 7,200                     | 267         | 40                          | 368                                     | 160                  | 28                                 | Tier 1 Location              |
| EX36B062                                                      | 60            | 40           | 2,400       | 10                   | 24,000                    | 889         | 133                         | 1,227                                   | 200                  | 37                                 | Tier 1 Location              |
| EX36B063                                                      | 40            | 40           | 1,600       | 8.5                  | 13,600                    | 504         | 76                          | 695                                     | 160                  | 28                                 | Tier 1 Location              |
| EX36B138                                                      | 40            | 40           | 1,600       | 3                    | 4,800                     | 178         | 27                          | 245                                     | 160                  | 28                                 | Tier 1 Location              |
| EX36B180                                                      | 80            | 40           | 3,200       | 4                    | 12,800                    | 474         | 71                          | 654                                     | 240                  | 46                                 | Tier 1 Location              |
| Block MU-1 Subtotals =                                        |               |              | 48,000      | -                    | 253,600                   | 9,393       | 1,409                       | 12,962                                  | -                    | 725                                |                              |
| <b>BLOCK MU-2 (SHIPYARD SOUTH MULTI-USE SOUTHERN PORTION)</b> |               |              |             |                      |                           |             |                             |                                         |                      |                                    |                              |
| EX14MW10A                                                     | 40            | 40           | 1,600       | 4.5                  | 7,200                     | 267         | 40                          | 368                                     | 160                  | 28                                 | Tier 1 Location              |
| EX14SS05                                                      | 40            | 40           | 1,600       | 2                    | 3,200                     | 119         | 18                          | 164                                     | 160                  | 28                                 | Tier 1 Location              |

**Table E-18. Alternative S-3 - Excavation Volume Estimates (continued)**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Excavation Name                                                           | Length (feet) | Width (feet) | Area (feet)    | Average Depth (feet) | Volume (ft <sup>3</sup> ) | Volume (CY)   | Over Excavation Volume (CY) | Total Volume with 20% Fluff Factor (CY) | Excavation Perimeter | Quantity of Samples <sup>(1)</sup> | Location Type <sup>(2)</sup> |
|---------------------------------------------------------------------------|---------------|--------------|----------------|----------------------|---------------------------|---------------|-----------------------------|-----------------------------------------|----------------------|------------------------------------|------------------------------|
| <b>BLOCK MU-2 (SHIPYARD SOUTH MULTI-USE SOUTHERN PORTION) (continued)</b> |               |              |                |                      |                           |               |                             |                                         |                      |                                    |                              |
| EX36B015                                                                  | 40            | 40           | 1,600          | 4.5                  | 7,200                     | 267           | 40                          | 368                                     | 160                  | 28                                 | Tier 1 Location              |
| EX36B072                                                                  | 60            | 40           | 2,400          | 4                    | 9,600                     | 356           | 53                          | 491                                     | 200                  | 37                                 | Tier 1 Location              |
| EX36B116                                                                  | 40            | 40           | 1,600          | 4                    | 6,400                     | 237           | 36                          | 327                                     | 160                  | 28                                 | Tier 1 Location              |
| EX36B162                                                                  | 40            | 40           | 1,600          | 10                   | 16,000                    | 593           | 89                          | 818                                     | 160                  | 28                                 | Tier 1 Location              |
| Block MU-2 Subtotals =                                                    |               |              | 10,400         | -                    | 49,600                    | 1,837         | 276                         | 2,535                                   | -                    | 180                                |                              |
| <b>BLOCK MU-3 (SHIPYARD SOUTH MULTI-USE NORTHERN PORTION)</b>             |               |              |                |                      |                           |               |                             |                                         |                      |                                    |                              |
| EX04B011                                                                  | 105           | 60           | 6,300          | 4                    | 25,200                    | 933           | 140                         | 1,288                                   | 330                  | 72                                 | Tier 1 Location              |
| EX04B012                                                                  | 40            | 40           | 1,600          | 8.5                  | 13,600                    | 504           | 76                          | 695                                     | 160                  | 28                                 | Tier 1 Location              |
| EX04B015                                                                  | 40            | 40           | 1,600          | 3.5                  | 5,600                     | 207           | 31                          | 286                                     | 160                  | 28                                 | Tier 1 Location              |
| EX04B030                                                                  | 40            | 40           | 1,600          | 5                    | 8,000                     | 296           | 44                          | 409                                     | 160                  | 28                                 | Tier 1 Location              |
| EX12TA13                                                                  | 40            | 40           | 1,600          | 6                    | 9,600                     | 356           | 53                          | 491                                     | 160                  | 28                                 | Tier 1 Location              |
| EX72SS23                                                                  | 40            | 40           | 1,600          | 2                    | 3,200                     | 119           | 18                          | 164                                     | 160                  | 28                                 | Tier 1 Location              |
| Block MU-3 Subtotals =                                                    |               |              | 14,300         | -                    | 65,200                    | 2,415         | 362                         | 3,332                                   | -                    | 214                                |                              |
| <b>BLOCK EOS-5 (RAILROAD RIGHT-OF-WAY)</b>                                |               |              |                |                      |                           |               |                             |                                         |                      |                                    |                              |
| EX52B009                                                                  | 40            | 40           | 1,600          | 6                    | 9,600                     | 356           | 53                          | 491                                     | 160                  | 28                                 | Tier 1 Location              |
| EX52SS02                                                                  | 20            | 20           | 400            | 3                    | 1,200                     | 44            | 7                           | 61                                      | 80                   | 12                                 | TPH Location                 |
| EX52SS06                                                                  | 40            | 40           | 1,600          | 3                    | 4,800                     | 178           | 27                          | 245                                     | 160                  | 28                                 | Tier 1 Location              |
| Railroad Right-of-Way Subtotals =                                         |               |              | 3,600          | -                    | 15,600                    | 578           | 87                          | 797                                     | -                    | 69                                 |                              |
| <b>TOTALS</b>                                                             |               |              | <b>153,957</b> | <b>-</b>             | <b>868,175</b>            | <b>32,155</b> | <b>4,823</b>                | <b>44,373</b>                           | <b>-</b>             | <b>2,456</b>                       |                              |

Notes:

<sup>(1)</sup> Confirmation soil samples will be collected from both the sidewalls and bottom of each excavation with the following frequency:

Two sidewall samples (one shallow and one deep) will be collected on each sidewall for every 15 feet of excavation perimeter.

Bottom samples will be collected every 225 square feet, or at least one per excavation.

<sup>(2)</sup> Alternative S-3 includes excavation of Tier 1 locations (with COCs at concentrations greater than 10 times the remedial goals) and TPH locations (exceeding the TPH source criterion)

<sup>(3)</sup> Excavations are adjacent buildings and are not uniform in shape in order to protect building footprint.



**Table E-19. Alternative S-3 - Tier 1 Excavations Cost Detail**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                                  | Quantity | Unit   | Unit Price    | Cost                | Remarks                                                                                                                           |
|----------------------------------------------------------------------------------------------|----------|--------|---------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Excavate areas with 1-1/2 CY excavator                                                       | 44,373   | CY     | \$ 2.86       | \$ 127,036          | Means 2009 Heavy Construction. Pg 219. 31 23 16.42 0250; multiplied by 1.25 for reduced production rate due to screening          |
| Coffer Dam                                                                                   | 1        | ls     | \$ 174,000.00 | \$ 174,000          | See Parcel E-2 FS                                                                                                                 |
| Confirmation sample collection (direct push)                                                 | 2,456    | each   | \$ 81.83      | \$ 200,995          | Means 2005 Environmental Remediation - Unit Price. Pg 9-24. 33 02 0648; see "ALT S-3 VOLUMES" Worksheet                           |
| Confirmation sample analysis                                                                 | 2,456    | each   | \$ 539.00     | \$ 1,323,921        | See "LAB COST" Worksheet; see "ALT S-3 VOLUMES" Worksheet                                                                         |
| Over excavate contaminated soils                                                             | 4,437    | CY     | \$ 2.86       | \$ 12,704           | Means 2009 Heavy Construction. Pg 219. 31 23 16.42 0250; multiplied by 1.25 for reduced production rate due to screening          |
| Conveyer system rental with misters and radiological detectors                               | 4        | months | \$ 8,170.80   | \$ 32,683           | Means 2009 Heavy Construction. Pg 466. 01 54 33.10 0800 (x6)                                                                      |
| Operation of conveyer system                                                                 | 65       | days   | \$ 594.24     | \$ 38,626           | Means 2009 Heavy Construction. Pg 466. 01 54 33.10 0800 (x6)                                                                      |
| Radiological monitoring equipment rental for pre-excavation screening                        | 4        | months | \$ 7,200.00   | \$ 28,800           | Ludlum Model 44-2 1"x 1" NaI GAMMA Scintillator (unit rental cost provided by Suntrac Services, 1-800-579-4513, March 2009) (x16) |
| Haul soil to secondary screening area with 8 CY trucks                                       | 48,811   | CY     | \$ 4.16       | \$ 203,037          | Means 2009 Heavy Construction. Pg 230. 31 23 23.20 0114                                                                           |
| Radiological monitoring equipment for post-excavation conveyor                               | 4        | months | \$ 27,000.00  | \$ 108,000          | Assumed to be 10 times the cost of the portable scintillator (x6)                                                                 |
| Soil analysis for disposal (1 per 500 CY) (4 pt. composite samples)                          | 98       | each   | \$ 539.00     | \$ 52,618           | See "LAB COST" Worksheet for Detail                                                                                               |
| Transport and disposal of excavated material                                                 |          |        |               |                     |                                                                                                                                   |
| Class II Beneficial Reuse Soil to Altamont                                                   | 25,626   | ton    | \$ 38.82      | \$ 994,787          | Assumed Fraction of Total Waste: 35%                                                                                              |
| Class II Soil to Altamont                                                                    | 18,304   | ton    | \$ 72.42      | \$ 1,325,578        | Assumed Fraction of Total Waste: 25%                                                                                              |
| Class I Non-RCRA Soil to Kettleman Hills                                                     | 10,982   | ton    | \$ 81.15      | \$ 891,223          | Assumed Fraction of Total Waste: 15%                                                                                              |
| Class I RCRA Direct LF Soil to Kettleman Hills                                               | 7,322    | ton    | \$ 130.04     | \$ 952,102          | Assumed Fraction of Total Waste: 10%                                                                                              |
| Class I RCRA Stabilization Soil to Kettleman Hills                                           | 7,322    | ton    | \$ 172.24     | \$ 1,261,075        | Assumed Fraction of Total Waste: 10%                                                                                              |
| Disposal of radiologically impacted waste                                                    | 3,661    | ton    | \$ 120.00     | \$ 439,297          | Assumed Fraction of Total Waste: 5%                                                                                               |
| Soil analysis for import soil (1 per 1000 CY) (4 pt. composite samples)                      | 44       | each   | \$ 539.00     | \$ 23,917           | See "LAB COST" Worksheet for Detail                                                                                               |
| Backfill excavations with unclassified fill<br>(delivered, spread, compacted in 6-in. lifts) | 44,373   | ton    | \$ 13.61      | \$ 603,936          | Means 2005 Environmental Remediation - Unit Price. Pg 4-23. 17 03 0423                                                            |
| <b>TOTAL</b>                                                                                 |          |        |               | <b>\$ 8,794,334</b> |                                                                                                                                   |

Notes:

Values from the "Means 2005 Environmental Remediation - Unit Price" and "Means 2005 Environmental Remediation - Assemblies" were multiplied by an inflation factor (see "BACKUP" Worksheet)

Tier 1 Excavation Volumes and Areas:

|                                                       |         |                  |                                      |
|-------------------------------------------------------|---------|------------------|--------------------------------------|
| Area requiring excavation and backfill                | 153,957 | SF               |                                      |
| Volume requiring excavation                           | 44,373  | CY               |                                      |
| Volume of overexcavation due to chasing contamination | 4,437   | CY               | Assume 10% of estimated volume       |
| Total volume requiring excavation and backfill        | 48,811  | CY               |                                      |
| Excavated material tonnage                            | 73,216  | TN               | Assumed unit weight of 1.5 TN/CY     |
| Total number of 50'x50' grid surfaces estimated       | 94      | surface grids    | See Backup Worksheet "RAD SCREENING" |
| Total number of estimated equivalent grids            | 570     | equivalent grids | See Backup Worksheet "RAD SCREENING" |

|    |                       |         |                                                                                                                                                                       |
|----|-----------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 43 | Capital Cost: \$37.3M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-1, E-7, E-23, E-24, and E-26. |
|----|-----------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-1. Soil and Sediment Alternatives Cost Estimate Summary**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Present Value <sup>(4)</sup> |
|----------------------|--------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------|
| S-1                  | \$ -               | \$ -           | \$ -                | 32 years                          | \$ -                      | \$ -                         |
| S-2                  | \$ 24,549,979      | \$ 2,841,789   | \$ 5,568,652        | 32 years                          | \$ 39,552,503             | \$ 35,184,308                |
| S-3                  | \$ 36,066,261      | \$ 2,841,789   | \$ 5,471,677        | 32 years                          | \$ 53,255,671             | \$ 48,719,497                |
| S-4                  | \$ 37,311,751      | \$ 2,841,789   | \$ 5,471,677        | 32 years                          | \$ 54,750,260             | \$ 50,190,697                |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)



Table E-7. Alternative S-4 - Capital Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                 |      |              |
|-------------------------------------------------|------|--------------|
| San Francisco Location Factors                  |      | Means 2009   |
| Material                                        |      | 111.2%       |
| Labor & Equipment                               |      | 141.3%       |
| Assemblies                                      |      | 123.8%       |
| Construction Project Duration:                  | 273  | working days |
|                                                 | 14   | months       |
| Operations and Maintenance / Monitoring Period: | 7965 | days         |
|                                                 | 360  | months       |

| Description                                                                                     | Quantity                                          | Unit | Unit Price   | Cost                 | Comments                                                                                                        |
|-------------------------------------------------------------------------------------------------|---------------------------------------------------|------|--------------|----------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>DISTRIBUTIVE COSTS</b>                                                                       | <b>DISTRIBUTIVE COSTS SUBTOTAL =</b>              |      |              | <b>\$ 4,985,721</b>  | <b>Includes labor and temporary facilities</b>                                                                  |
| <b>Labor</b>                                                                                    | <b>Labor Subtotal =</b>                           |      |              | <b>\$ 4,836,790</b>  |                                                                                                                 |
| Total project professional/technical labor cost                                                 |                                                   |      |              | \$ 2,910,900         | See backup worksheet "LABOR"                                                                                    |
| Total project field/construction operations labor cost                                          |                                                   |      |              | \$ 311,438           | See backup worksheet "LABOR"                                                                                    |
| Total project radiological screening labor cost                                                 |                                                   |      |              | \$ 1,237,600         | See backup worksheet "LABOR"                                                                                    |
| Total project clerical administrative labor cost                                                |                                                   |      |              | \$ 376,852           | See backup worksheet "LABOR"                                                                                    |
| <b>Temporary Facilities</b>                                                                     | <b>Temporary Facilities Subtotal =</b>            |      |              | <b>\$ 148,931</b>    |                                                                                                                 |
| Furnished Field Office Trailer (50' x 10' w/ air conditioning)                                  | 14                                                | mo   | \$ 767.56    | \$ 10,746            | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0450                                                        |
| Office Equipment Rental                                                                         | 14                                                | mo   | \$ 802.12    | \$ 11,230            | Dell (http://www.dell.com), March 2009.                                                                         |
| Office Supplies                                                                                 | 14                                                | mo   | \$ 115.75    | \$ 1,621             | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0120                                                        |
| City Water Supply                                                                               | 14                                                | mo   | \$ 84.18     | \$ 1,179             | Means 2009 Heavy Construction. Page 14, 01 51 13.80 0700                                                        |
| Telephone Bill                                                                                  | 14                                                | mo   | \$ 108.94    | \$ 1,525             | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0140                                                        |
| Field Office Electrical Bill                                                                    | 14                                                | mo   | \$ 204.27    | \$ 2,860             | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0160                                                        |
| Portable Toilets (6)                                                                            | 14                                                | mo   | \$ 635.09    | \$ 8,891             | Means 2009 Heavy Construction. Page 472. 01 54 33 6410                                                          |
| Rental Trucks (8) (for supervisory staff)                                                       | 14                                                | mo   | \$ 7,920.00  | \$ 110,880           | Hertz Equipment Rental (http://www.hertzequip.com), March 2009.                                                 |
| <b>CAPITAL COSTS</b>                                                                            | <b>CAPITAL COSTS SUBTOTAL =</b>                   |      |              | <b>\$ 32,326,030</b> | <b>Includes mob/demob, construction activites, design, and intitutional controls</b>                            |
| <b>Mobilization and Demobilization</b>                                                          | <b>Mobilization and Demobilization Subtotal =</b> |      |              | <b>\$ 27,632</b>     |                                                                                                                 |
| Excavator, 0.5 CY capacity                                                                      | 1                                                 | ea   | \$ 562.05    | \$ 562               | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Excavator, 1.5 CY capacity                                                                      | 2                                                 | ea   | \$ 1,039.92  | \$ 2,080             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Conveyer system with misters and radiological detectors                                         | 6                                                 | ea   | \$ 562.05    | \$ 3,372             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dump truck, 8 CY (12 ton payload)                                                               | 6                                                 | ea   | \$ 562.05    | \$ 3,372             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dozer, 200 H.P.                                                                                 | 2                                                 | ea   | \$ 1,039.92  | \$ 2,080             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Grader, self-propelled, 30,000 lb.                                                              | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dozer, 300 H.P.                                                                                 | 2                                                 | ea   | \$ 1,039.92  | \$ 2,080             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Roller, Vibratory, 25 Ton                                                                       | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Truck Tractor, 6x4, 450 H.P.                                                                    | 2                                                 | ea   | \$ 1,039.92  | \$ 2,080             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Water Tanker, 5000 gal                                                                          | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Asphalt Paver, 130 H.P.                                                                         | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Tandem Rollers, 10 Ton                                                                          | 4                                                 | ea   | \$ 562.05    | \$ 2,248             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Roller, Pneum. Whl, 12 Ton                                                                      | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Sheepsfoot Roller, 240 H.P.                                                                     | 2                                                 | ea   | \$ 562.05    | \$ 1,124             | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Office Trailers (assumed 100 mile haul) (2)                                                     | 2                                                 | ea   | \$ 1,225.62  | \$ 2,451             | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0800 (unit cost multiplied by 2 to account for mob & demob) |
| Water truck for dust suppression, 6,000 gallon capacity (1)                                     | 1                                                 | ea   | \$ 562.05    | \$ 562               | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| <b>Health &amp; Safety Equipment</b>                                                            | <b>Health and Safety Equipment Subtotal =</b>     |      |              | <b>\$ 393,457</b>    |                                                                                                                 |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment            | 20                                                | ea   | \$ 13,650.00 | \$ 273,000           | Assumed \$50 per field worker per day                                                                           |
| Water truck for dust suppression, 6,000 gallon capacity (1)                                     | 14                                                | mo   | \$ 8,604.10  | \$ 120,457           | Means 2009 Heavy Construction. Page 472. 01 54 33.40 6950                                                       |
| <b>Site Preparation</b>                                                                         | <b>Site Preparation Subtotal =</b>                |      |              | <b>\$ 944,696</b>    |                                                                                                                 |
| Grade soil staging area (3 acres)                                                               | 14,520                                            | sy   | \$ 0.92      | \$ 13,302            | Means 2009 Heavy Construction. Page 211. 31 22 16.10 0100                                                       |
| Install soil staging area liner (3 acre, 80 mil HDPE, for rad screening and stockpiling areas ) | 130,680                                           | sf   | \$ 4.18      | \$ 546,557           | Means 2005 Environmental Remediation - Assemblies. Pg 3-90. 33 08 0573                                          |
| Grade laydown area (200 ft x 100 ft)                                                            | 2,222                                             | sy   | \$ 0.92      | \$ 2,036             | Means 2009 Heavy Construction. Page 211. 31 22 16.10 0100                                                       |
| Cover over laydown area with crushed stone (6" thick)                                           | 2,222                                             | sy   | \$ 13.37     | \$ 29,709            | Means 2009 Heavy Construction. Page 275. 32 11 23.23 0100                                                       |
| Site security (24-hours uniformed watchman at entrance)                                         | 10,080                                            | hr   | \$ 33.55     | \$ 338,184           | Means 2009 Heavy Construction. Page 20. 01 56 32.50 0020                                                        |
| Aerial survey (2' contours)                                                                     | 4                                                 | ac   | \$ 117.61    | \$ 508               | Means 2009 Heavy Construction. Pg 22. 02 21 13.16 1850                                                          |
| Subsurface utility surveying                                                                    | 12                                                | day  | \$ 1,200.00  | \$ 14,400            | Quote from Subtronic Surveying (800) 998-3463, March 2009.                                                      |
| Construction SWPPP implementation                                                               | 1                                                 | ea   | \$ 30,000.00 | \$ 30,000            |                                                                                                                 |
| <b>Pre-Construction Demolition</b>                                                              | <b>Pre-Construction Demolition Subtotal =</b>     |      |              | <b>\$ 9,034</b>      |                                                                                                                 |
| Monitoring well abandonment                                                                     | 1.00                                              | ea   | \$ 9,033.60  | \$ 9,034             | See Backup Worksheet "WELL ABANDONMENT"                                                                         |



Table E-7. Alternative S-4 - Capital Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                 |      |              |
|-------------------------------------------------|------|--------------|
| San Francisco Location Factors                  |      | Means 2009   |
| Material                                        |      | 111.2%       |
| Labor & Equipment                               |      | 141.3%       |
| Assemblies                                      |      | 123.8%       |
| Construction Project Duration:                  | 273  | working days |
|                                                 | 14   | months       |
| Operations and Maintenance / Monitoring Period: | 7965 | days         |
|                                                 | 360  | months       |

| Description                                                                                                     | Quantity                                | Unit | Unit Price      | Cost                 | Comments                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------|------|-----------------|----------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>CAPITAL COSTS (continued)</b>                                                                                | <b>CAPITAL COSTS SUBTOTAL =</b>         |      |                 | <b>\$ 32,326,030</b> | <b>Includes mob/demob, construction activites, design, and intitutional controls</b>                                   |
| <b>Air Monitoring</b>                                                                                           | <b>Air Monitoring Subtotal =</b>        |      |                 | <b>\$ 277,313</b>    |                                                                                                                        |
| Ambient air monitor rental (12 total -placement frequency biased toward prevailing winds and residential areas) | 14                                      | mo   | \$ 12,169.55    | \$ 170,374           | Means 2005 Environmental Remediation - Unit Price. Pg 9-10. 33 02 0315                                                 |
| Analysis - principal organic hazardous constituents (1 per monitor per week)                                    | 117                                     | ea   | \$ 362.29       | \$ 42,388            | Means 2005 Environmental Remediation - Unit Price. Pg 9-38. 33 02 1802                                                 |
| Analysis - hydrocarbons (1 per monitor per week)                                                                | 117                                     | ea   | \$ 125.89       | \$ 14,729            | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1811                                                 |
| Analysis - mercury (1 per monitor per week)                                                                     | 117                                     | ea   | \$ 42.66        | \$ 4,992             | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1815                                                 |
| Analysis - cyanide (1 per monitor per week)                                                                     | 117                                     | ea   | \$ 51.76        | \$ 6,055             | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1816                                                 |
| Portable ambient air analyzer rental                                                                            | 14                                      | mo   | \$ 2,238.08     | \$ 31,333            | Means 2005 Environmental Remediation - Unit Price. Pg 9-11. 33 02 0328                                                 |
| Portable combustible gas/oxygen indicator rental                                                                | 14                                      | mo   | \$ 531.54       | \$ 7,442             | Means 2005 Environmental Remediation - Unit Price. Pg 9-11. 33 02 0330                                                 |
| <b>Decontamination</b>                                                                                          | <b>Decontamination Subtotal =</b>       |      |                 | <b>\$ 41,048</b>     |                                                                                                                        |
| Pressure washer (1,800 psi, 5gpm)                                                                               | 14                                      | mo   | \$ 1,150.00     | \$ 16,100            | Hertz Equipment Rental (http://www.hertzequip.com)                                                                     |
| Pressure washer operation (assume 2 hr/day)                                                                     | 546                                     | hr   | \$ 45.69        | \$ 24,948            | Means 2005 Environmental Remediation - Unit Price. Pg 9-168. 33 17 0823                                                |
| <b>SVE System</b>                                                                                               | <b>Excavations Subtotal =</b>           |      |                 | <b>\$ 151,169</b>    |                                                                                                                        |
| Install SVE System                                                                                              | 1.00                                    | ea   | \$ 151,168.74   | \$ 151,169           | See Backup Worksheet "SVE/AS." Split to reflect removal of air sparging cost (AS included in groundwater alternatives) |
| <b>Excavations</b>                                                                                              | <b>Excavations Subtotal =</b>           |      |                 | <b>\$ 9,444,214</b>  |                                                                                                                        |
| Excavation of Tier 1 and Tier 2 Locations                                                                       | 1.00                                    | ea   | \$ 9,444,213.89 | \$ 9,444,214         | See Backup Worksheet "ALL EXCAVATIONS"                                                                                 |
| <b>Water Treatment</b>                                                                                          | <b>Water Treatment Subtotal =</b>       |      |                 | <b>\$ 124,647</b>    |                                                                                                                        |
| Water Treatment System                                                                                          | 1.00                                    | ea   | \$ 60,005.90    | \$ 60,006            | See Backup Worksheet "WATER TREATMENT"                                                                                 |
| Metals wastewater analysis (1 sample per day + 10% QC samples)                                                  | 80                                      | ea   | \$ 130.00       | \$ 10,439            | STL Laboratories, San Francisco, CA (March 2009)                                                                       |
| PCBs/Pesticides wastewater analysis (1 sample per day + 10% QC samples)                                         | 80                                      | ea   | \$ 205.00       | \$ 16,462            | STL Laboratories, San Francisco, CA (March 2009)                                                                       |
| PAHs wastewater analysis (1 sample per day + 10% QC samples)                                                    | 80                                      | ea   | \$ 150.00       | \$ 12,045            | STL Laboratories, San Francisco, CA (March 2009)                                                                       |
| VOCs wastewater analysis (1 sample per day + 10% QC samples)                                                    | 80                                      | ea   | \$ 130.00       | \$ 10,439            | STL Laboratories, San Francisco, CA (March 2009)                                                                       |
| SVOCs wastewater analysis (1 sample per day + 10% QC samples)                                                   | 80                                      | ea   | \$ 190.00       | \$ 15,257            | STL Laboratories, San Francisco, CA (March 2009)                                                                       |
| <b>Steam Lines</b>                                                                                              | <b>Steam Lines Subtotal =</b>           |      |                 | <b>\$ 1,023,148</b>  |                                                                                                                        |
| Steam Line Closure and Removal                                                                                  | 1.00                                    | ea   | \$ 1,023,148.21 | \$ 1,023,148         | See Backup Worksheet "STEAM LINE"                                                                                      |
| <b>Fuel Lines</b>                                                                                               | <b>Fuel Lines Subtotal =</b>            |      |                 | <b>\$ 315,678</b>    |                                                                                                                        |
| Fuel Line Removal                                                                                               | 1.00                                    | ea   | \$ 315,677.71   | \$ 315,678           | See Backup Worksheet "FUEL LINE"                                                                                       |
| <b>Shoreline Protection</b>                                                                                     | <b>Shoreline Protection Subtotal =</b>  |      |                 | <b>\$ 8,158,992</b>  |                                                                                                                        |
| Shoreline protection                                                                                            | 1.00                                    | ea   | \$ 8,158,992.22 | \$ 8,158,992         | See Backup Worksheet "SHORELINE PROTECTION"                                                                            |
| <b>Asphalt Covers</b>                                                                                           | <b>Asphalt Covers Subtotal =</b>        |      |                 | <b>\$ 2,802,007</b>  |                                                                                                                        |
| Install 6" Aggregate Base Course                                                                                | 120,711                                 | sy   | \$ 13.37        | \$ 1,613,956         | Means 2009 Heavy Construction. Page 275. 32 11 23.23 0100                                                              |
| Install 2" Asphalt Cover                                                                                        | 120,711                                 | sy   | \$ 9.84         | \$ 1,188,051         | Means 2009 Heavy Construction. Page 276. 32 12 16.13 0120                                                              |
| <b>Asphalt Repair Covers</b>                                                                                    | <b>Asphalt Repair Covers Subtotal =</b> |      |                 | <b>\$ 818,835</b>    |                                                                                                                        |
| Install 1" Asphalt Repair Cover                                                                                 | 159,378                                 | sy   | \$ 5.14         | \$ 818,835           | Means 2009 Heavy Construction. Page 276. 32 12 16.13 0300                                                              |
| <b>HDPE Liner</b>                                                                                               | <b>HDPE Liner Subtotal =</b>            |      |                 | <b>\$ 955,104</b>    |                                                                                                                        |
| Install 60-mil HDPE liner in IR-02                                                                              | 326,700                                 | sf   | \$ 2.92         | \$ 955,104           | Means 2005 Environmental Remediation - Unit Price. Pg 9-85. 33 08 0572                                                 |
| <b>Soil Covers</b>                                                                                              | <b>Soil Covers Subtotal =</b>           |      |                 | <b>\$ 2,384,154</b>  |                                                                                                                        |
| Soil analysis (1 per 1000 CY)                                                                                   | 189                                     | ea   | \$ 539.00       | \$ 101,619           | See "LAB COST" Worksheet for Detail                                                                                    |
| Fill material, delivered from off-site                                                                          | 188,533                                 | CY   | \$ 8.39         | \$ 1,582,321         | Means 2005 Environmental Remediation - Unit Price; Pg 4-23. 17 03 0424                                                 |
| Spread dumped material                                                                                          | 188,533                                 | CY   | \$ 2.33         | \$ 438,800           | Means 2009 Heavy Construction. Page 229. 31 23 23.17 0020                                                              |
| Compact soil cover, 12" lifts, 3 passes                                                                         | 188,533                                 | CY   | \$ 1.39         | \$ 261,413           | Means 2009 Heavy Construction. Page 247. 31 23 23.23 5620                                                              |
| <b>Landscaping</b>                                                                                              | <b>Landscaping Subtotal =</b>           |      |                 | <b>\$ 63,461</b>     |                                                                                                                        |
| Seeding and vegetative cover                                                                                    | 58                                      | ac   | \$ 806.25       | \$ 47,109            | Means 2005 Environmental Remediation - Unit Price. Pg 5-18. 18 05 0401                                                 |
| Hydrofertilizer                                                                                                 | 2,545,200                               | sf   | \$ 0.004        | \$ 11,148            | Means 2009 Heavy Construction. Page 272. 32 01 90.13 0180                                                              |
| Watering                                                                                                        | 58                                      | ac   | \$ 89.06        | \$ 5,204             | Means 2005 Environmental Remediation - Unit Price. Pg 4-9; 18 05 0413                                                  |
| <b>Site Restoration</b>                                                                                         | <b>As-Built Survey Subtotal =</b>       |      |                 | <b>\$ 288,309</b>    |                                                                                                                        |
| Soil staging area liner removal                                                                                 | 130,680                                 | sf   | \$ 2.09         | \$ 273,279           | Assumed that removal cost would be half of the installation cost                                                       |
| As-built aerial survey (2' contours)                                                                            | 128                                     | ac   | \$ 117.61       | \$ 15,031            | Means 2009 Heavy Construction. Pg 22. 02 21 13.16 1850                                                                 |



Table E-7. Alternative S-4 - Capital Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                 |      |              |
|-------------------------------------------------|------|--------------|
| San Francisco Location Factors                  |      | Means 2009   |
| Material                                        |      | 111.2%       |
| Labor & Equipment                               |      | 141.3%       |
| Assemblies                                      |      | 123.8%       |
| Construction Project Duration:                  | 273  | working days |
|                                                 | 14   | months       |
| Operations and Maintenance / Monitoring Period: | 7965 | days         |
|                                                 | 360  | months       |

| Description                                                          | Quantity                          | Unit | Unit Price | Cost          | Comments                                                                                                                                                                          |
|----------------------------------------------------------------------|-----------------------------------|------|------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CAPITAL COSTS (continued)                                            | CAPITAL COSTS SUBTOTAL =          |      |            | \$ 32,326,030 | Includes mob/demob, construction activites, design, and intitutional controls                                                                                                     |
| Design                                                               | Design Subtotal =                 |      |            | \$ 3,985,034  |                                                                                                                                                                                   |
| Design assumed to be 12% of construction cost (including permitting) |                                   |      |            | \$ 3,985,034  | Includes: Remedial Design, Design Basis Report, Safety and Health Plan, Contingency Plan, QA/QC Plan, QAPP, and Cost Estmates; consistent with EPA guidance (pp. 5-13, EPA, 2000) |
| Institutional Contols                                                | Institutional Controls Subtotal = |      |            | \$ 118,097    |                                                                                                                                                                                   |
| Total institutional contols cost                                     |                                   |      |            | \$ 118,097    | See Backup Worksheet "INSTITUTIONAL CONTROLS"                                                                                                                                     |
| TOTAL PROJECT CAPITAL COST                                           | TOTAL PROJECT CAPITAL COST =      |      |            | \$ 37,311,751 | Includes Distributive Costs                                                                                                                                                       |
| Total Construction Cost                                              |                                   |      |            | \$ 33,208,620 |                                                                                                                                                                                   |
| Total Design Cost                                                    |                                   |      |            | \$ 3,985,034  |                                                                                                                                                                                   |
| Total Institutional Controls Cost                                    |                                   |      |            | \$ 118,097    |                                                                                                                                                                                   |
|                                                                      | TOTAL COST PER SQFT OF PARCEL =   |      |            | \$ 198.21     |                                                                                                                                                                                   |

General Assumptions:  
Work will be performed in Level D PPE  
Values from the "Means 2005 Environmental Remediation - Unit Price" and "Means 2005 Environmental Remediation - Assemblies" were multiplied by a factor of = 113% to account for an inflation rate of 3.1 percent per annum.



**Table E-23. Alternatives S-4 - Excavation Volume Estimates**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Excavation Name                                           | Length<br>(feet) | Width<br>(feet) | Area (feet)<br>Area (feet) | Average Depth<br>(feet) | Volume<br>(ft <sup>3</sup> ) | Volume<br>(CY) | Over Excavation<br>Volume (CY) | Total Volume with<br>20% Fluff Factor (CY) | Excavation<br>Perimeter | Quantity of<br>Samples <sup>(1)</sup> | Exceedance<br>Type <sup>(2)</sup> |
|-----------------------------------------------------------|------------------|-----------------|----------------------------|-------------------------|------------------------------|----------------|--------------------------------|--------------------------------------------|-------------------------|---------------------------------------|-----------------------------------|
| <b>BLOCK EOS-1 (SHORELINE OPEN SPACE WESTERN PORTION)</b> |                  |                 |                            |                         |                              |                |                                |                                            |                         |                                       |                                   |
| EX02B122                                                  | 60               | 50              | 3,000                      | 10                      | 30,000                       | 1,111          | 167                            | 1,533                                      | 220                     | 43                                    | Tier 1 Location                   |
| EX02B250                                                  | 20               | 20              | 400                        | 6                       | 2,400                        | 89             | 13                             | 123                                        | 80                      | 12                                    | TPH Location                      |
| EX02B256                                                  | 50               | 40              | 2,000                      | 9                       | 18,000                       | 667            | 100                            | 920                                        | 180                     | 33                                    | Tier 1 Location                   |
| EX02B288                                                  | 65               | 50              | 3,250                      | 6                       | 19,500                       | 722            | 108                            | 997                                        | 230                     | 45                                    | Tier 1 Location                   |
| EX02B412                                                  | 115              | 40              | 4,600                      | 4                       | 18,400                       | 681            | 102                            | 940                                        | 310                     | 62                                    | Tier 1 Location                   |
| EX02B428                                                  | 40               | 20              | 800                        | 5                       | 4,000                        | 148            | 22                             | 204                                        | 120                     | 20                                    | TPH Location                      |
| EX02B442                                                  | 20               | 20              | 400                        | 4                       | 1,600                        | 59             | 9                              | 82                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX02B456                                                  | 50               | 50              | 2,500                      | 8.5                     | 21,250                       | 787            | 118                            | 1,086                                      | 200                     | 38                                    | Tier 1 Location                   |
| EX02B524                                                  | 85               | 50              | 4,250                      | 5.5                     | 23,375                       | 866            | 130                            | 1,195                                      | 270                     | 55                                    | Tier 1 Location                   |
| EX02B525                                                  | 40               | 40              | 1,600                      | 5                       | 8,000                        | 296            | 44                             | 409                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX02GR71SW                                                | 20               | 20              | 400                        | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX02GR73SW                                                | 40               | 40              | 1,600                      | 3                       | 4,800                        | 178            | 27                             | 245                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX02GR93SW                                                | 40               | 40              | 1,600                      | 9                       | 14,400                       | 533            | 80                             | 736                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX02GR117SW                                               | 40               | 40              | 1,600                      | 7                       | 11,200                       | 415            | 62                             | 572                                        | 160                     | 28                                    | TPH Location                      |
| EX02GR131SW                                               | 20               | 20              | 400                        | 9                       | 3,600                        | 133            | 20                             | 184                                        | 80                      | 12                                    | TPH Location                      |
| EX02GR132BT                                               | 50               | 20              | 1,000                      | 8.5                     | 8,500                        | 315            | 47                             | 434                                        | 140                     | 23                                    | TPH Location                      |
| EX02GR179SW                                               | 40               | 40              | 1,600                      | 7                       | 11,200                       | 415            | 62                             | 572                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX02GR184SW                                               | 40               | 40              | 1,600                      | 7                       | 11,200                       | 415            | 62                             | 572                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX02SS310                                                 | 20               | 20              | 400                        | 2.5                     | 1,000                        | 37             | 6                              | 51                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX02TA16A                                                 | 20               | 20              | 400                        | 4                       | 1,600                        | 59             | 9                              | 82                                         | 80                      | 12                                    | Tier 2 Location                   |
| Block EOS-1 Subtotals =                                   |                  |                 | 33,400                     | -                       | 215,225                      | 7,971          | 1,196                          | 11,000                                     | -                       | 563                                   |                                   |
| <b>BLOCK EOS-2 (SHORELINE OPEN SPACE CENTRAL PORTION)</b> |                  |                 |                            |                         |                              |                |                                |                                            |                         |                                       |                                   |
| EX02B100                                                  | 40               | 40              | 1,600                      | 3.5                     | 5,600                        | 207            | 31                             | 286                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX02B398                                                  | 40               | 40              | 1,600                      | 5                       | 8,000                        | 296            | 44                             | 409                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX02B401                                                  | 100              | 60              | 6,000                      | 5                       | 30,000                       | 1,111          | 167                            | 1,533                                      | 320                     | 69                                    | Tier 1 Location                   |
| EX02B403                                                  | 40               | 40              | 1,600                      | 5                       | 8,000                        | 296            | 44                             | 409                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX02B405                                                  | 20               | 20              | 400                        | 4                       | 1,600                        | 59             | 9                              | 82                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX02B415                                                  | 80               | 55              | 4,400                      | 5                       | 22,000                       | 815            | 122                            | 1,124                                      | 270                     | 56                                    | Tier 1 Location                   |
| EX02B461                                                  | 40               | 40              | 1,600                      | 5                       | 8,000                        | 296            | 44                             | 409                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX02MW149                                                 | 55               | 20              | 1,100                      | 4                       | 4,400                        | 163            | 24                             | 225                                        | 150                     | 25                                    | Tier 2 Location                   |
| EX02SS320                                                 | 40               | 40              | 1,600                      | 2.5                     | 4,000                        | 148            | 22                             | 204                                        | 160                     | 28                                    | Tier 1 Location                   |
| Block EOS-2 Subtotals =                                   |                  |                 | 19,900                     | -                       | 91,600                       | 3,393          | 509                            | 4,682                                      | -                       | 304                                   |                                   |
| <b>BLOCK EOS-3 (SHORELINE OPEN SPACE - IR03)</b>          |                  |                 |                            |                         |                              |                |                                |                                            |                         |                                       |                                   |
| EX02B098D                                                 | 20               | 20              | 400                        | 3.5                     | 1,400                        | 52             | 8                              | 72                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX02GP002                                                 | 20               | 20              | 400                        | 10                      | 4,000                        | 148            | 22                             | 204                                        | 80                      | 12                                    | TPH Location                      |
| EX02GP008                                                 | 20               | 20              | 400                        | 10                      | 4,000                        | 148            | 22                             | 204                                        | 80                      | 12                                    | TPH Location                      |
| EX02GP016A                                                | 20               | 20              | 400                        | 16                      | 6,400                        | 237            | 36                             | 327                                        | 80                      | 12                                    | TPH Location                      |
| EX02GP038                                                 | 20               | 20              | 400                        | 10                      | 4,000                        | 148            | 22                             | 204                                        | 80                      | 12                                    | TPH Location                      |
| EX02GP040                                                 | 75               | 60              | 4,500                      | 16                      | 72,000                       | 2,667          | 400                            | 3,680                                      | 270                     | 56                                    | TPH Location                      |
| EX02GP050                                                 | 20               | 20              | 400                        | 16                      | 6,400                        | 237            | 36                             | 327                                        | 80                      | 12                                    | TPH Location                      |
| EX02GP051A                                                | 20               | 20              | 400                        | 16                      | 6,400                        | 237            | 36                             | 327                                        | 80                      | 12                                    | TPH Location                      |
| EX02MW146                                                 | 20               | 20              | 400                        | 10                      | 4,000                        | 148            | 22                             | 204                                        | 80                      | 12                                    | TPH Location                      |
| EX02MW173A                                                | 20               | 20              | 400                        | 10                      | 4,000                        | 148            | 22                             | 204                                        | 80                      | 12                                    | TPH Location                      |
| EX03B220                                                  | 20               | 20              | 400                        | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX03B343                                                  | 20               | 20              | 400                        | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |

**Table E-23. Alternatives S-4 - Excavation Volume Estimates (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Excavation Name                                              | Length<br>(feet) | Width<br>(feet) | Area (feet)<br>(feet) | Average Depth<br>(feet) | Volume<br>(ft <sup>3</sup> ) | Volume<br>(CY) | Over Excavation<br>Volume (CY) | Total Volume with<br>20% Fluff Factor (CY) | Excavation<br>Perimeter | Quantity of<br>Samples <sup>(1)</sup> | Exceedance<br>Type <sup>(2)</sup> |
|--------------------------------------------------------------|------------------|-----------------|-----------------------|-------------------------|------------------------------|----------------|--------------------------------|--------------------------------------------|-------------------------|---------------------------------------|-----------------------------------|
| <b>BLOCK EOS-3 (SHORELINE OPEN SPACE - IR03) (continued)</b> |                  |                 |                       |                         |                              |                |                                |                                            |                         |                                       |                                   |
| EX03B344                                                     | 20               | 20              | 400                   | 5                       | 2,000                        | 74             | 11                             | 102                                        | 80                      | 12                                    | Tier 2 Location                   |
| EX03B345                                                     | 20               | 20              | 400                   | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX03B367                                                     | 20               | 20              | 400                   | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX03SS368                                                    | 40               | 40              | 1,600                 | 2                       | 3,200                        | 119            | 18                             | 164                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX03TA40B                                                    | 40               | 40              | 1,600                 | 3                       | 4,800                        | 178            | 27                             | 245                                        | 160                     | 28                                    | Tier 1 Location                   |
| Block EOS-3 Subtotals =                                      |                  |                 | 13,300                | -                       | 127,400                      | 4,719          | 708                            | 6,512                                      | -                       | 287                                   |                                   |
| <b>BLOCK EOS-4 (SHORELINE OPEN SPACE SOUTHERN PORTION)</b>   |                  |                 |                       |                         |                              |                |                                |                                            |                         |                                       |                                   |
| EX02B184                                                     | 20               | 20              | 400                   | 3.5                     | 1,400                        | 52             | 8                              | 72                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX02B355                                                     | 20               | 20              | 400                   | 8.5                     | 3,400                        | 126            | 19                             | 174                                        | 80                      | 12                                    | TPH Location                      |
| EX02B369                                                     | 75               | 40              | 3,000                 | 3.5                     | 10,500                       | 389            | 58                             | 537                                        | 230                     | 44                                    | Tier 1 Location                   |
| EX02B464                                                     | 80               | 50              | 4,000                 | 5                       | 20,000                       | 741            | 111                            | 1,022                                      | 260                     | 52                                    | Tier 1 Location                   |
| EX02B468                                                     | 20               | 20              | 400                   | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | TPH Location                      |
| EX02B493                                                     | 20               | 20              | 400                   | 5                       | 2,000                        | 74             | 11                             | 102                                        | 80                      | 12                                    | Tier 2 Location                   |
| EX02B497                                                     | 70               | 40              | 2,800                 | 4                       | 11,200                       | 415            | 62                             | 572                                        | 220                     | 42                                    | Tier 1 Location                   |
| EX02B505                                                     | 40               | 40              | 1,600                 | 5                       | 8,000                        | 296            | 44                             | 409                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX02B506                                                     | 20               | 20              | 400                   | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX02G105                                                     | 20               | 20              | 400                   | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX02GR93SW                                                   | 20               | 20              | 400                   | 5                       | 2,000                        | 74             | 11                             | 102                                        | 80                      | 12                                    | Tier 2 Location                   |
| EX11B023 <sup>(3)</sup>                                      | -                | -               | 1,157                 | 3.5                     | 4,050                        | 150            | 23                             | 207                                        | 160                     | 26                                    | Tier 1 Location                   |
| EX11B024                                                     | 20               | 20              | 400                   | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX11SS022                                                    | 20               | 20              | 400                   | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX14B026                                                     | 20               | 20              | 400                   | 4                       | 1,600                        | 59             | 9                              | 82                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX15B027                                                     | 40               | 40              | 1,600                 | 4                       | 6,400                        | 237            | 36                             | 327                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX380803                                                     | 40               | 40              | 1,600                 | 3                       | 4,800                        | 178            | 27                             | 245                                        | 160                     | 28                                    | Tier 1 Location                   |
| Block EOS-4 Subtotals =                                      |                  |                 | 19,757                | -                       | 81,350                       | 3,013          | 452                            | 4,158                                      | -                       | 374                                   |                                   |
| <b>BLOCK MU-1 (SHIPYARD SOUTH MULTI-USE WESTERN PORTION)</b> |                  |                 |                       |                         |                              |                |                                |                                            |                         |                                       |                                   |
| EX01SS349                                                    | 40               | 40              | 1,600                 | 2.5                     | 4,000                        | 148            | 22                             | 204                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX05B094                                                     | 60               | 40              | 2,400                 | 10                      | 24,000                       | 889            | 133                            | 1,227                                      | 200                     | 37                                    | Tier 1 Location                   |
| EX05B104                                                     | 80               | 80              | 6,400                 | 4                       | 25,600                       | 948            | 142                            | 1,308                                      | 320                     | 71                                    | Tier 1 Location                   |
| EX05MW85A                                                    | 80               | 80              | 6,400                 | 5.5                     | 35,200                       | 1,304          | 196                            | 1,799                                      | 320                     | 71                                    | Tier 1 Location                   |
| EX12MW17A                                                    | 40               | 40              | 1,600                 | 8.5                     | 13,600                       | 504            | 76                             | 695                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX12MW18A                                                    | 40               | 40              | 1,600                 | 8.5                     | 13,600                       | 504            | 76                             | 695                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX12SS16                                                     | 60               | 40              | 2,400                 | 2                       | 4,800                        | 178            | 27                             | 245                                        | 200                     | 37                                    | Tier 1 Location                   |
| EX12SS17                                                     | 40               | 40              | 1,600                 | 2                       | 3,200                        | 119            | 18                             | 164                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX12SS18                                                     | 20               | 20              | 400                   | 2                       | 800                          | 30             | 4                              | 41                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX12TA08                                                     | 40               | 40              | 1,600                 | 10                      | 16,000                       | 593            | 89                             | 818                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX12TA10                                                     | 40               | 40              | 1,600                 | 5                       | 8,000                        | 296            | 44                             | 409                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX13B003B                                                    | 60               | 40              | 2,400                 | 4                       | 9,600                        | 356            | 53                             | 491                                        | 200                     | 37                                    | Tier 1 Location                   |
| EX13B004                                                     | 40               | 40              | 1,600                 | 4.5                     | 7,200                        | 267            | 40                             | 368                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX13B007                                                     | 40               | 40              | 1,600                 | 4.5                     | 7,200                        | 267            | 40                             | 368                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX13B010                                                     | 40               | 40              | 1,600                 | 4                       | 6,400                        | 237            | 36                             | 327                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX13B021                                                     | 40               | 20              | 800                   | 4                       | 3,200                        | 119            | 18                             | 164                                        | 120                     | 20                                    | Tier 2 Location                   |
| EX13B023                                                     | 80               | 40              | 3,200                 | 4                       | 12,800                       | 474            | 71                             | 654                                        | 240                     | 46                                    | Tier 1 Location                   |
| EX36B027                                                     | 40               | 40              | 1,600                 | 4.5                     | 7,200                        | 267            | 40                             | 368                                        | 160                     | 28                                    | Tier 1 Location                   |

**Table E-23. Alternatives S-4 - Excavation Volume Estimates (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Excavation Name                                                          | Length<br>(feet) | Width<br>(feet) | Area (feet)<br>Area (feet) | Average Depth<br>(feet) | Volume<br>(ft <sup>3</sup> ) | Volume<br>(CY) | Over Excavation<br>Volume (CY) | Total Volume with<br>20% Fluff Factor (CY) | Excavation<br>Perimeter | Quantity of<br>Samples <sup>(1)</sup> | Exceedance<br>Type <sup>(2)</sup> |
|--------------------------------------------------------------------------|------------------|-----------------|----------------------------|-------------------------|------------------------------|----------------|--------------------------------|--------------------------------------------|-------------------------|---------------------------------------|-----------------------------------|
| <b>BLOCK MU-1 (SHIPYARD SOUTH MULTI-USE WESTERN PORTION) (continued)</b> |                  |                 |                            |                         |                              |                |                                |                                            |                         |                                       |                                   |
| EX36B056                                                                 | 20               | 20              | 400                        | 3.5                     | 1,400                        | 52             | 8                              | 72                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX36B062                                                                 | 60               | 40              | 2,400                      | 10                      | 24,000                       | 889            | 133                            | 1,227                                      | 200                     | 37                                    | Tier 1 Location                   |
| EX36B063                                                                 | 40               | 40              | 1,600                      | 8.5                     | 13,600                       | 504            | 76                             | 695                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX36B078                                                                 | 20               | 20              | 400                        | 3.5                     | 1,400                        | 52             | 8                              | 72                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX36B105                                                                 | 20               | 20              | 400                        | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX36B136                                                                 | 20               | 20              | 400                        | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX36B138                                                                 | 40               | 40              | 1,600                      | 3                       | 4,800                        | 178            | 27                             | 245                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX36B180                                                                 | 80               | 40              | 3,200                      | 4                       | 12,800                       | 474            | 71                             | 654                                        | 240                     | 46                                    | Tier 1 Location                   |
| EX36B208                                                                 | 20               | 20              | 400                        | 4                       | 1,600                        | 59             | 9                              | 82                                         | 80                      | 12                                    | Tier 2 Location                   |
| Block MU-1 Subtotals =                                                   |                  |                 | 51,200                     | -                       | 264,400                      | 9,793          | 1,469                          | 13,514                                     | -                       | 820                                   |                                   |
| <b>BLOCK MU-2 (SHIPYARD SOUTH MULTI-USE SOUTHERN PORTION)</b>            |                  |                 |                            |                         |                              |                |                                |                                            |                         |                                       |                                   |
| EX14MW10A                                                                | 40               | 40              | 1,600                      | 4.5                     | 7,200                        | 267            | 40                             | 368                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX14SS05                                                                 | 40               | 40              | 1,600                      | 2                       | 3,200                        | 119            | 18                             | 164                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX36B015                                                                 | 40               | 40              | 1,600                      | 4.5                     | 7,200                        | 267            | 40                             | 368                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX36B072                                                                 | 60               | 40              | 2,400                      | 4                       | 9,600                        | 356            | 53                             | 491                                        | 200                     | 37                                    | Tier 1 Location                   |
| EX36B116                                                                 | 40               | 40              | 1,600                      | 4                       | 6,400                        | 237            | 36                             | 327                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX36B162                                                                 | 40               | 40              | 1,600                      | 10                      | 16,000                       | 593            | 89                             | 818                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX36B163                                                                 | 20               | 20              | 400                        | 4                       | 1,600                        | 59             | 9                              | 82                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX38SS01                                                                 | 20               | 20              | 400                        | 2                       | 800                          | 30             | 4                              | 41                                         | 80                      | 12                                    | Tier 2 Location                   |
| Block MU-2 Subtotals =                                                   |                  |                 | 11,200                     | -                       | 52,000                       | 1,926          | 289                            | 2,658                                      | -                       | 204                                   |                                   |
| <b>BLOCK MU-3 (SHIPYARD SOUTH MULTI-USE NORTHERN PORTION)</b>            |                  |                 |                            |                         |                              |                |                                |                                            |                         |                                       |                                   |
| EX04B011                                                                 | 105              | 60              | 6,300                      | 4                       | 25,200                       | 933            | 140                            | 1,288                                      | 330                     | 72                                    | Tier 1 Location                   |
| EX04B012                                                                 | 40               | 40              | 1,600                      | 8.5                     | 13,600                       | 504            | 76                             | 695                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX04B015                                                                 | 40               | 40              | 1,600                      | 3.5                     | 5,600                        | 207            | 31                             | 286                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX04B030                                                                 | 40               | 40              | 1,600                      | 5                       | 8,000                        | 296            | 44                             | 409                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX04B034                                                                 | 20               | 20              | 400                        | 4                       | 1,600                        | 59             | 9                              | 82                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX01SS350                                                                | 20               | 20              | 400                        | 2.5                     | 1,000                        | 37             | 6                              | 51                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX12SS02                                                                 | 20               | 20              | 400                        | 2                       | 800                          | 30             | 4                              | 41                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX12TA13                                                                 | 40               | 40              | 1,600                      | 6                       | 9,600                        | 356            | 53                             | 491                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX56B021                                                                 | 20               | 20              | 400                        | 4                       | 1,600                        | 59             | 9                              | 82                                         | 80                      | 12                                    | Tier 2 Location                   |
| EX72SS23                                                                 | 40               | 40              | 1,600                      | 2                       | 3,200                        | 119            | 18                             | 164                                        | 160                     | 28                                    | Tier 1 Location                   |
| Block MU-3 Subtotals =                                                   |                  |                 | 15,900                     | -                       | 70,200                       | 2,600          | 390                            | 3,588                                      | -                       | 264                                   |                                   |
| <b>BLOCK EOS-5 (RAILROAD RIGHT-OF-WAY)</b>                               |                  |                 |                            |                         |                              |                |                                |                                            |                         |                                       |                                   |
| EX52B009                                                                 | 40               | 40              | 1,600                      | 6                       | 9,600                        | 356            | 53                             | 491                                        | 160                     | 28                                    | Tier 1 Location                   |
| EX52SS02                                                                 | 20               | 20              | 400                        | 3                       | 1,200                        | 44             | 7                              | 61                                         | 80                      | 12                                    | TPH Location                      |
| EX52SS06                                                                 | 40               | 40              | 1,600                      | 3                       | 4,800                        | 178            | 27                             | 245                                        | 160                     | 28                                    | Tier 1 Location                   |
| Railroad Right-of-Way Subtotals =                                        |                  |                 | 3,600                      | -                       | 15,600                       | 578            | 87                             | 797                                        | -                       | 69                                    |                                   |
|                                                                          |                  |                 | <b>168,257</b>             | <b>-</b>                | <b>917,775</b>               | <b>33,992</b>  | <b>5,099</b>                   | <b>46,909</b>                              | <b>-</b>                | <b>2,886</b>                          |                                   |

Notes:

<sup>(1)</sup> Confirmation soil samples will be collected from both the sidewalls and bottom of each excavation with the following frequency:

Two sidewall samples (one shallow and one deep) will be collected on each sidewall for every 15 feet of excavation perimeter.

Bottom samples will be collected every 225 square feet, or at least one per excavation.

<sup>(2)</sup> Alternative S-4 includes excavation of Tier 1 and Tier 2 locations (with COCs at concentrations greater than 5 times the remedial goals) and TPH locations (exceeding the TPH source criterion)

<sup>(3)</sup> Excavations are adjacent buildings and are not uniform in shape in order to protect building footprint.



**Table E-24. Alternative S-4 - Tier 1 and Tier 2 Excavations Cost Detail**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                               | Quantity | Unit   | Unit Price    | Cost                | Remarks                                                                                                                           |
|-------------------------------------------------------------------------------------------|----------|--------|---------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Excavate areas with 1-1/2 CY excavator                                                    | 46,909   | CY     | \$ 2.86       | \$ 134,293          | Means 2009 Heavy Construction. Pg 219. 31 23 16.42 0250; multiplied by 1.25 for reduced production rate due to screening          |
| Coffer Dam                                                                                | 1        | Is     | \$ 174,000.00 | \$ 174,000          | See Parcel E-2 FS                                                                                                                 |
| Confirmation sample collection (direct push)                                              | 2,886    | each   | \$ 81.83      | \$ 236,200          | Means 2005 Environmental Remediation - Unit Price. Pg 9-24. 33 02 0648; see "ALT S-4 VOLUMES" Worksheet                           |
| Confirmation sample analysis                                                              | 2,886    | each   | \$ 539.00     | \$ 1,555,811        | See "LAB COST" Worksheet; see "ALT S-4 VOLUMES" Worksheet                                                                         |
| Over excavate contaminated soils                                                          | 4,691    | CY     | \$ 2.86       | \$ 13,429           | Means 2009 Heavy Construction. Pg 219. 31 23 16.42 0250; multiplied by 1.25 for reduced production rate due to screening          |
| Conveyer system rental with misters and radiological detectors                            | 4        | months | \$ 8,170.80   | \$ 32,683           | Means 2009 Heavy Construction. Pg 466. 01 54 33.10 0800 (x6)                                                                      |
| Operation of conveyer system                                                              | 47       | days   | \$ 594.24     | \$ 27,929           | Means 2009 Heavy Construction. Pg 466. 01 54 33.10 0800 (x6)                                                                      |
| Radiological monitoring equipment rental for pre-excavation screening                     | 4        | months | \$ 7,200.00   | \$ 28,800           | Ludlum Model 44-2 1"x 1" NaI GAMMA Scintillator (unit rental cost provided by Suntrac Services, 1-800-579-4513, March 2009) (x16) |
| Haul soil to secondary screening area with 8 CY trucks                                    | 51,599   | CY     | \$ 4.16       | \$ 214,637          | Means 2009 Heavy Construction. Pg 230. 31 23 23.20 0114                                                                           |
| Radiological monitoring equipment for post-excavation conveyor screening                  | 4        | months | \$ 27,000.00  | \$ 108,000          | Assumed to be 10 times the cost of the portable scintillator (x6)                                                                 |
| Soil analysis for disposal (1 per 500 CY) (4 pt. composite samples)                       | 103      | each   | \$ 539.00     | \$ 55,624           | See "LAB COST" Worksheet for Detail                                                                                               |
| Transport and disposal of excavated material                                              |          |        |               |                     |                                                                                                                                   |
| Class II Beneficial Reuse Soil to Altamont                                                | 27,090   | ton    | \$ 38.82      | \$ 1,051,621        | Assumed Fraction of Total Waste: 35%                                                                                              |
| Class II Soil to Altamont                                                                 | 19,350   | ton    | \$ 72.42      | \$ 1,401,310        | Assumed Fraction of Total Waste: 25%                                                                                              |
| Class I Non-RCRA Soil to Kettleman Hills                                                  | 11,610   | ton    | \$ 81.15      | \$ 942,140          | Assumed Fraction of Total Waste: 15%                                                                                              |
| Class I RCRA Direct LF Soil to Kettleman Hills                                            | 7,740    | ton    | \$ 130.04     | \$ 1,006,497        | Assumed Fraction of Total Waste: 10%                                                                                              |
| Class I RCRA Stabilization Soil to Kettleman Hills                                        | 7,740    | ton    | \$ 172.24     | \$ 1,333,121        | Assumed Fraction of Total Waste: 10%                                                                                              |
| Disposal of radiologically impacted waste                                                 | 3,870    | ton    | \$ 120.00     | \$ 464,394          | Assumed Fraction of Total Waste: 5%                                                                                               |
| Soil analysis for import soil (1 per 1000 CY) (4 pt. composite samples)                   | 47       | each   | \$ 539.00     | \$ 25,284           | See "LAB COST" Worksheet for Detail                                                                                               |
| Backfill excavations with unclassified fill (delivered, spread, compacted in 6-in. lifts) | 46,909   | ton    | \$ 13.61      | \$ 638,440          | Means 2005 Environmental Remediation - Unit Price. Pg 4-23. 17 03 0423                                                            |
| <b>TOTAL</b>                                                                              |          |        |               | <b>\$ 9,444,214</b> |                                                                                                                                   |

**Notes:**

Values from the "Means 2005 Environmental Remediation - Unit Price" and "Means 2005 Environmental Remediation - Assemblies" were multiplied by an inflation factor (see "BACKUP" Worksheet)

**Tier 1 and 2 Excavation Volumes and Areas:**

|                                                       |         |    |                                  |
|-------------------------------------------------------|---------|----|----------------------------------|
| Area requiring excavation and backfill                | 168,257 | SF |                                  |
| Volume requiring excavation                           | 46,909  | CY |                                  |
| Volume of overexcavation due to chasing contamination | 4,691   | CY | Assume 10% of estimated volume   |
| Total volume requiring excavation and backfill        | 51,599  | CY |                                  |
| Excavated material tonnage                            | 77,399  | TN | Assumed unit weight of 1.5 TN/CY |

**ALL EXCAVATIONS**

|                                                 |     |                  |
|-------------------------------------------------|-----|------------------|
| Total number of 50'x50' grid surfaces estimated | 127 | surface grids    |
| Total number of estimated equivalent grids      | 683 | equivalent grids |

Table E-26. Alternative S-4 - Soil Vapor Extraction with Air Sparging Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                          | Quantity | Unit | Unit Price                                           | Cost           | Remarks                                                                  |
|--------------------------------------------------------------------------------------|----------|------|------------------------------------------------------|----------------|--------------------------------------------------------------------------|
| <b>CAPITAL COSTS - SVE/AS SYSTEM INSTALLATION</b>                                    |          |      |                                                      |                |                                                                          |
| <b>Pilot Study</b>                                                                   |          |      | <b>Pilot Study Subtotal = \$</b>                     | <b>39,430</b>  |                                                                          |
| Study Design                                                                         | 1        | LS   | \$ 3,000.00                                          | \$ 3,000       |                                                                          |
| SVE/AS Equipment Mobilization/Demobilization                                         | 2        | LS   | \$ 1,500.00                                          | \$ 3,000       |                                                                          |
| SVE/AS Equipment Rental                                                              | 1        | LS   | \$ 9,000.00                                          | \$ 9,000       | Estimate provided by Maco Industries, Ltd, February 2009                 |
| Direct-Push Drilling Equipment and Support Vehicle                                   | 180      | mi   | \$ 6.00                                              | \$ 1,080       | Estimate supplied by TestAmerica Drilling, January 2009; \$6 per mile    |
| Drilling (Hollow-Stem Auger)                                                         | 1        | day  | \$ 3,500.00                                          | \$ 3,500       | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Per Diem Travel Expenses for a 3 Person Crew                                         | 2        | day  | \$ 450.00                                            | \$ 900         | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Well Drilling and Installation Cost                                                  | 50       | ft   | \$ 7.00                                              | \$ 350         | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Concrete Cutting                                                                     | 1        | ea   | \$ 400.00                                            | \$ 400         | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Drums                                                                                | 8        | ea   | \$ 50.00                                             | \$ 400         | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Well Development                                                                     | 4        | hr   | \$ 180.00                                            | \$ 720         | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Field Measurements and Air Sampling                                                  | 5        | day  | \$ 1,616.00                                          | \$ 8,080       | Assumed 5 field sampling days                                            |
| Laboratory Analysis                                                                  | 25       | ea   | \$ 200.00                                            | \$ 5,000       |                                                                          |
| Report                                                                               | 1        | LS   | \$ 4,000.00                                          | \$ 4,000       |                                                                          |
| <b>Mobilization and Demobilization</b>                                               |          |      | <b>Mobilization and Demobilization Subtotal = \$</b> | <b>3,690</b>   |                                                                          |
| SVE Equipment Mobilization                                                           | 1        | LS   | \$ 1,500.00                                          | \$ 1,500       | Estimate provided by Maco Industries, Ltd, February 2009                 |
| Air Sparging Equipment Mobilization                                                  | 1        | LS   | \$ 1,500.00                                          | \$ 1,500       | Estimate provided by Maco Industries, Ltd, February 2009                 |
| Direct-Push Drilling Equipment and Support Vehicle Mobilization                      | 100      | mi   | \$ 6.00                                              | \$ 600         | Estimate supplied by Precision Sampling Ltd., January 2009; \$5 per mile |
| Portable Toilet                                                                      | 2        | ea   | \$ 45.00                                             | \$ 90          | National Construction Rentals, January 2009                              |
| <b>Temporary Facilities</b>                                                          |          |      | <b>Temporary Facilities Costs Subtotal = \$</b>      | <b>365</b>     |                                                                          |
| Portable Toilet and Hand Wash Station                                                | 1        | mo   | \$ 140.00                                            | \$ 140         | National Construction Rentals, January 2009                              |
| Eye Wash Station                                                                     | 1        | ea   | \$ 225.00                                            | \$ 225         | Estimate provided by Grainger, January 2009                              |
| <b>Equipment Rental</b>                                                              |          |      | <b>Equipment Rental Subtotal = \$</b>                | <b>2,000</b>   |                                                                          |
| 4x4 Pickup Truck                                                                     | 4        | week | \$ 500.00                                            | \$ 2,000       | Estimate supplied by Hertz Equipment Rental, January 2009                |
| <b>Health &amp; Safety Equipment</b>                                                 |          |      | <b>Health and Safety Equipment Subtotal = \$</b>     | <b>4,000</b>   |                                                                          |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment | 80       | day  | \$ 50.00                                             | \$ 4,000       | Assumed \$50 per field worker per day                                    |
| <b>SVE/AS Equipment Installation</b>                                                 |          |      | <b>Equipment Installation Subtotal = \$</b>          | <b>163,446</b> |                                                                          |
| SVE and Treatment Equipment (Trailerized)                                            | 1        | LS   | \$ 22,000.00                                         | \$ 22,000      | Estimate provided by Maco Industries, Ltd, February 2009                 |
| Air Sparging Equipment (Trailerized)                                                 | 1        | LS   | \$ 25,000.00                                         | \$ 25,000      | Estimate provided by Maco Industries, Ltd, February 2009                 |
| Hollow-Stem Auger Drilling to Install Extraction and Sparge Points                   | 20       | day  | \$ 3,500.00                                          | \$ 70,000      | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Per Diem Travel Expenses for a 3 Person Crew                                         | 60       | day  | \$ 450.00                                            | \$ 27,000      | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Concrete Cutting                                                                     | 1        | ea   | \$ 1,600.00                                          | \$ 1,600       | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Well Development                                                                     | 80       | hr   | \$ 180.00                                            | \$ 14,400      | Estimate supplied by TestAmerica Drilling, January 2009                  |
| SVE/AS Equipment Installation                                                        | 10       | day  | \$ 344.60                                            | \$ 3,446       | Foreman, 2 laborers, and supervising field engineer                      |
| <b>Decontamination</b>                                                               |          |      | <b>Decontamination Subtotal = \$</b>                 | <b>1,000</b>   |                                                                          |
| Decontamination / Screening Equipment                                                | 10       | day  | \$ 100.00                                            | \$ 1,000       |                                                                          |
| <b>Waste Analysis</b>                                                                |          |      | <b>Waste Analysis Subtotal = \$</b>                  | <b>4,030</b>   |                                                                          |
| VOCs by 3550B/8270C                                                                  | 5        | ea   | 100                                                  | \$ 500         | Estimate provided by TestAmerica, January 2009                           |
| Semi-VOCs by 3550B/8270C                                                             | 5        | ea   | 190                                                  | \$ 950         | Estimate provided by TestAmerica, January 2009                           |
| Organochlorine Pesticides by 3550B/8081A                                             | 5        | ea   | 80                                                   | \$ 400         | Estimate provided by TestAmerica, January 2009                           |
| PCBs by 3550B/8082                                                                   | 5        | ea   | 65                                                   | \$ 325         | Estimate provided by TestAmerica, January 2009                           |
| Purgeable TPH by 5035A/8015B                                                         | 5        | ea   | 96                                                   | \$ 480         | Estimate provided by TestAmerica, January 2009                           |
| Extractable TPH by 3550B/8015B                                                       | 5        | ea   | 45                                                   | \$ 225         | Estimate provided by TestAmerica, January 2009                           |
| TTLIC, CA Title 22 Metals by 3010A/6010B and Mercury by 3010A/7470A                  | 5        | ea   | 130                                                  | \$ 650         | Estimate provided by TestAmerica, January 2009                           |
| TCLP, CA Title 22 Metals by 1311                                                     | 5        | ea   | 50                                                   | \$ 250         | Estimate provided by TestAmerica, January 2009                           |
| STLC, CA Title 22 Metals by CCR T26                                                  | 5        | ea   | 50                                                   | \$ 250         | Estimate provided by TestAmerica, January 2009                           |





Table E-26. Alternative S-4 - Soil Vapor Extraction with Air Sparging Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                            |                         | Quantity | Unit | Unit Price                               | Cost     | Remarks                                                                     |
|--------------------------------------------------------|-------------------------|----------|------|------------------------------------------|----------|-----------------------------------------------------------------------------|
| CAPITAL COSTS - SVE/AS SYSTEM INSTALLATION (continued) |                         |          |      |                                          |          |                                                                             |
| Waste Hauling and Disposal                             | Assumed Waste Fractions |          |      | Waste Hauling and Disposal Subtotal = \$ | 3,292    |                                                                             |
| Class II beneficial reuse soil at Altamont Landfill    | 35%                     | 11       | ton  | \$ 38.82                                 | \$ 408   |                                                                             |
| Class II soil for disposal at Altamont Landfill        | 35%                     | 11       | ton  | \$ 72.42                                 | \$ 760   |                                                                             |
| Class I non-RCRA soil at Kettleman Hills               | 50%                     | 15       | ton  | \$ 81.15                                 | \$ 1,217 |                                                                             |
| Class I RCRA direct landfill soil                      | 10%                     | 3        | ton  | \$ 130.04                                | \$ 390   |                                                                             |
| Class I RCRA stabilization soil                        | 10%                     | 3        | ton  | \$ 172.24                                | \$ 517   |                                                                             |
| Disposal of radiologically impacted waste              | 5%                      | 2        | ton  | \$ 120.00                                | \$ 180   |                                                                             |
| Construction Subtotal = \$                             |                         |          |      |                                          | 181,823  |                                                                             |
| Design                                                 |                         |          |      | Design Subtotal = \$                     | 49,430   | Includes pilot study (see cost detail above)                                |
| Work Plans                                             |                         |          |      | \$                                       | 10,000   | Includes: Well installation Work Plan and Safety and Health Plan QA/QC Plan |
| TOTAL CAPITAL COST (Slurry                             |                         |          |      | TOTAL PROJECT CAPITAL COST = \$          | 231,253  |                                                                             |
| Total Construction Cost                                |                         |          |      | \$                                       | 181,823  |                                                                             |
| Total Design Cost                                      |                         |          |      | \$                                       | 49,430   |                                                                             |

General Assumptions:  
Pilot study required to determine radius of influence for selection of appropriate sparge and extraction and sparging well spacing  
Sparge well spacing assumed to be approximately 50 feet  
Assumed 16 sparge and 32 extraction wells required



|    |                       |         |                                                                                                                                                                   |
|----|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 44 | Capital Cost: \$0.28M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-27, E-32, E-33, and E-35. |
|----|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-27. Groundwater Alternatives Cost Estimate Summary**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital and Labor Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Total Present Value <sup>(4)</sup> |
|----------------------|------------------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------------|
| GW-1                 | \$ -                         | \$ -           | \$ -                | 32 years                          | \$ -                      | \$ -                               |
| GW-2                 | \$ 279,318                   | \$ 2,603,930   | \$ 275,280          | 32 years                          | \$ 3,790,235              | \$ 2,640,310                       |
| GW-3A                | \$ 1,163,445                 | \$ 3,571,334   | \$ 275,280          | 32 years                          | \$ 6,012,071              | \$ 4,511,196                       |
| GW-3B                | \$ 2,064,814                 | \$ 3,676,959   | \$ 275,280          | 32 years                          | \$ 7,220,464              | \$ 5,661,667                       |
| GW-4                 | \$ 2,041,513                 | \$ 3,961,268   | \$ 275,280          | 32 years                          | \$ 7,533,673              | \$ 5,933,748                       |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for Federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)

GW-1: No Action (Retained [as required by the NCP] to provide a baseline for comparison to other alternatives)

GW-2: Institutional Controls and Long-Term Groundwater Monitoring

GW-3A: In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls

GW-3B: In-Situ Bioremediation, Zero Valent Iron Reduction, Monitored Natural Attenuation, and Institutional Controls

GW-4: Groundwater Containment, Air Sparging, In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls

Table E-32. Groundwater Alternatives - Monitoring Well Installation Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                                                                                                                   | Quantity | Unit | Unit Price                                        | Cost             | Comments                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|---------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DISTRIBUTIVE COSTS</b>                                                                                                                                                     |          |      | <b>DISTRIBUTIVE COSTS SUBTOTAL =</b>              | <b>\$ 30,525</b> | Includes labor and temporary facilities                                                                                                                                                                  |
| <b>Labor</b>                                                                                                                                                                  |          |      | <b>Labor Subtotal =</b>                           | <b>\$ 30,160</b> |                                                                                                                                                                                                          |
| Total project labor cost (Project Manager, Project Geologist, Health and Safety Officer, Radiological Screener)                                                               |          |      |                                                   | \$ 30,160        | See backup worksheet "LABOR" for unit rates                                                                                                                                                              |
| <b>Temporary Facilities</b>                                                                                                                                                   |          |      | <b>Temporary Facilities Costs Subtotal =</b>      | <b>\$ 365</b>    |                                                                                                                                                                                                          |
| Portable Toilet and Hand Wash Station                                                                                                                                         | 1        | mo   | \$ 140.00                                         | \$ 140           | National Construction Rentals, January 2009;                                                                                                                                                             |
| Eye Wash Station                                                                                                                                                              | 1        | ea   | \$ 225.00                                         | \$ 225           | Estimate provided by Grainger, January 2009                                                                                                                                                              |
| <b>CAPITAL COSTS - MONITORING WELL INSTALLATION</b>                                                                                                                           |          |      |                                                   |                  |                                                                                                                                                                                                          |
| <b>Mobilization and Demobilization</b>                                                                                                                                        |          |      | <b>Mobilization and Demobilization Subtotal =</b> | <b>\$ 1,125</b>  |                                                                                                                                                                                                          |
| Hollow-Stem Auger Drill Rig and Support Vehicle                                                                                                                               | 180      | mi   | \$ 6.00                                           | \$ 1,080         | Estimate supplied by TestAmerica Drilling, January 2009; \$6 per mile                                                                                                                                    |
| Portable Toilet                                                                                                                                                               | 1        | ea   | \$ 45.00                                          | \$ 45            | National Construction Rentals, January 2009                                                                                                                                                              |
| <b>Equipment Rental</b>                                                                                                                                                       |          |      | <b>Equipment Rental Subtotal =</b>                | <b>\$ 900</b>    |                                                                                                                                                                                                          |
| 4x4 Pickup Truck                                                                                                                                                              | 2        | week | \$ 450.00                                         | \$ 900           | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> ), January 2009                                                                                               |
| <b>Health &amp; Safety Equipment</b>                                                                                                                                          |          |      | <b>Health and Safety Equipment Subtotal =</b>     | <b>\$ 1,250</b>  |                                                                                                                                                                                                          |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment                                                                                          | 25       | day  | \$ 50.00                                          | \$ 1,250         | Assumed \$50 per field worker per day                                                                                                                                                                    |
| <b>Pre-Drilling Work</b>                                                                                                                                                      |          |      | <b>Pre-Drilling Work Subtotal =</b>               | <b>\$ 1,064</b>  |                                                                                                                                                                                                          |
| Subsurface Utility Surveying                                                                                                                                                  | 8        | hr   | \$ 133.00                                         | \$ 1,064         | Estimate provided by Subtronic Surveying, January 2009                                                                                                                                                   |
| Well Permit Application Preparation                                                                                                                                           | 9        | ea   | \$ 150.00                                         | \$ 1,350         |                                                                                                                                                                                                          |
| <b>Well Installation and Development</b>                                                                                                                                      |          |      | <b>Excavation Subtotal =</b>                      | <b>\$ 31,690</b> |                                                                                                                                                                                                          |
| Drilling (Hollow-Stem Auger)                                                                                                                                                  | 5        | day  | \$ 3,500.00                                       | \$ 17,500        | Estimate supplied by TestAmerica Drilling, January 2009                                                                                                                                                  |
| Per Diem Travel Expenses for a 3 Person Crew                                                                                                                                  | 5        | day  | \$ 450.00                                         | \$ 2,250         | Estimate supplied by TestAmerica Drilling, January 2009                                                                                                                                                  |
| Well Drilling and Installation Cost                                                                                                                                           | 280      | ft   | \$ 7.00                                           | \$ 1,960         | Estimate supplied by TestAmerica Drilling, January 2009                                                                                                                                                  |
| Well Box                                                                                                                                                                      | 9        | ea   | \$ 200.00                                         | \$ 1,800         | Estimate supplied by TestAmerica Drilling, January 2009                                                                                                                                                  |
| Concrete Cutter                                                                                                                                                               | 2        | ea   | \$ 400.00                                         | \$ 800           | Estimate supplied by TestAmerica Drilling, January 2009                                                                                                                                                  |
| Drums                                                                                                                                                                         | 18       | ea   | \$ 50.00                                          | \$ 900           | Estimate supplied by TestAmerica Drilling, January 2009                                                                                                                                                  |
| Well Development                                                                                                                                                              | 36       | hr   | \$ 180.00                                         | \$ 6,480         | Estimate supplied by TestAmerica Drilling, January 2009                                                                                                                                                  |
| <b>Post-Drilling Work</b>                                                                                                                                                     |          |      | <b>Post-Drilling Work Subtotal =</b>              | <b>\$ 950</b>    |                                                                                                                                                                                                          |
| Well Location and Elevation Survey                                                                                                                                            | 1        | day  | \$ 950.00                                         | \$ 950           | Estimate provided by PLS Surveying, January 2009                                                                                                                                                         |
| <b>Decontamination</b>                                                                                                                                                        |          |      | <b>Decontamination Subtotal =</b>                 | <b>\$ 900</b>    |                                                                                                                                                                                                          |
| Decontamination /Screening Equipment                                                                                                                                          | 9        | day  | \$ 100.00                                         | \$ 900           |                                                                                                                                                                                                          |
| <b>Waste Analysis (Drill Cuttings)</b>                                                                                                                                        |          |      | <b>Waste Analysis Subtotal =</b>                  | <b>\$ 9,936</b>  |                                                                                                                                                                                                          |
| Purgeable TPH and VOCs                                                                                                                                                        | 9        | ea   | 96                                                | \$ 864           | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                          |
| SVOCs                                                                                                                                                                         | 9        | ea   | 176                                               | \$ 1,584         | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                          |
| PCBs by 8082                                                                                                                                                                  | 9        | ea   | 72                                                | \$ 648           | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                          |
| Organochlorine Pesticides by 8081A                                                                                                                                            | 9        | ea   | 104                                               | \$ 936           | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                          |
| Extractable TPH by 8015B                                                                                                                                                      | 9        | ea   | 48                                                | \$ 432           | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                          |
| Metals by 6010B                                                                                                                                                               | 9        | ea   | 56                                                | \$ 504           | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                          |
| <b>Waste Analysis (Development Water)</b>                                                                                                                                     |          |      |                                                   |                  |                                                                                                                                                                                                          |
| Purgeable TPH and VOCs                                                                                                                                                        | 9        | ea   | 96                                                | \$ 864           | Estimate provided by TestAmerica, January 2009                                                                                                                                                           |
| SVOCs                                                                                                                                                                         | 9        | ea   | 176                                               | \$ 1,584         | Estimate provided by TestAmerica, January 2009                                                                                                                                                           |
| PCVs by 8082                                                                                                                                                                  | 9        | ea   | 72                                                | \$ 648           | Estimate provided by TestAmerica, January 2009                                                                                                                                                           |
| Organochlorine Pesticides by 8081A                                                                                                                                            | 9        | ea   | 104                                               | \$ 936           | Estimate provided by TestAmerica, January 2009                                                                                                                                                           |
| Extractable TPH by 8015B                                                                                                                                                      | 9        | ea   | 48                                                | \$ 432           | Estimate provided by TestAmerica, January 2009                                                                                                                                                           |
| Metals by 6010B                                                                                                                                                               | 9        | ea   | 56                                                | \$ 504           | Estimate provided by TestAmerica, January 2009                                                                                                                                                           |
| <b>Waste Hauling and Disposal (Drill Cuttings)</b>                                                                                                                            |          |      | <b>Waste Hauling and Disposal Subtotal =</b>      | <b>\$ 41</b>     |                                                                                                                                                                                                          |
| Class I non-RCRA soil at Kettleman Hills                                                                                                                                      | 0.5      | ton  | \$ 81.15                                          | \$ 41            |                                                                                                                                                                                                          |
| <b>Waste Hauling (Development Water)</b>                                                                                                                                      |          |      | <b>Waste Hauling Subtotal =</b>                   | <b>\$ 640</b>    |                                                                                                                                                                                                          |
| Hauling to CWM Kettleman Hills Landfill, Kettleman City, CA                                                                                                                   | 16       | drum | \$ 40.00                                          | \$ 640           |                                                                                                                                                                                                          |
| <b>Waste Disposal (Development Water)</b>                                                                                                                                     |          |      | <b>Waste Disposal Subtotal =</b>                  | <b>\$ 1,800</b>  |                                                                                                                                                                                                          |
| Non-RCRA Hazardous Waste                                                                                                                                                      | 16       | drum | \$ 100.00                                         | \$ 1,600         |                                                                                                                                                                                                          |
| Profiling Fee                                                                                                                                                                 | 1        | ls   | \$ 200.00                                         | \$ 200           |                                                                                                                                                                                                          |
|                                                                                                                                                                               |          |      | <b>Construction Subtotal =</b>                    | <b>\$ 80,821</b> |                                                                                                                                                                                                          |
| <b>Design</b>                                                                                                                                                                 |          |      | <b>Design Subtotal =</b>                          | <b>\$ 9,698</b>  |                                                                                                                                                                                                          |
| Work Plans                                                                                                                                                                    |          |      |                                                   | \$ 9,698         | Includes Well installation Work Plan and Safety and Health Plan, QA/QC Plan, QAPP, and Cost Estimates consistent with EPA guidance (pp. 5-13, EPA, 2000); assumed to be 12 percent of construction costs |
| <b>TOTAL CAPITAL COST (Well Installation)</b>                                                                                                                                 |          |      | <b>TOTAL PROJECT CAPITAL COST =</b>               | <b>\$ 90,519</b> |                                                                                                                                                                                                          |
| Total Construction Cost                                                                                                                                                       |          |      |                                                   | \$ 80,821        |                                                                                                                                                                                                          |
| Total Design Cost                                                                                                                                                             |          |      |                                                   | \$ 9,698         |                                                                                                                                                                                                          |
| General Assumptions:<br>Assumed 8 new wells to be installed<br>Work will be performed in Level D PPE<br>Drill cuttings assumed to be classifiable as Non-RCRA hazardous waste |          |      |                                                   |                  |                                                                                                                                                                                                          |



Table E-33. Groundwater Alternatives - Long-Term Groundwater Monitoring Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Groundwater Monitoring Summary            | 52 wells to sample (quarterly for 2 years, semiannually for 2 years, and annually for 26 years) |             |           |
|-------------------------------------------|-------------------------------------------------------------------------------------------------|-------------|-----------|
|                                           | Quarterly                                                                                       | Semi-Annual | Annual    |
| Labor subtotal per year                   | \$ 140,480                                                                                      | \$ 70,240   | \$ 35,120 |
| Lab and Data Validation subtotal per year | \$ 15,289                                                                                       | \$ 7,645    | \$ 3,822  |
| Sampling Equipment                        | \$ 42,994                                                                                       | \$ 21,497   | \$ 10,749 |
| Interim Report subtotal per year          | \$ 24,000                                                                                       | \$ 12,000   | \$ 6,000  |
| Annual Report subtotal per year           | \$ 10,000                                                                                       | \$ 10,000   | \$ 10,000 |
| Total monitoring costs per year           | \$ 232,763                                                                                      | \$ 121,382  | \$ 65,691 |

| Laboratory and Data Validation Analysis |                                  |                    |                                    |                                     |                    |                                    |       |            |                                     |                   |
|-----------------------------------------|----------------------------------|--------------------|------------------------------------|-------------------------------------|--------------------|------------------------------------|-------|------------|-------------------------------------|-------------------|
| Plume                                   | No. of A-aquifer Wells To Sample | A-aquifer Analyses | Cost Per Event for A-aquifer Wells | Number of B-aquifer Wells to Sample | B-aquifer Analyses | Cost Per Event for B-aquifer Wells | Years | Frequency  | Total Cost per Event <sup>(1)</sup> | Total Annual Cost |
| Building 406 TCE Plume                  | 13                               | 8260B              | \$ 1,248                           | 3                                   | 8260, 6010         | \$ 456                             | 2,3   | Quarterly  | \$ 2,360                            | \$ 9,438          |
|                                         | 13                               | 8260B              | \$ 1,248                           | 3                                   | 8260, 6010         | \$ 456                             | 4,5   | Semiannual | \$ 2,360                            | \$ 4,719          |
|                                         | 13                               | 8260B              | \$ 1,248                           | 3                                   | 8260, 6010         | \$ 456                             | 6-31  | Annual     | \$ 2,360                            | \$ 2,360          |
| IR-12 PCE Plume                         | 7                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 2,3   | Quarterly  | \$ 285                              | \$ 1,142          |
|                                         | 7                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 4,5   | Semiannual | \$ 285                              | \$ 571            |
|                                         | 7                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 6-31  | Annual     | \$ 285                              | \$ 285            |
| IR-12 Benzene Plume                     | 5                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 2,3   | Quarterly  | \$ 235                              | \$ 942            |
|                                         | 5                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 4,5   | Semiannual | \$ 235                              | \$ 471            |
|                                         | 5                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 6-31  | Annual     | \$ 235                              | \$ 235            |
| IR-04 TCE Plume                         | 5                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 2,3   | Quarterly  | \$ 235                              | \$ 942            |
|                                         | 5                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 4,5   | Semiannual | \$ 235                              | \$ 471            |
|                                         | 5                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 6-31  | Annual     | \$ 235                              | \$ 235            |
| IR-56 TCE Plume                         | 3                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 2,3   | Quarterly  | \$ 185                              | \$ 742            |
|                                         | 3                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 4,5   | Semiannual | \$ 185                              | \$ 371            |
|                                         | 3                                | 8260B              | \$ 96                              | 0                                   | NA                 | \$ -                               | 6-31  | Annual     | \$ 185                              | \$ 185            |
| IR-02 Central Nickel Plume              | 2                                | 6010               | \$ 30                              | 0                                   | NA                 | \$ -                               | 2,3   | Quarterly  | \$ 85                               | \$ 338            |
|                                         | 2                                | 6010               | \$ 30                              | 0                                   | NA                 | \$ -                               | 4,5   | Semiannual | \$ 85                               | \$ 169            |
|                                         | 2                                | 6010               | \$ 30                              | 0                                   | NA                 | \$ -                               | 6-31  | Annual     | \$ 85                               | \$ 85             |
| IR-02 Northwest Metals Plume            | 5                                | 6010               | \$ 56                              | 1                                   | 6010               | \$ 56                              | 2,3   | Quarterly  | \$ 279                              | \$ 1,115          |
|                                         | 5                                | 6010               | \$ 56                              | 1                                   | 6010               | \$ 56                              | 4,5   | Semiannual | \$ 279                              | \$ 558            |
|                                         | 5                                | 6010               | \$ 56                              | 1                                   | 6010               | \$ 56                              | 6-31  | Annual     | \$ 279                              | \$ 279            |
| IR-02 Northwest PCB and Pesticide Plume | 3                                | 8082, 8081A        | \$ 72                              | 0                                   | NA                 | \$ -                               | 2,3   | Quarterly  | \$ 158                              | \$ 631            |
|                                         | 3                                | 8082, 8081A        | \$ 72                              | 0                                   | NA                 | \$ -                               | 4,5   | Semiannual | \$ 158                              | \$ 316            |
|                                         | 3                                | 8082, 8081A        | \$ 72                              | 0                                   | NA                 | \$ -                               | 6-31  | Annual     | \$ 158                              | \$ 158            |

Notes:  
<sup>(1)</sup> Includes cost of quality control samples (10% duplicates and 5% matrix spike/matrix spike duplicate) and data validation (90% cursory and 10% complete)  
NA: not applicable



Table E-33. Groundwater Alternatives - Long-Term Groundwater Monitoring Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Laboratory Analysis Cost <sup>(1)</sup>                          | Cost per Sample |     |
|------------------------------------------------------------------|-----------------|-----|
| PCBs by EPA Method 8082                                          | \$              | 72  |
| Organochlorine Pesticides by EPA Method 8081A                    | \$              | 104 |
| VOCs by EPA Method 8260B (includes purgeable TPH)                | \$              | 96  |
| SVOCs by U.S. Environmental Protection Agency (EPA) Method 8270C | \$              | 176 |
| Metals by EPA Method 6010/7000                                   | \$              | 56  |
| Individual Metals by EPA Method 6010/7000                        | \$              | 30  |
| Extractable TPH by EPA Method 8015B                              | \$              | 48  |

Notes:

<sup>(1)</sup> Analytical costs provided by TestAmerica Laboratories, San Francisco, CA. on 01-21-2008

| Sampling Equipment Cost Analysis <sup>(1)</sup> | Rate <sup>(1)</sup> | Unit                 | Amount | Cost per Event | Remarks                                                                                              |
|-------------------------------------------------|---------------------|----------------------|--------|----------------|------------------------------------------------------------------------------------------------------|
| Water Level Meter (week)                        | \$                  | 60 per week          | 4      | \$ 240         |                                                                                                      |
| Telfon Tubing (3/16" x 3/8")                    | \$                  | 2 per foot           | 1,500  | \$ 3,000       |                                                                                                      |
| Silicon Tubing (3/16" x 3/8")                   | \$                  | 1 per foot           | 1,500  | \$ 750         |                                                                                                      |
| Bladder Pump System (week)                      | \$                  | 450 per week         | 2      | \$ 900         |                                                                                                      |
| Extra Bladders, o-rings, Grab Plate             | \$                  | 20 per unit          | 4      | \$ 80          |                                                                                                      |
| Multi-Parameter Water Quality Meter             | \$                  | 300 per week         | 2      | \$ 600         |                                                                                                      |
| 55-Gallon Drums                                 | \$                  | 42 per drum          | 10     | \$ 420         |                                                                                                      |
| Filters                                         | \$                  | 16 per filter        | 65     | \$ 1,008       |                                                                                                      |
| PPE D = Gloves                                  | \$                  | 6 per box of 100     | 4      | \$ 24          |                                                                                                      |
| Gallon Zip Lock Bags                            | \$                  | 5 per box of 20      | 4      | \$ 20          |                                                                                                      |
| Quart Zip Lock Bags                             | \$                  | 5 per box of 40      | 4      | \$ 20          |                                                                                                      |
| Garbage Bags                                    | \$                  | 15 per box of 40     | 1      | \$ 15          |                                                                                                      |
| Decon - Water Spray Bottles                     | \$                  | 5 per bottle         | 2      | \$ 10          |                                                                                                      |
| Decon - Soap Spray Bottles                      | \$                  | 5 per bottle         | 2      | \$ 10          |                                                                                                      |
| Decon - Buckets and Lids                        | \$                  | 5 per bucket         | 8      | \$ 40          |                                                                                                      |
| Bottled Water                                   | \$                  | 5 per case           | 2      | \$ 10          |                                                                                                      |
| DI Water                                        | \$                  | 2 per gallon         | 5      | \$ 10          |                                                                                                      |
| Phospahte-Free Detergent                        | \$                  | 5 per container      | 1      | \$ 5           |                                                                                                      |
| Paper Towels                                    | \$                  | 5 per roll           | 4      | \$ 20          |                                                                                                      |
| Tool Kit                                        | \$                  | 50 per week          | 4      | \$ 200         |                                                                                                      |
| Drum Labels                                     | \$                  | 10 per package of 25 | 1      | \$ 10          |                                                                                                      |
| Dye-Free Twine                                  | \$                  | 10 per roll          | 5      | \$ 50          |                                                                                                      |
| Truck (day)                                     | \$                  | 150 per day          | 0      | \$ -           |                                                                                                      |
| Truck (week)                                    | \$                  | 450 per week         | 2      | \$ 900         |                                                                                                      |
| Fuel                                            | \$                  | 3 per gallon         | 100    | \$ 300         |                                                                                                      |
| Waste Groundwater Characterization              | \$                  | 552 lump sum         | 1      | \$ 552         | Composite sample analyzed for metals, organic compunds, PCBs, pesticides, and petroleum hydrocarbons |
| Waste Transport and Treatment                   | \$                  | 200 per drum         | 6      | \$ 1,200       |                                                                                                      |
| Equipment Storage Box - 20'                     | \$                  | 115 per month        | 1      | \$ 115         |                                                                                                      |
| Equipment Storage Box - 20' - mob/demob         | \$                  | 240 delivery         | 1      | \$ 240         |                                                                                                      |
|                                                 |                     |                      | Total  | \$ 10,749      |                                                                                                      |

Notes:

<sup>(1)</sup> Unit rates provided by various local vendors in San Francisco, California

Table E-35. Groundwater Alternatives - Monitoring Well Decommissioning Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                                                     | Quantity                                   | Unit | Unit Price | Cost       | Comments                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------|------|------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DISTRIBUTIVE COSTS                                                                                              | DISTRIBUTIVE COSTS SUBTOTAL =              |      |            | 51,541.00  | Includes labor and temporary facilities                                                                                                                                                                   |
| Labor                                                                                                           | Labor Subtotal =                           |      |            | 51,176.00  |                                                                                                                                                                                                           |
| Total project labor cost (Project Manager, Project Geologist, Health and Safety Officer, Radiological Screener) |                                            |      |            | 51,176.00  | See backup worksheet "LABOR" for unit rates                                                                                                                                                               |
| Temporary Facilities                                                                                            | Temporary Facilities Costs Subtotal =      |      |            | 365.00     |                                                                                                                                                                                                           |
| Portable Toilet and Hand Wash Station                                                                           | 1.00                                       | mo   | 140.00     | 140.00     | National Construction Rentals, January 2009;                                                                                                                                                              |
| Eye Wash Station                                                                                                | 1.00                                       | ea   | 225.00     | 225.00     | Estimate provided by Grainger, January 2009                                                                                                                                                               |
| CAPITAL COSTS - MONITORING WELL INSTALLATION                                                                    |                                            |      |            |            |                                                                                                                                                                                                           |
| Mobilization and Demobilization                                                                                 | Mobilization and Demobilization Subtotal = |      |            | 1,125.00   |                                                                                                                                                                                                           |
| Hollow-Stem Auger Drill Rig and Support Vehicle                                                                 | 180.00                                     | mi   | 6.00       | 1,080.00   | Estimate supplied by TestAmerica Drilling, January 2009; \$6 per mile                                                                                                                                     |
| Portable Toilet                                                                                                 | 1.00                                       | ea   | 45.00      | 45.00      | National Construction Rentals, January 2009                                                                                                                                                               |
| Equipment Rental                                                                                                | Equipment Rental Subtotal =                |      |            | 1,000.00   |                                                                                                                                                                                                           |
| 4x4 Pickup Truck                                                                                                | 2.00                                       | week | 500.00     | 1,000.00   | Estimate supplied by Hertz Equipent Rental, January 2009                                                                                                                                                  |
| Health and Safety Equipment                                                                                     | Health and Safety Equipment Subtotal =     |      |            | 250.00     |                                                                                                                                                                                                           |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment                            | 5.00                                       | day  | 50.00      | 250.00     | Assumed \$50 per field worker per day                                                                                                                                                                     |
| Pre-Drilling Work                                                                                               | Pre-Drilling Work Subtotal =               |      |            | 2,128.00   |                                                                                                                                                                                                           |
| Subsurface Utility Surveying                                                                                    | 16.00                                      | hr   | 133.00     | 2,128.00   | Estimate provided by Subtronic Surveying, January 2009                                                                                                                                                    |
| Well Abandonment Permit Application Preparation                                                                 | 138.00                                     | ea   | 150.00     | 20,700.00  |                                                                                                                                                                                                           |
| Well Decomissioning                                                                                             | Excavation Subtotal =                      |      |            | 88,800.00  |                                                                                                                                                                                                           |
| Well Head Breakout                                                                                              | 130.00                                     | ea   | 100.00     | 13,000.00  | Estimate supplied by TestAmerica Drilling, January 2009                                                                                                                                                   |
| Over-Drilling (Hollow-Stem Auger)                                                                               | 24.00                                      | day  | 3,250.00   | 78,000.00  | Estimate supplied by TestAmerica Drilling, January 2009                                                                                                                                                   |
| Per Diem Travel Expenses for a 3 Person Crew                                                                    | 24.00                                      | day  | 450.00     | 10,800.00  | Estimate supplied by TestAmerica Drilling, January 2009                                                                                                                                                   |
| Backfill (Portland/Bentonite)                                                                                   | 6,200.00                                   | LF   | 4.00       | 24,800.00  | Estimate supplied by TestAmerica Drilling, January 2010                                                                                                                                                   |
| Decontamination                                                                                                 | Decontamination Subtotal =                 |      |            | 900.00     |                                                                                                                                                                                                           |
| Decontamination /Screening Equipment                                                                            | 9.00                                       | day  | 100.00     | 900.00     |                                                                                                                                                                                                           |
| Waste Analysis                                                                                                  | Waste Analysis Subtotal =                  |      |            | 8,060.00   |                                                                                                                                                                                                           |
| VOCs by 3550B/8270C                                                                                             | 10.00                                      | ea   | 100.00     | 1,000.00   | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                           |
| SVOCs by 3550B/8270C                                                                                            | 10.00                                      | ea   | 190.00     | 1,900.00   | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                           |
| Organochlorine Pesticides by 3550B/8081A                                                                        | 10.00                                      | ea   | 80.00      | 800.00     | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                           |
| PCBs by 3550B/8082                                                                                              | 10.00                                      | ea   | 65.00      | 650.00     | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                           |
| Purgeable TPH by 5035A/8015B                                                                                    | 10.00                                      | ea   | 96.00      | 960.00     | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                           |
| Extractable TPH by 3550B/8015B                                                                                  | 10.00                                      | ea   | 45.00      | 450.00     | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                           |
| TTLC, CA Title 22 Metals by 3010A/6010B and Mercury by 3010A/7470A                                              | 10.00                                      | ea   | 130.00     | 1,300.00   | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                           |
| TCLP, CA Title 22 Metals by 1311                                                                                | 10.00                                      | ea   | 50.00      | 500.00     | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                           |
| STLC, CA Title 22 Metals by CCR T26                                                                             | 10.00                                      | ea   | 50.00      | 500.00     | Estimate provided by TestAmerica, Janurary 2009                                                                                                                                                           |
| Waste Hauling and Disposal (Drill Cuttings)                                                                     | Waste Hauling and Disposal Subtotal =      |      |            | 81.15      |                                                                                                                                                                                                           |
| Class I non-RCRA soil at Kettleman Hills                                                                        | 1.00                                       | ton  | 81.15      | 81.15      |                                                                                                                                                                                                           |
| Construction Subtotal =                                                                                         |                                            |      |            | 153,885.15 |                                                                                                                                                                                                           |
| Design                                                                                                          | Design Subtotal =                          |      |            | 18,466.22  |                                                                                                                                                                                                           |
| Work Plans                                                                                                      |                                            |      |            | 18,466.22  | Includes: Well installation Work Plan and Safety and Health Plan, QA/QC Plan, QAPP, and Cost Estmates; consistent with EPA guidance (pp. 5-13, EPA, 2000); assumed to be 12 percent of construction costs |
| TOTAL CAPITAL COST (Well Decomissioning)                                                                        | TOTAL PROJECT CAPITAL COST =               |      |            | 172,351.37 |                                                                                                                                                                                                           |
| Total Construction Cost                                                                                         |                                            |      |            | 153,885.15 |                                                                                                                                                                                                           |
| Total Design Cost                                                                                               |                                            |      |            | 18,466.22  |                                                                                                                                                                                                           |

General Assumptions:  
Work will be performed in Level D PPE  
Assumed all existing and proposed wells at Parcel E will be abandoned



|    |                      |         |                                                                                                                                                                               |
|----|----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 45 | Capital Cost: \$1.2M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-27, E-36, E-37, E-38, E-39, and E-40. |
|----|----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-27. Groundwater Alternatives Cost Estimate Summary**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital and Labor Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Total Present Value <sup>(4)</sup> |
|----------------------|------------------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------------|
| GW-1                 | \$ -                         | \$ -           | \$ -                | 32 years                          | \$ -                      | \$ -                               |
| GW-2                 | \$ 279,318                   | \$ 2,603,930   | \$ 275,280          | 32 years                          | \$ 3,790,235              | \$ 2,640,310                       |
| GW-3A                | \$ 1,163,445                 | \$ 3,571,334   | \$ 275,280          | 32 years                          | \$ 6,012,071              | \$ 4,511,196                       |
| GW-3B                | \$ 2,064,814                 | \$ 3,676,959   | \$ 275,280          | 32 years                          | \$ 7,220,464              | \$ 5,661,667                       |
| GW-4                 | \$ 2,041,513                 | \$ 3,961,268   | \$ 275,280          | 32 years                          | \$ 7,533,673              | \$ 5,933,748                       |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for Federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html))

GW-1: No Action (Retained [as required by the NCP] to provide a baseline for comparison to other alternatives)

GW-2: Institutional Controls and Long-Term Groundwater Monitoring

GW-3A: In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls

GW-3B: In-Situ Bioremediation, Zero Valent Iron Reduction, Monitored Natural Attenuation, and Institutional Controls

GW-4: Groundwater Containment, Air Sparging, In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls



**Table E-36. Groundwater Alternatives - In-Situ Bioremediation Injection Cost Detail**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| <b>Cost to Implement ISB Using HRC or 3DMe at Parcel E (for Chlorinated Solvents)</b>                                    | <b>Building 406 TCE Plume</b> |                   | <b>IR12MW19A VOC Plume</b> |                   | <b>Building 810 TCE Plume</b> |                  | <b>Railroad Yard TCE Plume</b> |                  |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------|----------------------------|-------------------|-------------------------------|------------------|--------------------------------|------------------|
| <b>Material Cost Summary<sup>(1)</sup></b>                                                                               | <b>Quantity</b>               | <b>Cost</b>       | <b>Quantity</b>            | <b>Cost</b>       | <b>Quantity</b>               | <b>Cost</b>      | <b>Quantity</b>                | <b>Cost</b>      |
| HRC Application Rate (lbs/ft)                                                                                            | 9                             | --                | 12.2                       | --                | 5.0                           | --               | 5.0                            | --               |
| Amount of HRC per Point (lb)                                                                                             | 188                           | --                | 245                        | --                | 100                           | --               | 100                            | --               |
| Total amount of HRC (lb)                                                                                                 | 21,244                        | --                | 28,665                     | --                | 9,800                         | --               | 2,500                          | --               |
| HRC Unit Cost (\$/lb)                                                                                                    | --                            | \$ 6.25           | --                         | \$ 6.25           | --                            | \$ 6.25          | --                             | \$ 6.25          |
| <b>Total HRC Material Cost</b>                                                                                           |                               | <b>\$ 132,775</b> |                            | <b>\$ 179,156</b> |                               | <b>\$ 61,250</b> |                                | <b>\$ 15,625</b> |
| 3DMe Application Rate (lbs/ft) - 10:1 Base Emulsion                                                                      | 195                           | --                | 176                        | --                | 171                           | --               | 83                             | --               |
| Amount of 3DMe per point (lb) - 10:1 Base Emulsion                                                                       | 3,898                         | --                | 3,527                      | --                | 3,410                         | --               | 1,663                          | --               |
| Total amount of 3DMe Concentrate (gal)                                                                                   | 7,262                         | --                | 1,730                      | --                | 1,338                         | --               | 453                            | --               |
| Mass of 10:1 Base Emulsion                                                                                               | 666,600                       | --                | 158,730                    | --                | 122,760                       | --               | 41,580                         | --               |
| 3DMe Unit Cost for 10:1 Base Emulsion (\$/lb)                                                                            | --                            | \$ 0.36           | --                         | \$ 0.36           | --                            | \$ 0.36          | --                             | \$ 0.36          |
| <b>Total 3DMe Material Cost</b>                                                                                          |                               | <b>\$ 239,976</b> |                            | <b>\$ 57,143</b>  |                               | <b>\$ 44,194</b> |                                | <b>\$ 14,969</b> |
| <b>Implementation Cost Summary</b>                                                                                       |                               |                   |                            |                   |                               |                  |                                |                  |
| Number of Delivery Points                                                                                                | 113                           | --                | 117                        | --                | 98                            | --               | 25                             | --               |
| Average Length of Injection Point (ft)                                                                                   | 28                            | --                | 28                         | --                | 28                            | --               | 28                             | --               |
| Total Length of Direct Push (ft)                                                                                         | 3,164                         | --                | 3,276                      | --                | 2,744                         | --               | 700                            | --               |
| Estimated Production Rate for Direct Push (points/day)                                                                   | 11                            | --                | 11                         | --                | 11                            | --               | 11                             | --               |
| Required Number of Days to Install Points (days)                                                                         | 10.3                          | --                | 10.6                       | --                | 8.9                           | --               | 2.3                            | --               |
| Cost to Install Injection Points <sup>(2)</sup>                                                                          | --                            | \$ 20,645         | --                         | \$ 21,373         | --                            | \$ 17,918        | --                             | \$ 4,645         |
| <i>Geoprobe and Crew Mobilization (\$5 per mile, 100 miles each way)</i>                                                 | --                            | \$ 100            | --                         | \$ 100            | --                            | \$ 100           | --                             | \$ 100           |
| <i>Geoprobe Track Rig (2-man, 8 hr/day, incl. steam cleaning and sample lining, production rate = 11 points per day)</i> | --                            | \$ 19,518         | --                         | \$ 20,209         | --                            | \$ 16,927        | --                             | \$ 4,318         |
| <i>Injection Equipment (3.5 gpm, 1,000 psi)</i>                                                                          | --                            | \$ 1,027          | --                         | \$ 1,064          | --                            | \$ 891           | --                             | \$ 227           |
| Point Installation Oversight                                                                                             | --                            | \$ 10,108         | --                         | \$ 10,466         | --                            | \$ 8,767         | --                             | \$ 2,236         |
| Transportation Cost for HRC Delivery                                                                                     | --                            | \$ 1,550          | --                         | \$ 1,550          | --                            | \$ 1,550         | --                             | \$ 1,550         |
| <b>Total Implementation Cost (HRC or 3DMe)</b>                                                                           |                               | <b>\$ 32,304</b>  |                            | <b>\$ 33,389</b>  |                               | <b>\$ 28,235</b> |                                | <b>\$ 8,432</b>  |
| <b>Total Cost (HRC)</b>                                                                                                  |                               | <b>\$ 165,079</b> |                            | <b>\$ 212,545</b> |                               | <b>\$ 89,485</b> |                                | <b>\$ 24,057</b> |
| <b>Total Cost (3DMe)</b>                                                                                                 |                               | <b>\$ 272,280</b> |                            | <b>\$ 90,532</b>  |                               | <b>\$ 72,428</b> |                                | <b>\$ 23,401</b> |



**Table E-36. Groundwater Alternatives - In-Situ Bioremediation Injection Cost Detail** *(continued)*

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| <b>Cost to Implement ISB Using ORC at Parcel E (for Benzene)</b>                                                         |  | <b>IR12 Benzene Plume</b> |                   |
|--------------------------------------------------------------------------------------------------------------------------|--|---------------------------|-------------------|
| <b>Material Cost Summary<sup>(1)</sup></b>                                                                               |  | <b>Quantity</b>           | <b>Cost</b>       |
| ORC Advanced Application Rate (lbs/ft)                                                                                   |  | 5                         | --                |
| Amount of ORC Advanced per Point (lb)                                                                                    |  | 90                        | --                |
| Total amount of ORC Advanced (lb)                                                                                        |  | 16,110                    | --                |
| ORC Advanced Unit Cost (\$/lb)                                                                                           |  | --                        | \$ 8.15           |
| <b>Total ORC Advanced Material Cost</b>                                                                                  |  |                           | <b>\$ 131,297</b> |
| <b>Implementation Cost Summary</b>                                                                                       |  |                           |                   |
| Number of Delivery Points                                                                                                |  | 179                       | --                |
| Average Length of Injection Point (ft)                                                                                   |  | 28                        | --                |
| Total Length of Direct Push (ft)                                                                                         |  | 3,080                     | --                |
| Estimated Production Rate for Direct Push (points/day)                                                                   |  | 11                        | --                |
| Required Number of Days to Install Points (days)                                                                         |  | 10.0                      | --                |
| Cost to Install Injection Points <sup>(2)</sup>                                                                          |  | --                        | \$ 32,645         |
| <i>Geoprobe and Crew Mobilization (\$5 per mile, 100 miles each way)</i>                                                 |  | --                        | \$ 100            |
| <i>Geoprobe Track Rig (2-man, 8 hr/day, incl. steam cleaning and sample lining, production rate = 11 points per day)</i> |  | --                        | \$ 30,918         |
| <i>Injection Equipment (3.5 gpm, 1,000 psi)</i>                                                                          |  | --                        | \$ 1,627          |
| Point Installation Oversight                                                                                             |  | --                        | \$ 9,840          |
| Transportation Cost for HRC Delivery                                                                                     |  | --                        | \$ 2,520          |
| <b>Total Implementation Cost (ORC Advanced)</b>                                                                          |  |                           | <b>\$ 77,651</b>  |
| <b>Total Cost (ORC Advanced)</b>                                                                                         |  |                           | <b>\$ 208,947</b> |

Notes:

<sup>(1)</sup> ISB modeling to produce estimates performed by Regenesis, Ltd.<sup>(2)</sup> Direct push and product injection estimates provided by Precision Sampling, Ltd.

Assumptions:

Only a single injection application required to address plumes

|                                                                       |                   |
|-----------------------------------------------------------------------|-------------------|
| <b>Design and Pre-Implementation Cost</b>                             | <b>\$ 184,014</b> |
| Design assumed to be 12% of total cost; applied to year 0             | \$ 84,014         |
| Pilot Study (estimate provided by Regenesis, Ltd.); applied to year 0 | \$ 100,000        |

**Table E-37. Groundwater Alternatives - In-Situ Bioremediation Monitoring and Monitored Natural Attenuation Cost Detail**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Groundwater Monitoring Summary            | 30 wells to sample (quarterly for 2 years, semiannually for 2 years, and annually for 6 years) |                  |                  |
|-------------------------------------------|------------------------------------------------------------------------------------------------|------------------|------------------|
|                                           | Quarterly                                                                                      | Semiannual       | Annual           |
| Labor subtotal per year <sup>(1)</sup>    | \$ -                                                                                           | \$ -             | \$ -             |
| Lab and Data Validation subtotal per year | \$ 77,832                                                                                      | \$ 38,916        | \$ 19,458        |
| Sampling Equipment                        | -                                                                                              | -                | -                |
| Report subtotal per year                  | \$ 24,000                                                                                      | \$ 12,000        | \$ 6,000         |
| <b>Total monitoring costs per year</b>    | <b>\$ 101,832</b>                                                                              | <b>\$ 50,916</b> | <b>\$ 25,458</b> |

<sup>(1)</sup> Cost of labor and equipment required to sample wells is already borne by the long-term groundwater monitoring program

#### Lab and Data Validation Analysis

| Plume                   | Number of A-aquifer Wells To Sample | Years | Frequency  | Total Cost per Event <sup>(1)</sup> | Total Annual Cost |
|-------------------------|-------------------------------------|-------|------------|-------------------------------------|-------------------|
| Building 406 TCE Plume  | 9                                   | 2,3   | Quarterly  | \$ 5,837                            | \$ 23,350         |
|                         | 9                                   | 4,5   | Semiannual | \$ 5,837                            | \$ 11,675         |
|                         | 9                                   | 6-11  | Annual     | \$ 5,837                            | \$ 5,837          |
| IR12MW19A VOC Plume     | 6                                   | 2,3   | Quarterly  | \$ 3,892                            | \$ 15,566         |
|                         | 6                                   | 4,5   | Semiannual | \$ 3,892                            | \$ 7,783          |
|                         | 6                                   | 6-11  | Annual     | \$ 3,892                            | \$ 3,892          |
| IR-12 Benzene Plume     | 7                                   | 2,3   | Quarterly  | \$ 4,540                            | \$ 18,161         |
|                         | 7                                   | 4,5   | Semiannual | \$ 4,540                            | \$ 9,080          |
|                         | 7                                   | 6-11  | Annual     | \$ 4,540                            | \$ 4,540          |
| Building 810 TCE Plume  | 5                                   | 2,3   | Quarterly  | \$ 3,243                            | \$ 12,972         |
|                         | 5                                   | 4,5   | Semiannual | \$ 3,243                            | \$ 6,486          |
|                         | 5                                   | 6-11  | Annual     | \$ 3,243                            | \$ 3,243          |
| Railroad Yard TCE Plume | 3                                   | 2,3   | Quarterly  | \$ 1,946                            | \$ 7,783          |
|                         | 3                                   | 4,5   | Semiannual | \$ 1,946                            | \$ 3,892          |
|                         | 3                                   | 6-11  | Annual     | \$ 1,946                            | \$ 1,946          |

Notes:

<sup>(1)</sup> Includes cost of quality control samples (10% duplicates and 5% matrix spike/matrix spike duplicate) and data validation (90% cursory and 10% complete)

NA: not applicable

| Laboratory Analysis Cost <sup>(1)</sup>                         | Cost per sample |
|-----------------------------------------------------------------|-----------------|
| Total Organic Carbon                                            | \$ 35           |
| Turbidity                                                       | \$ 18           |
| Methane/Ethane/Ethene                                           | \$ 125          |
| Major Anions (Chloride, Nitrate, Nitrite, O-phosphate, Sulfate) | \$ 100          |
| Acidity                                                         | \$ 18           |
| Alkalinity                                                      | \$ 23           |
| Dissolved Hydrogen                                              | \$ 220          |
| <b>Total Analytical Suite Cost</b>                              | <b>\$ 539</b>   |

Notes:

<sup>(1)</sup> Analytical costs provided by TestAmerica Laboratories, San Francisco, CA. , January 2009

**Table E-38. Groundwater Alternatives - Zero-Valent Iron Reduction Injection Cost Detail**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| <b>Cost to Implement ZVI at Parcel E (for Buiding 406 TCE Plume)</b> | <b>Building 406 TCE Plume</b> |                   |
|----------------------------------------------------------------------|-------------------------------|-------------------|
| <b>Material and Implementation Cost Summary<sup>(1)</sup></b>        | <b>Quantity</b>               | <b>Cost</b>       |
| High-Reactivity ZVI Powder Application Rate (lbs/borehole)           | 1,500                         | --                |
| Number of Boreholes                                                  | 92                            | --                |
| Total amount of ZVI (lb)                                             | 138,000                       | --                |
| Planning, Coordination, and Field Management Cost                    | --                            | \$ 28,000         |
| Mobilization/Demobilization Cost                                     | --                            | \$ 4,000          |
| Field Implementation Cost <sup>(2)</sup>                             | --                            | \$ 817,900        |
| Field Summay Report Cost                                             | --                            | \$ 13,000         |
| <b>Total ZVI Material and Implementation Cost</b>                    |                               | <b>\$ 862,900</b> |

Notes:

<sup>(1)</sup> Conceptual design and cost estimates for ZVI implementation performed by ARS Technologies, Inc.

<sup>(2)</sup> Implementation cost includes drilling, injection, borehole abandonment, bulk nitrogen gas, and ZVI material

Assumptions:

Only a single injection application required to address plumes

|                                                                              | <b>Building 406 Plume</b> |                |
|------------------------------------------------------------------------------|---------------------------|----------------|
| <b>Design and Pre-Implementation Cost</b>                                    | <b>\$</b>                 | <b>203,548</b> |
| Design assumed to be 12% of total cost; applied to year 0                    | \$                        | 103,548        |
| Pilot Study (estimate provided by ARS Technologies, Ltd.); applied to year 0 | \$                        | 100,000        |

**Table E-39. Groundwater Alternatives - Zero-Valent Iron Reduction Injection Monitoring and Monitored Natural Attenuation Cost Detail**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Groundwater Monitoring Summary            | Nine Wells to Sample for Building 406 TCE Plume<br>(quarterly for 2 years, semiannually for 2 years,<br>and annually for 6 years) |                  |                  |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|
|                                           | Quarterly                                                                                                                         | Semiannual       | Annual           |
| Labor subtotal per year <sup>(1)</sup>    | \$ -                                                                                                                              | \$ -             | \$ -             |
| Lab and Data Validation subtotal per year | \$ 25,668                                                                                                                         | \$ 12,834        | \$ 6,417         |
| Sampling Equipment                        | - \$                                                                                                                              | - \$             | -                |
| Report subtotal per year                  | \$ 16,000                                                                                                                         | \$ 8,000         | \$ 4,000         |
| <b>Total monitoring costs per year</b>    | <b>\$ 41,668</b>                                                                                                                  | <b>\$ 20,834</b> | <b>\$ 10,417</b> |

<sup>(1)</sup> Cost of labor and equipment required to sample wells is already borne by the long-term groundwater monitoring program

#### Lab and Data Validation Analysis

| Plume                  | Number of<br>A-aquifer Wells<br>To Sample | Years | Frequency  | Total Cost per<br>Event <sup>(1)</sup> | Total<br>Annual Cost |
|------------------------|-------------------------------------------|-------|------------|----------------------------------------|----------------------|
| Building 406 TCE Plume | 9                                         | 2,3,  | Quarterly  | \$ 6,417                               | \$ 25,668            |
|                        | 9                                         | 4,5   | Semiannual | \$ 6,417                               | \$ 12,834            |
|                        | 9                                         | 6-11  | Annual     | \$ 6,417                               | \$ 6,417             |

Notes:

<sup>(1)</sup> Includes cost of quality control samples (10% duplicates and 5% matrix spike/matrix spike duplicate) and data validation (90% cursory and 10% full)

| Laboratory Analysis Cost <sup>(1)</sup>                         | Cost per Sample |
|-----------------------------------------------------------------|-----------------|
| Metals by EPA Method 6010/7000 (Unfiltered)                     | \$ 56           |
| Total Organic Carbon                                            | \$ 35           |
| Turbidity                                                       | \$ 18           |
| Methane/Ethane/Ethene                                           | \$ 125          |
| Major Anions (Chloride, Nitrate, Nitrite, O-phosphate, Sulfate) | \$ 100          |
| Acidity                                                         | \$ 18           |
| Alkalinity                                                      | \$ 23           |
| Dissolved Hydrogen                                              | \$ 220          |
| <b>Total Analytical Suite Cost</b>                              | <b>\$ 595</b>   |

Notes:

<sup>(1)</sup> Analytical costs provided by TestAmerica Laboratories, San Francisco, CA. on 01-21-2008

Table E-40. Groundwater Alternatives - Slurry Wall Installation Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

Estimate of Quantities:

|                                   | Length (ft) | Width (ft) | Average Depth (ft) | Surface Area (ft <sup>2</sup> ) | Volume (ft <sup>3</sup> ) |
|-----------------------------------|-------------|------------|--------------------|---------------------------------|---------------------------|
| Slurry Wall Dimensions and Volume | 1,070       | 2.5        | 33                 | 35,310                          | 88,275                    |

Cost Estimate:

| Description                                   |                                                                                      | Quantity                                   | Unit     | Unit Price   | Cost       | Comments                                                                                                     |
|-----------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------|----------|--------------|------------|--------------------------------------------------------------------------------------------------------------|
| CAPITAL COSTS - SLURRY WALL INSTALLATION      |                                                                                      |                                            |          |              |            |                                                                                                              |
| Mobilization and Demobilization               |                                                                                      | Mobilization and Demobilization Subtotal = |          |              | \$ 40,090  |                                                                                                              |
| Temporary Facilities                          | Excavation and Slurry Equipment                                                      | 2                                          | LS       | \$ 20,000.00 | \$ 40,000  |                                                                                                              |
|                                               | Portable Toilet                                                                      | 2                                          | ea       | \$ 45.00     | \$ 90      | National Construction Rentals, January 2009                                                                  |
|                                               |                                                                                      | Temporary Facilities Costs Subtotal =      |          |              | \$ 365     |                                                                                                              |
|                                               | Portable Toilet and Hand Wash Station                                                | 1                                          | mo       | \$ 140.00    | \$ 140     | National Construction Rentals, January 2009                                                                  |
|                                               | Eye Wash Station                                                                     | 1                                          | ea       | \$ 225.00    | \$ 225     | Estimate provided by Grainger, January 2009                                                                  |
| Equipment Rental                              |                                                                                      | Equipment Rental Subtotal =                |          |              | \$ 2,000   |                                                                                                              |
|                                               | 4x4 Pickup Truck                                                                     | 4                                          | week     | \$ 500.00    | \$ 2,000   | Estimate supplied by Hertz, January 2009                                                                     |
| Health & Safety Equipment                     |                                                                                      | Health and Safety Equipment Subtotal =     |          |              | \$ 13,000  |                                                                                                              |
|                                               | Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment | 260                                        | day      | \$ 50.00     | \$ 13,000  | Assumed \$50 per field worker per day                                                                        |
| Slurry Wall Installation                      |                                                                                      | Post-Drilling Work Subtotal =              |          |              | \$ 207,122 |                                                                                                              |
|                                               | Excavate Slurry Trench in Wet Soils                                                  | 3,269                                      | cy       | \$ 26.28     | \$ 85,910  | Average unit rate assumed, Means 2009 Heavy Construction. Pg 260; 31 56 23.20 0050 and 0100                  |
|                                               | Import Soil                                                                          | 3,575                                      | ton      | \$ 22.00     | \$ 78,653  | Assumed 90% soil, 10% Bentonite Slurry Mix                                                                   |
|                                               | Bentonite                                                                            | 210                                        | ton      | \$ 203.00    | \$ 42,560  | Assumed 90% soil, 10% Bentonite Slurry Mix; Estimate provided by CETCO Lining Technologies, February 2009    |
| Decontamination                               |                                                                                      | Decontamination Subtotal =                 |          |              | \$ 2,000   |                                                                                                              |
|                                               | Decontamination /Screening Equipment                                                 | 20                                         | day      | \$ 100.00    | \$ 2,000   |                                                                                                              |
| Waste Analysis                                |                                                                                      | Waste Analysis Subtotal =                  |          |              | \$ 8,060   |                                                                                                              |
|                                               | VOCs by 3550B/8270C                                                                  | 10                                         | ea       | 100          | \$ 1,000   | Estimate provided by TestAmerica, January 2009                                                               |
|                                               | Semi-VOCs by 3550B/8270C                                                             | 10                                         | ea       | 190          | \$ 1,900   | Estimate provided by TestAmerica, January 2009                                                               |
|                                               | Organochlorine Pesticides by 3550B/8081A                                             | 10                                         | ea       | 80           | \$ 800     | Estimate provided by TestAmerica, January 2009                                                               |
|                                               | PCBs by 3550B/8082                                                                   | 10                                         | ea       | 65           | \$ 650     | Estimate provided by TestAmerica, January 2009                                                               |
|                                               | Purgeable TPH by 5035A/8015B                                                         | 10                                         | ea       | 96           | \$ 960     | Estimate provided by TestAmerica, January 2009                                                               |
|                                               | Extractable TPH by 3550B/8015B                                                       | 10                                         | ea       | 45           | \$ 450     | Estimate provided by TestAmerica, January 2009                                                               |
|                                               | TTLc, CA Title 22 Metals by 3010A/6010B and Mercury by 3010A/7470A                   | 10                                         | ea       | 130          | \$ 1,300   | Estimate provided by TestAmerica, January 2009                                                               |
|                                               | TCLP, CA Title 22 Metals by 1311                                                     | 10                                         | ea       | 50           | \$ 500     | Estimate provided by TestAmerica, January 2009                                                               |
|                                               | STLC, CA Title 22 Metals by CCR T26                                                  | 10                                         | ea       | 50           | \$ 500     | Estimate provided by TestAmerica, January 2009                                                               |
| Waste Hauling and Disposal                    |                                                                                      | Waste Hauling and Disposal Subtotal =      |          |              | \$ 294,323 |                                                                                                              |
|                                               | Class II beneficial reuse soil at Altamont Landfill                                  | 35%                                        | 1390 ton | \$ 38.82     | \$ 53,973  |                                                                                                              |
|                                               | Class II soil for disposal at Altamont Landfill                                      | 25%                                        | 993 ton  | \$ 72.42     | \$ 71,920  |                                                                                                              |
|                                               | Class I non-RCRA soil at Kettleman Hills                                             | 15%                                        | 596 ton  | \$ 81.15     | \$ 48,354  |                                                                                                              |
|                                               | Class I RCRA direct landfill soil                                                    | 10%                                        | 397 ton  | \$ 130.04    | \$ 51,657  |                                                                                                              |
|                                               | Class I RCRA stabilization soil                                                      | 10%                                        | 397 ton  | \$ 172.24    | \$ 68,420  |                                                                                                              |
|                                               | Disposal of radiologically impacted waste                                            | 5%                                         | 199 ton  | \$ 120.00    | \$ 23,834  |                                                                                                              |
| Design                                        |                                                                                      | Construction Subtotal =                    |          |              | \$ 566,961 |                                                                                                              |
|                                               | Work Plans                                                                           | Design Subtotal =                          |          |              | \$ 68,035  |                                                                                                              |
|                                               |                                                                                      |                                            |          |              | \$ 68,035  | Includes: Work Plan and Safety and Health Plan<br>QA/QC Plan; assumed to be 12 percent of construction costs |
| TOTAL CAPITAL COST (Slurry Wall Installation) |                                                                                      | TOTAL PROJECT CAPITAL COST =               |          |              | \$ 634,996 |                                                                                                              |
|                                               | Total Construction Cost                                                              |                                            |          |              | \$ 566,961 |                                                                                                              |
|                                               | Total Design Cost                                                                    |                                            |          |              | \$ 68,035  |                                                                                                              |

General Assumptions:  
On-site mixing pad/staging area will be used.  
Slurry wall will be comprised of a 90% soil / 10% bentonite mixture  
Import soil will be used to construct slurry wall



|    |                      |         |                                                                                                                                                                   |
|----|----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 46 | Capital Cost: \$2.0M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-27, E-41, E-42, and E-43. |
|----|----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-27. Groundwater Alternatives Cost Estimate Summary**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital and Labor Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Total Present Value <sup>(4)</sup> |
|----------------------|------------------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------------|
| GW-1                 | \$ -                         | \$ -           | \$ -                | 32 years                          | \$ -                      | \$ -                               |
| GW-2                 | \$ 279,318                   | \$ 2,603,930   | \$ 275,280          | 32 years                          | \$ 3,790,235              | \$ 2,640,310                       |
| GW-3A                | \$ 1,163,445                 | \$ 3,571,334   | \$ 275,280          | 32 years                          | \$ 6,012,071              | \$ 4,511,196                       |
| GW-3B                | \$ 2,064,814                 | \$ 3,676,959   | \$ 275,280          | 32 years                          | \$ 7,220,464              | \$ 5,661,667                       |
| GW-4                 | \$ 2,041,513                 | \$ 3,961,268   | \$ 275,280          | 32 years                          | \$ 7,533,673              | \$ 5,933,748                       |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for Federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)

GW-1: No Action (Retained [as required by the NCP] to provide a baseline for comparison to other alternatives)

GW-2: Institutional Controls and Long-Term Groundwater Monitoring

GW-3A: In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls

GW-3B: In-Situ Bioremediation, Zero Valent Iron Reduction, Monitored Natural Attenuation, and Institutional Controls

GW-4: Groundwater Containment, Air Sparging, In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls

**Table E-41. Groundwater Alternatives - Soil Vapor Extraction with Air Sparging Cost Detail**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                          | Quantity                                          | Unit | Unit Price   | Cost              | Remarks                                                                  |
|--------------------------------------------------------------------------------------|---------------------------------------------------|------|--------------|-------------------|--------------------------------------------------------------------------|
| <b>CAPITAL COSTS - SVE/AS SYSTEM INSTALLATION</b>                                    |                                                   |      |              |                   |                                                                          |
| <b>Pilot Study</b>                                                                   | <b>Pilot Study Subtotal =</b>                     |      |              | <b>\$ 39,430</b>  |                                                                          |
| Study Design                                                                         | 1                                                 | LS   | \$ 3,000.00  | \$ 3,000          |                                                                          |
| SVE/AS Equipment Mobilization/Demobilization                                         | 2                                                 | LS   | \$ 1,500.00  | \$ 3,000          |                                                                          |
| SVE/AS Equipment Rental                                                              | 1                                                 | LS   | \$ 9,000.00  | \$ 9,000          | Estimate provided by Maco Industries, Ltd, February 2009                 |
| Direct-Push Drilling Equipment and Support Vehicle                                   | 180                                               | mi   | \$ 6.00      | \$ 1,080          | Estimate supplied by TestAmerica Drilling, January 2009; \$6 per mile    |
| Drilling (Hollow-Stem Auger)                                                         | 1                                                 | day  | \$ 3,500.00  | \$ 3,500          | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Per Diem Travel Expenses for a 3 Person Crew                                         | 2                                                 | day  | \$ 450.00    | \$ 900            | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Well Drilling and Installation Cost                                                  | 50                                                | ft   | \$ 7.00      | \$ 350            | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Concrete Cutting                                                                     | 1                                                 | ea   | \$ 400.00    | \$ 400            | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Drums                                                                                | 8                                                 | ea   | \$ 50.00     | \$ 400            | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Well Development                                                                     | 4                                                 | hr   | \$ 180.00    | \$ 720            | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Field Measurements and Air Sampling                                                  | 5                                                 | day  | \$ 1,616.00  | \$ 8,080          | Assumed 5 field sampling days                                            |
| Laborator Analysis                                                                   | 25                                                | ea   | \$ 200.00    | \$ 5,000          |                                                                          |
| Report                                                                               | 1                                                 | LS   | \$ 4,000.00  | \$ 4,000          |                                                                          |
| <b>Mobilization and Demobilization</b>                                               | <b>Mobilization and Demobilization Subtotal =</b> |      |              | <b>\$ 3,690</b>   |                                                                          |
| SVE Equipment Mobilization                                                           | 1                                                 | LS   | \$ 1,500.00  | \$ 1,500          | Estimate provided by Maco Industries, Ltd, February 2009                 |
| Air Sparging Equipment Mobilization                                                  | 1                                                 | LS   | \$ 1,500.00  | \$ 1,500          | Estimate provided by Maco Industries, Ltd, February 2009                 |
| Direct-Push Drilling Equipment and Support Vehicle Mobilization                      | 100                                               | mi   | \$ 6.00      | \$ 600            | Estimate supplied by Precision Sampling Ltd., January 2009; \$5 per mile |
| Portable Toilet                                                                      | 2                                                 | ea   | \$ 45.00     | \$ 90             | National Construction Rentals, January 2009                              |
| <b>Temporary Facilities</b>                                                          | <b>Temporary Facilities Costs Subtotal =</b>      |      |              | <b>\$ 365</b>     |                                                                          |
| Portable Toilet and Hand Wash Station                                                | 1                                                 | mo   | \$ 140.00    | \$ 140            | National Construction Rentals, January 2009                              |
| Eye Wash Station                                                                     | 1                                                 | ea   | \$ 225.00    | \$ 225            | Estimate provided by Grainger, January 2009                              |
| <b>Equipment Rental</b>                                                              | <b>Equipment Rental Subtotal =</b>                |      |              | <b>\$ 2,000</b>   |                                                                          |
| 4x4 Pickup Truck                                                                     | 4                                                 | week | \$ 500.00    | \$ 2,000          | Estimate supplied by Hertz Equipment Rental, January 2009                |
| <b>Health &amp; Safety Equipment</b>                                                 | <b>Health and Safety Equipment Subtotal =</b>     |      |              | <b>\$ 4,000</b>   |                                                                          |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment | 80                                                | day  | \$ 50.00     | \$ 4,000          | Assumed \$50 per field worker per day                                    |
| <b>SVE/AS Equipment Installation</b>                                                 | <b>Equipment Installation Subtotal =</b>          |      |              | <b>\$ 163,446</b> |                                                                          |
| SVE and Treatment Equipment (Trailerized)                                            | 1                                                 | LS   | \$ 22,000.00 | \$ 22,000         | Estimate provided by Maco Industries, Ltd, February 2009                 |
| Air Sparging Equipment (Trailerized)                                                 | 1                                                 | LS   | \$ 25,000.00 | \$ 25,000         | Estimate provided by Maco Industries, Ltd, February 2009                 |
| Hollow-Stem Auger Drilling to Install Extraction and Sparge Points                   | 20                                                | day  | \$ 3,500.00  | \$ 70,000         | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Per Diem Travel Expenses for a 3 Person Crew                                         | 60                                                | day  | \$ 450.00    | \$ 27,000         | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Concrete Cutting                                                                     | 1                                                 | ea   | \$ 1,600.00  | \$ 1,600          | Estimate supplied by TestAmerica Drilling, January 2009                  |
| Well Development                                                                     | 80                                                | hr   | \$ 180.00    | \$ 14,400         | Estimate supplied by TestAmerica Drilling, January 2009                  |
| SVE/AS Equipment Installation                                                        | 10                                                | day  | \$ 344.60    | \$ 3,446          | Foreman, 2 laborers, and supervising field engineer                      |
| <b>Decontamination</b>                                                               | <b>Decontamination Subtotal =</b>                 |      |              | <b>\$ 1,000</b>   |                                                                          |
| Decontamination / Screening Equipment                                                | 10                                                | day  | \$ 100.00    | \$ 1,000          |                                                                          |
| <b>Waste Analysis</b>                                                                | <b>Waste Analysis Subtotal =</b>                  |      |              | <b>\$ 4,030</b>   |                                                                          |
| VOCs by 3550B/8270C                                                                  | 5                                                 | ea   | 100          | \$ 500            | Estimate provided by TestAmerica, Janurary 2009                          |
| Semi-VOCs by 3550B/8270C                                                             | 5                                                 | ea   | 190          | \$ 950            | Estimate provided by TestAmerica, Janurary 2009                          |
| Organochlorine Pesticides by 3550B/8081A                                             | 5                                                 | ea   | 80           | \$ 400            | Estimate provided by TestAmerica, Janurary 2009                          |
| PCBs by 3550B/8082                                                                   | 5                                                 | ea   | 65           | \$ 325            | Estimate provided by TestAmerica, Janurary 2009                          |
| Purgeable TPH by 5035A/8015B                                                         | 5                                                 | ea   | 96           | \$ 480            | Estimate provided by TestAmerica, Janurary 2009                          |
| Extractable TPH by 3550B/8015B                                                       | 5                                                 | ea   | 45           | \$ 225            | Estimate provided by TestAmerica, Janurary 2009                          |
| TTLC, CA Title 22 Metals by 3010A/6010B and Mercury by 3010A/7470A                   | 5                                                 | ea   | 130          | \$ 650            | Estimate provided by TestAmerica, Janurary 2009                          |
| TCLP, CA Title 22 Metals by 1311                                                     | 5                                                 | ea   | 50           | \$ 250            | Estimate provided by TestAmerica, Janurary 2009                          |
| STLC, CA Title 22 Metals by CCR T26                                                  | 5                                                 | ea   | 50           | \$ 250            | Estimate provided by TestAmerica, Janurary 2009                          |

Table E-41. Groundwater Alternatives - Soil Vapor Extraction with Air Sparging Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                   |                                                     | Quantity                | Unit   | Unit Price                               | Cost     | Remarks                                                                                                                                                      |
|-----------------------------------------------|-----------------------------------------------------|-------------------------|--------|------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Waste Hauling and Disposal                    |                                                     | Assumed Waste Fractions |        | Waste Hauling and Disposal Subtotal = \$ |          | 3,292                                                                                                                                                        |
|                                               | Class II beneficial reuse soil at Altamont Landfill | 35%                     | 11 ton | \$ 38.82                                 | \$ 408   |                                                                                                                                                              |
|                                               | Class II soil for disposal at Altamont Landfill     | 35%                     | 11 ton | \$ 72.42                                 | \$ 760   |                                                                                                                                                              |
|                                               | Class I non-RCRA soil at Kettleman Hills            | 50%                     | 15 ton | \$ 81.15                                 | \$ 1,217 |                                                                                                                                                              |
|                                               | Class I RCRA direct landfill soil                   | 10%                     | 3 ton  | \$ 130.04                                | \$ 390   |                                                                                                                                                              |
|                                               | Class I RCRA stabilization soil                     | 10%                     | 3 ton  | \$ 172.24                                | \$ 517   |                                                                                                                                                              |
|                                               | Disposal of radiologically impacted waste           | 5%                      | 2 ton  | \$ 120.00                                | \$ 180   |                                                                                                                                                              |
|                                               |                                                     |                         |        | Construction Subtotal = \$               |          | 181,823                                                                                                                                                      |
| Design                                        |                                                     |                         |        | Design Subtotal = \$                     |          | 61,249                                                                                                                                                       |
|                                               | Work Plans                                          |                         |        | \$ 21,819                                |          | Includes pilot study (see cost detail above)<br>Includes: Work Plan and Safety and Health Plan<br>QA/QC Plan; assumed to be 12 percent of construction costs |
| TOTAL CAPITAL COST (Slurry Wall Installation) |                                                     |                         |        | TOTAL PROJECT CAPITAL COST = \$          |          | 243,072                                                                                                                                                      |
| Total Construction Cost                       |                                                     |                         |        | \$                                       |          | 181,823                                                                                                                                                      |
| Total Design Cost                             |                                                     |                         |        | \$                                       |          | 61,249                                                                                                                                                       |

General Assumptions:  
Pilot study required to determine radius of influence for selection of appropriate sparge and extraction and sparging well spacing  
Sparge well spacing assumed to be approximately 50 feet  
Assumed 16 sparge and 32 extraction wells required





**Table E-42. Groundwater Alternatives - Soil Vapor Extraction with Air Sparging and Monitored Natural Attenuation Cost Detail**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Groundwater Monitoring Summary            | Nine wells to sample<br>(quarterly for 2 years, semiannually for<br>2 years, and annually for 26 years) |                  |                  |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------|------------------|
|                                           | Quarterly                                                                                               | Semiannual       | Annual           |
| Labor subtotal per year <sup>(1)</sup>    | \$ -                                                                                                    | \$ -             | \$ -             |
| Lab and Data Validation subtotal per year | \$ 23,350                                                                                               | \$ 11,675        | \$ 5,837         |
| Sampling Equipment                        | -                                                                                                       | -                | -                |
| Report subtotal per year                  | \$ 24,000                                                                                               | \$ 12,000        | \$ 6,000         |
| <b>Total monitoring costs per year</b>    | <b>\$ 47,350</b>                                                                                        | <b>\$ 23,675</b> | <b>\$ 11,837</b> |

Notes:

<sup>(1)</sup> Cost of labor and equipment required to sample wells is already borne by the long-term groundwater monitoring program

#### Lab and Data Validation Analysis

| Plume                  | Number of<br>A-aquifer Wells To<br>Sample | Years | Frequency  | Total Cost<br>per Event <sup>(1)</sup> | Total Annual<br>Cost |
|------------------------|-------------------------------------------|-------|------------|----------------------------------------|----------------------|
| Building 406 TCE Plume | 9                                         | 2,3   | Quarterly  | \$ 5,837                               | \$ 23,350            |
|                        | 9                                         | 4,5   | Semiannual | \$ 5,837                               | \$ 11,675            |
|                        | 9                                         | 6-11  | Annual     | \$ 5,837                               | \$ 5,837             |

Notes:

<sup>(1)</sup> Includes cost of quality control samples (10% duplicates and 5% matrix spike/matrix spike duplicate) and data validation (90% cursory and 10% complete)

| Laboratory Analysis Cost <sup>(1)</sup>                         | Cost per Sample |
|-----------------------------------------------------------------|-----------------|
| Total Organic Carbon                                            | \$ 35           |
| Turbidity                                                       | \$ 18           |
| Methane/Ethane/Ethene                                           | \$ 125          |
| Major Anions (Chloride, Nitrate, Nitrite, O-phosphate, Sulfate) | \$ 100          |
| Acidity                                                         | \$ 18           |
| Alkalinity                                                      | \$ 23           |
| Dissolved Hydrogen                                              | \$ 220          |
| <b>Total Analytical Suite Cost</b>                              | <b>\$ 539</b>   |

Notes:

<sup>(1)</sup> Analytical costs provided by TestAmerica Laboratories, San Francisco, CA. , January 2009

Table E-43. Groundwater Alternatives - Soil Vapor Extraction with Air Sparging Operations, Maintenance, and Monitoring Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                          | Quantity | Unit                                                   | Unit Price  | Cost      | Remarks                                                                                      |
|--------------------------------------------------------------------------------------|----------|--------------------------------------------------------|-------------|-----------|----------------------------------------------------------------------------------------------|
| <b>OM&amp;M COSTS - SVE/AS SYSTEM</b>                                                |          |                                                        |             |           |                                                                                              |
| <b>Annual Operating and Maintenance Costs</b>                                        |          | <b>Pilot Study Subtotal = \$ 56,336</b>                |             |           |                                                                                              |
| Electrical Charge                                                                    | 12       | mo                                                     | \$ 2,500.00 | \$ 30,000 | Estimate provided by Maco Industries, Ltd, February 2009                                     |
| Operational Labor                                                                    | 26       | day                                                    | \$ 632.00   | \$ 16,432 | Includes unanticipated repairs and scheduled maintenance                                     |
| System Inspections                                                                   | 6        | day                                                    | \$ 984.00   | \$ 5,904  | Estimate provided by Maco Industries, Ltd, February 2009                                     |
| GAC Changeout                                                                        | 4,000    | lb                                                     | \$ 1.00     | \$ 4,000  | Includes changeout with virgin GAC, transport and disposal; assumes four changeouts per year |
| <b>Annual Monitoring Costs</b>                                                       |          | <b>Temporary Facilities Costs Subtotal = \$ 16,292</b> |             |           |                                                                                              |
| Field Measurements and Air Sampling                                                  | 6        | day                                                    | \$ 632.00   | \$ 3,792  | Assumed 6 field sampling days                                                                |
| Laborator Analysis (VOCs by TO-15 GC/MS Full Scan)                                   | 25       | ea                                                     | \$ 260.00   | \$ 6,500  | Estimate provided by Air Toxics Ltd., February 2009                                          |
| Reports                                                                              | 6        | ea                                                     | \$ 1,000.00 | \$ 6,000  |                                                                                              |
| <b>Equipment Rental</b>                                                              |          | <b>Equipment Rental Subtotal = \$ 3,200</b>            |             |           |                                                                                              |
| 4x4 Pickup Truck                                                                     | 32       | day                                                    | \$ 100.00   | \$ 3,200  | Estimate supplied by Hertz Equipment Rental, January 2009                                    |
| <b>Health &amp; Safety Equipment</b>                                                 |          | <b>Health and Safety Equipment Subtotal = \$ 950</b>   |             |           |                                                                                              |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment | 38       | day                                                    | \$ 25.00    | \$ 950    | Assumed \$25 per field worker per day                                                        |
| <b>Total Annual O, M &amp; M Cost = \$ 76,778</b>                                    |          |                                                        |             |           |                                                                                              |

General Assumptions:  
Assumed 4 GAC changeouts per year required  
Assumed operational period would span 3 years



|    |                      |         |                                                                                                                                                                               |
|----|----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 47 | Capital Cost: \$1.1M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-45, E-52, E-53, E-66, E-69, and E-71. |
|----|----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-45. NAPL Alternatives Cost Estimate Summary<sup>1</sup>**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital and Labor Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Total Present Value <sup>(4)</sup> |
|----------------------|------------------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------------|
| N-1                  | \$ -                         | \$ -           | \$ -                | 31 years                          | \$ -                      | \$ -                               |
| N-2                  | \$ 1,098,011                 | \$ 82,950      | \$ 343,440          | 31 years                          | \$ 1,829,281              | \$ 1,659,191                       |
| N-3                  | \$ 11,233,627                | \$ 248,160     | \$ 343,440          | 34 years                          | \$ 14,190,272             | \$ 13,115,688                      |
| N-4A                 | \$ 12,476,924                | \$ 559,334     | \$ 343,440          | 35 years                          | \$ 16,055,638             | \$ 14,734,000                      |
| N-4B                 | \$ 14,110,466                | \$ 248,160     | \$ 343,440          | 35 years                          | \$ 17,642,480             | \$ 16,240,425                      |
| N-5                  | \$ 18,696,383                | \$ 559,334     | \$ 343,440          | 35 years                          | \$ 23,518,989             | \$ 22,001,139                      |
| N-6                  | \$ 17,888,983                | \$ 82,950      | \$ 343,440          | 31 years                          | \$ 21,978,447             | \$ 21,799,704                      |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for Federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)

N-1: No Action (Retained [as required by the NCP] to provide a baseline for comparison to other alternatives)

N-2: Source Containment, Long-Term Groundwater Monitoring, and Institutional Controls

N-3: Source Removal or Treatment, Containment, Monitored Natural Attenuation, and Institutional Controls

N-4A: Source Removal or Treatment, Containment, Groundwater Treatment by In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls

N-4B: Source Removal or Treatment, Groundwater Treatment by Steaming, Containment, Monitored Natural Attenuation, and Institutional Controls

N-5: Source Removal by Excavation and NAPL Extraction/Treatment, Groundwater Treatment by In-Situ Bioremediation, Containment, Monitored Natural Attenuation, and Institutional Controls

N-6: Source Removal by Excavation, Monitored Natural Attenuation, and Institutional Controls

**Table E-52. NAPL Alternatives - Monitoring Well Decommissioning Cost Detail**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| <b>Well Decomissioning</b>                      | <b>Unit</b> | <b>Quantity</b> | <b>Unit Price</b> | <b>Cost</b>         | <b>Comment</b>                                                                         |
|-------------------------------------------------|-------------|-----------------|-------------------|---------------------|----------------------------------------------------------------------------------------|
| Mobilization and Demobilization                 |             |                 |                   |                     |                                                                                        |
| Hollow-Stem Auger Drill Rig and Support Vehicle | mi          | 180             | \$ 6.00           | \$ 1,080.00         | Estimate supplied by TestAmerica Drilling, January 2009                                |
| Well Decomissioning                             |             |                 |                   |                     |                                                                                        |
| Well Head Breakout                              | ea          | 11              | \$ 100.00         | \$ 1,100.00         | Estimate supplied by TestAmerica Drilling, January 2009                                |
| Over-Drilling (Hollow-Stem Auger)               | day         | 2               | \$ 3,250.00       | \$ 6,500.00         | Estimate supplied by TestAmerica Drilling, January 2009                                |
| Per Diem Travel Expenses for a 3 Person Crew    | day         | 2               | \$ 450.00         | \$ 900.00           | Estimate supplied by TestAmerica Drilling, January 2009                                |
| Labor                                           | day         | 2               | \$ 1,771.34       | \$ 3,542.67         | Means 2009 Heavy Construction. Pg 479; Two Laborers and One Equipment Operator (light) |
| Report                                          | ea          | 1               | \$ 3,000.00       | \$ 3,000.00         |                                                                                        |
| <b>Total Well Abandonment</b>                   |             |                 |                   | <b>\$ 16,122.67</b> | 11 wells total, assuming total footage = 242 feet                                      |

Table E-53. NAPL Alternatives - Slurry Wall Installation Cost Detail

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

Estimate of Quantities:

|                                     | Length<br>(ft) | Width<br>(ft) | Average<br>Depth (ft) | Surface Area (ft <sup>2</sup> ) | Volume<br>(ft <sup>3</sup> ) |
|-------------------------------------|----------------|---------------|-----------------------|---------------------------------|------------------------------|
| Slury Wall Dimensions<br>and Volume | 885            | 2.5           | 35                    | 30,975                          | 77,438                       |

Cost Estimate:

| Description                                                                           | Quantity | Unit | Unit Price                                 | Cost | Comments                                                                                                                                    |
|---------------------------------------------------------------------------------------|----------|------|--------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------|
| CAPITAL COSTS - SLURRY WALL INSTALLATION                                              |          |      |                                            |      |                                                                                                                                             |
| Mobilization and Demobilization                                                       |          |      | Mobilization and Demobilization Subtotal = |      | \$ 56,520                                                                                                                                   |
| Excavation and Slurry Equipment                                                       | 2        | ls   | \$ 28,260.00                               | \$   | 56,520                                                                                                                                      |
| Temporary Facilities                                                                  |          |      | Temporary Facilities Costs Subtotal =      |      | \$ 437                                                                                                                                      |
| Portable Toilet                                                                       | 1        | mo   | \$ 211.70                                  | \$   | 212 Means 2009 Heavy Construction. Page 472. 01 54 33 6410                                                                                  |
| Eye Wash Station                                                                      | 1        | ea   | \$ 225.00                                  | \$   | 225 Estimate provided by Grainger, January 2009                                                                                             |
| Equipment Rental                                                                      |          |      | Equipment Rental Subtotal =                |      | \$ 1,350                                                                                                                                    |
| 4x4 Pickup Truck                                                                      | 3        | week | \$ 450.00                                  | \$   | 1,350 Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> ), January 2009                            |
| Health & Safety Equipment                                                             |          |      | Health and Safety Equipment Subtotal =     |      | \$ 10,000                                                                                                                                   |
| Includes PPE, First Aid Equipment, Fire Safety Equipment, and Spill Control Equipment | 200      | ea   | \$ 50.00                                   | \$   | 10,000 Assumed \$50 per field worker per day                                                                                                |
| Slurry Wall (Operations)                                                              |          |      | Operations Subtotal =                      |      | \$ 10,484                                                                                                                                   |
| Slurry wall excavation, clay/sand with boulders, 26'-75'                              | 32       | hr   | \$ 148.01                                  | \$   | 4,736 Means 2005 Environmental Remediation - Unit Price. Pg 2-10; 1 Equipment Operator (crane), 1 Equipment Operator (oiler), and 1 Laborer |
| Backfill slurry wall trench                                                           | 59       | hr   | \$ 97.96                                   | \$   | 5,747 Means 2005 Environmental Remediation - Unit Price. Pg 2-2; 1 Equipment Operator (medium) and 1 Laborer                                |
| Slurry Wall Installation                                                              |          |      | Post-Drilling Work Subtotal =              |      | \$ 143,699                                                                                                                                  |
| Excavate Slurry Trench in Wet Soils                                                   | 2,868    | cy   | \$ 13.03                                   | \$   | 37,368 Means 2005 Environmental Remediation - Unit Price; Pg 9-76; 33 06 0306                                                               |
| Import Soil                                                                           | 3,136    | ton  | \$ 22.00                                   | \$   | 68,997 Assumed 90% soil, 10% Bentonite Slurry Mix                                                                                           |
| Bentonite                                                                             | 184      | ton  | \$ 203.00                                  | \$   | 37,335 Assumed 90% soil, 10% Bentonite Slurry Mix; Estimate provided by CETCO Lining Technologies, February 2009                            |
| Decontamination                                                                       |          |      | Decontamination Subtotal =                 |      | \$ 1,500                                                                                                                                    |
| Decontamination/Screening Equipment                                                   | 15       | day  | \$ 100.00                                  | \$   | 1,500                                                                                                                                       |
| Waste Analysis                                                                        |          |      | Waste Analysis Subtotal =                  |      | \$ 7,254                                                                                                                                    |
| VOCs by 3550B/8270C                                                                   | 9        | ea   | 100                                        | \$   | 900 Estimate provided by TestAmerica, Janurary 2009                                                                                         |
| Semi-VOCs by 3550B/8270C                                                              | 9        | ea   | 190                                        | \$   | 1,710 Estimate provided by TestAmerica, Janurary 2009                                                                                       |
| Organochlorine Pesticides by 3550B/8081A                                              | 9        | ea   | 80                                         | \$   | 720 Estimate provided by TestAmerica, Janurary 2009                                                                                         |
| PCBs by 3550B/8082                                                                    | 9        | ea   | 65                                         | \$   | 585 Estimate provided by TestAmerica, Janurary 2009                                                                                         |
| Purgeable TPH by 5035A/8015B                                                          | 9        | ea   | 96                                         | \$   | 864 Estimate provided by TestAmerica, Janurary 2009                                                                                         |
| Extractable TPH by 3550B/8015B                                                        | 9        | ea   | 45                                         | \$   | 405 Estimate provided by TestAmerica, Janurary 2009                                                                                         |
| TTLC, CA Title 22 Metals by 3010A/6010B and Mercury by 3010A/7470A                    | 9        | ea   | 130                                        | \$   | 1,170 Estimate provided by TestAmerica, Janurary 2009                                                                                       |
| TCLP, CA Title 22 Metals by 1311                                                      | 9        | ea   | 50                                         | \$   | 450 Estimate provided by TestAmerica, Janurary 2009                                                                                         |
| STLC, CA Title 22 Metals by CCR T26                                                   | 9        | ea   | 50                                         | \$   | 450 Estimate provided by TestAmerica, Janurary 2009                                                                                         |

Table E-53. NAPL Alternatives - Slurry Wall Installation Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

Estimate of Quantities:

|                                     | Length<br>(ft) | Width<br>(ft) | Average<br>Depth (ft) | Surface Area (ft <sup>2</sup> ) | Volume<br>(ft <sup>3</sup> ) |
|-------------------------------------|----------------|---------------|-----------------------|---------------------------------|------------------------------|
| Slury Wall Dimensions<br>and Volume | 885            | 2.5           | 35                    | 30,975                          | 77,438                       |

Cost Estimate:

| Description                                   |                                                     | Quantity Unit           |           | Unit Price                            |        | Cost       | Comments                                                                           |
|-----------------------------------------------|-----------------------------------------------------|-------------------------|-----------|---------------------------------------|--------|------------|------------------------------------------------------------------------------------|
| Waste Hauling and Disposal                    |                                                     | Assumed Waste Fractions |           | Waste Hauling and Disposal Subtotal = |        | \$ 258,189 |                                                                                    |
|                                               | Class II beneficial reuse soil at Altamont Landfill | 35%                     | 1,220 ton | \$                                    | 38.82  | \$ 47,346  |                                                                                    |
|                                               | Class II soil for disposal at Altamont Landfill     | 25%                     | 871 ton   | \$                                    | 72.42  | \$ 63,090  |                                                                                    |
|                                               | Class I non-RCRA soil at Kettleman Hills            | 15%                     | 523 ton   | \$                                    | 81.15  | \$ 42,417  |                                                                                    |
|                                               | Class I RCRA direct landfill soil                   | 10%                     | 348 ton   | \$                                    | 130.04 | \$ 45,315  |                                                                                    |
|                                               | Class I RCRA stabilization soil                     | 10%                     | 348 ton   | \$                                    | 172.24 | \$ 60,020  |                                                                                    |
|                                               | Disposal of radiologically impacted waste           | 5%                      | 174 ton   | \$                                    | 120.00 | \$ 20,908  |                                                                                    |
|                                               |                                                     |                         |           | Construction Subtotal =               |        | \$ 478,949 |                                                                                    |
| Design                                        |                                                     |                         |           | Design Subtotal =                     |        | \$ 57,474  |                                                                                    |
|                                               | Work Plans                                          |                         |           |                                       |        | \$ 57,474  | Includes: Work Plan, Safety and Health Plan, QA/QC Plan; 12% of construction costs |
| TOTAL CAPITAL COST (Slurry Wall Installation) |                                                     |                         |           | TOTAL PROJECT CAPITAL COST =          |        | \$ 536,423 |                                                                                    |
| Total Construction Cost                       |                                                     |                         |           |                                       |        | \$ 478,949 |                                                                                    |
| Total Design Cost                             |                                                     |                         |           |                                       |        | \$ 57,474  |                                                                                    |

General Assumptions:  
On-site mixing pad/staging area will be used.  
Slurry wall will be comprised of a 90% soil / 10% bentonite mixture  
Import soil will be used to construct slurry wall

Table E-66. NAPL Alternatives - Monitoring Well Installation Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                                                     | Quantity                                   | Unit | Unit Price  | Cost      | Comments                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------|------|-------------|-----------|------------------------------------------------------------------------------------------------------------|
| DISTRIBUTIVE COSTS                                                                                              | DISTRIBUTIVE COSTS SUBTOTAL =              |      |             | \$ 30,597 | Includes labor and temporary facilities                                                                    |
| Labor                                                                                                           | Labor Subtotal =                           |      |             | \$ 30,160 |                                                                                                            |
| Total project labor cost (Project Manager, Project Geologist, Health and Safety Officer, Radiological Screener) |                                            |      |             | \$ 30,160 | See backup worksheet "LABOR" for unit rates                                                                |
| Temporary Facilities                                                                                            | Temporary Facilities Costs Subtotal =      |      |             | \$ 437    |                                                                                                            |
| Portable Toilet                                                                                                 | 1                                          | mo   | \$ 211.70   | \$ 212    | Means 2009 Heavy Construction. Page 472. 01 54 33 6410                                                     |
| Eye Wash Station                                                                                                | 1                                          | ea   | \$ 225.00   | \$ 225    | Estimate provided by Grainger, January 2009                                                                |
| CAPITAL COSTS - MONITORING WELL INSTALLATION                                                                    |                                            |      |             |           |                                                                                                            |
| Mobilization and Demobilization                                                                                 | Mobilization and Demobilization Subtotal = |      |             | \$ 1,080  |                                                                                                            |
| Hollow-Stem Auger Drill Rig and Support Vehicle                                                                 | 180                                        | mi   | \$ 6.00     | \$ 1,080  | Estimate supplied by TestAmerica Drilling, January 2009                                                    |
| Equipment Rental                                                                                                | Equipment Rental Subtotal =                |      |             | \$ 900    |                                                                                                            |
| 4x4 Pickup Truck                                                                                                | 2                                          | week | \$ 450.00   | \$ 900    | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> ), January 2009 |
| Health & Safety Equipment                                                                                       | Health and Safety Equipment Subtotal =     |      |             | \$ 3,750  |                                                                                                            |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment                            | 75                                         | ea   | \$ 50.00    | \$ 3,750  | Assumed \$50 per field worker per day                                                                      |
| Pre-Drilling Work                                                                                               | Pre-Drilling Work Subtotal =               |      |             | \$ 1,064  |                                                                                                            |
| Subsurface Utility Surveying                                                                                    | 8                                          | hr   | \$ 133.00   | \$ 1,064  | Estimate provided by Subtronic Surveying, January 2009                                                     |
| Well Permit Application Preparation                                                                             | 8                                          | ea   | \$ 150.00   | \$ 1,200  |                                                                                                            |
| Well Installation and Development                                                                               | Excavation Subtotal =                      |      |             | \$ 30,670 |                                                                                                            |
| Drilling (Hollow-Stem Auger)                                                                                    | 5                                          | day  | \$ 3,500.00 | \$ 17,500 | Estimate supplied by TestAmerica Drilling, January 2009                                                    |
| Per Diem Travel Expenses for a 3 Person Crew                                                                    | 5                                          | day  | \$ 450.00   | \$ 2,250  | Estimate supplied by TestAmerica Drilling, January 2009                                                    |
| Well Drilling and Installation Cost                                                                             | 280                                        | ft   | \$ 7.00     | \$ 1,960  | Estimate supplied by TestAmerica Drilling, January 2009                                                    |
| Well Box                                                                                                        | 8                                          | ea   | \$ 200.00   | \$ 1,600  | Estimate supplied by TestAmerica Drilling, January 2009                                                    |
| Concrete Cutter                                                                                                 | 2                                          | ea   | \$ 400.00   | \$ 800    | Estimate supplied by TestAmerica Drilling, January 2009                                                    |
| Drums                                                                                                           | 16                                         | ea   | \$ 50.00    | \$ 800    | Estimate supplied by TestAmerica Drilling, January 2009                                                    |
| Well Development                                                                                                | 32                                         | hr   | \$ 180.00   | \$ 5,760  | Estimate supplied by TestAmerica Drilling, January 2009                                                    |
| Post-Drilling Work                                                                                              | Post-Drilling Work Subtotal =              |      |             | \$ 1,484  |                                                                                                            |
| Land Surveying (2 person crew)                                                                                  | 1                                          | day  | \$ 1,483.65 | \$ 1,484  | Means 2009 Heavy Construction. Pg 20; 01 71 23.13 1100                                                     |
| Decontamination                                                                                                 | Decontamination Subtotal =                 |      |             | \$ 900    |                                                                                                            |
| Decontamination /Screening Equipment                                                                            | 9                                          | day  | \$ 100.00   | \$ 900    |                                                                                                            |
| Waste Analysis (Drill Cuttings)                                                                                 | Waste Analysis Subtotal =                  |      |             | \$ 8,832  |                                                                                                            |
| Purgeable TPH & VOCs                                                                                            | 8                                          | ea   | 96          | \$ 768    | Estimate provided by TestAmerica, January 2009                                                             |
| SemiVOCs                                                                                                        | 8                                          | ea   | 176         | \$ 1,408  | Estimate provided by TestAmerica, January 2009                                                             |
| PCBs by 8082                                                                                                    | 8                                          | ea   | 72          | \$ 576    | Estimate provided by TestAmerica, January 2009                                                             |
| Organochlorine Pesticides by 8081A                                                                              | 8                                          | ea   | 104         | \$ 832    | Estimate provided by TestAmerica, January 2009                                                             |
| Extractable TPH by 8015B                                                                                        | 8                                          | ea   | 48          | \$ 384    | Estimate provided by TestAmerica, January 2009                                                             |
| Metals by 6010B                                                                                                 | 8                                          | ea   | 56          | \$ 448    | Estimate provided by TestAmerica, January 2009                                                             |
| Waste Analysis (Development Water)                                                                              |                                            |      |             |           |                                                                                                            |
| Purgeable TPH & VOCs                                                                                            | 8                                          | ea   | 96          | \$ 768    | Estimate provided by TestAmerica, January 2009                                                             |
| SemiVOCs                                                                                                        | 8                                          | ea   | 176         | \$ 1,408  | Estimate provided by TestAmerica, January 2009                                                             |
| PCVs by 8082                                                                                                    | 8                                          | ea   | 72          | \$ 576    | Estimate provided by TestAmerica, January 2009                                                             |
| Organochlorine Pesticides by 8081A                                                                              | 8                                          | ea   | 104         | \$ 832    | Estimate provided by TestAmerica, January 2009                                                             |
| Extractable TPH by 8015B                                                                                        | 8                                          | ea   | 48          | \$ 384    | Estimate provided by TestAmerica, January 2009                                                             |
| Metals by 6010B                                                                                                 | 8                                          | ea   | 56          | \$ 448    | Estimate provided by TestAmerica, January 2009                                                             |
| Waste Hauling and Disposal (Drill Cuttings)                                                                     | Waste Hauling and Disposal Subtotal =      |      |             | \$ 41     |                                                                                                            |
| Class I non-RCRA soil at Kettleman Hills                                                                        | 0.5                                        | ton  | \$ 81.15    | \$ 41     |                                                                                                            |
| Waste Hauling (Development Water)                                                                               | Waste Hauling Subtotal =                   |      |             | \$ 640    |                                                                                                            |
| Hauling to CWM Kettleman Hills Landfill, Kettleman City, CA                                                     | 16                                         | drum | \$ 40.00    | \$ 640    |                                                                                                            |
| Waste Disposal (Development Water)                                                                              | Waste Disposal Subtotal =                  |      |             | \$ 1,800  |                                                                                                            |
| Non-RCRA Hazardous Waste                                                                                        | 16                                         | drum | \$ 100.00   | \$ 1,600  |                                                                                                            |
| Profiling Fee                                                                                                   | 1                                          | ls   | \$ 200.00   | \$ 200    |                                                                                                            |
| Construction Subtotal =                                                                                         |                                            |      |             | \$ 81,757 |                                                                                                            |





Table E-66. NAPL Alternatives - Monitoring Well Installation Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                            | Quantity | Unit | Unit Price                      | Cost   | Comments                                                                                                                                                                                         |
|----------------------------------------|----------|------|---------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Design                                 |          |      | Design Subtotal = \$            | 9,811  |                                                                                                                                                                                                  |
| Work Plans                             |          |      | \$                              | 9,811  | Includes: Well Installation Work Plan, Safety and Health Plan, QA/QC Plan, QAPP, and Cost Estimates; consistent with EPA guidance (pp. 5-13, EPA, 2000); assumes 12 percent of construction cost |
| TOTAL CAPITAL COST (Well Installation) |          |      | TOTAL PROJECT CAPITAL COST = \$ | 91,568 |                                                                                                                                                                                                  |
| Total Construction Cost                |          |      | \$                              | 81,757 |                                                                                                                                                                                                  |
| Total Design Cost                      |          |      | \$                              | 9,811  |                                                                                                                                                                                                  |

General Assumptions:  
Assumed 8 new wells to be installed  
Work will be performed in Level D PPE  
Drill cuttings assumed to be classifiable as Non-RCRA hazardous waste





**Table E-69. NAPL Alternatives - Long-Term Groundwater Monitoring Cost Detail**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Groundwater Monitoring Summary            | Sixteen Wells to Sample<br>(quarterly for 2 years, semiannually for 2 years, and annually for 26 years) |                   |                  |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------|------------------|
|                                           | Quarterly                                                                                               | Semiannual        | Annual           |
| Labor subtotal per year                   | \$ 140,480                                                                                              | \$ 70,240         | \$ 35,120        |
| Lab and Data Validation subtotal per year | \$ 1,692                                                                                                | \$ 846            | \$ 423           |
| Sampling Equipment                        | \$ 26,520                                                                                               | \$ 13,260         | \$ 6,630         |
| Interim Report subtotal per year          | \$ 24,000                                                                                               | \$ 12,000         | \$ 6,000         |
| Annual Report subtotal per year           | \$ 10,000                                                                                               | \$ 10,000         | \$ 10,000        |
| <b>Total monitoring costs per year</b>    | <b>\$ 202,692</b>                                                                                       | <b>\$ 106,346</b> | <b>\$ 58,173</b> |

#### Lab and Data Validation Analysis

| Plume           | Number of A-aquifer Wells To Sample | A-aquifer Analyses        | Cost Per Event for A-aquifer Wells | Number of B-aquifer Wells To Sample | B-aquifer Analyses        | Cost Per Event for B-aquifer Wells | Years | Frequency  | Total Cost per Event <sup>(1)</sup> | Total Annual Cost |
|-----------------|-------------------------------------|---------------------------|------------------------------------|-------------------------------------|---------------------------|------------------------------------|-------|------------|-------------------------------------|-------------------|
| IR-03 TPH Plume | 14                                  | 8015B, 6010, 8260B, 8081A | \$ 20                              | 2                                   | 8015B, 6010, 8260B, 8081A | \$0                                | 2,3   | Quarterly  | \$ 423                              | \$ 1,692          |
|                 | 14                                  | 8015B, 6010, 8260B, 8081A | \$ 20                              | 2                                   | 8015B, 6010, 8260B, 8081A | \$0                                | 4,5   | Semiannual | \$ 423                              | \$ 846            |
|                 | 14                                  | 8015B, 6010, 8260B, 8081A | \$ 20                              | 2                                   | 8015B, 6010, 8260B, 8081A | \$0                                | 6-31  | Annual     | \$ 423                              | \$ 423            |

Notes:

<sup>(1)</sup> Includes cost of quality control samples (10% duplicates and 5% matrix spike/matrix spike duplicate) and data validation (90% cursory and 10% complete)

| Laboratory Analysis Cost <sup>(1)</sup>                          | Cost per Sample |
|------------------------------------------------------------------|-----------------|
| PCBs by EPA Method 8082                                          | \$ 72           |
| Organochlorine Pesticides by EPA Method 8081A                    | \$ 104          |
| VOCs by EPA Method 8260B (includes purgeable TPH)                | \$ 96           |
| SVOCs by U.S. Environmental Protection Agency (EPA) Method 8270C | \$ 176          |
| Metals by EPA Method 6010/7000                                   | \$ 56           |
| Individual Metals by EPA Method 6010/7000                        | \$ 30           |
| Extractable TPH by EPA Method 8015B                              | \$ 48           |

Notes:

<sup>(1)</sup> Analytical costs provided by TestAmerica Laboratories, San Francisco, CA. on 01-21-2008

**Table E-69. NAPL Alternatives - Long-Term Groundwater Monitoring Cost Detail** *(continued)*

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| <b>Sampling Equipment Cost Analysis<sup>(1)</sup></b> | <b>Rate<sup>(1)</sup></b> | <b>Unit</b>      | <b>Amount</b> | <b>Cost per Event</b> | <b>Remarks</b>                                                                                        |
|-------------------------------------------------------|---------------------------|------------------|---------------|-----------------------|-------------------------------------------------------------------------------------------------------|
| Water Level Meter (week)                              | \$ 60                     | per week         | 2             | \$ 120                |                                                                                                       |
| Telfon Tubing (3/16" x 3/8")                          | \$ 2                      | per foot         | 500           | \$ 1,000              |                                                                                                       |
| Silicon Tubing (3/16" x 3/8")                         | \$ 1                      | per foot         | 500           | \$ 250                |                                                                                                       |
| Bladder Pump System (week)                            | \$ 450                    | per week         | 2             | \$ 900                |                                                                                                       |
| Extra Bladders, o-rings, Grab Plate                   | \$ 20                     | per unit         | 4             | \$ 80                 |                                                                                                       |
| Multi-Parameter Water Quality Meter                   | \$ 300                    | per week         | 2             | \$ 600                |                                                                                                       |
| 55-Gallon Drums                                       | \$ 42                     | per drum         | 5             | \$ 210                |                                                                                                       |
| Filters                                               | \$ 16                     | per filter       | 20            | \$ 310                |                                                                                                       |
| PPE D = Gloves                                        | \$ 6                      | per box of 100   | 2             | \$ 12                 |                                                                                                       |
| Gallon Zip Lock Bags                                  | \$ 5                      | per box of 20    | 2             | \$ 10                 |                                                                                                       |
| Quart Zip Lock Bags                                   | \$ 5                      | per box of 40    | 2             | \$ 10                 |                                                                                                       |
| Garbage Bags                                          | \$ 15                     | per box of 40    | 1             | \$ 15                 |                                                                                                       |
| Decon - Water Spray Bottles                           | \$ 5                      | per bottle       | 2             | \$ 10                 |                                                                                                       |
| Decon - Soap Spray Bottles                            | \$ 5                      | per bottle       | 2             | \$ 10                 |                                                                                                       |
| Decon - Buckets and Lids                              | \$ 5                      | per bucket       | 4             | \$ 20                 |                                                                                                       |
| Bottled Water                                         | \$ 5                      | per case         | 2             | \$ 10                 |                                                                                                       |
| DI Water                                              | \$ 2                      | per gallon       | 3             | \$ 6                  |                                                                                                       |
| Phospahte-Free Detergent                              | \$ 5                      | per container    | 1             | \$ 5                  |                                                                                                       |
| Paper Towels                                          | \$ 5                      | per roll         | 3             | \$ 15                 |                                                                                                       |
| Tool Kit                                              | \$ 50                     | per week         | 2             | \$ 100                |                                                                                                       |
| Drum Labels                                           | \$ 10                     | per package of 2 | 1             | \$ 10                 |                                                                                                       |
| Dye-Free Twine                                        | \$ 10                     | per roll         | 2             | \$ 20                 |                                                                                                       |
| Truck (day)                                           | \$ 150                    | per day          | 0             | \$ -                  |                                                                                                       |
| Truck (week)                                          | \$ 450                    | per week         | 2             | \$ 900                |                                                                                                       |
| Fuel                                                  | \$ 3                      | per gallon       | 100           | \$ 300                |                                                                                                       |
| Waste Groundwater Characterization                    | \$ 552                    | lump sum         | 1             | \$ 552                | Composite sample analyzed for metals, organic compounds, PCBs, pesticides, and petroleum hydrocarbons |
| Waste Transport and Treatment                         | \$ 200                    | per drum         | 4             | \$ 800                |                                                                                                       |
| Equipment Storage Box - 20'                           | \$ 115                    | per month        | 1             | \$ 115                |                                                                                                       |
| Equipment Storage Box - 20' - mob/demob               | \$ 240                    | delivery         | 1             | \$ 240                |                                                                                                       |
|                                                       |                           |                  | <b>Total</b>  | <b>\$ 6,630</b>       |                                                                                                       |

Notes:

<sup>(1)</sup> Unit rates provided by various local vendors in San Francisco, California

**Table E-71. NAPL Alternatives - Geosynthetic Liner Cost Detail**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                    | Quantity | Unit | Unit Price   | Cost       | Remarks                                                                                                                 |
|------------------------------------------------|----------|------|--------------|------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Design and Pre-Implementation Cost</b>      |          |      |              |            |                                                                                                                         |
| Work Plan, Safety and Health Plan, QA/QC Plan  | 1        | ea   | \$ 58,368.17 | \$ 58,368  | Assumes 12 percent of construction cost                                                                                 |
| <b>Mobilization</b>                            |          |      |              |            |                                                                                                                         |
| Dozer, 200 H.P.                                | 2        | ea   | \$ 1,039.92  | \$ 2,080   | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (2x)<br>(unit cost multiplied by 2 to account for mob & demob) |
| Sheepsfoot Roller, 240 H.P.                    | 2        | ea   | \$ 562.05    | \$ 1,124   | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (2x)<br>(unit cost multiplied by 2 to account for mob & demob) |
| <b>Geosynthetic Liner</b>                      |          |      |              |            |                                                                                                                         |
| Delivered and dumped sand for foundation layer | 1,952    | sf   | \$ 47.10     | \$ 91,921  | Means 2005 Environmental Remediation - Unit Price. Pg 4-21. 17 03 0406                                                  |
| 60 mil HDPE liner                              | 52,691   | sf   | \$ 2.92      | \$ 154,057 | Means 2005 Environmental Remediation - Unit Price. Pg 9-85. 33 08 0572                                                  |
| 16 oz/sy geotextile/drainage fabric            | 52,691   | sf   | \$ 3.54      | \$ 186,490 | Means 2005 Environmental Remediation - Unit Price. Pg 9-84. 33 08 0535                                                  |
| <b>Soil Covers</b>                             |          |      |              |            |                                                                                                                         |
| Soil analysis (1 per 1000 CY)                  | 4        | ea   | \$ 539.00    | \$ 2,104   | See "LAB COST" Worksheet for Detail                                                                                     |
| Fill material, delivered from off-site         | 3,903    | CY   | \$ 8.39      | \$ 32,761  | Means 2005 Environmental Remediation - Unit Price; Pg 4-23. 17 03 0424                                                  |
| Spread dumped material                         | 3,903    | CY   | \$ 2.33      | \$ 9,084   | Means 2009 Heavy Construction. Page 229. 31 23 23.17 0020                                                               |
| Compact soil cover, 12" lifts, 3 passes        | 3,903    | CY   | \$ 1.39      | \$ 5,412   | Means 2009 Heavy Construction. Page 247. 31 23 23.23 5620                                                               |
| <b>Landscaping</b>                             |          |      |              |            |                                                                                                                         |
| Seeding and vegetative cover                   | 1        | ac   | \$ 806.34    | \$ 975     | Means 2005 Environmental Remediation - Unit Price. Pg 5-18. 18 05 0401                                                  |
| Hydrofertilizer                                | 52,691   | sf   | \$ 0.005     | \$ 286     | Means 2009 Heavy Construction. Page 272. 32 01 90.13 0180                                                               |
| Watering                                       | 1        | ac   | \$ 89.07     | \$ 108     | Means 2005 Environmental Remediation - Unit Price. Pg 4-9; 18 05 0413                                                   |
| <b>TOTAL</b>                                   |          |      |              | \$ 544,770 |                                                                                                                         |

Notes:

Cover Area 52,691 Sf

|    |                       |         |                                                                                                                                                      |
|----|-----------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 48 | Capital Cost: \$11.2M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-45 and E-54. |
|----|-----------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-45. NAPL Alternatives Cost Estimate Summary<sup>1</sup>**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital and Labor Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Total Present Value <sup>(4)</sup> |
|----------------------|------------------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------------|
| N-1                  | \$ -                         | \$ -           | \$ -                | 31 years                          | \$ -                      | \$ -                               |
| N-2                  | \$ 1,098,011                 | \$ 82,950      | \$ 343,440          | 31 years                          | \$ 1,829,281              | \$ 1,659,191                       |
| N-3                  | \$ 11,233,627                | \$ 248,160     | \$ 343,440          | 34 years                          | \$ 14,190,272             | \$ 13,115,688                      |
| N-4A                 | \$ 12,476,924                | \$ 559,334     | \$ 343,440          | 35 years                          | \$ 16,055,638             | \$ 14,734,000                      |
| N-4B                 | \$ 14,110,466                | \$ 248,160     | \$ 343,440          | 35 years                          | \$ 17,642,480             | \$ 16,240,425                      |
| N-5                  | \$ 18,696,383                | \$ 559,334     | \$ 343,440          | 35 years                          | \$ 23,518,989             | \$ 22,001,139                      |
| N-6                  | \$ 17,888,983                | \$ 82,950      | \$ 343,440          | 31 years                          | \$ 21,978,447             | \$ 21,799,704                      |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for Federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)

N-1: No Action (Retained [as required by the NCP] to provide a baseline for comparison to other alternatives)

N-2: Source Containment, Long-Term Groundwater Monitoring, and Institutional Controls

N-3: Source Removal or Treatment, Containment, Monitored Natural Attenuation, and Institutional Controls

N-4A: Source Removal or Treatment, Containment, Groundwater Treatment by In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls

N-4B: Source Removal or Treatment, Groundwater Treatment by Steaming, Containment, Monitored Natural Attenuation, and Institutional Controls

N-5: Source Removal by Excavation and NAPL Extraction/Treatment, Groundwater Treatment by In-Situ Bioremediation, Containment, Monitored Natural Attenuation, and Institutional Controls

N-6: Source Removal by Excavation, Monitored Natural Attenuation, and Institutional Controls

Table E-54. NAPL Alternatives - Electrical Resistive Heating Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                      | Unit | Quantity | Unit Price    | Cost          | Remarks                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------|------|----------|---------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pre-Implementation Design and Testing                            |      |          |               |               |                                                                                                                                                                                                                                                                                             |
| Field and Lab SETI Testing, Modeling, and Site Evaluation        | ls   | 1        | \$ 191,496    | \$ 191,496    | Assumes duration of 11 wks                                                                                                                                                                                                                                                                  |
| Site Evaluation Test                                             |      |          |               |               | Assumes yr 0                                                                                                                                                                                                                                                                                |
| Lab Electrical Test                                              |      |          |               |               |                                                                                                                                                                                                                                                                                             |
| Laboratory Bench Tests                                           |      |          |               |               |                                                                                                                                                                                                                                                                                             |
| Numerical Modeling                                               |      |          |               |               |                                                                                                                                                                                                                                                                                             |
| Design, Work Plan, and Permits                                   | ls   | 1        | \$ 572,880    | \$ 572,880    | Assumes duration of 25 wks; assumes 12 percent of implementation costs                                                                                                                                                                                                                      |
| Design and Kick-Off Meetings                                     |      |          |               |               | Assumes yr 1                                                                                                                                                                                                                                                                                |
| Work Plan, HASP, EPP, etc.                                       |      |          |               |               | Assumes treatment volume = 97,000 yd³                                                                                                                                                                                                                                                       |
| Pre-construction survey, utility location survey                 |      |          |               |               | Model estimates approximately 1.1 million gals of NAPL in the subsurface                                                                                                                                                                                                                    |
| Remedy Implementation                                            |      |          |               |               |                                                                                                                                                                                                                                                                                             |
| Subsurface Electrode and Well Installation                       | ls   | 1        | \$ 1,389,991  | \$ 1,389,991  | Assumes duration of 20 wks                                                                                                                                                                                                                                                                  |
|                                                                  |      |          |               |               | Assumes yr 2                                                                                                                                                                                                                                                                                |
|                                                                  |      |          |               |               | 429 dual phase extraction wells will be installed. For the purpose of this cost estimate, 100% of the electrodes will be utilized during the first in a quarter of the extraction duration, 75% of the time in the second quarter, 50% in the third quarter, and 25% in the fourth quarter. |
| Equipment Construction and Mobilization                          | ls   | 1        | \$ 390,946    | \$ 390,946    | Assumes duration of 2 wks                                                                                                                                                                                                                                                                   |
|                                                                  |      |          |               |               | Assumes yr 2                                                                                                                                                                                                                                                                                |
| ERH Field Construction and Setup                                 | ls   | 1        | \$ 2,051,406  | \$ 2,051,406  | Assumes SPH construction and setup duration of 17 wks                                                                                                                                                                                                                                       |
|                                                                  |      |          |               |               | Assumes yr 2                                                                                                                                                                                                                                                                                |
|                                                                  |      |          |               |               | Electrodes should be installed at least 30 ft from the sheet pile wall                                                                                                                                                                                                                      |
| SVE Construction and Setup                                       | ls   | 1        | \$ 492,787    | \$ 492,787    | Assumes SVE construction and setup duration of 17 wks                                                                                                                                                                                                                                       |
|                                                                  |      |          |               |               | Assumes yr 2                                                                                                                                                                                                                                                                                |
| Installation of Electrical Service                               | ls   | 1        | \$ 90,000.00  | \$ 90,000.00  | Assumes yr 2                                                                                                                                                                                                                                                                                |
| Installation of Temporary Sewer Discharge Line (Above Ground)    | ls   | 1        | \$ 16,000.00  | \$ 16,000.00  | Assumes yr 2                                                                                                                                                                                                                                                                                |
| Startup Operations                                               | ls   | 1        | \$ 342,870    | \$ 342,870    | Assumes duration of 8 wks                                                                                                                                                                                                                                                                   |
|                                                                  |      |          |               |               | Assumes yr 2                                                                                                                                                                                                                                                                                |
| ERH Control and Temperature Monitoring; Offset for CO₂ Emissions |      |          |               |               | 26 (16 sensors each) temperature monitoring points                                                                                                                                                                                                                                          |
|                                                                  |      |          |               |               | Assumes steaming in select areas as a polishing alternative                                                                                                                                                                                                                                 |
| Post-Implementation Activities                                   |      |          |               |               |                                                                                                                                                                                                                                                                                             |
| ERH Operations and Maintenance for NAPL Recovery                 | ls   | 1        | \$ 3,131,911  | \$ 3,131,911  | Assumes SPH, DVE, and SVE operation duration of 59 wks                                                                                                                                                                                                                                      |
|                                                                  |      |          |               |               | Assumes yr 3                                                                                                                                                                                                                                                                                |
| ERH Operations and Maintenance for Steaming                      | ls   | 1        | \$ 1,565,956  | \$ 1,565,956  | ONLY INCLUDED IN ALTERNATIVE N-4B                                                                                                                                                                                                                                                           |
|                                                                  |      |          |               |               | Assumes yr 4                                                                                                                                                                                                                                                                                |
| Estimated Electrical Use for NAPL removal                        | ls   | 1        | 626,628       | \$ 626,628.13 | Assumes \$0.07/kWh for one year                                                                                                                                                                                                                                                             |
|                                                                  |      |          |               |               | Assumes Year 3                                                                                                                                                                                                                                                                              |
| Estimated Electrical Use for steaming                            | ls   | 1        | 626,628       | \$ 626,628.13 | ONLY INCLUDED IN ALTERNATIVE N-4B                                                                                                                                                                                                                                                           |
|                                                                  |      |          |               |               | Assumes \$0.07/kWh for 6 months                                                                                                                                                                                                                                                             |
|                                                                  |      |          |               |               | Assumes Year 4                                                                                                                                                                                                                                                                              |
| Soil, Vapor, and Water Analyses                                  | ls   | 1        | \$ 16,950.00  | \$ 16,950.00  | Assumes yr 3                                                                                                                                                                                                                                                                                |
| Water and NAPL Disposal                                          | ls   | 1        | \$ 256,690.00 | \$ 256,690.00 | Assumes condensate water disposal = \$0.01/gal                                                                                                                                                                                                                                              |
|                                                                  |      |          |               |               | NAPL can be recovered and recycled for cost savings                                                                                                                                                                                                                                         |
|                                                                  |      |          |               |               | 1,000 gal poly tank to hold recovered NAPL and groundwater                                                                                                                                                                                                                                  |
| Production Water Treatment                                       | ls   | 1        | \$ 109,875.00 | \$ 109,875.00 | Assumes 90 gpm of production water extracted and treated by GAC prior to discharge to POTW                                                                                                                                                                                                  |
|                                                                  |      |          |               |               | Assumes GAC changeouts once per 1.5 months                                                                                                                                                                                                                                                  |
|                                                                  |      |          |               |               | Assumes yr 3                                                                                                                                                                                                                                                                                |



Table E-54. NAPL Alternatives - Electrical Resistive Heating Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                                  | Unit | Quantity | Unit Price |           | Cost | Remarks    |                                                                                                                                                  |
|----------------------------------------------------------------------------------------------|------|----------|------------|-----------|------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Post-Implementation Activities (continued)                                                   |      |          |            |           |      |            |                                                                                                                                                  |
| Estimate of POTW Discharge Fees                                                              | yr   | 1        | \$         | 30,000.00 | \$   | 30,000.00  | Assumes yr 3                                                                                                                                     |
| Condenser Rental and Operation for Steaming                                                  | ls   | 1        | \$         | 92,160.00 | \$   | 92,160.00  | ONLY INCLUDED IN ALTERNATIVE N-4B<br>Assumes steaming duration of 6 months after ERH NAPL treatment completed<br>Assumes yr 4                    |
| Condensate Disposal                                                                          | ls   | 1        | \$         | 6,900.00  | \$   | 6,900.00   | ONLY INCLUDED IN ALTERNATIVE N-4B<br>Assumes condensate water disposal = \$0.01/gal<br>Assumes 690,000 gal of condensate generated over 6 months |
| Thermal Oxidizer for Vapor Treatment, 150 scfm                                               | ls   | 1        | \$         | 40,426.00 | \$   | 40,426.00  | ONLY INCLUDED IN ALTERNATIVE N-4B<br>Assumes yr 4                                                                                                |
| Electrode and Well Abandonment                                                               | ls   | 1        | \$         | 22,803.00 | \$   | 22,803.00  | Assumes well abandonment by filling with grout<br>Assumes yr 3 or 4                                                                              |
| Post-Remediation Site Restoration (Construction Clearing, Grading, and Restoration Services) | ls   | 1        | \$         | 10,720.00 | \$   | 10,720.00  | Assumes yr 3 or 4                                                                                                                                |
| Demobilization and Final Report                                                              | ls   | 1        | \$         | 391,663   | \$   | 391,663    | Assumes duration of 6 wks<br>Assumes yr 3 or 4                                                                                                   |
| Subtotal for Pre-Implementation Testing                                                      |      |          |            |           | \$   | 191,496    |                                                                                                                                                  |
| Subtotal for Pre-Implementation Design                                                       |      |          |            |           | \$   | 572,880    |                                                                                                                                                  |
| Subtotal for Remedy Implementation                                                           |      |          |            |           | \$   | 4,774,000  |                                                                                                                                                  |
| Subtotal for Post-Implementation Activities                                                  |      |          |            |           | \$   | 4,597,240  |                                                                                                                                                  |
| Total Remedy Cost <sup>2</sup>                                                               |      |          |            |           | \$   | 10,135,616 |                                                                                                                                                  |
| Subtotal for Pre-Implementation Testing                                                      |      |          |            |           | \$   | 191,496    |                                                                                                                                                  |
| Subtotal for Pre-Implementation Design                                                       |      |          |            |           | \$   | 572,880    |                                                                                                                                                  |
| Subtotal for Remedy Implementation                                                           |      |          |            |           | \$   | 4,774,000  |                                                                                                                                                  |
| Subtotal for Post-Implementation Activities                                                  |      |          |            |           | \$   | 4,597,240  |                                                                                                                                                  |
| Subtotal for Steaming                                                                        |      |          |            |           | \$   | 2,332,070  |                                                                                                                                                  |
| Total Remedy Cost <sup>3</sup>                                                               |      |          |            |           | \$   | 12,467,686 |                                                                                                                                                  |

Notes:

1. Cost estimates for ERH implementation provided by Current Environmental Services, LLC. And Thermal Remediation Services, Inc. - January, 2009. Assumes that work will be phased to optimize NAPL extraction, control capital costs, and control energy costs.

2. Does not include cost to perform steaming as a polishing step (one year duration)

3. Does include cost to perform steaming as a polishing step (additional 6 month duration)



|    |                       |         |                                                                                                                                                             |
|----|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 49 | Capital Cost: \$12.5M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-45, E-55, and E-68. |
|----|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-45. NAPL Alternatives Cost Estimate Summary<sup>1</sup>**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital and Labor Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Total Present Value <sup>(4)</sup> |
|----------------------|------------------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------------|
| N-1                  | \$ -                         | \$ -           | \$ -                | 31 years                          | \$ -                      | \$ -                               |
| N-2                  | \$ 1,098,011                 | \$ 82,950      | \$ 343,440          | 31 years                          | \$ 1,829,281              | \$ 1,659,191                       |
| N-3                  | \$ 11,233,627                | \$ 248,160     | \$ 343,440          | 34 years                          | \$ 14,190,272             | \$ 13,115,688                      |
| N-4A                 | \$ 12,476,924                | \$ 559,334     | \$ 343,440          | 35 years                          | \$ 16,055,638             | \$ 14,734,000                      |
| N-4B                 | \$ 14,110,466                | \$ 248,160     | \$ 343,440          | 35 years                          | \$ 17,642,480             | \$ 16,240,425                      |
| N-5                  | \$ 18,696,383                | \$ 559,334     | \$ 343,440          | 35 years                          | \$ 23,518,989             | \$ 22,001,139                      |
| N-6                  | \$ 17,888,983                | \$ 82,950      | \$ 343,440          | 31 years                          | \$ 21,978,447             | \$ 21,799,704                      |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for Federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)

N-1: No Action (Retained [as required by the NCP] to provide a baseline for comparison to other alternatives)

N-2: Source Containment, Long-Term Groundwater Monitoring, and Institutional Controls

N-3: Source Removal or Treatment, Containment, Monitored Natural Attenuation, and Institutional Controls

N-4A: Source Removal or Treatment, Containment, Groundwater Treatment by In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls

N-4B: Source Removal or Treatment, Groundwater Treatment by Steaming, Containment, Monitored Natural Attenuation, and Institutional Controls

N-5: Source Removal by Excavation and NAPL Extraction/Treatment, Groundwater Treatment by In-Situ Bioremediation, Containment, Monitored Natural Attenuation, and Institutional Controls

N-6: Source Removal by Excavation, Monitored Natural Attenuation, and Institutional Controls

**Table E-55. NAPL Alternatives - In-Situ Bioremediation Injection Cost Detail**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| <b>Cost to Implement ISB Using ORC at Parcel E (for Benzene)</b>                                                         |  | <b>IR03 Benzene Plume</b> |                   |
|--------------------------------------------------------------------------------------------------------------------------|--|---------------------------|-------------------|
| <b>Material Cost Summary<sup>(1)</sup></b>                                                                               |  | <b>Quantity</b>           | <b>Cost</b>       |
| ORC Advanced Application Rate (lbs/ft)                                                                                   |  | 5                         | --                |
| Amount of ORC Advanced per Point (lb)                                                                                    |  | 90                        | --                |
| Total amount of ORC Advanced (lb)                                                                                        |  | 49,500                    | --                |
| ORC Advanced Unit Cost (\$/lb)                                                                                           |  | --                        | \$ 8.15           |
| <b>Total ORC Advanced Material Cost</b>                                                                                  |  |                           | <b>\$ 403,425</b> |
| <b>Implementation Cost Summary</b>                                                                                       |  |                           |                   |
| Number of Delivery Points                                                                                                |  | 550                       | --                |
| Average Length of Injection Point (ft)                                                                                   |  | 28                        | --                |
| Total Length of Direct Push (ft)                                                                                         |  | 15,400                    | --                |
| Estimated Production Rate for Direct Push (points/day)                                                                   |  | 11                        | --                |
| Required Number of Days to Install Points (days)                                                                         |  | 50.0                      | --                |
| Cost to Install Injection Points <sup>(2)</sup>                                                                          |  | --                        | \$ 115,500        |
| <i>Geoprobe and Crew Mobilization (\$5 per mile, 100 miles each way)</i>                                                 |  | --                        | \$ 15,500         |
| <i>Geoprobe Track Rig (2-man, 8 hr/day, incl. steam cleaning and sample lining, production rate = 11 points per day)</i> |  | --                        | \$ 95,000         |
| <i>Injection Equipment (3.5 gpm, 1,000 psi)</i>                                                                          |  | --                        | \$ 5,000          |
| Point Installation Oversight                                                                                             |  | --                        | \$ 10,824         |
| Transportation Cost for ORC Delivery                                                                                     |  | --                        | \$ 4,650          |
| <b>Total Implementation Cost (ORC Advanced)</b>                                                                          |  |                           | <b>\$ 130,974</b> |
| <b>Total Cost (ORC Advanced)</b>                                                                                         |  |                           | <b>\$ 534,399</b> |

Notes:

<sup>(1)</sup> ISB modeling to produce estimates performed by Regenesis, Ltd.<sup>(2)</sup> Direct push and product injection estimates provided by Precision Sampling, Ltd.

Assumptions:

Only a single injection application required to address plumes

|                                                                       |                   |
|-----------------------------------------------------------------------|-------------------|
| <b>Design and Pre-Implementation Cost</b>                             | <b>\$ 164,128</b> |
| Design assumed to be 12% of total cost; applied to year 0             | \$ 64,128         |
| Pilot Study (estimate provided by Regenesis, Ltd.); applied to year 0 | \$ 100,000        |



**Table E-68. NAPL Alternatives - In-Situ Bioremediation Monitoring and Monitored Natural Attenuation Cost Detail**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Groundwater Monitoring Summary            | Eight Wells to Sample<br>(quarterly for 2 years, semiannually for 2 years, and<br>annually for 6 years) |                  |                 |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------|-----------------|
|                                           | Quarterly                                                                                               | Semiannual       | Annual          |
| Labor subtotal per year <sup>(1)</sup>    | \$ -                                                                                                    | \$ -             | \$ -            |
| Lab and Data Validation subtotal per year | \$ 20,755                                                                                               | \$ 10,378        | \$ 5,189        |
| Sampling Equipment <sup>(1)</sup>         | \$ -                                                                                                    | \$ -             | \$ -            |
| Report subtotal per year                  | \$ 12,000                                                                                               | \$ 6,000         | \$ 3,000        |
| <b>Total monitoring costs per year</b>    | <b>\$ 32,755</b>                                                                                        | <b>\$ 16,378</b> | <b>\$ 8,189</b> |

Notes:

<sup>(1)</sup> Cost of labor and equipment required to sample wells is already borne by the long-term groundwater monitoring program

#### Lab and Data Validation Analysis

| Plume           | Number of<br>A-aquifer Wells<br>To Sample | Years | Frequency  | Total<br>Cost per<br>Event <sup>(1)</sup> | Total<br>Annual<br>Cost |
|-----------------|-------------------------------------------|-------|------------|-------------------------------------------|-------------------------|
| IR-03 TPH Plume | 8                                         | 3,4   | Quarterly  | \$ 5,189                                  | \$ 20,755               |
|                 | 8                                         | 5,6   | Semiannual | \$ 5,189                                  | \$ 10,378               |
|                 | 8                                         | 7-31  | Annual     | \$ 5,189                                  | \$ 5,189                |

Notes:

<sup>(1)</sup> Includes cost of quality control samples (10% duplicates and 5% matrix spike/matrix spike duplicate) and data validation (90% cursory and 10% complete)

| Laboratory Analysis Cost <sup>(1)</sup>                         | Cost per Sample |
|-----------------------------------------------------------------|-----------------|
| Total Organic Carbon                                            | \$ 35           |
| Turbidity                                                       | \$ 18           |
| Methane/Ethane/Ethene                                           | \$ 125          |
| Major Anions (Chloride, Nitrate, Nitrite, O-phosphate, Sulfate) | \$ 100          |
| Acidity                                                         | \$ 18           |
| Alkalinity                                                      | \$ 23           |
| Dissolved Hydrogen                                              | \$ 220          |
| <b>Total ISB-MNA Analytical Suite</b>                           | <b>\$ 539</b>   |

Notes:

<sup>(1)</sup> Analytical costs provided by TestAmerica Laboratories, San Francisco, CA. , January 2009

|    |                       |         |                                                                                                                                                             |
|----|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 50 | Capital Cost: \$18.7M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-45, E-56, and E-59. |
|----|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-45. NAPL Alternatives Cost Estimate Summary<sup>1</sup>**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital and Labor Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Total Present Value <sup>(4)</sup> |
|----------------------|------------------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------------|
| N-1                  | \$ -                         | \$ -           | \$ -                | 31 years                          | \$ -                      | \$ -                               |
| N-2                  | \$ 1,098,011                 | \$ 82,950      | \$ 343,440          | 31 years                          | \$ 1,829,281              | \$ 1,659,191                       |
| N-3                  | \$ 11,233,627                | \$ 248,160     | \$ 343,440          | 34 years                          | \$ 14,190,272             | \$ 13,115,688                      |
| N-4A                 | \$ 12,476,924                | \$ 559,334     | \$ 343,440          | 35 years                          | \$ 16,055,638             | \$ 14,734,000                      |
| N-4B                 | \$ 14,110,466                | \$ 248,160     | \$ 343,440          | 35 years                          | \$ 17,642,480             | \$ 16,240,425                      |
| N-5                  | \$ 18,696,383                | \$ 559,334     | \$ 343,440          | 35 years                          | \$ 23,518,989             | \$ 22,001,139                      |
| N-6                  | \$ 17,888,983                | \$ 82,950      | \$ 343,440          | 31 years                          | \$ 21,978,447             | \$ 21,799,704                      |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for Federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)

N-1: No Action (Retained [as required by the NCP] to provide a baseline for comparison to other alternatives)

N-2: Source Containment, Long-Term Groundwater Monitoring, and Institutional Controls

N-3: Source Removal or Treatment, Containment, Monitored Natural Attenuation, and Institutional Controls

N-4A: Source Removal or Treatment, Containment, Groundwater Treatment by In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls

N-4B: Source Removal or Treatment, Groundwater Treatment by Steaming, Containment, Monitored Natural Attenuation, and Institutional Controls

N-5: Source Removal by Excavation and NAPL Extraction/Treatment, Groundwater Treatment by In-Situ Bioremediation, Containment, Monitored Natural Attenuation, and Institutional Controls

N-6: Source Removal by Excavation, Monitored Natural Attenuation, and Institutional Controls

Table E-56. Alternative N-5 - Capital Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                             |       |            |
|-------------------------------------------------------------|-------|------------|
| <u>San Francisco Location Factors</u>                       |       | Means 2009 |
| Material                                                    |       | 111.2%     |
| Labor & Equipment                                           |       | 141.3%     |
| Assemblies                                                  |       | 123.8%     |
| Construction Project Duration:                              | 52    | days       |
| 3.0 months or 52 working days                               | 3     | months     |
| Operations and Maintenance / Monitoring Period              | 7,965 | days       |
|                                                             | 360   | months     |
| <br><u>Means Environmental Remediation Factor Inflation</u> |       | Means 2009 |
| Assemblies and Unit Price                                   |       | 13%        |

| Description                                                                                   | Quantity                                             | Unit | Unit Price   | Cost             | Comments                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------|------------------------------------------------------|------|--------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DISTRIBUTIVE COSTS</b>                                                                     | <b>DISTRIBUTIVE COSTS SUBTOTAL = \$</b>              |      |              | <b>2,352,358</b> | Includes labor and temporary facilities                                                                                                                     |
| <b>Labor</b>                                                                                  | <b>Labor Subtotal = \$</b>                           |      |              | <b>2,326,685</b> |                                                                                                                                                             |
| Total project labor cost                                                                      |                                                      |      |              | \$ 2,326,685     | See backup worksheet "LABOR"                                                                                                                                |
| <b>Temporary Facilities</b>                                                                   | <b>Temporary Facilities Costs Subtotal = \$</b>      |      |              | <b>25,673</b>    |                                                                                                                                                             |
| Furnished Field Office Trailer (50' x 10' w/ air conditioning)                                | 3                                                    | mo   | \$ 439.49    | \$ 1,318         | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0400 + 0700                                                                                             |
| Office Equipment Rental                                                                       | 3                                                    | mo   | \$ 2,500.00  | \$ 7,500         |                                                                                                                                                             |
| Office Supplies                                                                               | 3                                                    | mo   | \$ 115.75    | \$ 347           | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0120                                                                                                    |
| City Water Supply                                                                             | 3                                                    | mo   | \$ 84.18     | \$ 253           | Means 2009 Heavy Construction. Page 14. 01 51 13.80 0700                                                                                                    |
| Telephone Bill                                                                                | 3                                                    | mo   | \$ 108.94    | \$ 327           | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0140                                                                                                    |
| Field Office Electrical Bill                                                                  | 3                                                    | mo   | \$ 204.27    | \$ 613           | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0160                                                                                                    |
| Portable Toilets (3)                                                                          | 3                                                    | mo   | \$ 635.09    | \$ 1,905         | Means 2009 Heavy Construction. Page 472. 01 54 33 6410                                                                                                      |
| Rental Trucks (3) (for supervisory staff)                                                     | 3                                                    | mo   | \$ 4,470.00  | \$ 13,410        | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> ), January 2009                                                  |
| <b>CAPITAL COSTS</b>                                                                          |                                                      |      |              |                  |                                                                                                                                                             |
| <b>Mobilization and Demobilization</b>                                                        | <b>Mobilization and Demobilization Subtotal = \$</b> |      |              | <b>11,187</b>    |                                                                                                                                                             |
| Excavator, diesel hydraulic, crawler mounted (1.5 CY capacity)                                | 1                                                    | ea   | \$ 562.05    | \$ 562           | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Skid Steer Loader, wheeled, diesel (1 CY, 78 hp) (2)                                          | 2                                                    | ea   | \$ 562.05    | \$ 1,124         | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Grader, self-propelled, 30,000 lb.                                                            | 1                                                    | ea   | \$ 562.05    | \$ 562           | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Dump truck, 8 CY (12 ton payload) (6)                                                         | 6                                                    | ea   | \$ 562.05    | \$ 3,372         | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Forklift, straight mast, 12' lift, 5,000 lb, 2 wheel drive, gas                               | 1                                                    | ea   | \$ 562.05    | \$ 562           | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Office Trailer (assumed 100 mile haul)                                                        | 1                                                    | ea   | \$ 1,225.62  | \$ 1,226         | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0800 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Modular tank, 21,000 gallons (2)                                                              | 5                                                    | hr   | \$ 190.00    | \$ 855           | BakerCorp ( <a href="http://www.bakercorp.com/">http://www.bakercorp.com/</a> ), March 2009                                                                 |
| Conveyer system with misters and radiological detectors (6)                                   | 6                                                    | ea   | \$ 393.68    | \$ 2,362         | Means 2009 Heavy Construction. Page 18. 01 54 36.50 1150 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Water truck for dust suppression, 2,000 gallon capacity                                       | 1                                                    | ea   | \$ 562.05    | \$ 562           | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| <b>Equipment Rental</b>                                                                       | <b>Equipment Rental Subtotal = \$</b>                |      |              | <b>263,412</b>   |                                                                                                                                                             |
| Excavator, diesel hydraulic, crawler mounted (1.5 CY capacity)                                | 3                                                    | mo   | \$ 10,703.48 | \$ 32,110        | Means 2009 Heavy Construction. Pg 466. 01 54 33 20 0200                                                                                                     |
| Skid Steer Loader, wheeled, diesel (1 CY, 78 hp) (2)                                          | 3                                                    | mo   | \$ 733.63    | \$ 2,201         | Means 2009 Heavy Construction. Pg 469. 01 54 33 20 4890                                                                                                     |
| Dump truck, 8 CY (12 ton payload) (6)                                                         | 3                                                    | mo   | \$ 16,532.10 | \$ 49,596        | Means 2009 Heavy Construction. Pg 469. 01 54 33 20 5250                                                                                                     |
| Forklift, straight mast, 12' lift, 5,000 lb, 2 wheel drive, gas                               | 3                                                    | mo   | \$ 2,508.08  | \$ 7,524         | Means 2009 Heavy Construction. Pg 470. 01 54 33 40 2020                                                                                                     |
| Feed pump (submersible 2", 120 gpm)                                                           | 3                                                    | mo   | \$ 284.01    | \$ 852           | Means 2009 Heavy Construction. Pg 471. 01 54 33 40 4700                                                                                                     |
| Water truck for dust suppression, 2,000 gallon capacity                                       | 3                                                    | mo   | \$ 4,761.81  | \$ 14,285        | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> ), January 2009                                                  |
| Pressure washer, gas (2,000 - 2,999 psi)                                                      | 3                                                    | mo   | \$ 1,624.95  | \$ 4,875         | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> ), January 2009                                                  |
| Conveyer system with misters and radiological detectors (6)                                   | 3                                                    | mo   | \$ 9,325.80  | \$ 27,977        | Means 2009 Heavy Construction. Pg 466; 01 54 33 10 0800                                                                                                     |
| Radiological monitoring equipment (5) for pre-excavation screening                            | 3                                                    | mo   | \$ 3,179.25  | \$ 9,538         | Ludlum Model 44-2 1"x 1" NaI GAMMA Scintillator and Ludlum Model 3 Survey Meter (unit rental cost provided by Suntrac Services, 1-800-579-4513, 03/05/2009) |
| Radiological monitoring equipment (6) for post-excavation conveyor screening                  | 3                                                    | mo   | \$ 38,151.00 | \$ 114,453       | Assumed to be 10 times the cost of the portable scintillator and meter                                                                                      |
| <b>Health &amp; Safety Equipment</b>                                                          | <b>Health and Safety Equipment Subtotal = \$</b>     |      |              | <b>91,000</b>    |                                                                                                                                                             |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment          | 1,820                                                | ea   | \$ 50.00     | \$ 91,000        | Assumed \$50 per field worker per day                                                                                                                       |
| <b>Site Preparation</b>                                                                       | <b>Site Preparation Subtotal = \$</b>                |      |              | <b>272,290</b>   |                                                                                                                                                             |
| Modular tank, 21,000 gallons (2)                                                              | 3                                                    | mo   | \$ 1,036.00  | \$ 3,108         | BakerCorp ( <a href="http://www.bakercorp.com/">http://www.bakercorp.com/</a> ), March 2009                                                                 |
| Sump pump, 25 gpm                                                                             | 1                                                    | ea   | \$ 3,648.44  | \$ 3,648         | Means 2005 Environmental Remediation - Assemblies; Pg 3-91; 33 29 0401                                                                                      |
| Soil staging area grading, 1/2 acre                                                           | 2,420                                                | sy   | \$ 1.77      | \$ 4,284         | Means 2009 Heavy Construction. Pg 211; 31 22 16.10 1100                                                                                                     |
| Soil staging area liner, includes rad screening and stockpiling areas (1/2 acre, 80 mil HDPE) | 21,780                                               | sf   | \$ 4.18      | \$ 91,102        | Means 2005 Environmental Remediation - Assemblies; Pg 3-90; 33 08 0573                                                                                      |
| Laydown area grading (100 x 100 ft)                                                           | 1,111                                                | sy   | \$ 0.92      | \$ 1,018         | Means 2009 Heavy Construction. Pg 211; 31 22 16.10 0100                                                                                                     |
| Granular cover over laydown area (6 inch thick crushed stone)                                 | 1,111                                                | sy   | \$ 13.00     | \$ 14,442        | Means 2009 Heavy Construction. Pg 275; 32 11 23.23 0100                                                                                                     |
| Site security (24-hours uniformed watchman at entrance)                                       | 2,160                                                | hr   | \$ 70.65     | \$ 152,604       | Means 2009 Heavy Construction. Pg 20; 01 56 32.50 0100                                                                                                      |
| Land Surveying (2 person crew)                                                                | 1                                                    | day  | \$ 1,483.65  | \$ 1,484         | Means 2009 Heavy Construction. Pg 20; 01 71 23.13 1100                                                                                                      |
| Subsurface utility surveying                                                                  | 2                                                    | hr   | \$ 600.00    | \$ 600           | Quote from Subtronic Surveying (800) 998-3463, 03/04/2009.                                                                                                  |



Table E-56. Alternative N-5 - Capital Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                             |       |            |
|-------------------------------------------------------------|-------|------------|
| <u>San Francisco Location Factors</u>                       |       | Means 2009 |
| Material                                                    |       | 111.2%     |
| Labor & Equipment                                           |       | 141.3%     |
| Assemblies                                                  |       | 123.8%     |
| Construction Project Duration:                              | 52    | days       |
| 3.0 months or 52 working days                               | 3     | months     |
| Operations and Maintenance / Monitoring Period              | 7,965 | days       |
|                                                             | 360   | months     |
| <br><u>Means Environmental Remediation Factor Inflation</u> |       | Means 2009 |
| Assemblies and Unit Price                                   |       | 13%        |

| Description                                                                                               | Quantity                                       | Unit                                         | Unit Price   | Cost                | Comments                                                                                           |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------|--------------|---------------------|----------------------------------------------------------------------------------------------------|
| <b>CAPITAL COSTS (continued)</b>                                                                          |                                                |                                              |              |                     |                                                                                                    |
| <b>Pre-Construction Demolition</b>                                                                        | <b>Pre-Construction Demolition Subtotal =</b>  |                                              |              | <b>\$ 16,123</b>    |                                                                                                    |
| Monitoring well abandonment                                                                               | 1                                              | ls                                           | \$ 16,122.67 | \$ 16,123           | See Backup Worksheet "WELL ABANDON"                                                                |
| <b>Excavation and Backfill (Operations)</b>                                                               | <b>Excavation Subtotal =</b>                   |                                              |              | <b>\$ 191,518</b>   |                                                                                                    |
| Excavator, diesel hydraulic, crawler mounted (1.5 CY capacity)                                            | 13                                             | day                                          | \$ 1,276.79  | \$ 16,598           | Means 2009 Heavy Construction. Pg 482; 1 Equipment Operator (crane) and 1 laborer                  |
| Skid Steer Loader, wheeled, diesel (1 CY, 78 hp) (2)                                                      | 24                                             | day                                          | \$ 1,958.98  | \$ 47,016           | Means 2009 Heavy Construction. Pg 481; 1 Equipment Operator (medium) and 0.5 laborer               |
| Grader, self-propelled, 30,000 lb.                                                                        | 10                                             | day                                          | \$ 2,111.62  | \$ 21,116           | Means 2009 Heavy Construction. Pg 482; Crew B-11L                                                  |
| Dump truck, 8 CY (12 ton payload) (6)                                                                     | 24                                             | day                                          | \$ 3,333.55  | \$ 80,005           | Means 2009 Heavy Construction. Pg 477; 1 Truck Driver (heavy)                                      |
| Water truck for dust suppression, 2,000 gallon capacity                                                   | 52                                             | day                                          | \$ 486.78    | \$ 25,313           | Means 2009 Heavy Construction. Pg 477; 1 Truck Driver (heavy)                                      |
| Dewatering with contractor's pump (4 inch dia., 300 gpm)                                                  | 13                                             | day                                          | \$ 113.08    | \$ 1,470            | Means 2005 Environmental Remediation - Unit Price; Pg 4-31; 17 03 1004                             |
| <b>Air Monitoring</b>                                                                                     | <b>Monitoring Subtotal =</b>                   |                                              |              | <b>\$ 28,963</b>    |                                                                                                    |
| Ambient air monitors (3 total -placement frequency biased towards prevailing winds and residential areas) | 3                                              | mo                                           | \$ 3,042.69  | \$ 9,128            | Means 2005 Environmental Remediation - Unit Price; Pg 9-10; 33 02 0315                             |
| Analysis - principal organic hazardous constituents (1 per monitor per week)                              | 24                                             | ea                                           | \$ 354.31    | \$ 8,503            | Means 2005 Environmental Remediation - Unit Price; Pg 9-38; 33 02 1802                             |
| Analysis - hydrocarbons (1 per monitor per week)                                                          | 24                                             | ea                                           | \$ 125.90    | \$ 3,022            | Means 2005 Environmental Remediation - Unit Price; Pg 9-39; 33 02 1811                             |
| Portable ambient air analyzer                                                                             | 3                                              | mo                                           | \$ 2,238.30  | \$ 6,715            | Means 2005 Environmental Remediation - Unit Price; Pg 9-10; 33 02 0328                             |
| Portable combustible gas/oxygen indicator                                                                 | 3                                              | mo                                           | \$ 531.60    | \$ 1,595            | Means 2005 Environmental Remediation - Unit Price; Pg 9-11; 33 02 0330                             |
| <b>Storm Water Control</b>                                                                                | <b>Storm Water Control Subtotal =</b>          |                                              |              | <b>\$ 4,000</b>     |                                                                                                    |
| Construction SWPPP implementation                                                                         | 1                                              | ea                                           | \$ 4,000.00  | \$ 4,000            |                                                                                                    |
| <b>Contaminated Water Treatment</b>                                                                       | <b>Contaminated Water Treatment Subtotal =</b> |                                              |              | <b>\$ 61,643</b>    |                                                                                                    |
| Structural slab on grade (8 in. thick; 60 x 15 ft.)                                                       | 900                                            | sf                                           | \$ 10.48     | \$ 9,430            | Means 2005 Environmental Remediation - Assemblies; Pg 3-60; 18 02 0322                             |
| Box weir                                                                                                  | 3                                              | mo                                           | \$ 1,064.00  | \$ 3,192            | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Electric centrifugal pump, 20 GPM                                                                         | 3                                              | mo                                           | \$ 1,250.00  | \$ 3,750            | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Electrical panel and cable                                                                                | 3                                              | mo                                           | \$ 100.00    | \$ 300              | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Particulate filter, PF 50 (2)                                                                             | 3                                              | mo                                           | \$ 1,500.00  | \$ 4,500            | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Clay vessel, 35 CY                                                                                        | 3                                              | mo                                           | \$ 225.00    | \$ 675              | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Carbon vessels, 2,000 lbs (3)                                                                             | 3                                              | mo                                           | \$ 2,277.00  | \$ 6,831            | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Miscellaneous pipe, hose, adapters, etc.                                                                  | 3                                              | mo                                           | \$ 1,000.00  | \$ 3,000            | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Organophillic clay, initial fill                                                                          | 1                                              | ls                                           | \$ 4,945.00  | \$ 4,945            | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| 12x30 Virgin coconut shell carbon acid washed, initial fill                                               | 6,000                                          | lb                                           | \$ 1.25      | \$ 7,500            | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Disposal of clay and carbon                                                                               | 1                                              | ls                                           | \$ 3,070.00  | \$ 3,070            | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Mobilization of clay and carbon filtration system                                                         | 1                                              | ls                                           | \$ 500.00    | \$ 500              | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Demobilization of clay and carbon filtration system                                                       | 1                                              | ls                                           | \$ 725.00    | \$ 725              | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Filter bags, 25 micron PDDA                                                                               | 1                                              | ea                                           | \$ 3.20      | \$ 3                | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Particulate filter cartridges, 5.0 micron                                                                 | 8                                              | ea                                           | \$ 9.05      | \$ 72               | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Delivery and pick-up hauling                                                                              | 1                                              | ls                                           | \$ 1,260.00  | \$ 1,260            | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Fuel Surcharge                                                                                            | 1                                              | ls                                           | \$ 378.00    | \$ 378              | Quote from Rain for Rent (www.rainforrent.com), for Stockton site, 10/3/2008                       |
| Wastewater analysis (1 sample per day + 10% QC samples)                                                   | 14                                             | ea                                           | \$ 805.00    | \$ 11,512           | Quote from Surinder Sidhu at STL, (925) 484-1919; See "DISCHARGE SAMPLE COST" Worksheet for Detail |
| <b>Waste Hauling and Disposal</b>                                                                         | <b>Assumed Waste Fractions</b>                 | <b>Waste Hauling and Disposal Subtotal =</b> |              | <b>\$ 2,264,816</b> |                                                                                                    |
| Class II beneficial reuse soil at Altamont Landfill                                                       | 35%                                            | 9897                                         | ton          | \$ 38.82            | \$ 384,206                                                                                         |
| Class II soil for disposal at Altamont Landfill                                                           | 25%                                            | 7069                                         | ton          | \$ 72.42            | \$ 511,964                                                                                         |
| Class I non-RCRA soil at Kettleman Hills                                                                  | 15%                                            | 4242                                         | ton          | \$ 81.15            | \$ 344,208                                                                                         |
| Class I RCRA direct landfill soil                                                                         | 10%                                            | 2828                                         | ton          | \$ 130.04           | \$ 367,721                                                                                         |
| Class I RCRA stabilization soil                                                                           | 10%                                            | 2828                                         | ton          | \$ 172.24           | \$ 487,052                                                                                         |
| Disposal of radiologically impacted waste                                                                 | 5%                                             | 1414                                         | ton          | \$ 120.00           | \$ 169,665                                                                                         |
| <b>Backfilling</b>                                                                                        | <b>Backfilling Subtotal =</b>                  |                                              |              | <b>\$ 384,905</b>   |                                                                                                    |
| Backfill landfill with unclassified fill (delivered, spread, compacted in 6-in. lifts)                    |                                                | 28,278                                       | cy           | \$ 13.61            | \$ 384,905 Means 2005 Environmental Remediation - Unit Price; Pg 4-23; 17 03 0423                  |



Table E-56. Alternative N-5 - Capital Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                  |       |            |
|--------------------------------------------------|-------|------------|
| San Francisco Location Factors                   |       | Means 2009 |
| Material                                         |       | 111.2%     |
| Labor & Equipment                                |       | 141.3%     |
| Assemblies                                       |       | 123.8%     |
| Construction Project Duration:                   | 52    | days       |
| 3.0 months or 52 working days                    | 3     | months     |
| Operations and Maintenance / Monitoring Period   | 7,965 | days       |
|                                                  | 360   | months     |
| Means Environmental Remediation Factor Inflation |       | Means 2009 |
| Assemblies and Unit Price                        |       | 13%        |

| Description                                                                                | Quantity                              | Unit | Unit Price | Cost         | Comments                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------|---------------------------------------|------|------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CAPITAL COSTS (continued)                                                                  |                                       |      |            |              |                                                                                                                                                                                    |
| Soil Covers                                                                                | Soil Covers Subtotal =                |      |            | \$ 49,360    |                                                                                                                                                                                    |
| Soil analysis (1 per 1000 CY)                                                              | 4                                     | ea   | \$ 539.00  | \$ 2,104     | See "LAB COST" Worksheet for Detail                                                                                                                                                |
| Fill material, delivered from off-site                                                     | 3,903                                 | CY   | \$ 8.39    | \$ 32,761    | Means 2005 Environmental Remediation - Unit Price; Pg 4-23. 17 03 0424                                                                                                             |
| Spread dumped material                                                                     | 3,903                                 | CY   | \$ 2.33    | \$ 9,084     | Means 2009 Heavy Construction. Page 229. 31 23 23.17 0020                                                                                                                          |
| Compact soil cover, 12" lifts, 3 passes                                                    | 3,903                                 | CY   | \$ 1.39    | \$ 5,412     | Means 2009 Heavy Construction. Page 247. 31 23 23.23 5620                                                                                                                          |
| Landscaping                                                                                | Landscaping Subtotal =                |      |            | \$ 1,314     |                                                                                                                                                                                    |
| Seeding and vegetative cover                                                               | 1                                     | ac   | \$ 806.34  | \$ 975       | Means 2005 Environmental Remediation - Unit Price. Pg 5-18. 18 05 0401                                                                                                             |
| Hydrofertilizer                                                                            | 52,691                                | sf   | \$ 0.004   | \$ 231       | Means 2009 Heavy Construction. Page 272. 32 01 90.13 0180                                                                                                                          |
| Watering                                                                                   | 1                                     | ac   | \$ 89.07   | \$ 108       | Means 2005 Environmental Remediation - Unit Price. Pg 4-9; 18 05 0413                                                                                                              |
| Site Restoration                                                                           | Site Restoration Subtotal =           |      |            | \$ 46,601    |                                                                                                                                                                                    |
| Soil staging area liner removal (assumed 1/2 of construction cost)                         | 21,780                                | sf   | \$ 2.09    | \$ 45,551    | Assumed half of installation cost                                                                                                                                                  |
| Land Surveying (topographical)                                                             | 2                                     | ac   | \$ 525.00  | \$ 1,050     | Means 2009 Heavy Construction. Pg 22; 02 21 13.09 0020                                                                                                                             |
|                                                                                            | Construction Subtotal =               |      |            | \$ 6,039,491 |                                                                                                                                                                                    |
| Design                                                                                     | Design Subtotal =                     |      |            | \$ 724,739   |                                                                                                                                                                                    |
| Pre-design characterization study assumed to be 6% of construction cost (including report) |                                       |      |            | \$ 362,369   |                                                                                                                                                                                    |
| Design assumed to be 6% of construction cost (including permitting)                        |                                       |      |            | \$ 362,369   | Includes: Remedial Design, Design Basis Report, Safety and Health Plan, Contingency Plan, QA/QC Plan, QAPP, and Cost Estimates; consistent with EPA guidance (pp. 5-13, EPA, 2000) |
| TOTAL PROJECT CAPITAL COST                                                                 | TOTAL PROJECT CAPITAL COST =          |      |            | \$ 6,764,229 |                                                                                                                                                                                    |
| Total Construction Cost                                                                    |                                       |      |            | \$ 6,039,491 |                                                                                                                                                                                    |
| Total Design Cost                                                                          |                                       |      |            | \$ 724,739   |                                                                                                                                                                                    |
|                                                                                            | TOTAL COST PER CY OF SOIL EXCAVATED = |      |            | \$ 335       |                                                                                                                                                                                    |

General Assumptions:  
Work will be performed in Level D PPE  
Excavation dewatering will be implemented as needed using a skid-mounted pump through dewatering points  
Water from decontamination and dewatering activities will require treatment and discharge to a sanitary sewer line, or to the San Francisco Bay under NPDES permit  
Dewatering and treatment volume estimates provided in worksheet "DEWATER"  
Stripped landfill cap can be used as fill material  
Finish grade will slope evenly from north to south; backfill volume estimated by proposed grading plan, and includes a 20% contingency and a 20% fluff factor to account for compaction and consolidation  
Assumed soil density of 1.4 ton/cy



**Table E-59. Alternative N-5 - Dewatering (and Treatment) Volume**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                        | Excavation<br>Area (ft <sup>2</sup> ) | Saturated<br>Depth (feet) | Effective<br>Porosity        |                     |                       |                         |            |                  | Volume (G) |
|----------------------------------------|---------------------------------------|---------------------------|------------------------------|---------------------|-----------------------|-------------------------|------------|------------------|------------|
| Initial Dewatering                     | 52,691                                | 2                         | 0.25                         |                     |                       |                         |            |                  | 197,064    |
|                                        | Slurry Wall<br>Length (feet)          | Saturated<br>Depth (feet) | Total Joint<br>Length (feet) | Leakage<br>(ml/s/m) | Leakage<br>(G/day/ft) | Leakage Rate<br>(G/day) | Total Days | Total Volume (G) |            |
| Ongoing dewatering                     | 885                                   | 2                         | 885                          | 0.5                 | 3.48                  | 3079.8                  | 13         | 40,037           |            |
|                                        | Rate (G/day)                          |                           |                              |                     |                       |                         | Total Days | Total Volume (G) |            |
| Daily waste dewatering                 | 25                                    |                           |                              |                     |                       |                         | 13         | 325              |            |
|                                        | Rate (G/day)                          |                           |                              |                     |                       |                         | Total Days | Total Volume (G) |            |
| Daily decontamination                  | 100                                   |                           |                              |                     |                       |                         | 13         | 1,300            |            |
| Total Volume Requiring Treatment (G) = |                                       |                           |                              |                     |                       |                         |            | 238,727          |            |

|    |                       |         |                                                                                                                                                             |
|----|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 51 | Capital Cost: \$17.9M | Table 9 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Appendix E, Tables E-45, E-60, and E-63. |
|----|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table E-45. NAPL Alternatives Cost Estimate Summary<sup>1</sup>**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial Alternative | Total Capital and Labor Cost | Total O&M Cost | Total Periodic Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Total Present Value <sup>(4)</sup> |
|----------------------|------------------------------|----------------|---------------------|-----------------------------------|---------------------------|------------------------------------|
| N-1                  | \$ -                         | \$ -           | \$ -                | 31 years                          | \$ -                      | \$ -                               |
| N-2                  | \$ 1,098,011                 | \$ 82,950      | \$ 343,440          | 31 years                          | \$ 1,829,281              | \$ 1,659,191                       |
| N-3                  | \$ 11,233,627                | \$ 248,160     | \$ 343,440          | 34 years                          | \$ 14,190,272             | \$ 13,115,688                      |
| N-4A                 | \$ 12,476,924                | \$ 559,334     | \$ 343,440          | 35 years                          | \$ 16,055,638             | \$ 14,734,000                      |
| N-4B                 | \$ 14,110,466                | \$ 248,160     | \$ 343,440          | 35 years                          | \$ 17,642,480             | \$ 16,240,425                      |
| N-5                  | \$ 18,696,383                | \$ 559,334     | \$ 343,440          | 35 years                          | \$ 23,518,989             | \$ 22,001,139                      |
| N-6                  | \$ 17,888,983                | \$ 82,950      | \$ 343,440          | 31 years                          | \$ 21,978,447             | \$ 21,799,704                      |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for Federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)

N-1: No Action (Retained [as required by the NCP] to provide a baseline for comparison to other alternatives)

N-2: Source Containment, Long-Term Groundwater Monitoring, and Institutional Controls

N-3: Source Removal or Treatment, Containment, Monitored Natural Attenuation, and Institutional Controls

N-4A: Source Removal or Treatment, Containment, Groundwater Treatment by In-Situ Bioremediation, Monitored Natural Attenuation, and Institutional Controls

N-4B: Source Removal or Treatment, Groundwater Treatment by Steaming, Containment, Monitored Natural Attenuation, and Institutional Controls

N-5: Source Removal by Excavation and NAPL Extraction/Treatment, Groundwater Treatment by In-Situ Bioremediation, Containment, Monitored Natural Attenuation, and Institutional Controls

N-6: Source Removal by Excavation, Monitored Natural Attenuation, and Institutional Controls



Table E-60. Alternative N-6 - Capital Cost Detail  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                         |      |        |  |            |
|---------------------------------------------------------|------|--------|--|------------|
| <u>San Francisco Location Factors</u>                   |      |        |  | Means 2009 |
| Material                                                |      |        |  | 111.2%     |
| Labor & Equipment                                       |      |        |  | 141.3%     |
| Assemblies                                              |      |        |  | 123.8%     |
| Construction Project Duration:                          | 117  | days   |  |            |
| 6.0 months or 117 working days                          | 6    | months |  |            |
| Operations and Maintenance / Monitoring Period          | 7965 | days   |  |            |
|                                                         | 360  | months |  |            |
| <u>Means Environmental Remediation Factor Inflation</u> |      |        |  | Means 2009 |
| Assemblies and Unit Price                               |      |        |  | 13%        |

| Description                                                                                 | Quantity                             | Unit | Unit Price   | Cost                                                        | Comments                                                                                                                                                    |
|---------------------------------------------------------------------------------------------|--------------------------------------|------|--------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DISTRIBUTIVE COSTS</b>                                                                   | <b>DISTRIBUTIVE COSTS SUBTOTAL =</b> |      |              | <b>\$ 4,183,088</b>                                         | Includes labor and temporary facilities                                                                                                                     |
| <b>Labor</b>                                                                                |                                      |      |              | <b>Labor Subtotal = \$ 4,129,201</b>                        |                                                                                                                                                             |
| Total project labor cost                                                                    |                                      |      |              | \$ 4,129,201                                                | See backup worksheet "LABOR"                                                                                                                                |
| <b>Temporary Facilities</b>                                                                 |                                      |      |              | <b>Temporary Facilities Costs Subtotal = \$ 53,887</b>      |                                                                                                                                                             |
| Furnished Field Office Trailer (50' x 10' w/ air conditioning)                              | 6                                    | mo   | \$ 439.49    | \$ 2,637                                                    | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0400 + 0700                                                                                             |
| Office Equipment Rental                                                                     | 6                                    | mo   | \$ 2,500.00  | \$ 15,000                                                   |                                                                                                                                                             |
| Office Supplies                                                                             | 6                                    | mo   | \$ 115.75    | \$ 695                                                      | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0120                                                                                                    |
| City Water Supply                                                                           | 6                                    | mo   | \$ 84.18     | \$ 505                                                      | Means 2009 Heavy Construction. Page 14. 01 51 13.80 0700                                                                                                    |
| Telephone Bill                                                                              | 6                                    | mo   | \$ 108.94    | \$ 654                                                      | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0140                                                                                                    |
| Field Office Electrical Bill                                                                | 6                                    | mo   | \$ 204.27    | \$ 1,226                                                    | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0160                                                                                                    |
| Portable Toilets (5)                                                                        | 6                                    | mo   | \$ 1,058.49  | \$ 6,351                                                    | Means 2009 Heavy Construction. Page 472. 01 54 33 6410                                                                                                      |
| Rental Trucks (3) (for supervisory staff)                                                   | 6                                    | mo   | \$ 4,470.00  | \$ 26,820                                                   | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> ), January 2009                                                  |
| <b>CAPITAL COSTS</b>                                                                        |                                      |      |              |                                                             |                                                                                                                                                             |
| <b>Mobilization and Demobilization</b>                                                      |                                      |      |              | <b>Mobilization and Demobilization Subtotal = \$ 19,890</b> |                                                                                                                                                             |
| Crawler Crane, 40 ton                                                                       | 1                                    | ea   | \$ 562.05    | \$ 562                                                      | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Excavator, diesel hydraulic, crawler mounted (2 CY capacity) (2)                            | 2                                    | ea   | \$ 562.05    | \$ 1,124                                                    | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Backhoe-loader, 80 hp, 1.25 CY capacity (4)                                                 | 4                                    | ea   | \$ 562.05    | \$ 2,248                                                    | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Grader, self-propelled, 30,000 lb.                                                          | 1                                    | ea   | \$ 562.05    | \$ 562                                                      | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Vibrating hammer and generator                                                              | 1                                    | ea   | \$ 562.05    | \$ 562                                                      | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Dump truck, 8 CY (12 ton payload) (11)                                                      | 11                                   | ea   | \$ 562.05    | \$ 6,183                                                    | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Office Trailer (assumed 100 mile haul)                                                      | 1                                    | ea   | \$ 1,225.62  | \$ 1,226                                                    | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0800 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Modular tank, 21,000 gallons (5)                                                            | 5                                    | hr   | \$ 475.00    | \$ 2,138                                                    | BakerCorp ( <a href="http://www.bakercorp.com/">http://www.bakercorp.com/</a> ), March 2009                                                                 |
| Conveyer system with misters and radiological detectors (12)                                | 12                                   | ea   | \$ 393.68    | \$ 4,724                                                    | Means 2009 Heavy Construction. Page 18. 01 54 36.50 1150 (unit cost multiplied by 2 to account for mob & demob)                                             |
| Water truck for dust suppression, 6,000 gallon capacity                                     | 1                                    | ea   | \$ 562.05    | \$ 562                                                      | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob)                                             |
| <b>Equipment Rental</b>                                                                     |                                      |      |              | <b>Equipment Rental Subtotal = \$ 836,585</b>               |                                                                                                                                                             |
| Excavator, diesel hydraulic, crawler mounted (2 CY capacity) (2)                            | 6                                    | mo   | \$ 4,041.18  | \$ 24,247                                                   | Means 2009 Heavy Construction. Pg 466. 01 54 33 20 0320                                                                                                     |
| Backhoe-loader, 80 hp, 1.25 CY capacity (4)                                                 | 6                                    | mo   | \$ 16,390.80 | \$ 98,345                                                   | Means 2009 Heavy Construction. Pg 467. 01 54 33 20 0460                                                                                                     |
| Dump truck, 8 CY (12 ton payload) (11)                                                      | 6                                    | mo   | \$ 30,308.85 | \$ 181,853                                                  | Means 2009 Heavy Construction. Pg 469. 01 54 33 20 5250                                                                                                     |
| Feed pump (submersible 2", 120 gpm) (2)                                                     | 6                                    | mo   | \$ 568.03    | \$ 3,408                                                    | Means 2009 Heavy Construction. Pg 471. 01 54 33 40 4700                                                                                                     |
| Water truck for dust suppression, 6,000 gallon capacity                                     | 6                                    | mo   | \$ 9,820.35  | \$ 58,922                                                   | Means 2009 Heavy Construction. Pg 472. 01 54 33 40 6950                                                                                                     |
| Pressure washer, gas (2,000 - 2,999 psi)                                                    | 6                                    | mo   | \$ 1,150.00  | \$ 6,900                                                    | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> ), January 2009                                                  |
| Conveyer system with misters and radiological detectors (12)                                | 6                                    | mo   | \$ 18,651.60 | \$ 111,910                                                  | Means 2009 Heavy Construction. Pg 466; 01 54 33 10 0800                                                                                                     |
| Radiological monitoring equipment (10) for pre-excavation screening                         | 6                                    | mo   | \$ 4,500.00  | \$ 27,000                                                   | Ludlum Model 44-2 1"x 1" NaI GAMMA Scintillator and Ludlum Model 3 Survey Meter (unit rental cost provided by Suntrac Services, 1-800-579-4513, 03/05/2009) |
| Radiological monitoring equipment (12) for post-excavation conveyor screening               | 6                                    | mo   | \$ 54,000.00 | \$ 324,000                                                  | Assumed to be 10 times the cost of the portable scintillator and meter                                                                                      |
| <b>Health &amp; Safety Equipment</b>                                                        |                                      |      |              | <b>Health and Safety Equipment Subtotal = \$ 321,750</b>    |                                                                                                                                                             |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment        | 6,435                                | ea   | \$ 50.00     | \$ 321,750                                                  | Assumed \$50 per field worker per day                                                                                                                       |
| <b>Site Preparation</b>                                                                     |                                      |      |              | <b>Site Preparation Subtotal = \$ 532,632</b>               |                                                                                                                                                             |
| Sheet piling steel, left in place, 40 ft. deep excavation, 38 psf                           | 588                                  | ton  | \$ 2,104.60  | \$ 1,237,505                                                | Means 2009 Heavy Construction. Pg 257; 31 41 16.10 0900                                                                                                     |
| Wales, connections, and struts, 2/3 salvage                                                 | 59                                   | ton  | \$ 371.40    | \$ 21,838                                                   | Means 2009 Heavy Construction. Pg 257; 31 41 16.10 2500                                                                                                     |
| Modular tank, 21,000 gallons (5)                                                            | 6                                    | mo   | \$ 1,036.00  | \$ 6,216                                                    | BakerCorp ( <a href="http://www.bakercorp.com/">http://www.bakercorp.com/</a> ), March 2009                                                                 |
| Sump pump, 25 gpm                                                                           | 1                                    | ea   | \$ 3,648.44  | \$ 3,648                                                    | Means 2005 Environmental Remediation - Assemblies; Pg 3-91; 33 29 0401                                                                                      |
| Soil staging area grading, 1 acre                                                           | 4,840                                | sy   | \$ 1.77      | \$ 8,568                                                    | Means 2009 Heavy Construction. Pg 211; 31 22 16.10 1100                                                                                                     |
| Soil staging area liner, includes rad screening and stockpiling areas (1 acre, 80 mil HDPE) | 43,560                               | sf   | \$ 4.18      | \$ 182,204                                                  | Means 2005 Environmental Remediation - Assemblies; Pg 3-90; 33 08 0573                                                                                      |
| Laydown area grading (200 x 100 ft)                                                         | 2,222                                | sy   | \$ 0.92      | \$ 2,036                                                    | Means 2009 Heavy Construction. Pg 211; 31 22 16.10 0100                                                                                                     |
| Granular cover over laydown area (6 inch thick crushed stone)                               | 2,222                                | sy   | \$ 13.00     | \$ 28,884                                                   | Means 2009 Heavy Construction. Pg 275; 32 11 23.23 0100                                                                                                     |
| Site security (24-hours uniformed watchman at entrance)                                     | 4,320                                | hr   | \$ 70.65     | \$ 305,208                                                  | Means 2009 Heavy Construction. Pg 20; 01 56 32.50 0100                                                                                                      |
| Land Surveying (2 person crew)                                                              | 1                                    | day  | \$ 1,483.65  | \$ 1,484                                                    | Means 2009 Heavy Construction. Pg 20; 01 71 23.13 1100                                                                                                      |
| Subsurface utility surveying                                                                | 2                                    | hr   | \$ 600.00    | \$ 600                                                      | Quote from Subtronic Surveying (800) 998-3463, 03/04/2009.                                                                                                  |





Table E-60. Alternative N-6 - Capital Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                  |      |            |
|--------------------------------------------------|------|------------|
| San Francisco Location Factors                   |      | Means 2009 |
| Material                                         |      | 111.2%     |
| Labor & Equipment                                |      | 141.3%     |
| Assemblies                                       |      | 123.8%     |
| Construction Project Duration:                   | 117  | days       |
| 6.0 months or 117 working days                   | 6    | months     |
| Operations and Maintenance / Monitoring Period   | 7965 | days       |
|                                                  | 360  | months     |
| Means Environmental Remediation Factor Inflation |      | Means 2009 |
| Assemblies and Unit Price                        |      | 13%        |

| Description                                                                                               | Quantity                                       | Unit                              | Unit Price    | Cost                | Comments                                                                                       |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------|---------------|---------------------|------------------------------------------------------------------------------------------------|
| <b>CAPITAL COSTS (continued)</b>                                                                          |                                                |                                   |               |                     |                                                                                                |
| <b>Pre-Construction Demolition</b>                                                                        | <b>Pre-Construction Demolition Subtotal =</b>  |                                   |               | <b>\$ 16,123</b>    |                                                                                                |
| Monitoring well abandonment                                                                               | 1                                              | ls                                | \$ 16,122.67  | \$ 16,123           | See Backup Worksheet "WELL ABANDON"                                                            |
| <b>Excavation (Operations)</b>                                                                            | <b>Excavation Subtotal =</b>                   |                                   |               | <b>\$ 613,077</b>   |                                                                                                |
| Sheetpile installation                                                                                    | 28                                             | day                               | \$ 9,451.88   | \$ 264,653          | Means 2009 Heavy Construction. Pg 489; Crew B-40                                               |
| Excavator, diesel hydraulic, crawler mounted (2 CY capacity) (2)                                          | 25                                             | day                               | \$ 2,553.57   | \$ 63,839           | Means 2009 Heavy Construction. Pg 482; 1 Equipment Operator (crane) and 1 laborer              |
| Backhoe-loader, 80 hp, 1.25 CY capacity (4)                                                               | 43                                             | day                               | \$ 1,958.98   | \$ 84,236           | Means 2009 Heavy Construction. Pg 481; 1 Equipment Operator (medium) and 0.5 laborer           |
| Grader, self-propelled, 30,000 lb.                                                                        | 10                                             | day                               | \$ 2,111.62   | \$ 21,116           | Means 2009 Heavy Construction. Pg 482; Crew B-11L                                              |
| Dump truck, 8 CY (12 ton payload) (11)                                                                    | 43                                             | day                               | \$ 2,777.96   | \$ 119,452          | Means 2009 Heavy Construction. Pg 477; 1 Truck Driver (heavy)                                  |
| Water truck for dust suppression, 6,000 gallon capacity                                                   | 117                                            | day                               | \$ 486.78     | \$ 56,953           | Means 2009 Heavy Construction. Pg 477; 1 Truck Driver (heavy)                                  |
| Dewatering with contractor's pump (4 inch dia., 300 gpm)                                                  | 25                                             | day                               | \$ 113.08     | \$ 2,827            | Means 2005 Environmental Remediation - Unit Price; Pg 4-31; 17 03 1004                         |
| <b>Air Monitoring</b>                                                                                     | <b>Monitoring Subtotal =</b>                   |                                   |               | <b>\$ 86,739</b>    |                                                                                                |
| Ambient air monitors (3 total -placement frequency biased towards prevailing winds and residential areas) | 6                                              | mo                                | \$ 3,042.69   | \$ 18,256           | Means 2005 Environmental Remediation - Unit Price; Pg 9-10; 33 02 0315                         |
| Analysis - principal organic hazardous constituents (1 per monitor per week)                              | 108                                            | ea                                | \$ 354.31     | \$ 38,266           | Means 2005 Environmental Remediation - Unit Price; Pg 9-38; 33 02 1802                         |
| Analysis - hydrocarbons (1 per monitor per week)                                                          | 108                                            | ea                                | \$ 125.90     | \$ 13,598           | Means 2005 Environmental Remediation - Unit Price; Pg 9-39; 33 02 1811                         |
| Portable ambient air analyzer                                                                             | 6                                              | mo                                | \$ 2,238.30   | \$ 13,430           | Means 2005 Environmental Remediation - Unit Price; Pg 9-10; 33 02 0328                         |
| Portable combustible gas/oxygen indicator                                                                 | 6                                              | mo                                | \$ 531.60     | \$ 3,190            | Means 2005 Environmental Remediation - Unit Price; Pg 9-11; 33 02 0330                         |
| <b>Soil Confirmation Sampling</b>                                                                         | <b>Confirmation Sampling Subtotal =</b>        |                                   |               | <b>\$ 226,556</b>   |                                                                                                |
| Sample collection (1 sample per grid cell + 4 sidewalls + 10% QC samples)                                 | 352                                            | ea                                | \$ 81.84      | \$ 28,822           | Means 2005 Environmental Remediation - Unit Price; Pg 9-24; 33 02 0648                         |
| Confirmation sample soil analysis                                                                         | 352                                            | ea                                | \$ 539.00     | \$ 189,826          | See Backup Worksheet "SOIL LAB COST"                                                           |
| Radioactivity screening                                                                                   | 352                                            | ea                                | \$ 22.45      | \$ 7,908            | Means 2005 Environmental Remediation - Unit Price; Pg 9-9; 33 02 0223                          |
| <b>Storm Water Control</b>                                                                                | <b>Storm Water Control Subtotal =</b>          |                                   |               | <b>\$ 4,000</b>     |                                                                                                |
| Construction SWPPP implementation                                                                         | 1                                              | ea                                | \$ 4,000.00   | \$ 4,000            |                                                                                                |
| <b>Contaminated Water Treatment</b>                                                                       | <b>Contaminated Water Treatment Subtotal =</b> |                                   |               | <b>\$ 918,768</b>   |                                                                                                |
| Structural slab on grade (8 in. thick; 60 x 40 ft.)                                                       | 2,400                                          | sf                                | \$ 10.48      | \$ 25,147           | Means 2005 Environmental Remediation - Assemblies; Pg 3-60; 18 02 0322                         |
| 4" submersible pump                                                                                       | 6                                              | mo                                | \$ 818.18     | \$ 4,909            | Means 2005 Environmental Remediation - Cost Data; Pg 9-223; 33 23 0511                         |
| Bag filters (300 gpm; 3 parallel filter system)                                                           | 6                                              | mo                                | \$ 536.75     | \$ 3,221            | Quote from Wayne Friesell, TIGG Corporation (wfriesell@tigg.com). Jan 13, 2006 + 15% inflation |
| Filterbag changeout (assumed 1 changeout per week; 3 bags per changeout; 1, 10 or 25 micron bags)         | 105                                            | ea                                | \$ 6.78       | \$ 712              | Quote from Wayne Friesell, TIGG Corporation (wfriesell@tigg.com). Jan 13, 2006 + 15%           |
| Carbon adsorption units (HP1020) rental (first month)                                                     | 1                                              | ls                                | \$ 52,206.00  | \$ 52,206           | Quote from Keith Jones, USFilter (510) 639-7274. Jan 20, 2006 + 15%                            |
| Carbon adsorption units rental (subsequent months)                                                        | 5                                              | mo                                | \$ 3,729.00   | \$ 18,645           | Quote from Keith Jones, USFilter (510) 639-7274. Jan 20, 2006 + 15%                            |
| Carbon changeouts (one year of operation with 490 lbs/day estimated usage)                                | 18                                             | ea                                | \$ 29,832.00  | \$ 536,976          | Quote from Keith Jones, USFilter (510) 639-7274. Jan 20, 2006 + 15%                            |
| Metals removal system rental (ion exchange)                                                               | 6                                              | mo                                | \$ 9,322.50   | \$ 55,935           | Quote from Keith Jones, USFilter (510) 639-7274. Jan 20, 2006 + 15%                            |
| Resin regeneration (assumed 2 per year)                                                                   | 2                                              | ea                                | \$ 99,440.00  | \$ 198,880          | Quote from Keith Jones, USFilter (510) 639-7274. Jan 20, 2006 + 15%                            |
| Wastewater analysis (1 sample per day + 10% QC samples)                                                   | 28                                             | ea                                | \$805.00      | \$ 22,138           | See Backup Worksheet "DISCHARGE SAMPLING COST"                                                 |
| <b>Waste Hauling and Disposal</b>                                                                         | <b>Assumed Waste Fractions</b>                 | <b>Waste Hauling and Disposal</b> |               | <b>\$ 7,658,798</b> |                                                                                                |
|                                                                                                           |                                                | <b>Subtotal =</b>                 |               |                     |                                                                                                |
| Class II beneficial reuse soil at Altamont Landfill                                                       | 35%                                            | 33469                             | ton \$ 38.82  | \$ 1,299,249        |                                                                                                |
| Class II soil for disposal at Altamont Landfill                                                           | 25%                                            | 23906                             | ton \$ 72.42  | \$ 1,731,280        |                                                                                                |
| Class I non-RCRA soil at Kettleman Hills                                                                  | 15%                                            | 14344                             | ton \$ 81.15  | \$ 1,163,988        |                                                                                                |
| Class I RCRA direct landfill soil                                                                         | 10%                                            | 9562                              | ton \$ 130.04 | \$ 1,243,500        |                                                                                                |
| Class I RCRA stabilization soil                                                                           | 10%                                            | 9562                              | ton \$ 172.24 | \$ 1,647,035        |                                                                                                |
| Disposal of radiologically impacted waste                                                                 | 5%                                             | 4781                              | ton \$ 120.00 | \$ 573,746          |                                                                                                |
| <b>Backfilling</b>                                                                                        | <b>Backfilling Subtotal =</b>                  |                                   |               | <b>\$ 1,301,609</b> |                                                                                                |
| Backfill landfill with unclassified fill (delivered, spread, compacted in 6-in. lifts)                    | 95,624                                         | cy                                | \$ 13.61      | \$ 1,301,609        | Means 2005 Environmental Remediation - Unit Price; Pg 4-23; 17 03 0423                         |
| <b>Soil Covers</b>                                                                                        | <b>Soil Covers Subtotal =</b>                  |                                   |               | <b>\$ 47,452</b>    |                                                                                                |
| Soil analysis (1 per 1000 CY)                                                                             | 4                                              | ea                                | \$ 50.00      | \$ 195              | See "LAB COST" Worksheet for Detail                                                            |
| Fill material, delivered from off-site                                                                    | 3,903                                          | CY                                | \$ 8.39       | \$ 32,761           | Means 2005 Environmental Remediation - Unit Price; Pg 4-23. 17 03 0424                         |
| Spread dumped material                                                                                    | 3,903                                          | CY                                | \$ 2.33       | \$ 9,084            | Means 2009 Heavy Construction. Page 229. 31 23 23.17 0020                                      |
| Compact soil cover, 12" lifts, 3 passes                                                                   | 3,903                                          | CY                                | \$ 1.39       | \$ 5,412            | Means 2009 Heavy Construction. Page 247. 31 23 23.23 5620                                      |



Table E-60. Alternative N-6 - Capital Cost Detail (continued)  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                  |      |            |
|--------------------------------------------------|------|------------|
| San Francisco Location Factors                   |      | Means 2009 |
| Material                                         |      | 111.2%     |
| Labor & Equipment                                |      | 141.3%     |
| Assemblies                                       |      | 123.8%     |
| Construction Project Duration:                   | 117  | days       |
| 6.0 months or 117 working days                   | 6    | months     |
| Operations and Maintenance / Monitoring Period   | 7965 | days       |
|                                                  | 360  | months     |
| Means Environmental Remediation Factor Inflation |      | Means 2009 |
| Assemblies and Unit Price                        |      | 13%        |

| Description                                                         | Quantity                    | Unit | Unit Price | Cost          | Comments                                                                                                                                                                           |
|---------------------------------------------------------------------|-----------------------------|------|------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CAPITAL COSTS (continued)                                           |                             |      |            |               |                                                                                                                                                                                    |
| Landscaping                                                         | Landscaping Subtotal =      |      |            | \$ 1,314      |                                                                                                                                                                                    |
| Seeding and vegetative cover                                        | 1                           | ac   | \$ 806.34  | \$ 975        | Means 2005 Environmental Remediation - Unit Price. Pg 5-18. 18 05 0401                                                                                                             |
| Hydrofertilizer                                                     | 52,691                      | sf   | \$ 0.004   | \$ 231        | Means 2009 Heavy Construction. Page 272. 32 01 90.13 0180                                                                                                                          |
| Watering                                                            | 1                           | ac   | \$ 89.07   | \$ 108        | Means 2005 Environmental Remediation - Unit Price. Pg 4-9; 18 05 0413                                                                                                              |
| Site Restoration                                                    | Site Restoration Subtotal = |      |            | \$ 92,152     |                                                                                                                                                                                    |
| Soil staging area liner removal (assumed 1/2 of construction cost)  | 43,560                      | sf   | \$ 2.09    | \$ 91,102     | Assumed half of installation cost                                                                                                                                                  |
| Land Surveying (topographical)                                      | 2                           | ac   | \$ 525.00  | \$ 1,050      | Means 2009 Heavy Construction. Pg 22; 02 21 13.09 0020                                                                                                                             |
|                                                                     | Construction Subtotal =     |      |            | \$ 16,860,533 |                                                                                                                                                                                    |
| Design                                                              | Design Subtotal =           |      |            | \$ 1,011,632  |                                                                                                                                                                                    |
| Design assumed to be 6% of construction cost (including permitting) |                             |      |            | \$ 1,011,632  | Includes: Remedial Design, Design Basis Report, Safety and Health Plan, Contingency Plan, QA/QC Plan, QAPP, and Cost Estimates; consistent with EPA guidance (pp. 5-13, EPA, 2000) |
| TOTAL PROJECT CAPITAL COST                                          |                             |      |            | \$ 17,872,165 |                                                                                                                                                                                    |
| Total Construction Cost                                             |                             |      |            | \$ 16,860,533 |                                                                                                                                                                                    |
| Total Design Cost                                                   |                             |      |            | \$ 1,011,632  |                                                                                                                                                                                    |
| TOTAL COST PER CY OF SOIL EXCAVATED =                               |                             |      |            | \$ 262        |                                                                                                                                                                                    |

General Assumptions:  
Work will be performed in Level D PPE  
Excavation dewatering will be implemented as needed using a skid-mounted pump through dewatering points  
Water from decontamination and dewatering activities will require treatment and discharge to a sanitary sewer line, or to the San Francisco Bay under NPDES permit  
Dewatering and treatment volume estimates provided in worksheet "DEWATER"  
Stripped landfill cap can be used as fill material  
Finish grade will slope evenly from north to south; backfill volume estimated by proposed grading plan, and includes a 20% contingency and a 20% fluff factor to account for compaction and consolidation  
Assumed soil density of 1.4 ton/cy



**Table E-63. Alternative N-6 - Dewatering (and Treatment) Volume**

Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                        | Excavation Area (ft²)        | Saturated Depth (feet) | Effective Porosity        |                  |                    |                      |            |                  | Volume (G) |
|----------------------------------------|------------------------------|------------------------|---------------------------|------------------|--------------------|----------------------|------------|------------------|------------|
| Initial Dewatering                     | 52,691                       | 27                     | 0.25                      |                  |                    |                      |            |                  | 2,660,369  |
|                                        | Sheetpile Wall Length (feet) | Saturated Depth (feet) | Total joint length (feet) | Leakage (ml/s/m) | Leakage (G/day/ft) | Leakage Rate (G/day) | Total Days | Total Volume (G) |            |
| Ongoing dewatering                     | 885                          | 27                     | 11947.5                   | 0.5              | 3.48               | 41577.3              | 25         | 1,039,433        |            |
|                                        |                              |                        |                           |                  |                    |                      | Total Days | Total Volume (G) |            |
|                                        | Rate (G/day)                 |                        |                           |                  |                    |                      | Total Days | Total Volume (G) |            |
| Daily waste dewatering                 | 25                           |                        |                           |                  |                    |                      | 25         | 625              |            |
|                                        |                              |                        |                           |                  |                    |                      | Total Days | Total Volume (G) |            |
|                                        | Rate (G/day)                 |                        |                           |                  |                    |                      | Total Days | Total Volume (G) |            |
| Daily decontamination                  | 100                          |                        |                           |                  |                    |                      | 25         | 2,500            |            |
| Total Volume Requiring Treatment (G) = |                              |                        |                           |                  |                    |                      | 3,702,926  |                  |            |

|    |                       |         |                                                                                                                                                                                                                             |
|----|-----------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 52 | Capital Cost: \$29.5M | Table 9 | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix D, Tables D-1, D-3, D-8, D-9, D-10, D-11, D-12, and D-13. |
|----|-----------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table D-1. Radiological Alternatives Cost Estimate Summary**

Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial<br>Alternative | Total Capital<br>Cost | Total O&M<br>Cost | Total Periodic<br>Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Present Value <sup>(4)</sup> |
|-------------------------|-----------------------|-------------------|------------------------|-----------------------------------|---------------------------|------------------------------|
| R-1                     | \$ -                  | \$ -              | \$ -                   | 32 years                          | \$ -                      | \$ -                         |
| R-2                     | \$ 29,480,254         | \$ -              | \$ -                   | 32 years                          | \$ 35,376,305             | \$ 34,890,774                |
| R-3                     | \$ 30,474,124         | \$ -              | \$ -                   | 32 years                          | \$ 36,568,948             | \$ 36,053,556                |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)

Table D-3. Alternative R-2 - Capital Cost Detail  
Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| San Francisco Location Factors                                                                                   |                                                      |              | Means 2009      |                   |                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|--------------|-----------------|-------------------|-----------------------------------------------------------------------------------------------------------------|
| Material                                                                                                         |                                                      |              | 111.2%          |                   |                                                                                                                 |
| Labor & Equipment                                                                                                |                                                      |              | 141.3%          |                   |                                                                                                                 |
| Assemblies                                                                                                       |                                                      |              | 123.8%          |                   |                                                                                                                 |
| Project Duration:                                                                                                | 580                                                  | working days |                 |                   |                                                                                                                 |
|                                                                                                                  | 29                                                   | months       |                 |                   |                                                                                                                 |
| Description                                                                                                      | Quantity                                             | Unit         | Unit Price      | Cost              | Comments                                                                                                        |
| <b>DISTRIBUTIVE COSTS</b>                                                                                        | <b>DISTRIBUTIVE COSTS SUBTOTAL = \$</b>              |              |                 | <b>5,015,106</b>  | <b>Includes labor and temporary facilities</b>                                                                  |
| <b>Labor</b>                                                                                                     | <b>Labor Subtotal = \$</b>                           |              |                 | <b>4,870,495</b>  |                                                                                                                 |
| Total project professional/technical labor cost                                                                  |                                                      |              |                 | \$ 3,223,503      | See Backup Table D-6                                                                                            |
| Total project field/construction management labor cost                                                           |                                                      |              |                 | \$ 1,234,316      | See Backup Table D-6                                                                                            |
| Total project clerical administrative labor cost                                                                 |                                                      |              |                 | \$ 412,675        | See Backup Table D-6                                                                                            |
| <b>Temporary Facilities</b>                                                                                      | <b>Temporary Facilities Subtotal = \$</b>            |              |                 | <b>144,611</b>    |                                                                                                                 |
| Furnished Field Office Trailer (50' x 10' w/ air conditioning)                                                   | 29                                                   | mo           | \$ 383.78       | \$ 11,130         | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0450                                                        |
| Office Equipment Rental                                                                                          | 29                                                   | mo           | \$ 802.12       | \$ 23,262         | Dell ( <a href="http://www.dell.com">http://www.dell.com</a> ), March 2009.                                     |
| Office Supplies                                                                                                  | 29                                                   | mo           | \$ 115.75       | \$ 3,357          | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0120                                                        |
| City Water Supply                                                                                                | 29                                                   | mo           | \$ 84.18        | \$ 2,441          | Means 2009 Heavy Construction. Page 14. 01 51 13.80 0700                                                        |
| Telephone Bill                                                                                                   | 29                                                   | mo           | \$ 108.94       | \$ 3,159          | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0140                                                        |
| Field Office Electrical Bill                                                                                     | 29                                                   | mo           | \$ 204.27       | \$ 5,924          | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0160                                                        |
| Portable Toilets (3)                                                                                             | 29                                                   | mo           | \$ 317.55       | \$ 9,209          | Means 2009 Heavy Construction. Page 472. 01 54 33 6410                                                          |
| Rental Trucks (3) (for supervisory staff)                                                                        | 29                                                   | mo           | \$ 2,970.00     | \$ 86,130         | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> ), March 2009.       |
| <b>CAPITAL COSTS</b>                                                                                             | <b>CAPITAL COSTS SUBTOTAL = \$</b>                   |              |                 | <b>24,465,148</b> | <b>Includes mob/demob, construction activites, and design</b>                                                   |
| <b>Mobilization and Demobilization</b>                                                                           | <b>Mobilization and Demobilization Subtotal = \$</b> |              |                 | <b>13,816</b>     |                                                                                                                 |
| Excavator, 0.5 CY capacity                                                                                       | 1                                                    | ea           | \$ 562.05       | \$ 562            | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Excavator, 1.5 CY capacity                                                                                       | 2                                                    | ea           | \$ 1,039.92     | \$ 2,080          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Conveyer system with misters and radialogical detectors                                                          | 6                                                    | ea           | \$ 562.05       | \$ 3,372          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dump truck, 8 CY (12 ton payload)                                                                                | 4                                                    | ea           | \$ 562.05       | \$ 2,248          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dozer, 200 H.P.                                                                                                  | 2                                                    | ea           | \$ 1,039.92     | \$ 2,080          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Sheepsfoot Roller, 240 H.P.                                                                                      | 2                                                    | ea           | \$ 562.05       | \$ 1,124          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Office Trailers (assumed 100 mile haul) (2)                                                                      | 1                                                    | ea           | \$ 1,225.62     | \$ 1,226          | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0800 (unit cost multiplied by 2 to account for mob & demob) |
| Water truck for dust suppression, 6,000 gallon capacity (1)                                                      | 2                                                    | ea           | \$ 562.05       | \$ 1,124          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| <b>Health &amp; Safety Equipment</b>                                                                             | <b>Health and Safety Equipment Subtotal = \$</b>     |              |                 | <b>829,119</b>    |                                                                                                                 |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment                             | 20                                                   | ea           | \$ 28,980.00    | \$ 579,600        | Assumed \$50 per field worker per day                                                                           |
| Water truck for dust suppression, 6,000 gallon capacity (1)                                                      | 29                                                   | mo           | \$ 8,604.10     | \$ 249,519        | Means 2009 Heavy Construction. Page 472. 01 54 33.40 6950                                                       |
| <b>Site Preparation - included in estimate provided in FS Report for Parcel E</b>                                |                                                      |              |                 |                   |                                                                                                                 |
| <b>Air Monitoring</b>                                                                                            | <b>Air Monitoring Subtotal = \$</b>                  |              |                 | <b>635,841</b>    |                                                                                                                 |
| Ambient air monitor rental (12 total -placement frequency biased towards prevailing winds and residential areas) | 29                                                   | mo           | \$ 12,169.55    | \$ 352,917        | Means 2005 Environmental Remediation - Unit Price. Pg 9-10. 33 02 0315                                          |
| Analysis - principal organic hazardous constituents (1 per monitor per week)                                     | 348                                                  | ea           | \$ 362.29       | \$ 125,990        | Means 2005 Environmental Remediation - Unit Price. Pg 9-38. 33 02 1802                                          |
| Analysis - hydrocarbons (1 per monitor per week)                                                                 | 348                                                  | ea           | \$ 125.89       | \$ 43,780         | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1811                                          |
| Analysis - mercury (1 per monitor per week)                                                                      | 348                                                  | ea           | \$ 42.66        | \$ 14,837         | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1815                                          |
| Analysis - cyanide (1 per monitor per week)                                                                      | 348                                                  | ea           | \$ 51.76        | \$ 17,999         | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1816                                          |
| Portable ambient air analyzer rental                                                                             | 29                                                   | mo           | \$ 2,238.08     | \$ 64,904         | Means 2005 Environmental Remediation - Unit Price. Pg 9-11. 33 02 0328                                          |
| Portable combustible gas/oxygen indicator rental                                                                 | 29                                                   | mo           | \$ 531.54       | \$ 15,415         | Means 2005 Environmental Remediation - Unit Price. Pg 9-11. 33 02 0330                                          |
| <b>Decontamination</b>                                                                                           | <b>Decontamination Subtotal = \$</b>                 |              |                 | <b>86,317</b>     |                                                                                                                 |
| Pressure washer (1,800 psi, 5gpm)                                                                                | 29                                                   | mo           | \$ 1,150.00     | \$ 33,350         | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> )                    |
| Pressure washer operation (assume 2 hr/day)                                                                      | 1,159                                                | hr           | \$ 45.69        | \$ 52,967         | Means 2005 Environmental Remediation - Unit Price. Pg 9-168. 33 17 0823                                         |
| <b>Scoping Surveys</b>                                                                                           | <b>Scoping Survey Subtotal = \$</b>                  |              |                 | <b>497,587</b>    |                                                                                                                 |
| Scoping Surveys                                                                                                  | 1.00                                                 | ea           | \$ 497,587.50   | \$ 497,587        | See Backup Table D-8                                                                                            |
| <b>Characterization Surveys</b>                                                                                  | <b>Characterization Survey Subtotal = \$</b>         |              |                 | <b>964,940</b>    |                                                                                                                 |
| Characterization Surveys                                                                                         | 1.00                                                 | ea           | \$ 964,939.93   | \$ 964,940        | See Backup Table D-9                                                                                            |
| <b>Remediation of Building Sites</b>                                                                             | <b>Building Remediation Subtotal = \$</b>            |              |                 | <b>506,163</b>    |                                                                                                                 |
| Remediation of Building Sites                                                                                    | 1.00                                                 | ea           | \$ 506,163.30   | \$ 506,163        | See Backup Table D-11                                                                                           |
| <b>Remediation of Non-Building Sites</b>                                                                         | <b>Non-Building Remediation Subtotal = \$</b>        |              |                 | <b>4,973,733</b>  |                                                                                                                 |
| Remediation of Non-Building Sites                                                                                | 1.00                                                 | ea           | \$ 4,973,732.76 | \$ 4,973,733      | See Backup Table D-12                                                                                           |



Table D-3. Alternative R-2 - Capital Cost Detail (continued)  
Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                                                                                                                                              |          |              |                                    |               |                                                                                                                                                                                                                   |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------|------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <u>San Francisco Location Factors</u>                                                                                                                        |          | Means 2009   |                                    |               |                                                                                                                                                                                                                   |  |
| Material                                                                                                                                                     |          | 111.2%       |                                    |               |                                                                                                                                                                                                                   |  |
| Labor & Equipment                                                                                                                                            |          | 141.3%       |                                    |               |                                                                                                                                                                                                                   |  |
| Assemblies                                                                                                                                                   |          | 123.8%       |                                    |               |                                                                                                                                                                                                                   |  |
| Project Duration:                                                                                                                                            | 580      | working days |                                    |               |                                                                                                                                                                                                                   |  |
|                                                                                                                                                              | 29       | months       |                                    |               |                                                                                                                                                                                                                   |  |
|                                                                                                                                                              |          |              |                                    |               |                                                                                                                                                                                                                   |  |
| Description                                                                                                                                                  | Quantity | Unit         | Unit Price                         | Cost          | Comments                                                                                                                                                                                                          |  |
| Sanitary Sewer, Storm Drain, and Septic Sewer Lines                                                                                                          |          |              | Utility Line Subtotal = \$         | 12,519,510    |                                                                                                                                                                                                                   |  |
| Sanitary Sewer, Storm Drain, and Septic Sewer Lines                                                                                                          | 1.00     | ea           | \$ 12,519,509.57                   | \$ 12,519,510 | See Backup Table D-13                                                                                                                                                                                             |  |
| Final Status Surveys                                                                                                                                         |          |              | Final Status Survey Subtotal = \$  | 2,034,300     |                                                                                                                                                                                                                   |  |
| Final Status Survey                                                                                                                                          | 1        | ea           | \$ 2,034,300.32                    | \$ 2,034,300  | See Backup Table D-10                                                                                                                                                                                             |  |
| Soil Covers - included in the estimate provided in FS Report for Parcel E                                                                                    |          |              |                                    |               |                                                                                                                                                                                                                   |  |
|                                                                                                                                                              |          |              |                                    |               |                                                                                                                                                                                                                   |  |
| Site Restoration - included in estimate provided in FS Report for Parcel E                                                                                   |          |              |                                    |               |                                                                                                                                                                                                                   |  |
|                                                                                                                                                              |          |              |                                    |               |                                                                                                                                                                                                                   |  |
| Institutional Contols - included in estimate provided in FS Report for Parcel E                                                                              |          |              |                                    |               |                                                                                                                                                                                                                   |  |
|                                                                                                                                                              |          |              |                                    |               |                                                                                                                                                                                                                   |  |
| Design                                                                                                                                                       |          |              | Design Subtotal = \$               | 1,403,822     |                                                                                                                                                                                                                   |  |
| Design assumed to be 5% of construction cost (including permitting)                                                                                          |          |              | \$                                 | 1,403,822     | Includes: Radiological-specific portions of Remedial Design, Design Basis Report, Safety and Health Plan, QA/QC Plan, Task-Specific Plans, and Cost Estimates; consistent with EPA guidance (pp. 5-13, EPA, 2000) |  |
|                                                                                                                                                              |          |              |                                    |               |                                                                                                                                                                                                                   |  |
| TOTAL PROJECT CAPITAL COST                                                                                                                                   |          |              | TOTAL PROJECT CAPITAL COST = \$    | 29,480,254    | Includes Distributive Costs                                                                                                                                                                                       |  |
| Total Construction Cost                                                                                                                                      |          |              | \$                                 | 28,076,432    |                                                                                                                                                                                                                   |  |
| Total Design Cost                                                                                                                                            |          |              | \$                                 | 1,403,822     |                                                                                                                                                                                                                   |  |
|                                                                                                                                                              |          |              | TOTAL COST PER SQFT OF PARCEL = \$ | 156.61        |                                                                                                                                                                                                                   |  |
| General Assumptions:                                                                                                                                         |          |              |                                    |               |                                                                                                                                                                                                                   |  |
| Work will be performed in Level D PPE                                                                                                                        |          |              |                                    |               |                                                                                                                                                                                                                   |  |
| Values from the "Means 2005 Environmental Remediation - Unit Price" and "Means 2005 Environmental Remediation - Assemblies" were multiplied by a factor of = |          |              |                                    | 113%          | to account for an inflation rate of 3.1 percent per annum.                                                                                                                                                        |  |



**Table D-8. Alternatives R-2 and R-3 - Radiological Scoping Survey Cost Detail**

Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                 | Quantity | Unit | Unit Price   | Cost       | Remarks                                                                                                                                          |
|---------------------------------------------|----------|------|--------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Scoping Surveys - Surface Scans</b>      |          |      |              |            |                                                                                                                                                  |
| 500 Series Buildings                        | 999,094  | SF   | \$ 0.30      | \$ 302,068 | Assumes 4-person crew scan 2,500 SF in two-hour period, includes rental of Ludlum Model 44-2 1"x 1" NaI GAMMA Scintillators (4)                  |
| Former radiological storage yard            | 2,984    | SF   | \$ 0.30      | \$ 902     |                                                                                                                                                  |
| Salvage yard                                | 142,584  | SF   | \$ 0.30      | \$ 43,109  |                                                                                                                                                  |
| South piers and berths                      | 155,335  | SF   | \$ 0.30      | \$ 46,964  |                                                                                                                                                  |
| Building 500                                | 13,450   | SF   | \$ 0.30      | \$ 4,066   |                                                                                                                                                  |
| Building 503                                | 26,881   | SF   | \$ 0.30      | \$ 8,127   |                                                                                                                                                  |
| Building 521                                | 7,040    | SF   | \$ 0.30      | \$ 2,128   |                                                                                                                                                  |
| Building 527                                | 408      | SF   | \$ 0.30      | \$ 123     |                                                                                                                                                  |
| Building 702                                | 5,713    | SF   | \$ 0.30      | \$ 1,727   |                                                                                                                                                  |
| Building 810                                | 34,111   | SF   | \$ 0.30      | \$ 10,313  |                                                                                                                                                  |
| Building S-719                              | 720      | SF   | \$ 0.30      | \$ 218     |                                                                                                                                                  |
| IR-03 (Oil Reclamation Ponds)               | 45,000   | SF   | \$ 0.30      | \$ 13,605  |                                                                                                                                                  |
| Data reduction, compilation, and analysis   | 1        | LS   | \$ 14,476.53 | \$ 14,477  | Assumes 2-person team compile and analyze data from 20,000 SF per hour                                                                           |
| <b>Scoping Surveys - Soil/Wipe Sampling</b> |          |      |              |            |                                                                                                                                                  |
| 500 Series Buildings                        | 93       | EA   | \$ 307.00    | \$ 28,551  | 1 soil or wipe sample per 1,000 square meters; analyzed for ROCs (Am-241, Cs-137, Pu-239, Ra-226, and Sr-90); see LAB COST detail for unit rates |
| Former radiological storage yard            | 1        | EA   | \$ 307.00    | \$ 307     | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                          |
| Salvage yard                                | 14       | EA   | \$ 209.00    | \$ 2,926   | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                  |
| South piers and berths                      | 15       | EA   | \$ 307.00    | \$ 4,605   | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                          |
| Building 500                                | 2        | EA   | \$ 90.00     | \$ 180     | ROCs: Cs-137 and Ra-226                                                                                                                          |
| Building 503                                | 3        | EA   | \$ 209.00    | \$ 627     | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                  |
| Building 521                                | 1        | EA   | \$ 307.00    | \$ 307     | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                          |
| Building 527                                | 1        | EA   | \$ 307.00    | \$ 307     | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                          |
| Building 702                                | 1        | EA   | \$ 209.00    | \$ 209     | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                  |
| Building 810                                | 4        | EA   | \$ 209.00    | \$ 836     | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                  |
| Building S-719                              | 1        | EA   | \$ 209.00    | \$ 209     | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                  |
| IR-03 (Oil Reclamation Ponds)               | 1        | EA   | \$ 209.00    | \$ 209     | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                  |
| Sample collection and documentation         | 1        | LS   | \$ 4,950.40  | \$ 4,950   | Assumes 4-person crew collect/document 10 samples per hour                                                                                       |
| Data compilation and analysis               | 1        | LS   | \$ 5,534.80  | \$ 5,535   | Assumes 2-person team compile and analyze data from 5 samples per hour                                                                           |
| <b>TOTAL</b>                                |          |      |              | \$ 497,587 |                                                                                                                                                  |

**Table D-9. Alternatives R-2 and R-3 - Radiological Characterization Survey Cost Detail**

Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                          | Quantity  | Unit | Unit Price   | Cost       | Remarks                                                                                                                          |
|------------------------------------------------------|-----------|------|--------------|------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Characterization Surveys - Surface Scans</b>      |           |      |              |            |                                                                                                                                  |
| IR-02 (Bay Fill Area)                                | 1,898,650 | SF   | \$ 0.30      | \$ 574,042 | Assumes 4-person crew scan 2,500 SF in two-hour period, includes rental of Ludlum Model 44-2 1"x 1" NaI GAMMA Scintillators (4)  |
| 707 Triangle Area                                    | 223,045   | SF   | \$ 0.30      | \$ 67,436  |                                                                                                                                  |
| IR-04 (former scrap yard)                            | 49,855    | SF   | \$ 0.30      | \$ 15,073  |                                                                                                                                  |
| Building 506                                         | 9,375     | SF   | \$ 0.30      | \$ 2,834   |                                                                                                                                  |
| Building 507                                         | 6,650     | SF   | \$ 0.30      | \$ 2,011   |                                                                                                                                  |
| Building 508                                         | 6,650     | SF   | \$ 0.30      | \$ 2,011   |                                                                                                                                  |
| Building 509                                         | 5,000     | SF   | \$ 0.30      | \$ 1,512   |                                                                                                                                  |
| Building 510/510A                                    | 3,150     | SF   | \$ 0.30      | \$ 952     |                                                                                                                                  |
| Building 517                                         | 2,500     | SF   | \$ 0.30      | \$ 756     |                                                                                                                                  |
| Building 520                                         | 31,058    | SF   | \$ 0.30      | \$ 9,390   |                                                                                                                                  |
| Building 529                                         | 510       | SF   | \$ 0.30      | \$ 154     |                                                                                                                                  |
| Building 707                                         | 13,000    | SF   | \$ 0.30      | \$ 3,930   |                                                                                                                                  |
| Building 707B                                        | 1,000     | SF   | \$ 0.30      | \$ 302     |                                                                                                                                  |
| Building 707C                                        | 1,000     | SF   | \$ 0.30      | \$ 302     |                                                                                                                                  |
| Shack 79                                             | 400       | SF   | \$ 0.30      | \$ 121     |                                                                                                                                  |
| Data reduction, compilation, and analysis            | 1         | LS   | \$ 22,743.61 | \$ 22,744  | Assumes 2-person team compile and analyze data from 20,000 SF per hour                                                           |
| <b>Characterization Surveys - Soil/Wipe Sampling</b> |           |      |              |            |                                                                                                                                  |
| IR-02 (Bay Fill Area)                                | 708       | EA   | \$ 209.00    | \$ 147,972 | 4 soil or wipe sample per 1,000 square meters; analyzed for ROCs (Cs-137, Ra-226, and Sr-90); see LAB COST detail for unit rates |
| 707 Triangle Area                                    | 84        | EA   | \$ 307.00    | \$ 25,788  | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                          |
| IR-04 (former scrap yard)                            | 20        | EA   | \$ 209.00    | \$ 4,180   | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                  |
| Building 506                                         | 4         | EA   | \$ 405.00    | \$ 1,620   | ROCs: Am-241, Cs-137, H-3, Pu-239, Ra-226, and Sr-90                                                                             |
| Building 507                                         | 4         | EA   | \$ 307.00    | \$ 1,228   | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                          |
| Building 508                                         | 4         | EA   | \$ 209.00    | \$ 836     | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                  |
| Building 509                                         | 4         | EA   | \$ 209.00    | \$ 836     | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                  |
| Building 510/510A                                    | 4         | EA   | \$ 307.00    | \$ 1,228   | ROCs: Am-241, Cs-137, Pu-239, Ra-226, and Sr-90                                                                                  |
| Building 517                                         | 4         | EA   | \$ 307.00    | \$ 1,228   | ROCs: Co-60, Cs-137, Ra-226, and Sr-90                                                                                           |
| Building 520                                         | 12        | EA   | \$ 209.00    | \$ 2,508   | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                  |
| Building 529                                         | 4         | EA   | \$ 307.00    | \$ 1,228   | ROCs: Cs-137, H-3, Ra-226, and Sr-90                                                                                             |
| Building 707                                         | 8         | EA   | \$ 307.00    | \$ 2,456   | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                          |
| Building 707B                                        | 4         | EA   | \$ 307.00    | \$ 1,228   | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                          |
| Building 707C                                        | 4         | EA   | \$ 307.00    | \$ 1,228   | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                          |
| Shack 79                                             | 4         | EA   | \$ 209.00    | \$ 836     | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                  |
| Sample collection and documentation                  | 1         | LS   | \$ 31,740.80 | \$ 31,741  | Assumes 4-person crew collect/document 10 samples per hour                                                                       |
| Data compilation and analysis                        | 1         | LS   | \$ 35,228.80 | \$ 35,229  | Assumes 2-person team compile and analyze data from 5 samples per hour                                                           |
| <b>TOTAL</b>                                         |           |      |              | \$ 964,940 |                                                                                                                                  |



**Table D-10. Alternatives R-2 and R-3 - Radiological Final Status Survey Cost Detail**

Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                                                                        | Quantity  | Unit | Unit Price   | Cost       | Remarks                                                                |
|------------------------------------------------------------------------------------------------------------------------------------|-----------|------|--------------|------------|------------------------------------------------------------------------|
| <b>Final Status Surveys - Additional Surface Scans at Locations Remediated Based on Scoping or Characterization Survey Results</b> |           |      |              |            |                                                                        |
| 500 Series Buildings                                                                                                               | 299,728   | SF   | \$ 0.30      | \$ 90,620  | Assumes 30 percent of area requires additional surface scan            |
| Former radiological storage yard                                                                                                   | 2,984     | SF   | \$ 0.30      | \$ 902     | Assumes 100 percent of area requires additional surface scan           |
| Salvage yard                                                                                                                       | 71,292    | SF   | \$ 0.30      | \$ 21,555  | Assumes 50 percent of area requires additional surface scan            |
| South piers and berths                                                                                                             | 31,067    | SF   | \$ 0.30      | \$ 9,393   | Assumes 20 percent of area requires additional surface scan            |
| Building 500                                                                                                                       | 0         | SF   | \$ 0.30      | \$ -       | Assumes scoping survey will verify that no remediation is required     |
| Building 503                                                                                                                       | 0         | SF   | \$ 0.30      | \$ -       | Assumes scoping survey will verify that no remediation is required     |
| Building 521                                                                                                                       | 7,040     | SF   | \$ 0.30      | \$ 2,128   | Assumes 100 percent of area requires additional surface scan           |
| Building 527                                                                                                                       | 0         | SF   | \$ 0.30      | \$ -       | Assumes that building will be demolished with pier (after remediation) |
| Building 702                                                                                                                       | 2,857     | SF   | \$ 0.30      | \$ 864     | Assumes 50 percent of area requires additional surface scan            |
| Building 810                                                                                                                       | 0         | SF   | \$ 0.30      | \$ -       | Assumes scoping survey will verify that no remediation is required     |
| Building S-719                                                                                                                     | 720       | SF   | \$ 0.30      | \$ 218     | Assumes 100 percent of area requires additional surface scan           |
| IR-03 (Oil Reclamation Ponds)                                                                                                      | 22,500    | SF   | \$ 0.30      | \$ 6,803   | Assumes 50 percent of area requires additional surface scan            |
| IR-02 (Bay Fill Area)                                                                                                              | 1,898,650 | SF   | \$ 0.30      | \$ 574,042 | Assumes 100 percent of area requires additional surface scan           |
| 707 Triangle Area                                                                                                                  | 111,523   | SF   | \$ 0.30      | \$ 33,718  | Assumes 50 percent of area requires additional surface scan            |
| IR-04 (former scrap yard)                                                                                                          | 24,928    | SF   | \$ 0.30      | \$ 7,537   | Assumes 50 percent of area requires additional surface scan            |
| Building 506                                                                                                                       | 9,375     | SF   | \$ 0.30      | \$ 2,834   | Assumes 100 percent of area requires additional surface scan           |
| Building 507                                                                                                                       | 6,650     | SF   | \$ 0.30      | \$ 2,011   | Assumes 100 percent of area requires additional surface scan           |
| Building 508                                                                                                                       | 6,650     | SF   | \$ 0.30      | \$ 2,011   | Assumes 100 percent of area requires additional surface scan           |
| Building 509                                                                                                                       | 5,000     | SF   | \$ 0.30      | \$ 1,512   | Assumes 100 percent of area requires additional surface scan           |
| Building 510/510A                                                                                                                  | 3,150     | SF   | \$ 0.30      | \$ 952     | Assumes 100 percent of area requires additional surface scan           |
| Building 517                                                                                                                       | 2,500     | SF   | \$ 0.30      | \$ 756     | Assumes 100 percent of area requires additional surface scan           |
| Building 520                                                                                                                       | 7,040     | SF   | \$ 0.30      | \$ 2,128   | Assumes 100 percent of area requires additional surface scan           |
| Building 529                                                                                                                       | 510       | SF   | \$ 0.30      | \$ 154     | Assumes 100 percent of area requires additional surface scan           |
| Building 707                                                                                                                       | 13,000    | SF   | \$ 0.30      | \$ 3,930   | Assumes 100 percent of area requires additional surface scan           |
| Building 707B                                                                                                                      | 1,000     | SF   | \$ 0.30      | \$ 302     | Assumes 100 percent of area requires additional surface scan           |
| Building 707C                                                                                                                      | 1,000     | SF   | \$ 0.30      | \$ 302     | Assumes 100 percent of area requires additional surface scan           |
| Shack 79                                                                                                                           | 400       | SF   | \$ 0.30      | \$ 121     | Assumes 100 percent of area requires additional surface scan           |
| Data reduction, compilation, and analysis                                                                                          | 1         | LS   | \$ 25,548.58 | \$ 25,549  | Assumes 2-person team compile and analyze data from 20,000 SF per hour |
| <b>Final Status Surveys - Surface Scans at Locations with Scoping Surveys and Remediation Completed Previously</b>                 |           |      |              |            |                                                                        |
| Building 406                                                                                                                       | 42,885    | SF   | \$ 0.30      | \$ 12,966  | Assumes 100 percent of area requires additional surface scan           |
| Building 414                                                                                                                       | 31,058    | SF   | \$ 0.30      | \$ 9,390   | Assumes 100 percent of area requires additional surface scan           |
| Building 701                                                                                                                       | 5,836     | SF   | \$ 0.30      | \$ 1,764   | Assumes 100 percent of area requires additional surface scan           |
| Building 708                                                                                                                       | 1,000     | SF   | \$ 0.30      | \$ 302     | Assumes 100 percent of area requires additional surface scan           |
| Shack 80                                                                                                                           | 400       | SF   | \$ 0.30      | \$ 121     | Assumes 100 percent of area requires additional surface scan           |
| Data reduction, compilation, and analysis                                                                                          | 1         | LS   | \$ 819.90    | \$ 820     | Assumes 2-person team compile and analyze data from 20,000 SF per hour |

**Table D-10. Alternatives R-2 and R-3 - Radiological Final Status Survey Cost Detail** *(continued)*  
Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                                                                  | Quantity | Unit | Unit Price    | Cost                | Remarks                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------|----------|------|---------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Final Status Surveys - Soil/Wipe Sampling at Locations Remediated Based on Scoping or Characterization Survey Results</b> |          |      |               |                     |                                                                                                                                                   |
| 500 Series Buildings                                                                                                         | 448      | EA   | \$ 307.00     | \$ 137,536          | 16 soil or wipe sample per 1,000 square meters; analyzed for ROCs (Am-241, Cs-137, Pu-239, Ra-226, and Sr-90); see LAB COST detail for unit rates |
| Former radiological storage yard                                                                                             | 16       | EA   | \$ 307.00     | \$ 4,912            | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                           |
| Salvage yard                                                                                                                 | 112      | EA   | \$ 209.00     | \$ 23,408           | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| South piers and berths                                                                                                       | 48       | EA   | \$ 307.00     | \$ 14,736           | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                           |
| Building 500                                                                                                                 | 0        | EA   | \$ 90.00      | \$ -                | ROCs: Cs-137 and Ra-226                                                                                                                           |
| Building 503                                                                                                                 | 0        | EA   | \$ 209.00     | \$ -                | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| Building 521                                                                                                                 | 16       | EA   | \$ 307.00     | \$ 4,912            | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                           |
| Building 527                                                                                                                 | 0        | EA   | \$ 307.00     | \$ -                | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                           |
| Building 702                                                                                                                 | 16       | EA   | \$ 209.00     | \$ 3,344            | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| Building 810                                                                                                                 | 0        | EA   | \$ 209.00     | \$ -                | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| Building S-719                                                                                                               | 16       | EA   | \$ 209.00     | \$ 3,344            | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| IR-03 (Oil Reclamation Ponds)                                                                                                | 48       | EA   | \$ 209.00     | \$ 10,032           | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| IR-02 (Bay Fill Area)                                                                                                        | 2,832    | EA   | \$ 209.00     | \$ 591,888          | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| 707 Triangle Area                                                                                                            | 176      | EA   | \$ 307.00     | \$ 54,032           | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                           |
| IR-04 (former scrap yard)                                                                                                    | 48       | EA   | \$ 209.00     | \$ 10,032           | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| Building 506                                                                                                                 | 16       | EA   | \$ 307.00     | \$ 4,912            | ROCs: Am-241, Cs-137, H-3, Pu-239, Ra-226, and Sr-90                                                                                              |
| Building 507                                                                                                                 | 16       | EA   | \$ 307.00     | \$ 4,912            | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                           |
| Building 508                                                                                                                 | 16       | EA   | \$ 209.00     | \$ 3,344            | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| Building 509                                                                                                                 | 16       | EA   | \$ 209.00     | \$ 3,344            | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| Building 510/510A                                                                                                            | 16       | EA   | \$ 307.00     | \$ 4,912            | ROCs: Am-241, Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                   |
| Building 517                                                                                                                 | 16       | EA   | \$ 209.00     | \$ 3,344            | ROCs: Co-60, Cs-137, Ra-226, and Sr-90                                                                                                            |
| Building 520                                                                                                                 | 16       | EA   | \$ 209.00     | \$ 3,344            | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| Building 529                                                                                                                 | 16       | EA   | \$ 209.00     | \$ 3,344            | ROCs: Cs-137, H-3, Ra-226, and Sr-90                                                                                                              |
| Building 707                                                                                                                 | 32       | EA   | \$ 307.00     | \$ 9,824            | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                           |
| Building 707B                                                                                                                | 16       | EA   | \$ 307.00     | \$ 4,912            | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                           |
| Building 707C                                                                                                                | 16       | EA   | \$ 307.00     | \$ 4,912            | ROCs: Cs-137, Pu-239, Ra-226, and Sr-90                                                                                                           |
| Shack 79                                                                                                                     | 16       | EA   | \$ 209.00     | \$ 3,344            | ROCs: Cs-137, Ra-226, and Sr-90                                                                                                                   |
| Sample collection and documentation                                                                                          | 1        | LS   | \$ 145,017.60 | \$ 145,018          | Assumes 4-person crew collect/document 10 samples per hour                                                                                        |
| Data compilation and analysis                                                                                                | 1        | LS   | \$ 160,953.60 | \$ 160,954          | Assumes 2-person team compile and analyze data from 5 samples per hour                                                                            |
| <b>TOTAL</b>                                                                                                                 |          |      |               | <b>\$ 2,034,300</b> |                                                                                                                                                   |

**Table D-11. Alternatives R-2 and R-3 - Radiological Remediation at Building Sites Cost Detail**

Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                   | Quantity | Unit | Unit Price | Cost       | Remarks                                                                                                                                                                                         |
|---------------------------------------------------------------|----------|------|------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Remediation at Existing Buildings - to remain in place</b> |          |      |            |            |                                                                                                                                                                                                 |
| Building 406                                                  | 4,288    | SF   | \$ 8.55    | \$ 36,666  | Assumes 10 percent of area requires remediation by hydraulic scrubbling; Means 2009 Heavy Construction. Pg 23; 02 41 13.15 0015                                                                 |
| Building 414                                                  | 3,106    | SF   | \$ 8.55    | \$ 26,555  | Assumes 10 percent of area requires remediation by hydraulic scrubbling; Means 2009 Heavy Construction. Pg 23; 02 41 13.15 0015                                                                 |
| Building 500                                                  | 0        | SF   | \$ 8.55    | -          | Assumes scoping survey will verify that no remediation is required; Means 2009 Heavy Construction. Pg 23; 02 41 13.15 0015                                                                      |
| Building 521                                                  | 2,112    | SF   | \$ 8.55    | \$ 18,058  | Assumes 30 percent of area requires remediation by hydraulic scrubbling; Means 2009 Heavy Construction. Pg 23; 02 41 13.15 0015                                                                 |
| Building 810                                                  | 0        | SF   | \$ 8.55    | -          | Assumes scoping survey will verify that no remediation is required; Means 2009 Heavy Construction. Pg 23; 02 41 13.15 0015                                                                      |
| Disposal of low-level radioactive waste                       | 106      | CY   | \$ 820.00  | \$ 86,613  | Assumes 2-inch scrubbling depth with 50% bulking factor                                                                                                                                         |
| <b>Remediation at Existing Buildings - to be demolished</b>   |          |      |            |            |                                                                                                                                                                                                 |
| Building 527                                                  | 0        | SF   | \$ 8.55    | -          | Assumes no spot remediation required prior to demolition                                                                                                                                        |
| Building 707                                                  | 1,300    | SF   | \$ 8.55    | \$ 11,115  | Assumes 10 percent of area requires spot remediation prior to demolition                                                                                                                        |
| Building 708                                                  | 0        | SF   | \$ 8.55    | -          | Assumes no spot remediation required prior to demolition                                                                                                                                        |
| Disposal of low-level radioactive waste                       | 14       | CY   | \$ 820.00  | \$ 11,844  | Assumes 2-person team compile and analyze data from 20,000 SF per hour                                                                                                                          |
| <b>Demolition of Existing Buildings</b>                       |          |      |            |            |                                                                                                                                                                                                 |
| Building 527                                                  | 6,120    | CF   | \$ 0.42    | \$ 2,570   | Assumes no spot remediation required prior to demolition; Means 2009 Heavy Construction. Pg 33-34; 02 41 16.13 0600 ; cost includes demolition and 20 mile truck haul of debris.                |
| Building 707                                                  | 195,000  | CF   | \$ 0.32    | \$ 62,400  | Assumes 10 percent of area requires spot remediation prior to demolition; Means 2009 Heavy Construction. Pg 33-34; 02 41 16.13 0700; cost includes demolition and 20 mile truck haul of debris. |
| Building 708                                                  | 15,000   | CF   | \$ 0.32    | \$ 4,800   | Assumes no spot remediation required prior to demolition; Means 2009 Heavy Construction. Pg 33-34; 02 41 16.13 0500; cost includes demolition and 20 mile truck haul of debris.                 |
| Screening/segregation of demolition debris                    | 2,001    | CY   | \$ 19.40   | \$ 38,822  | Means 2009 Heavy Construction. Pg 36; 02 41 19.23 3080                                                                                                                                          |
| Disposal of low-level radioactive waste                       | 200      | CY   | \$ 820.00  | \$ 164,091 | Assumes 10 percent of debris requires disposal as LLRW                                                                                                                                          |
| Disposal of construction debris                               | 1,801    | CY   | \$ 23.67   | \$ 42,630  | Quote from Norcal Waste Systems, Inc., San Francisco, CA                                                                                                                                        |
| <b>TOTAL</b>                                                  |          |      |            | \$ 506,163 |                                                                                                                                                                                                 |

**Table D-12. Alternatives R-2 and R-3 - Radiological Remediation at Non-Building Sites Cost Detail**  
Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                             | Quantity | Unit | Unit Price  | Cost         | Remarks                                                                                                                       |
|-------------------------------------------------------------------------|----------|------|-------------|--------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Remediation of Open Space Areas</b>                                  |          |      |             |              |                                                                                                                               |
| 500 Series Buildings                                                    | 1,857    | CY   | \$ 2.86     | \$ 5,311     | Means 2009 Heavy Construction. Pg 219. 31 23 16.42 0250; assumes 20 CY of LLRW is generated per 1,000 square meters of area   |
| Former radiological storage yard                                        | 6        | CY   | \$ 2.86     | \$ 17        | (which correlates to 5 percent of the volume within the upper foot)                                                           |
| Salvage yard                                                            | 265      | CY   | \$ 2.86     | \$ 758       |                                                                                                                               |
| IR-03 (Oil Reclamation Ponds)                                           | 84       | CY   | \$ 2.86     | \$ 240       |                                                                                                                               |
| IR-02 (Bay Fill Area)                                                   | 3,528    | CY   | \$ 2.86     | \$ 10,090    |                                                                                                                               |
| 707 Triangle Area                                                       | 415      | CY   | \$ 2.86     | \$ 1,187     |                                                                                                                               |
| IR-04 (former scrap yard)                                               | 93       | CY   | \$ 2.86     | \$ 266       |                                                                                                                               |
| South piers and berths                                                  | 7,767    | SF   | \$ 8.55     | \$ 66,408    | Assumes 5 percent of area requires remediation by hydraulic scrubbing; Means 2009 Heavy Construction. Pg 23; 02 41 13.15 0015 |
| <b>Remediation of Former Building Sites</b>                             |          |      |             |              |                                                                                                                               |
| Building 506                                                            | 18       | CY   | \$ 2.86     | \$ 51        | Assumes 20 CY of LLRW is generated per 1,000 square meters of area                                                            |
| Building 507                                                            | 13       | CY   | \$ 2.86     | \$ 37        | (which correlates to 5 percent of the volume within the upper foot)                                                           |
| Building 508                                                            | 13       | CY   | \$ 2.86     | \$ 37        |                                                                                                                               |
| Building 509                                                            | 10       | CY   | \$ 2.86     | \$ 29        |                                                                                                                               |
| Building 510/510A                                                       | 6        | CY   | \$ 2.86     | \$ 17        |                                                                                                                               |
| Building 517                                                            | 5        | CY   | \$ 2.86     | \$ 14        |                                                                                                                               |
| Building 520                                                            | 14       | CY   | \$ 2.86     | \$ 40        |                                                                                                                               |
| Building 529                                                            | 1        | CY   | \$ 2.86     | \$ 3         |                                                                                                                               |
| Building 702                                                            | 11       | CY   | \$ 2.86     | \$ 31        |                                                                                                                               |
| Building 707B                                                           | 2        | CY   | \$ 2.86     | \$ 6         |                                                                                                                               |
| Building 707C                                                           | 2        | CY   | \$ 2.86     | \$ 6         |                                                                                                                               |
| Building S-719                                                          | 2        | CY   | \$ 2.86     | \$ 6         |                                                                                                                               |
| Shack 79                                                                | 1        | CY   | \$ 2.86     | \$ 3         |                                                                                                                               |
| <b>Pier Demolition and Construction Debris Disposal</b>                 |          |      |             |              |                                                                                                                               |
| Saw cut concrete pier deck (1,400 ft. x 60 ft.)                         | 16,800   | LF   | \$ 10.77    | \$ 180,936   | Means 2009 Heavy Construction. Pg 74; 03 81 13.50 0400 and 0420                                                               |
| Relocate concrete pier deck sections by barge crane                     | 1,400    | LF   | \$ 179.00   | \$ 250,600   | Means 2009 Heavy Construction. Pg 30-31; 02 41 13.72 0500                                                                     |
| Demolition of concrete pier deck (1,400 ft. x 60 ft.)                   | 84,000   | SF   | \$ 22.00    | \$ 1,848,000 | Means 2009 Heavy Construction. Pg 30-31; 02 41 16.17 2500                                                                     |
| Demolition of wooden pier decking (2,000 ft. x 30 ft.)                  | 60,000   | SF   | \$ 9.80     | \$ 588,000   | Means 2009 Heavy Construction. Pg 30-31; 02 41 13.72 0700                                                                     |
| Demolition of wood piles (up to 14" dia.)                               | 38,400   | LF   | \$ 9.80     | \$ 376,320   | Means 2009 Heavy Construction. Pg 31; 02 41 13.74 2000                                                                        |
| Disposal of concrete construction debris                                | 3,800    | CY   | \$ 69.60    | \$ 264,480   | Based on \$58/ton quote for transportation/disposal; assumes 1.2 tons/CY                                                      |
| Disposal of wood construction debris                                    | 4,600    | CY   | \$ 11.60    | \$ 53,360    | Based on \$58/ton quote for transportation/disposal; assumes 0.2 tons/CY                                                      |
| <b>Backfilling of Excavation Areas</b>                                  |          |      |             |              |                                                                                                                               |
| Soil analysis for import soil (1 per 1000 CY) (4 pt. composite samples) | 7        | EA   | \$ 1,042.00 | \$ 7,294     | Assumes sampling for chemical and rad analyses                                                                                |
| Backfill excavations (delivered, spread, compacted in 6-in. lifts)      | 10,935   | ton  | \$ 13.61    | \$ 148,825   | Means 2005 Environmental Remediation - Unit Price. Pg 4-23. 17 03 0423                                                        |
| <b>Radioactive Waste Characterization and Disposal</b>                  |          |      |             |              |                                                                                                                               |
| Waste Characterization                                                  | 13       | EA   | \$ 1,042.00 | \$ 13,546    | Assumes 1, 4 pt. composite sample (for chemical and rad analyses) per 500 CY                                                  |
| Disposal of low-level radioactive waste                                 | 9,648    | ton  | \$ 120.00   | \$ 1,157,814 |                                                                                                                               |
| <b>TOTAL</b>                                                            |          |      |             | \$ 4,973,733 |                                                                                                                               |

**Table D-13. Alternatives R-2 and R-3 - Utility Line Removal Cost Detail**

Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                             | Quantity  | Unit | Unit Price  | Cost                 | Remarks                                                                          |
|-------------------------------------------------------------------------|-----------|------|-------------|----------------------|----------------------------------------------------------------------------------|
| Excavate trench along utility line alignment with 1/2 CY excavator      | 66,496    | CY   | \$ 7.86     | \$ 522,745           | Means 2009 Heavy Construction. Pg 211. 31 23 16.13 0050                          |
| Confirmation sample analysis                                            | 1,357     | each | \$ 209.00   | \$ 283,545           | Assume one sample per 50 feet of line + 10% QC samples; see "LAB COST" Worksheet |
| Over excavate contaminated soils (25% contingency)                      | 16,624    | CY   | \$ 7.86     | \$ 130,686           | Means 2009 Heavy Construction. Pg 211. 31 23 16.13 0050                          |
| Haul soil to radiological screening yard with 8 CY trucks               | 83,120    | CY   | \$ 4.16     | \$ 345,753           | Means 2009 Heavy Construction. Pg 230. 31 23 23.20 0114                          |
| Radiological screening                                                  | 2,244,240 | SF   | \$ 0.30     | \$ 673,272           | Assumed to be 10 times the cost of the portable scintillator (x6)                |
| Soil analysis for disposal (1 per 500 CY) (4 pt. composite samples)     | 166       | each | \$ 1,042.00 | \$ 173,222           | See "LAB COST" Worksheet for Detail                                              |
| Transport and disposal of excavated material                            |           |      |             |                      |                                                                                  |
| Class II Beneficial Reuse Soil to Altamont                              | 70,652    | ton  | \$ 38.82    | \$ 2,742,711         | Assumed Fraction of Total Waste: 50%                                             |
| Class II Soil to Altamont                                               | 42,391    | ton  | \$ 72.42    | \$ 3,069,971         | Assumed Fraction of Total Waste: 30%                                             |
| Class I Non-RCRA Soil to Kettleman Hills                                | 21,196    | ton  | \$ 81.15    | \$ 1,720,023         | Assumed Fraction of Total Waste: 15%                                             |
| Disposal of radiologically impacted waste                               | 7,065     | ton  | \$ 120.00   | \$ 847,824           | Assumed Fraction of Total Waste: 5%                                              |
| Soil analysis for import soil (1 per 1000 CY) (4 pt. composite samples) | 83        | each | \$ 1,042.00 | \$ 86,611            | See "LAB COST" Worksheet for Detail                                              |
| Backfill excavations (delivered, spread, compacted in 6-in. lifts)      | 141,304   | ton  | \$ 13.61    | \$ 1,923,147         | Means 2005 Environmental Remediation - Unit Price. Pg 4-23. 17 03 0423           |
| <b>TOTAL</b>                                                            |           |      |             | <b>\$ 12,519,510</b> |                                                                                  |

|    |                       |         |                                                                                                                                                                                                 |
|----|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 53 | Capital Cost: \$30.5M | Table 9 | Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG and RSRS. August 2012. Appendix D, Tables D-1, D-5, and D-15. |
|----|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table D-1. Radiological Alternatives Cost Estimate Summary**

Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Remedial<br>Alternative | Total Capital<br>Cost | Total O&M<br>Cost | Total Periodic<br>Cost | Period of Analysis <sup>(2)</sup> | Total Cost <sup>(3)</sup> | Present Value <sup>(4)</sup> |
|-------------------------|-----------------------|-------------------|------------------------|-----------------------------------|---------------------------|------------------------------|
| R-1                     | \$ -                  | \$ -              | \$ -                   | 32 years                          | \$ -                      | \$ -                         |
| R-2                     | \$ 29,480,254         | \$ -              | \$ -                   | 32 years                          | \$ 35,376,305             | \$ 34,890,774                |
| R-3                     | \$ 30,474,124         | \$ -              | \$ -                   | 32 years                          | \$ 36,568,948             | \$ 36,053,556                |

Notes:

<sup>(1)</sup> Appended tables summarize backup calculations for all cost estimates provided

<sup>(2)</sup> Period of analysis assumes the base year is 2010

<sup>(3)</sup> Total cost includes a 20 percent contingency factor

<sup>(4)</sup> Based on a 2.7% discount factor for projects with a 30 year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective December 2008) at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)

Table D-5. Alternative R-3 - Capital Cost Detail  
Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| San Francisco Location Factors                                                                                   |                                                      | Means 2009             |              |                   |                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------|--------------|-------------------|-----------------------------------------------------------------------------------------------------------------|
| Material                                                                                                         |                                                      | 111.2%                 |              |                   |                                                                                                                 |
| Labor & Equipment                                                                                                |                                                      | 141.3%                 |              |                   |                                                                                                                 |
| Assemblies                                                                                                       |                                                      | 123.8%                 |              |                   |                                                                                                                 |
| Project Duration:                                                                                                | 580<br>29                                            | working days<br>months |              |                   |                                                                                                                 |
| Description                                                                                                      | Quantity                                             | Unit                   | Unit Price   | Cost              | Comments                                                                                                        |
| <b>DISTRIBUTIVE COSTS</b>                                                                                        | <b>DISTRIBUTIVE COSTS SUBTOTAL = \$</b>              |                        |              | <b>5,015,106</b>  | <b>Includes labor and temporary facilities</b>                                                                  |
| <b>Labor</b>                                                                                                     | <b>Labor Subtotal = \$</b>                           |                        |              | <b>4,870,495</b>  |                                                                                                                 |
| Total project professional/technical labor cost                                                                  |                                                      |                        |              | \$ 3,223,503      | See Backup Table D-6                                                                                            |
| Total project field/construction management labor cost                                                           |                                                      |                        |              | \$ 1,234,316      | See Backup Table D-6                                                                                            |
| Total project clerical administrative labor cost                                                                 |                                                      |                        |              | \$ 412,675        | See Backup Table D-6                                                                                            |
| <b>Temporary Facilities</b>                                                                                      | <b>Temporary Facilities Subtotal = \$</b>            |                        |              | <b>144,611</b>    |                                                                                                                 |
| Furnished Field Office Trailer (50' x 10' w/ air conditioning)                                                   | 29 mo                                                | \$                     | 383.78       | \$ 11,130         | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0450                                                        |
| Office Equipment Rental                                                                                          | 29 mo                                                | \$                     | 802.12       | \$ 23,262         | Dell ( <a href="http://www.dell.com">http://www.dell.com</a> ), March 2009.                                     |
| Office Supplies                                                                                                  | 29 mo                                                | \$                     | 115.75       | \$ 3,357          | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0120                                                        |
| City Water Supply                                                                                                | 29 mo                                                | \$                     | 84.18        | \$ 2,441          | Means 2009 Heavy Construction. Page 14. 01 51 13.80 0700                                                        |
| Telephone Bill                                                                                                   | 29 mo                                                | \$                     | 108.94       | \$ 3,159          | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0140                                                        |
| Field Office Electrical Bill                                                                                     | 29 mo                                                | \$                     | 204.27       | \$ 5,924          | Means 2009 Heavy Construction. Page 15. 01 52 13.40 0160                                                        |
| Portable Toilets (3)                                                                                             | 29 mo                                                | \$                     | 317.55       | \$ 9,209          | Means 2009 Heavy Construction. Page 472. 01 54 33 6410                                                          |
| Rental Trucks (3) (for supervisory staff)                                                                        | 29 mo                                                | \$                     | 2,970.00     | \$ 86,130         | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> ), March 2009.       |
| <b>CAPITAL COSTS</b>                                                                                             | <b>CAPITAL COSTS SUBTOTAL = \$</b>                   |                        |              | <b>25,459,018</b> | <b>Includes mob/demob, construction activites, and design</b>                                                   |
| <b>Mobilization and Demobilization</b>                                                                           | <b>Mobilization and Demobilization Subtotal = \$</b> |                        |              | <b>13,816</b>     |                                                                                                                 |
| Excavator, 0.5 CY capacity                                                                                       | 1 ea                                                 | \$                     | 562.05       | \$ 562            | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Excavator, 1.5 CY capacity                                                                                       | 2 ea                                                 | \$                     | 1,039.92     | \$ 2,080          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Conveyer system with misters and radiological detectors                                                          | 6 ea                                                 | \$                     | 562.05       | \$ 3,372          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dump truck, 8 CY (12 ton payload)                                                                                | 4 ea                                                 | \$                     | 562.05       | \$ 2,248          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Dozer, 200 H.P.                                                                                                  | 2 ea                                                 | \$                     | 1,039.92     | \$ 2,080          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0100 (unit cost multiplied by 2 to account for mob & demob) |
| Sheepsfoot Roller, 240 H.P.                                                                                      | 2 ea                                                 | \$                     | 562.05       | \$ 1,124          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| Office Trailers (assumed 100 mile haul) (2)                                                                      | 1 ea                                                 | \$                     | 1,225.62     | \$ 1,226          | Means 2009 Heavy Construction. Page 15. 01 52 13.20 0800 (unit cost multiplied by 2 to account for mob & demob) |
| Water truck for dust suppression, 6,000 gallon capacity (1)                                                      | 2 ea                                                 | \$                     | 562.05       | \$ 1,124          | Means 2009 Heavy Construction. Page 18. 01 54 36.50 0020 (unit cost multiplied by 2 to account for mob & demob) |
| <b>Health &amp; Safety Equipment</b>                                                                             | <b>Health and Safety Equipment Subtotal = \$</b>     |                        |              | <b>829,119</b>    |                                                                                                                 |
| Includes PPE, First Aid Equipment, Fire Safety Equipment and Spill Control Equipment                             | 20 ea                                                | \$                     | 28,980.00    | \$ 579,600        | Assumed \$50 per field worker per day                                                                           |
| Water truck for dust suppression, 6,000 gallon capacity (1)                                                      | 29 mo                                                | \$                     | 8,604.10     | \$ 249,519        | Means 2009 Heavy Construction. Page 472. 01 54 33.40 6950                                                       |
| <b>Site Preparation - included in estimate provided in FS Report for Parcel E</b>                                |                                                      |                        |              |                   |                                                                                                                 |
| <b>Air Monitoring</b>                                                                                            | <b>Air Monitoring Subtotal = \$</b>                  |                        |              | <b>635,841</b>    |                                                                                                                 |
| Ambient air monitor rental (12 total -placement frequency biased towards prevailing winds and residential areas) | 29 mo                                                | \$                     | 12,169.55    | \$ 352,917        | Means 2005 Environmental Remediation - Unit Price. Pg 9-10. 33 02 0315                                          |
| Analysis - principal organic hazardous constituents (1 per monitor per week)                                     | 348 ea                                               | \$                     | 362.29       | \$ 125,990        | Means 2005 Environmental Remediation - Unit Price. Pg 9-38. 33 02 1802                                          |
| Analysis - hydrocarbons (1 per monitor per week)                                                                 | 348 ea                                               | \$                     | 125.89       | \$ 43,780         | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1811                                          |
| Analysis - mercury (1 per monitor per week)                                                                      | 348 ea                                               | \$                     | 42.66        | \$ 14,837         | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1815                                          |
| Analysis - cyanide (1 per monitor per week)                                                                      | 348 ea                                               | \$                     | 51.76        | \$ 17,999         | Means 2005 Environmental Remediation - Unit Price. Pg 9-39. 33 02 1816                                          |
| Portable ambient air analyzer rental                                                                             | 29 mo                                                | \$                     | 2,238.08     | \$ 64,904         | Means 2005 Environmental Remediation - Unit Price. Pg 9-11. 33 02 0328                                          |
| Portable combustible gas/oxygen indicator rental                                                                 | 29 mo                                                | \$                     | 531.54       | \$ 15,415         | Means 2005 Environmental Remediation - Unit Price. Pg 9-11. 33 02 0330                                          |
| <b>Decontamination</b>                                                                                           | <b>Decontamination Subtotal = \$</b>                 |                        |              | <b>86,317</b>     |                                                                                                                 |
| Pressure washer (1,800 psi, 5gpm)                                                                                | 29 mo                                                | \$                     | 1,150.00     | \$ 33,350         | Hertz Equipment Rental ( <a href="http://www.hertzequip.com">http://www.hertzequip.com</a> )                    |
| Pressure washer operation (assume 2 hr/day)                                                                      | 1,159 hr                                             | \$                     | 45.69        | \$ 52,967         | Means 2005 Environmental Remediation - Unit Price. Pg 9-168. 33 17 0823                                         |
| <b>Scoping Surveys</b>                                                                                           | <b>Scoping Survey Subtotal = \$</b>                  |                        |              | <b>497,587</b>    |                                                                                                                 |
| Scoping Surveys                                                                                                  | 1.00 ea                                              | \$                     | 497,587.50   | \$ 497,587        | See Backup Table D-8                                                                                            |
| <b>Characterization Surveys</b>                                                                                  | <b>Characterization Survey Subtotal = \$</b>         |                        |              | <b>964,940</b>    |                                                                                                                 |
| Characterization Surveys                                                                                         | 1.00 ea                                              | \$                     | 964,939.93   | \$ 964,940        | See Backup Table D-9                                                                                            |
| <b>Remediation of Building Sites</b>                                                                             | <b>Building Remediation Subtotal = \$</b>            |                        |              | <b>506,163</b>    |                                                                                                                 |
| Remediation of Building Sites                                                                                    | 1.00 ea                                              | \$                     | 506,163.30   | \$ 506,163        | See Backup Table D-11                                                                                           |
| <b>Remediation of Non-Building Sites</b>                                                                         | <b>Non-Building Remediation Subtotal = \$</b>        |                        |              | <b>4,973,733</b>  |                                                                                                                 |
| Remediation of Non-Building Sites                                                                                | 1.00 ea                                              | \$                     | 4,973,732.76 | \$ 4,973,733      | See Backup Table D-12                                                                                           |



Table D-5. Alternative R-3 - Capital Cost Detail (continued)  
Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

|                                |           |                        |  |  |  |
|--------------------------------|-----------|------------------------|--|--|--|
| San Francisco Location Factors |           | Means 2009             |  |  |  |
| Material                       |           | 111.2%                 |  |  |  |
| Labor & Equipment              |           | 141.3%                 |  |  |  |
| Assemblies                     |           | 123.8%                 |  |  |  |
| Project Duration:              | 580<br>29 | working days<br>months |  |  |  |

| Description                                                                     | Quantity | Unit | Unit Price                         | Cost          | Comments                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------|----------|------|------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sanitary Sewer, Storm Drain, and Septic Sewer Lines                             |          |      | Utility Line Subtotal = \$         | 12,519,510    |                                                                                                                                                                                                                  |
| Sanitary Sewer, Storm Drain, and Septic Sewer Lines                             | 1.00 ea  |      | \$ 12,519,509.57                   | \$ 12,519,510 | See Backup Table D-13                                                                                                                                                                                            |
| Final Status Surveys                                                            |          |      | Final Status Survey Subtotal = \$  | 2,034,300     |                                                                                                                                                                                                                  |
| Final Status Survey                                                             | 1 ea     |      | \$ 2,034,300.32                    | \$ 2,034,300  | See Backup Table D-10                                                                                                                                                                                            |
| Soil Covers - IR-02                                                             |          |      | Soil Covers Subtotal = \$          | 946,543       |                                                                                                                                                                                                                  |
| Soil cover installation and landscaping                                         | 1 ea     |      | \$ 946,542.71                      | \$ 946,543    | See Backup Table D-15                                                                                                                                                                                            |
| Site Restoration - included in estimate provided in FS Report for Parcel E      |          |      |                                    |               |                                                                                                                                                                                                                  |
| Institutional Contols - included in estimate provided in FS Report for Parcel E |          |      |                                    |               |                                                                                                                                                                                                                  |
| Design                                                                          |          |      | Design Subtotal = \$               | 1,451,149     |                                                                                                                                                                                                                  |
| Design assumed to be 5% of construction cost (including permitting)             |          |      | \$                                 | 1,451,149     | Includes: Radiological-specific portions of Remedial Design, Design Basis Report, Safety and Health Plan, QA/QC Plan, Task-Specific Plans, and Cost Estmates; consistent with EPA guidance (pp. 5-13, EPA, 2000) |
| TOTAL PROJECT CAPITAL COST                                                      |          |      | TOTAL PROJECT CAPITAL COST = \$    | 30,474,124    | Includes Distributive Costs                                                                                                                                                                                      |
| Total Construction Cost                                                         |          |      | \$                                 | 29,022,975    |                                                                                                                                                                                                                  |
| Total Design Cost                                                               |          |      | \$                                 | 1,451,149     |                                                                                                                                                                                                                  |
|                                                                                 |          |      | TOTAL COST PER SQFT OF PARCEL = \$ | 161.89        |                                                                                                                                                                                                                  |

General Assumptions:

Work will be performed in Level D PPE

Values from the "Means 2005 Environmental Remediation - Unit Price" and "Means 2005 Environmental Remediation - Assemblies" were multiplied by a factor of =

113%

to account for an inflation rate of 3.1 percent per annum.





**Table D-15. Alternative R-3 - Soil Cover at IR-02 and IR-03**

Radiological Addendum to Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Description                                                                                     | Quantity | Unit | Unit Price             | Cost                | Remarks                                                                |
|-------------------------------------------------------------------------------------------------|----------|------|------------------------|---------------------|------------------------------------------------------------------------|
| <b>Additional 1 Foot of Soil Cover at IR-02 and IR-03 (included as part of Alternative R-3)</b> |          |      |                        |                     |                                                                        |
| Soil analysis (1 per 1000 CY)                                                                   | 72       | ea   | \$ 1,042.00            | \$ 75,010           | See Table D-10 for Detail                                              |
| Fill material, delivered from off-site                                                          | 71,987   | CY   | \$ 8.39                | \$ 604,172          | Means 2005 Environmental Remediation - Unit Price; Pg 4-23. 17 03 0424 |
| Spread dumped material                                                                          | 71,987   | CY   | \$ 2.33                | \$ 167,546          | Means 2009 Heavy Construction. Page 229. 31 23 23.17 0020              |
| Compact soil cover, 12" lifts, 3 passes                                                         | 71,987   | CY   | \$ 1.39                | \$ 99,814           | Means 2009 Heavy Construction. Page 247. 31 23 23.23 5620              |
|                                                                                                 |          |      | Subtotal               | \$ 946,543          |                                                                        |
|                                                                                                 |          |      | 20 percent contingency | \$ 189,309          |                                                                        |
|                                                                                                 |          |      | <b>TOTAL</b>           | <b>\$ 1,135,851</b> |                                                                        |

**Notes:**

In the Final FS Report for Parcel E, a 2-foot thick soil cover was assumed at Redevelopment Blocks EOS-1 through EOS-5 for soil alternatives S-2 through S-4. Since these Redevelopment Blocks encompass all of IR-02 and IR-03, no additional soil cover costs are presented in the Radiological Addendum to avoid duplication. Radiological Alternative R-3 includes a 3-foot soil cover to offer additional protection from residual radioactivity; therefore, the soil cover costs for IR-02 and IR-03 reflect the costs of construction an additional foot of soil cover (from 2 feet to 3 feet). These costs are limited to IR-02 and IR-03, rather than all of Redevelopment Blocks EOS-1 through EOS-5.

## Section 5. Detailed and Comparative Analysis of Remedial Alternatives

This section provides a detailed analysis of each remedial alternative developed in [Section 4](#), followed by comparative analysis. This information will be used to help select a final remedy for Parcel E. The alternatives developed in [Section 4](#) are evaluated using criteria based on statutory requirements of CERCLA as amended by the Superfund Amendments and Reauthorization Act, Section 121; the NCP; and “Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA” (EPA, 1988).

The NCP specifies nine criteria to be used in the detailed analysis. The first two criteria are threshold criteria that must be satisfied in order for a remedy to be eligible for selection; the next five criteria are balancing criteria used to evaluate the comparative advantages and disadvantages of the remedial alternatives; and the final two criteria are modifying criteria generally considered after regulatory agency and public comments are received on the Proposed Plan. The nine criteria are listed below.

1. **Overall Protection of Human Health and the Environment:** This criterion describes how each alternative, as a whole, protects human health and the environment and indicates how each hazardous substance source is to be eliminated, reduced, or controlled.
2. **Compliance with ARARs:** This criterion evaluates each alternative’s compliance with ARARs, or, if an ARAR waiver is required, how the waiver is justified. ARARs consider location-specific, chemical-specific, and cleanup action-specific concerns.
3. **Long-Term Effectiveness and Permanence:** This criterion evaluates the effectiveness of each alternative in protecting human health and the environment after the response action is complete. Factors considered include magnitude of residual risks and adequacy and reliability of release controls.
4. **Reduction of Toxicity, Mobility, or Volume through Treatment:** This criterion evaluates the anticipated capability of each alternative’s specific treatment technology to reduce the toxicity, mobility, or volume of hazardous substances.
5. **Short-Term Effectiveness:** This criterion addresses the effectiveness of each alternative in protecting human health and the environment during the construction and implementation phase. Factors considered include:
  - Exposure of the community during implementation
  - Exposure of the workers during construction

- Effects to the environment (as supported by the green and sustainable remediation [GSR] analysis in [Appendix F](#))
  - Time required to meet the RAOs
6. **Implementability:** This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of the required services and materials during its implementation. Factors considered include:
- Ability to construct the technology
  - Reliability of the technology
  - Monitoring considerations
  - Availability of equipment and specialists
7. **Cost:** This criterion evaluates the capital and O&M costs for each alternative. Capital and O&M cost estimates are order-of-magnitude-level estimates and have an expected accuracy of minus 30 to plus 50 percent ([EPA, 2000b](#)). [Table 5-1](#) summarizes the capital cost for each alternative.
8. **Community Acceptance:** This criterion evaluates issues and concerns the public may have regarding each alternative. This criterion will be assessed following receipt of public comments on the FS Report and the Proposed Plan.
9. **State Acceptance:** This criterion evaluates technical and administrative issues and concerns the state regulatory agencies may have about each alternative. This criterion will be assessed following receipt of regulatory agency comments on the FS Report and the Proposed Plan.

In the following sections, each remedial alternative is compared with the two threshold and five balancing NCP criteria, and subsequently compared with the other alternatives to assess their relative performance with respect to the NCP criteria. Comparison with the two modifying criteria of community and state acceptance will be included in the Proposed Plan; further discussion of these criteria is not included in this FS Report. Section 5.1 provides a detailed analysis of each soil remedial alternative, and [Section 5.2](#) provides a comparative analysis of the soil remedial alternatives. [Section 5.3](#) presents a detailed analysis of each groundwater remedial alternative, and [Section 5.4](#) provides a comparative analysis of the groundwater remedial alternatives. [Section 5.5](#) presents a detailed analysis of each NAPL remedial alternative, and [Section 5.6](#) provides a comparative analysis of the NAPL remedial alternatives.

### 5.1. DETAILED ANALYSIS OF SOIL ALTERNATIVES

This section compares each soil alternative with the two threshold and five balancing NCP evaluation criteria. [Table 5-1](#) summarizes the costs for each alternative, and [Table 5-2](#) summarizes each alternative's rating under the seven NCP evaluation criteria. The ranking categories used in [Table 5-2](#) and in the discussion of the alternatives are (1) protective or not protective, and meets ARARs or does not meet ARARs, for the two threshold criteria; and (2) excellent, very good, good, poor, and not acceptable for the five balancing criteria.

|    |                             |               |                                                                                                                               |
|----|-----------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------|
| 55 | Further developed in the RD | Section 2.9.2 | Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California. ERRG. August 2012. Table 4-8. |
|----|-----------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------|

**Table 4-8. Actions to be Addressed in Remedial Design for Parcel E**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Alternatives                 | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S-2, S-3, and S-4            | Evaluate the extent of maintenance, upgrades, or repairs to the existing covers.                                                                                                                                                                                                                                                                                                                                                                                          |
| S-2, S-3, and S-4            | Develop cover performance standards and finalize cover design to address potential exposure to radionuclides and COCs in soil. Specifically, include plans for a performance standard for completion near the seawalls, as well as inspection, maintenance, and identification of problems. The RD would address (1) drainage to prevent erosion and standing water, (2) maintenance, and (3) methods for completion of the cover near the shoreline protection features. |
| S-2, S-3, and S-4            | Present engineering design details for geotechnical stabilization measures (such as a geosynthetic reinforcement material) to ensure stability of the shoreline protection and refine conceptual design as necessary.                                                                                                                                                                                                                                                     |
| S-2, S-3, and S-4            | Evaluate if additional characterization of potential subsurface methane at oil reclamation ponds (IR-03) and disposal trenches (IR-12) is warranted.                                                                                                                                                                                                                                                                                                                      |
| S-2, S-3, and S-4            | Prepare detailed excavation and sampling plans for removal of buried fuel lines (IR-47) and steam lines (IR-45).                                                                                                                                                                                                                                                                                                                                                          |
| S-3 and S-4                  | Perform pre-excavation characterization of hot spots and exceedances and further refine preliminary excavation details for soil excavation.                                                                                                                                                                                                                                                                                                                               |
| S-3 and S-4                  | Develop post-excavation confirmation sampling procedures, including specific DQOs to facilitate proper implementation.                                                                                                                                                                                                                                                                                                                                                    |
| S-4                          | Prepare specific DQOs and perform additional investigations to further define the areas requiring removal by SVE.                                                                                                                                                                                                                                                                                                                                                         |
| S-4                          | Refine the spacing of the SVE wells and the operational characteristics of SVE system through field testing and an SVE pilot-scale study.                                                                                                                                                                                                                                                                                                                                 |
| GW-2, GW-3A, GW-3B, and GW-4 | Develop groundwater monitoring parameters to evaluate effectiveness of the remedial alternative.                                                                                                                                                                                                                                                                                                                                                                          |
| GW-2, GW-3A, GW-3B, and GW-4 | Further refine the approach for long-term groundwater monitoring, including wells to be monitored, chemicals to be analyzed for, laboratory analytical methods, sample collection procedures, and quality control requirements. The analysis in the RD would include data evaluated for this FS Report and newer data (including data from newly installed wells).                                                                                                        |
| GW-3A, GW-3B and GW-4        | Refine the implementation approaches, develop optimization strategies, and develop remediation endpoints for ISB.                                                                                                                                                                                                                                                                                                                                                         |
| GW-3A, GW-3B and GW-4        | Conduct source zone characterization to refine the extent of the contaminated areas requiring remediation under the ISB alternatives.                                                                                                                                                                                                                                                                                                                                     |

**Table 4-8. Actions to be Addressed in Remedial Design for Parcel E (continued)**  
Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California

| Alternatives                       | Action                                                                                                                                                                                                                                                                                                                         |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GW-3A, GW-3B, GW-4, and N-2        | Develop contingency plan for issues encountered during installation of the slurry wall, such as performing pre-design studies to identify subsurface obstacles and planning for potential realignment of the wall if large obstacles are encountered.                                                                          |
| GW-3A, GW-3B and GW-4              | Evaluate alternatives for oxygen delivery under ISB alternatives to maximize the efficiency of aerobic bioremediation.                                                                                                                                                                                                         |
| GW-3A, GW-3B and GW-4              | Evaluate the benefit of a dedicated permeability enhancement event (injection of a substrate under pressure to fracture the formation and enhance permeability) under the ISB alternatives.                                                                                                                                    |
| GW-3A, GW-3B and GW-4              | Evaluate the need for special substrates, such as substrates with sulfur-containing compounds, to immobilize metals under the ISB alternatives.                                                                                                                                                                                |
| GW-3B                              | Define the parameters for final planning and costing of ZVI.                                                                                                                                                                                                                                                                   |
| GW-4                               | Refine the spacing of the AS wells and the operational characteristics of SVE/AS system through field testing and an SVE/AS pilot-scale study.                                                                                                                                                                                 |
| N-2, N-3, N-4A, N-4B, N-5, and N-6 | Perform additional characterization of NAPL at IR-03 and refine the area targeted by the NAPL alternatives. Characterization is needed to refine the nature and extent of NAPL at IR-03 and to better understand the site conditions (such as the presence of large subsurface debris) to properly implement each alternative. |
| N-3, N-4A, N-4B, and N-5           | Adjust the source removal approaches within and beyond IR-03 and develop optimization strategies to allow for appropriate adjustments based on site conditions.                                                                                                                                                                |
| N-3, N-4A, N-4B, and N-5           | Conduct bench-scale and field-scale testing to select specific thermal enhancement technology.                                                                                                                                                                                                                                 |
| N-6                                | Prepare detailed excavation plans for removal of NAPL and associated soil.                                                                                                                                                                                                                                                     |

Notes:

|      |                            |
|------|----------------------------|
| AS   | air sparging               |
| COC  | chemical of concern        |
| DQO  | data quality objective     |
| IR   | Installation Restoration   |
| ISB  | in-situ bioremediation     |
| NAPL | nonaqueous-phase liquids   |
| RD   | remedial design            |
| SVE  | soil vapor extraction      |
| ZVI  | zero-valent iron reduction |

N:\Projects\2005 Projects\25-049\_Navy\_HPS\_E-2\_RI-FS\B\_Originals\Parcel-E\_FS\05Final\Tables\source\Table 4-8 Items for RD.doc

|    |                                     |                 |                                                                                                                                                                                                                                                                                                                                    |
|----|-------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 56 | Exposure depth for aquatic wildlife | Section 2.9.2.1 | Draft Parcels E and E-2 Shoreline Characterization Technical Memorandum, Hunters Point Shipyard, San Francisco, California. SulTech. June 2007. Appendix G, Sections 2.1, 2.2, and 2.3. (note: this document was accepted as final and was provided as Appendix G to the Final Revised Remedial Investigation Report for Parcel E) |
|----|-------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 2.0 SCREENING-LEVEL PROBLEM FORMULATION AND ECOLOGICAL EFFECTS CHARACTERIZATION (STEP 1)

The SLERA described in steps 1 and 2 of EPA's eight-step process results in a list of "preliminary contaminants of concern for the baseline risk assessment" (EPA 1997, page 2-1). This section describes the screening methods used to identify COPECs in shoreline sediment based on comparison with toxicological benchmarks for particular groups of ecological receptors and ambient concentrations of chemicals.

### 2.1 GENERAL APPROACH TO SCREENING-LEVEL EVALUATION

All chemicals detected in sediment samples from the Parcels E and E-2 shoreline were screened to identify COPECs, except for essential mineral nutrients such as sodium, chloride, potassium, phosphorus, magnesium, and calcium. A toxicity-based approach was used to identify site-related chemicals that may pose risks to sensitive ecological receptors in the intertidal zone, including benthic invertebrates, birds, and mammals. Inorganic and organic chemicals were screened against toxicity benchmarks for each ecological receptor, as recommended by EPA (1997).

Sediment samples were evaluated in two spatial groups.

1. *Surface* shoreline samples: 0 to 0.5 feet below ground surface (bgs)
2. *Subsurface* shoreline samples: 2.0 to 2.5 feet bgs

The process and rationale for identifying COPECs are similar for all areas and ecological receptors. COPECs for benthic invertebrates were identified as those chemicals with concentrations exceeding the effects range-median (ER-M) values (see Section 3.0). In the evaluation of birds and mammals, chemicals were screened using food chain modeling against toxicity reference values (TRV) (see Section 4.0). In the risk characterization step, COPECs were refined by comparing Hunters Point ambient levels (HPAL) (PRC Environmental Management, Inc. 1995) and ambient sediment concentrations of selected chemicals in San Francisco Bay (see Section 5.0).

The site-specific data set used in this SLERA included (1) laboratory chemical analysis of sediment samples and (2) ecological surveys. Table G-1 summarizes the sediment samples collected from all locations along the Parcels E and E-2 shoreline. Sediment samples were analyzed for metals, PCBs, pesticides, semivolatile organic compounds, volatile organic compounds, total petroleum hydrocarbons, dioxins and furans, and organotins. Additionally, the evaluation of risk to birds and mammals used the following data.

- Wildlife surveys in Parcel E
- Bioaccumulation factors (BAF) derived from prey tissue collected in Parcels E, E-2, and F
- Protective soil concentrations for wildlife based on food chain modeling done in the terrestrial areas of Parcels E and E-2
- San Francisco Bay ambient sediment data

Early in the ecological investigation, rapid assessment of sediment samples was conducted using x-ray fluorescence and immunoassay techniques, as discussed in the SAP ([Tetra Tech 2002a](#)). However, results of these field measurements were not always corroborated by standard laboratory results. [Appendix F](#) of this technical memorandum describes the comparability of field screening results with laboratory analytical results. For some purposes, both types of data were combined; however, only laboratory data were evaluated in the SLERA.

For purposes of the SLERA, the entire shoreline of Parcels E and E-2 was considered intertidal habitat and the solid medium was defined as sediment. The rationale for choosing sampling locations and analytical methods is provided in the main text of this technical memorandum and in [Appendix F](#). Complete analytical data are provided in [Appendix A](#).

[Tables G-2 and G-3](#) present descriptive statistics for chemicals analyzed in surface and subsurface sediment samples, respectively. Values in the tables were calculated using a distribution-dependent formula, following the approach illustrated on [Figure G-1](#). For samples with at least 85 percent detected data, one-half the reporting limit was substituted for censored data (such as nondetected data qualified as “U”). Unbiased estimates of the mean and standard deviations were calculated using equations 13.3 and 13.5 in [Gilbert \(1987\)](#) for samples confirmed or assumed to follow a lognormal distribution. The 95 percent upper confidence limit (UCL<sub>95</sub>) for lognormal distributions was calculated using Land’s method, as discussed in [Gilbert \(1987\)](#) and [EPA \(1992c\)](#).

For samples with more than 15 percent censored data, population parameters were calculated using stochastic modeling, following the “bounding” approach described in [EPA \(2002\)](#) and illustrated on [Figure G-2](#). This approach treats each censored datum as a random, uniform variable that can assume any value between zero and its respective reporting limit. Monte Carlo simulation is used to develop a distribution of the range of possible estimates for a UCL based on the selection of a particular mathematical form for the UCL. Random surrogate values between zero and the reporting limit are used for individual censored measurements in each calculation (default is 2,000 calculations) of the UCL. As a result, the distribution reflects the entire range of possible values that could be calculated for the UCL. Because substitution of random surrogate values is made for each censored measurement, this technique reflects the uncertainty contributed by varying levels of censored data, and is appropriate for samples with either single or multiple censoring limits. The maximum estimated value (from the distribution of all 2,000 estimates of the UCL<sub>95</sub>) was used as a plausible upper bound for the

UCL<sub>95</sub> of the mean. The mean and standard deviation were calculated based on the median values of the means and standard deviations used to calculate the 2,000 estimates of the UCL<sub>95</sub>.

The median (50th percentile) and 95th percentile were calculated for all samples, regardless of detection frequency based on nonparametric assumptions (that is, based strictly on a rank ordering of the combined detected and censored measurements). Exposure point concentrations (EPC) were estimated as the lesser of the maximum detected concentration and the UCL<sub>95</sub> for each chemical.

## **2.2 FATE AND TRANSPORT PATHWAYS**

The primary sources of contaminants in sediment along the Parcels E and E-2 shoreline are described in [Section 1.3](#) of the technical memorandum. [Appendix F](#) describes the potential pathways for contaminant mobilization and transport from the Parcels E and E-2 shoreline to the offshore areas (Parcel F). Chemicals associated with sediment in Parcels E and E-2 are transported to the bay when the sediment is suspended in water moving over the land. Metals present beneath the soil surface in Parcels E and E-2 are effectively immobile because they are not transported overland as dry particulate materials. Groundwater in contact with contaminated soils at depth in Parcels E and E-2 is unlikely to contribute to metals contamination in offshore sediments (see [Appendix F](#) for details).

Water from San Francisco Bay daily inundates the shoreline of Parcels E and E-2. The amount of sediment carried on incoming tides varies with tidal height, storm energy, and other dynamic factors. Most areas of the shoreline are accreting sediment, as described in [Appendix F](#). Total concentrations of chemicals in sediment at the shoreline reflect both regional ambient and site-specific components. The transport pathways and processes and the potential for migration of chemicals from the Parcels E and E-2 shoreline are discussed in greater detail in the Parcel F validation study ([Battelle, Entrix, and Neptune and Company 2002](#)). The relevance of the potential exchange of sediment between the Parcels E and E-2 shoreline, and San Francisco Bay is discussed in [Section 5.0](#) of this appendix for identifying site-related risk.

## **2.3 IDENTIFICATION OF COMPLETE EXPOSURE PATHWAYS AND GENERIC ASSESSMENT ENDPOINTS**

At the screening level, exposure pathways were assumed to be complete to all ecological receptors that potentially occur in the shoreline area of Parcels E and E-2. EPA defines an assessment endpoint as an “explicit expression of an environmental value to be protected” ([EPA 1997](#)). Site-specific factors for Parcels E and E-2 influenced the selection of endpoints, including the occurrence, ecological significance, life and natural history characteristics, and potential toxicological susceptibility of receptors; the known and potential contaminants present and their mechanisms of toxicity; and the spatial and temporal patterns of potential exposure. Measurement endpoints are considered to be primary lines of evidence that have a direct relationship to the assessment endpoints defined for each receptor group.



### **2.3.1 Benthic Invertebrates**

Benthic invertebrates may be exposed to chemicals in sediment and surface water across all areas of the shoreline at this site. [Section 3.0](#) summarizes the evaluation of risk to benthic invertebrates in the intertidal zone of Parcels E and E-2. Benthic invertebrates are exposed to sediment in all shoreline subareas. The shoreline is affected by daily and annual tidal cycles, during which water quality has an unknown effect on ecological receptors. The assessment endpoint for benthic invertebrates is maintenance of sufficient rates of survival, growth, and reproduction to sustain populations of benthic invertebrates. The measurement endpoint for benthic invertebrates is exposure concentrations of chemicals in their home sediment.

The risk question addressed for benthic invertebrates was as follows: Do exposure concentrations of chemicals in sediments exceed the ER-M?

### **2.3.2 Birds and Mammals**

Various birds and mammals forage in the intertidal habitat that characterizes the Parcels E and E-2 shoreline. [Section 4.0](#) summarizes the evaluation of risk to birds and mammals using food chain modeling of ingested sediment and prey.

In food chain modeling, for each of the trophic or feeding guilds selected as assessment endpoints, representative or surrogate species were identified based on information available from bird and mammal surveys and natural history assessments conducted along the Parcels E and E-2 shoreline. The endpoints are sufficient rates of survival, growth, and reproduction to sustain populations of species representing the following trophic guilds.

- Diving ducks (represented by the surf scoter)
- Carnivorous shorebirds (represented by the willet)
- Raptors (represented by the red-tailed hawk)
- Omnivorous mammals (represented by the house mouse)

The measurement endpoints are daily ingested chemical doses and hazard quotients (HQ) calculated for each species using food chain modeling. Dose calculations incorporate several types of data, including (1) chemical concentrations in sediment, (2) estimated prey tissue concentrations based on biotransfer factors from terrestrial areas of Parcels E and E-2, (3) ecological field studies, and (4) natural history of selected receptors.

The risk question addressed for each endpoint was as follows: Do typical site-specific ingested doses of chemical concentrations exceed effects levels defined by the high TRVs?

|    |                               |              |                                                                                                                    |
|----|-------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------|
| 57 | Community<br>Involvement Plan | Section 2.10 | Final Community Involvement Plan, Hunters Point Shipyard, San Francisco, California. Department of Navy. May 2011. |
|----|-------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------|

# **Final**

## **Community Involvement Plan**

**Hunters Point Shipyard  
San Francisco, California**

**NAVFAC Southwest CLEAN IV Program**

**Contract Number: N62473-09-D-2622**

**Contract Task Order 0004**

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**U.S. Department of the Navy (Navy)  
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Program Management Office West**



**May 2011**

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## Executive Summary

*An executive summary gives a brief snapshot of what the full document contains. If you have limited time to read a document, especially a long technical document, try focusing on the executive summary first.*

An important part of the Department of the Navy's environmental cleanup program at former Hunters Point Shipyard (**HPS**) includes informing and involving the community in cleanup discussions. This Community Involvement Plan (**CIP**) presents the Navy's plans to inform and involve the community in the environmental cleanup program moving forward based on feedback obtained from the HPS community about past communication and community involvement program activities. The activities presented in the CIP for HPS go beyond the minimum requirements for community involvement set forth in the National Oil and Hazardous Substances Pollution Contingency Plan (known as the National Contingency Plan, or **NCP**). The CIP adheres to the applicable regulatory guidance from the Navy and United States Environmental Protection Agency (**U.S. EPA**). The CIP is also a resource for general information on the Navy's cleanup and whom to contact for further information.

From 1994 through 2009, the primary means of community involvement was the Navy's Restoration Advisory Board (**RAB**). Although the RAB was dissolved in December 2009 because it was no longer fulfilling its purpose, the Navy continues to involve the community in the details of the HPS environmental cleanup program. The Navy believes this CIP presents communication and community involvement program activities that will meet the specific needs and desires of the HPS community.

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## *Executive Summary (continued)*

### *Overview of Community Interviews and Feedback*

During the summer of 2010, the Navy interviewed 73 members of the HPS community, defined as ZIP codes 94107, 94124, and 94134. Historically, these ZIP codes have been used to define the HPS community for the purpose of local contracting and community involvement efforts, such as establishing a mailing list. These three ZIP codes were used to define the HPS community because they comprise the majority of District 10 in the City and County of San Francisco and are served by one Supervisor. In addition, the Navy is attempting to reach out to as many people impacted by environmental conditions as possible, and these three ZIP codes are nearest to the shipyard.

The Navy went to significant lengths to ensure the most comprehensive survey practicable. The interviews focused on gathering feedback about the community's cleanup interests and concerns, as well as communication needs and preferences to help design this CIP to be more effective for the HPS community. The following six recurring themes surfaced during the interviews:

- Theme 1.** The Navy's communication with the HPS community about the environmental cleanup program has not been effective.
- Theme 2.** General information about the Navy's environmental cleanup program at HPS is lacking.
- Theme 3.** The HPS community is diverse, resulting in varied concerns, communication preferences, and needs.
- Theme 4.** The difference between the Navy's HPS environmental cleanup program and the San Francisco Redevelopment Agency's (**SFRA's**) redevelopment of HPS has not been made clear.
- Theme 5.** Health is a primary concern for most segments of the community.
- Theme 6.** Coordinating with established community members to conduct involvement may be a good way to reach all sectors of the community.

### *Overview of the Navy's Community Involvement Program Actions and Activities*

Prior to developing a plan of action, the Navy considered the themes in the community feedback, reviewed applicable Navy and U.S. EPA guidance for community involvement, and evaluated what works well for other similar environmental cleanup programs. The Navy has developed a plan of action to ensure the success of the CIP for the HPS community. The Navy's objectives in its community involvement activities include the following:

- Work with the community to communicate information in a way that is transparent and in a way that the community wants to receive it
- Get information out early, and make sure it is easy to understand and translated as needed
- Respond to the community's concerns, ideas, and information and show how they are used in making decisions about the environmental cleanup

## *Executive Summary (continued)*

The Navy will track action items at meetings and respond to questions and comments. Frequently asked questions (**FAQs**) and responses will be posted on the Navy's Web site and brought to meetings as a handout, if appropriate. If written formal comments are received on any document, the Navy will respond to those comments in writing and include the responses in the next version of the document that also contains the applicable revisions.

Some of the actions and activities in this updated CIP for improving community involvement in the HPS cleanup include:

- Preparing short fact sheets with general information, such as the status of cleanup, and distributing them on the Internet, in the mail, and by having community members give them to their neighbors
- Conducting regularly scheduled community meetings
- Giving presentations at small group meetings (such as tenant associations and churches)
- Working with established community members to spread information and invite community members to participate in the HPS environmental cleanup discussions (referred to as "grassroots outreach")
- Participating in local radio shows, including multi-lingual shows, and answering questions from call-in listeners
- Providing tours of HPS for those who are curious about what the property currently looks like and to see any ongoing environmental cleanup work
- Using a Web site and social media outlets such as Facebook to reach people who are online regularly and prefer electronic communication
- Publishing a calendar of community involvement program activities so community members can plan ahead to participate
- Providing a telephone hotline with a recorded update of activities, and also allow callers to leave a message

The Navy will seek feedback during community involvement events about whether community members are getting the engagement they need. The goals for each activity will be evaluated on a yearly basis by the Navy's Community Involvement Manager to ensure that they are being met. The Navy will also distribute a survey to the mailing list to evaluate the community involvement program every two years. The findings of this survey will be documented in a memorandum that will be included in the Administrative Record for HPS. The survey and documentation will comply with 32 Code of Federal Regulations (**CFR**) 202.10. The Navy will periodically review this CIP and update it accordingly.

### ***Overview of the Navy's Environmental Cleanup Program at HPS and Opportunities for Public Involvement***

A general understanding of the Navy's environmental cleanup program is helpful to the HPS community when providing input on the cleanup. To help the HPS community understand the Navy's cleanup process, this CIP includes a chapter that discusses the historical operations at HPS that resulted in contamination. The Navy is actively conducting environmental investigations and cleanup at HPS to



## *Executive Summary (continued)*

protect human health and the environment and to prepare the property to be transferred to the SFRA. The shipyard is divided into parcels that are in various stages of environmental investigation and cleanup. The cleanup status at these parcels is often discussed during meetings and presented in technical reports.

### *Overview of Environmental Cleanup Roles and Responsibilities*

The Navy is responsible for the environmental cleanup at HPS; however, government agencies oversee the regulations for the cleanup process. These agencies are collectively referred to as “the regulatory agencies,” and are important resources for the HPS community. The responsibility of the regulatory agencies is to review the Navy’s plans and work at HPS to make sure regulations are followed. The primary regulatory agencies actively involved at HPS include the following:

- U.S. EPA
- California Environmental Protection Agency, Department of Toxic Substances Control (**DTSC**)
- San Francisco Bay Regional Water Quality Control Board (**Water Board**)

In addition, the SFRA is responsible for redeveloping HPS. The San Francisco Department of Public Health (**SFDPH**) is another agency providing input to the Navy’s cleanup of HPS.

The HPS community plays an active role in the Navy’s environmental cleanup program by providing input to the regulatory agencies and the Navy on cleanup alternatives and selection of remedies. When it comes to concerns and interests related to the current or future redevelopment of the property, the community is responsible for communicating directly with the SFRA.

## Chapter 1: Introduction

The Department of the Navy and United States Environmental Protection Agency (**U.S. EPA**) recognize that Americans have the right to be involved in government decisions that affect their lives. Public involvement in the cleanup process results in a better outcome and a more robust cleanup. In addition to meeting the minimum requirements for community involvement set forth in the National Oil and Hazardous Substances Pollution Contingency Plan (known as the National Contingency Plan, or **NCP**), the primary purpose of this Hunters Point Shipyard (**HPS**) Community Involvement Plan (**CIP**) includes the following:

- Summarize concerns found through the community interview process
- Outline the actions that the Navy will use to achieve the community involvement program
- Incorporate community issues and concerns more effectively into cleanup decisions
- Serve as a resource for general information on the HPS environmental cleanup and provide guidance on where to obtain more information

“Environmental justice” is the fair treatment and meaningful involvement of all people in the development, implementation, and enforcement of environmental laws, regulations, and policies. Race, economic status and social status should not be barriers to becoming involved. The Navy is mindful of the diverse community representing numerous racial, economic and social groups that immediately surrounds HPS and takes steps to reach and engage all segments of the community. Demographic information for the HPS community is provided in [Appendix D](#).

At HPS, the Navy has incorporated the principles of environmental justice into the planning and preparation of this Community

Involvement Plan. The Navy is addressing environmental justice through its outreach efforts, public participation process, and by providing access to information in a variety of ways. This includes providing information, as needed, in other languages.

Community members are encouraged to be involved in the cleanup process by providing feedback and information on an ongoing basis. The Navy acknowledges that community members, especially long-time residents, have knowledge about HPS activities which may assist the cleanup activities.

From 1994 until 2009, the Navy maintained a Restoration Advisory Board (**RAB**) at HPS. The purpose of the RAB was to (1) provide an expanded opportunity for community involvement in the environmental cleanup process, (2) act as a forum for the discussion and exchange of information about the environmental cleanup program, and (3) provide RAB members an opportunity to review progress and participate in discussions about the environmental cleanup with the cleanup decision makers. At one time, the RAB was a main component of the Navy’s community involvement program. On a voluntary basis, RAB members contributed their time and energy to improving the Navy’s environmental cleanup program at HPS.

In December 2009, the Navy, in consultation with the government agencies responsible for overseeing the cleanup process at HPS (which include the U.S. EPA, the California Department of Toxic Substances Control [**DTSC**], and the San Francisco Bay Regional Water Quality Control Board [**Water Board**], referred to in this CIP as “the regulatory agencies”) determined that the RAB was no longer fulfilling its purpose, and the RAB was dissolved (for more information on the

## Chapter 1: Introduction (continued)

dissolution of the RAB, see [Appendix E](#)). The Navy Installation Commander is required by the RAB Rule to assess community interest every 24 months to determine (1) if the cause for dissolution has been resolved, and (2) if there is community interest in reestablishing a RAB per the RAB Rule Handbook (2007). This new CIP meets this initial requirement in assessing community interest (for a list of community involvement program actions since the RAB was dissolved, see [Appendix E](#)).

The Navy is committed to keeping the community engaged in the environmental cleanup program at HPS. Part of that commitment includes preparing this CIP to plan the path forward for community involvement at HPS. This CIP presents communication and community involvement program activities to meet the specific needs of the HPS community.

The Navy will seek feedback during community involvement events about whether community members are getting the engagement they need. The goals for each activity will be evaluated on a yearly basis by the Navy's Community Involvement Manager to ensure that they are being met. The Navy will also distribute a survey to the HPS community involvement program mailing list to evaluate the program every two years. The findings of this survey will be documented in a memorandum that is included in the Administrative Record for HPS. The survey and documentation will comply with 32 CFR 202.10. The Navy will periodically review this CIP and update it accordingly.

[/Kf-LjÚŠN0H](#) of this document describes the issues and concerns identified during the community interview process that the Navy conducted in 2010. [/Kf-LjÚŠN0o](#) outlines the Navy's plans for the community involvement program, including

specific activities to be conducted. [/Kf-LjÚŠN0n](#) provides a history and timeline of HPS and also describes the status of the Navy's environmental cleanup program; it includes maps and a table of planned environmental milestones and related community involvement program activities. [/Kf-LjÚŠN0p](#) describes the roles and responsibilities of the agencies involved in the environmental cleanup at HPS, including the transfer process. [/Kf-LjÚŠN0c](#) presents the references cited in this plan.

[!LjÚŠyŘÄ0!](#) provides various resources for health-related concerns. [!LjÚŠyŘÄ0.](#) provides contact information so you can directly contact Navy and regulatory agency members working on the HPS project as well as other government officials. [!LjÚŠyŘÄ0/](#) provides a list of all the organizations interviewed, the questions they were asked, and selected statements made by interviewees. [!LjÚŠyŘÄ05](#) provides census data on the population, race, age, education, average income, employment, and housing for the HPS community. [!LjÚŠyŘÄ09](#) provides information on the Navy's former RAB, and the details of the dissolution of the RAB.

[!LjÚŠyŘÄ0C](#) provides a list of recent community involvement activities conducted by the Navy.

[!LjÚŠyŘÄ0D](#) provides a list and some details about the regulations and guidance for conducting community involvement.

[!LjÚŠyŘÄ0I](#) provides a list of media useful to reach the HPS community, as well as locations for holding meetings and posting flyers about involvement activities. [!LjÚŠyŘÄ0L](#) defines the acronyms and abbreviations used in this document. [!LjÚŠyŘÄ0W](#) provides the Navy's responses to the regulatory agency and public comments received on the draft version of this document. When applicable, the response also provides information on how this CIP was revised to incorporate the comment.

## Chapter 2: Community Interviews and Feedback

Community interviews help the Navy to better understand the community's issues and concerns. The Navy went to significant lengths to gather interview candidates for this CIP, mailed postcards to residents, and contacted interested stakeholders to ensure that they had the most comprehensive interview list practicable.

The Navy conducted 73 interviews in 2010 with people who live in, work in, or serve the HPS community—defined as ZIP codes 94107, 94124, and 94134. [Appendix C](#) includes a breakdown of the interviewees by ZIP code.

Historically, these ZIP codes have been used to define the HPS community for the purpose of local contracting and community involvement efforts such as establishing a mailing list. These three ZIP codes were used to define the HPS community because they comprise the majority of District 10 in the City and County of San Francisco and are served by one Supervisor. In addition, the Navy is attempting to reach out to as many people impacted by environmental conditions as possible, and these three ZIP codes are nearest to the shipyard.

Interviewees were asked approximately 29 questions from a questionnaire that was created in advance with input from the regulatory agencies. The interviews were conducted in a discussion format. Each interviewee was encouraged to discuss his or her interests, concerns, and ideas, and some questions were occasionally unanswered as a result. A Navy representative and a contractor responsible for taking notes were present at each interview. At least one and up to four regulatory agency representatives were also present during all but one of the 73 interviews. For a list of all of the organizations interviewed and the full list of questions, see [Appendix C](#).

**The community wants the cleanup to be completed in a way that protects the current community and all future users and neighbors of HPS.** The Navy and regulators share this goal with the community and are committed to involving the community in the cleanup process. The team will work with the community to ensure that the cleanup results are protective for current and future inhabitants and neighbors. The following six themes summarize the community concerns and opinions about public participation in the cleanup process that were revealed in the

### Overview of Interviewees

*73 interviews conducted from June 15 to September 9, 2010:*

*10 interviews by phone*

*63 interviews in person*

*Average time interviewees have lived or worked in the HPS community area:*

*20 years*

*Self-described knowledge of the cleanup program:*

*A little bit: 37*

*A lot: 26*

*Nothing/No response: 10*

*35 interviewees had attended Navy events or provided input to the Navy on the cleanup program.*

### Categories of Interviewees:

*Civic Groups/Clubs and Organizations: 34*

*Local Residents: 31*

*Environmental Groups/  
Activists: 15*

*Former RAB Members: 12*

*Local Business: 11*

*Educators/Childcare: 6*

*Media: 3*

*Health Providers: 2*

*Elected Official: 1*

*(Some interviewees represented multiple categories; therefore, total is greater than 73.)*

## Chapter 2: Community Interviews and Feedback (continued)

interviews. The Navy's plan to address these themes is discussed in [Chapter 3](#) –Community Involvement Actions and Activities.

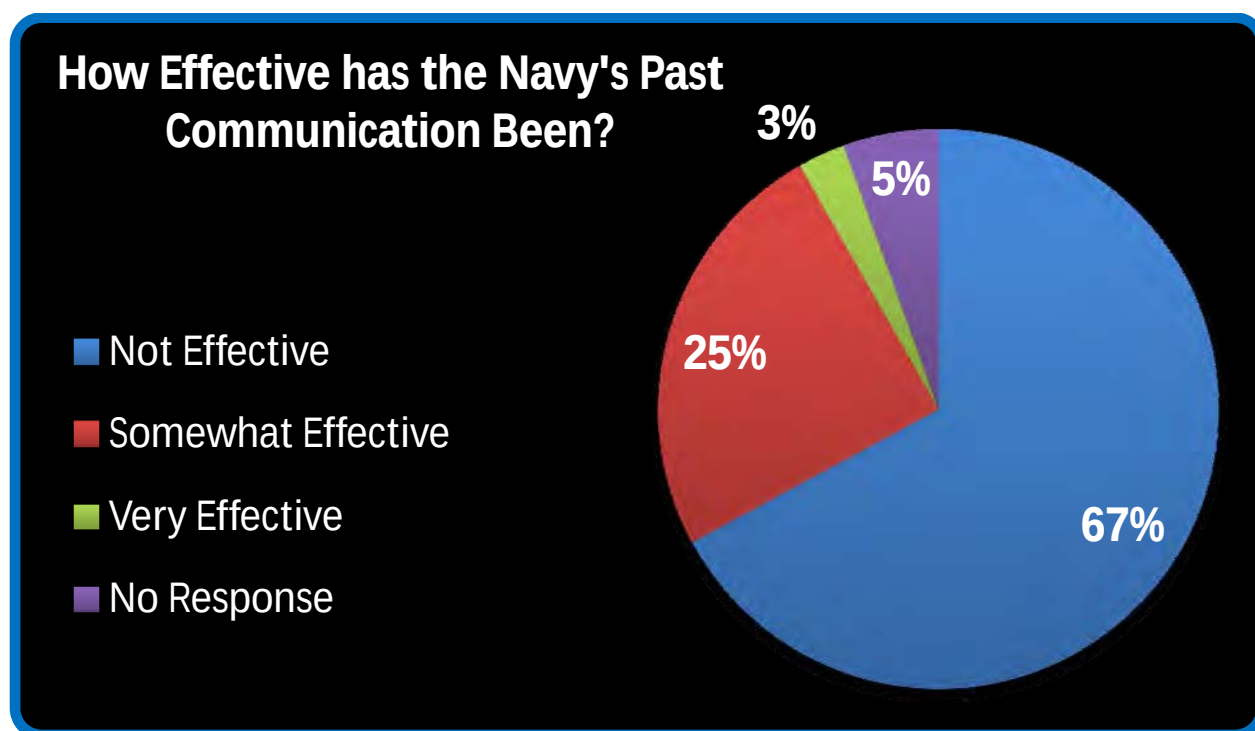
- Theme 1. The Navy's communication with the HPS community about the environmental cleanup program has not been effective.** The majority of interviewees said they think the Navy's communication has not been effective; many people said they do not know what is going on at HPS.
- Theme 2. General information about the Navy's environmental cleanup program at HPS is lacking.** Most interviewees said they would like general information about the cleanup at HPS but do not know where to find it. General information includes an overview of the program, the responsibilities of the people working on the cleanup, a timeline, and the status of work.
- Theme 3. The HPS community is diverse, resulting in varied concerns, communication preferences, and needs.** No single involvement method exists to communicate with all of the stakeholders in the HPS community. Various segments of the community include those who:
- a. Have Internet access, and those who do not
  - b. Do not speak English
  - c. Want general information, and those who want technical details
  - d. Live right next to the Base, and those who live in the outlying community
  - e. Prefer discussions and two-way information, and those who just want an update
- Theme 4. The difference between the Navy's HPS environmental cleanup program and the San Francisco Redevelopment Agency's (SFRA's) redevelopment of HPS has not been made clear.** Many interviewees did not know that the Navy is still doing work on HPS; others thought the Navy is conducting the current redevelopment on a transferred parcel (known as Parcel A), when in fact it is the SFRA that now owns and controls development of Parcel A. In addition, confusion exists about the Navy's role in the selection of the SFRA's master developer.
- Theme 5. Health is a primary concern for most segments of the community.** Interviewees were concerned that contamination at HPS is affecting their health, and they noted high rates of cancer and asthma in the area. Interviewees were also concerned that contamination at HPS will have negative health effects in the future, especially for people who will live on former HPS property.
- Theme 6. Coordinating with established community members to conduct involvement activities may be a good way to reach all sectors of the community.** Some interviewees felt that the HPS community distrusts the Navy. It was suggested that the Navy work more closely with members from various sectors of the community who can relay information about the cleanup directly to their neighborhoods. This communication method was identified as the best way to inform members of every part of the community.

## Chapter 2: Community Interviews and Feedback (continued)

The following subsections present a summary of the questions asked of the interviewees. Each interviewee was encouraged to discuss his or her interests, concerns, and ideas; some questions were occasionally unanswered as a result.

### *Effectiveness of the Navy's Communication*

Interviewees were asked if they think the Navy's communication about the environmental cleanup program has been effective. The following chart presents the percentages of interviewees responses. The chart confirms that most interviewees felt the Navy did not effectively communicate with the public in the past.

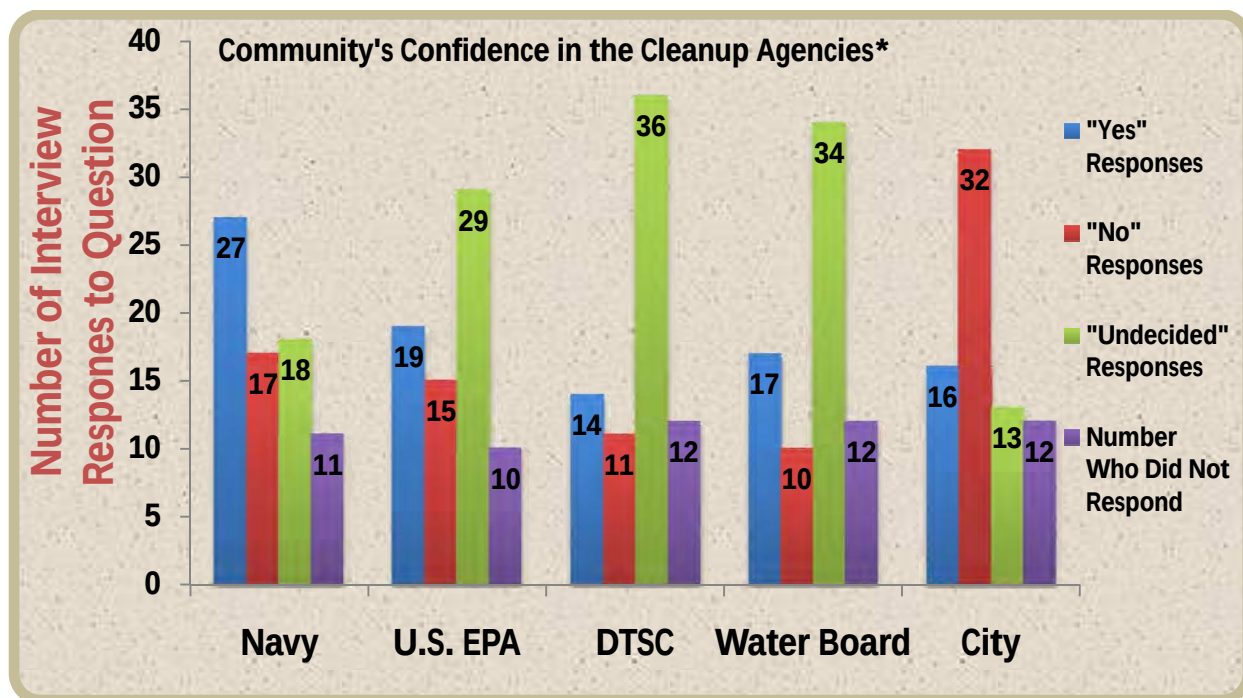




## Chapter 2: Community Interviews and Feedback (continued)

### *Confidence in the Navy, Regulatory Agencies, and the City of San Francisco*

Interviewees were asked if they have confidence in the Navy's ability to conduct the environmental cleanup at HPS. They were also asked if they have confidence in U.S. EPA, DTSC, the Water Board, and the City of San Francisco to oversee the Navy's environmental cleanup (to understand more about these agencies and their responsibilities in the HPS cleanup, see [Chapter 5](#)). The following graphic represents the results.



**Note:**

\*"Cleanup agencies" includes the regulatory agencies responsible for oversight of the cleanup. See [Chapter 5](#) for more information about the cleanup agencies.

The "Undecided" category includes responses such as "somewhat" and "depends," as well as the response that an interviewee was not familiar enough with a particular agency to have an opinion. "Number Who Did Not Respond" indicates the number of interviewees who declined to answer that question.

## Chapter 2: Community Interviews and Feedback (continued)

### Interests and Concerns

Interviewees were asked an open-ended question about whether they have concerns or interests related to the base and the cleanup program, and what all of their concerns and interests might be. The following table represents concerns, listed in order of how frequently they were cited.

| Interests and Concerns Listed by Frequency of Response                                                    | Number of Responses |
|-----------------------------------------------------------------------------------------------------------|---------------------|
| Health                                                                                                    | 54                  |
| Redevelopment*                                                                                            | 49                  |
| Quality or completeness of cleanup                                                                        | 43                  |
| Jobs/economics                                                                                            | 35                  |
| Air quality/dust                                                                                          | 30                  |
| Schedule and general status of the cleanup                                                                | 28                  |
| Parcel E2 landfill                                                                                        | 19                  |
| Lack of information going to the community                                                                | 15                  |
| Navy responsibility in the future                                                                         | <5                  |
| Shipyard history, having a museum about shipyard history and cleanup                                      | <5                  |
| Politics related to cleanup                                                                               | <5                  |
| Protection of the bay and wildlife                                                                        | <5                  |
| Distrust for the Navy                                                                                     | <5                  |
| Budget for cleanup                                                                                        | <5                  |
| Yosemite Slough                                                                                           | <5                  |
| Concern that there is no RAB                                                                              | <5                  |
| Confusion about cleanup versus redevelopment                                                              | <5                  |
| Shoreline access                                                                                          | <5                  |
| <b>Note:</b>                                                                                              |                     |
| * Although the question was about environmental cleanup, many people voiced concerns about redevelopment. |                     |

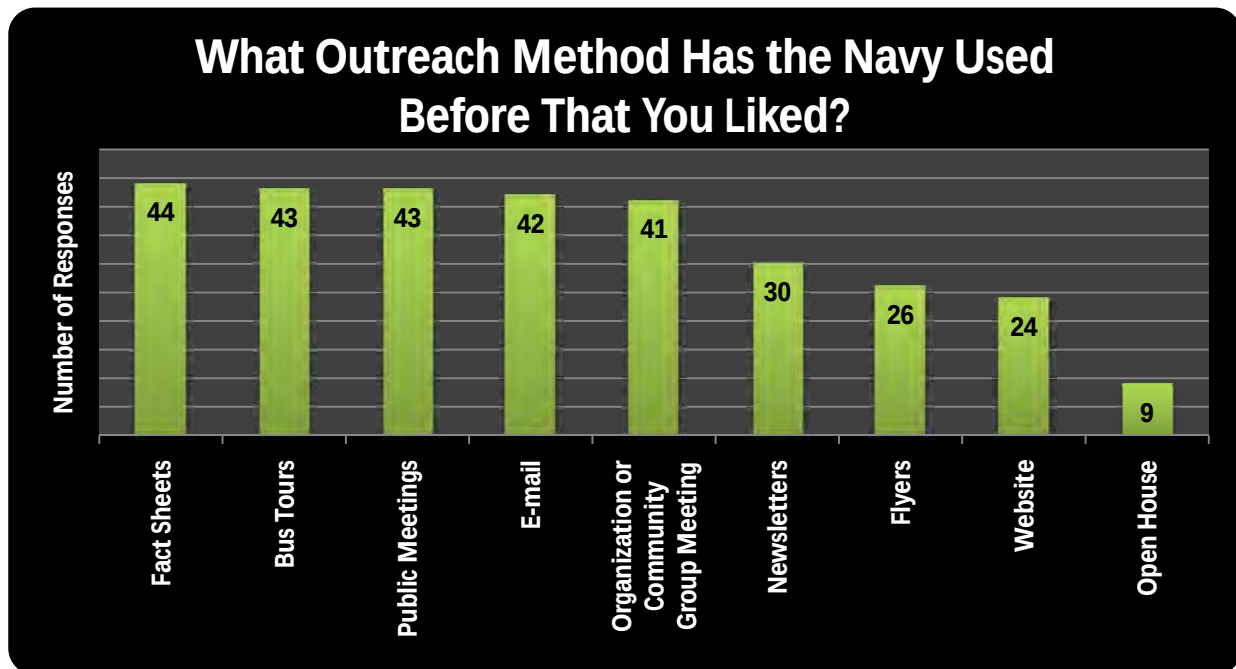
### Community Rating of Navy Communication Methods

A list of nine communication methods the Navy has used in the past was provided during the interview. Interviewees were asked to give their opinions about whether any of these past methods would be useful in the future. People were also asked for other ideas that were not included on the list provided.



## Chapter 2: Community Interviews and Feedback (continued)

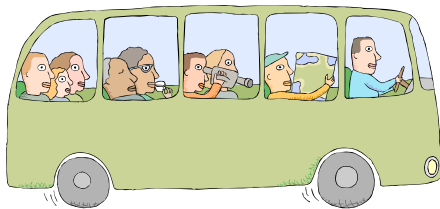
The following chart represents the preferences for established communication methods. The table describes each method and includes some of the reasons people said that a particular method may or may not be effective.



**Note:** Interviewees were asked to give their opinions about whether any of the nine communication methods the Navy has used in the past would be useful in the future. Some interviewees noted multiple methods in their answer.

### *Description of the Navy's Standard Involvement Activities and Interviewees' Concerns*

| Communication Method | Description                                                                                                                                                                                                               | Pros and Cons Noted by Interviewees                                                                                                                                             |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Fact Sheets       | One- or two-page mailers typically focused on one topic or site. Hardcopies are distributed via the mail, handed out, and placed at businesses. Electronic copies are distributed by posting on a Web site and e-mailing. | Pro: Easy to read; reaches people with and without e-mail.<br>Con: People do not have time to read them; they are too technical.                                                |
| 2. Bus Tour of Site  | Navy staff discusses activities at sites while community members see the sites in person. Typically, the Navy provides the bus; a map or other handout also may be provided.                                              | Pro: People who have never been on the site get to see it; may be more interesting than just a meeting.<br>Con: There is nothing to see; it is dangerous to be at the shipyard. |



## Chapter 2: Community Interviews and Feedback (continued)

### *Description of the Navy's Standard Involvement Activities and Interviewees' Concerns*

| Communication Method                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Pros and Cons Noted by Interviewees                                                                                                                                                                                                                                                                   |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3. Public Meeting                          | An at-large, community-wide meeting advertised to the greater community and held at a large venue. Examples include the current Navy community technical meetings, the former RAB, and Proposed Plan meetings (formal public meetings held per the NCP to obtain public comments on a proposed remedy).                                                                                                                                                               | Pro: Many people are informed at once.<br>Con: Many members of the community feel intimidated at a large, centralized meeting. It was stated that it is difficult to have individual questions addressed; there is no single venue where everyone in the community feels comfortable.                 |
| 4. E-mail                                  | An e-mail message is sent to everyone who has submitted an e-mail address for the Navy's list. E-mail can include an announcement, an attached fact sheet or newsletter, or a link to a Web site containing more information.                                                                                                                                                                                                                                         | Pro: Quick delivery, inexpensive, good way to reach people who check e-mail often.<br>Con: Not everyone has access to e-mail.                                                                                                                                                                         |
| 5. Organization or Community Group Meeting | The Navy has been added to the agenda of an already-established meeting and presents an update on the environmental cleanup program. Attendees can then ask questions about specific interests. Groups have included or could include homeowners or tenant associations, churches, business groups, parent-teacher associations, and related organizations. Meetings were not open to the public unless the established group meeting was already open to the public. | Pro: Target information for just the interests of that group, more likely to get attendance when combined with a meeting people already attend.<br>Con: Different groups may get different or conflicting messages; may reach fewer people or require too great of an effort on the part of the Navy. |
| 6. Newsletters                             | Four- to eight-page packet usually on general topics related to cleanup, providing overviews and language that is not overly technical. Hardcopies are distributed via the mail, handed out, and placed at businesses. Electronic copies are distributed by posting on a Web site and e-mailing.                                                                                                                                                                      | Pro: Familiarize people with various aspects of cleanup, does not need overly technical language.<br>Con: They are too long; people do not have time to read them.                                                                                                                                    |



## Chapter 2: Community Interviews and Feedback (continued)

### *Description of the Navy's Standard Involvement Activities and Interviewees' Concerns*

| Communication Method                 | Description                                                                                                                                                                                                       | Pros and Cons Noted by Interviewees                                                                                                                                                                                                                                                                    |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7. Hardcopy Flyers and Announcements | One-page or smaller, meant to announce an upcoming meeting or document for review and provide contact information. They are usually handed out at community meetings, posted in businesses, mailed, and e-mailed. | Pro: Short, easy to produce quickly to announce meetings in a timely manner. Can be posted in community.<br>Con: May be ignored unless someone from the community discusses the content with whoever receives the flyer.                                                                               |
| 8. Navy's Web Site                   | A public Web site that the community can access to review various information about the environmental cleanup program.                                                                                            | Pro: Convenient for Web-savvy community members, people can seek out various information and documents without having to keep track of hardcopy information.<br>Con: Navy's Web site is not up-to-date; not everyone has access; easier to talk to a person.                                           |
| 9. Open House                        | Multiple poster board stations set up with staff at each location to allow people to drop in any time during open hours and ask questions about topics of interest to them.                                       | Pro: Informal setting makes some people feel more comfortable; people can stay long enough to ask their questions and then leave without having to attend a long meeting.<br>Con: Not everyone hears the same information; there is no single venue where everyone in the community feels comfortable. |

### *Additional Community-Suggested Communication Methods*

Interviewees provided many different suggestions for different communication methods, not all of which will end up as part of the Navy's program. Some of the common suggestions provided by interviewees are listed as follows (a complete table of all suggestions made by interviewees is provided in [Appendix C](#)):

- Work with churches to share information
- Reestablish the RAB or a similar advisory board
- Give cleanup information on radio talk shows that allow listeners to call in and ask questions
- Collaborate with established community members to convey cleanup information
- Attend established community events and host a booth
- Create social media pages for HPS (Facebook and Twitter)

## *Chapter 2: Community Interviews and Feedback (continued)*

- Hold a community forum or town hall-type of meeting
- Distribute a calendar of Navy involvement events
- Use food or free school supplies as incentive for community members to attend meetings or take information handouts
- Use a public relations firm to engage the community with well-crafted messages and graphics

The interviews were successful with gathering feedback about the community's cleanup interests and concerns, as well as communication needs and preferences. The information obtained during the interviews was used to help design this CIP to be more effective for the HPS community, as discussed in the following chapter.

## *Chapter 2: Community Interviews and Feedback (continued)*

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## *Chapter 3: Community Involvement—Actions and Activities*

**The most important part of this CIP identifies the Navy's community involvement program actions and activities.** The Navy used numerous resources to prepare the community involvement program actions, including community interview feedback, community census information, Navy and regulatory agency community involvement guidance, and CIPs from various environmental cleanup sites, including Fort Ord, McClellan Air Force Base, and Iron King Mine Site. The Navy considered what works well for other similar environmental cleanup programs; however, the Navy has developed a plan of action to specifically address the needs of the HPS community. The Navy's objectives in conducting activities include the following:

- Work with the community to communicate information in a way that is transparent and how the community wants to receive it
- Get information out early, make sure it is easy to understand, and translated as needed
- Share how community input is used in the cleanup process
- Respond to and show how community's concerns, ideas, and information is used in making decisions about the environmental cleanup

### *Community Involvement Program Actions and Activities*

The following community involvement program activities are designed to meet the communication needs, concerns, and preferences of the various HPS stakeholders in the HPS community. The actions are designed to link with Community Themes 1 through 6 found on Page 8. It is important to also note that the Navy will have to balance its resources and staff to appropriately plan and implement any of these activities.

Feedback from the HPS community on the Navy's environmental cleanup program will be considered and used by the Navy and regulatory agencies. The Navy will track action items at meetings and respond to questions and comments. Frequently asked questions (**FAQs**) and responses will be posted on the Navy's Web site and brought to meetings as a handout, if applicable. If written formal comments are received on any document, the Navy will respond to those comments in writing and include the responses in the next version of the document that also contains the applicable revisions.

## Chapter 3: Community Involvement—Actions and Activities (continued)

### Linking Interview Feedback Themes With Community Involvement Program Actions

#### **THEME 1: THE NAVY'S COMMUNICATION WITH THE HPS COMMUNITY ABOUT THE ENVIRONMENTAL CLEANUP PROGRAM HAS NOT BEEN EFFECTIVE.**

*The goal for these actions is to make the Navy's communication with the community more effective. This goal will be measured based on feedback from the community and the regulatory agencies.*

##### **Actions to address this theme:**

##### **1. Distribute this CIP**

- Draft CIP was made available for public comment on March 8, 2011. Comments received on the Draft CIP and the Navy's responses are included in [Appendix J](#).
- Final copy will be on the Navy's Web site, in the information repositories, and available on request. It will include how the Navy addressed comments received during the public comment period.

##### **2. Prepare a Calendar of Outreach Events**

- The event calendar will be created annually and distributed in December for the next year.
- It will be prominently displayed on the Navy's Web site.
- The calendar will be designed to show forethought and commitment to activities and to help the public plan community involvement program activities into their schedules.
- The calendar is intended for wide distribution by mail and e-mail; distribution at community meetings, the Web site, and social media outlets (Facebook); and posted in select neighborhood locations, including churches.
- At meetings, an updated calendar of events and documents to be released will be distributed for the next 3 months.

##### **3. Prepare Topic-Specific Fact Sheets**

- Prepare and distribute fact sheets on specific topics as requested by the community, including topics to address the top interests and concerns noted during the interviews, found on [Page 11](#).

##### **4. Use a Community Involvement Manager**

- The Navy will designate a full-time Navy contractor to be the Community Involvement Manager and assist the Base Realignment and Closure (BRAC) Environmental Coordinator with the implementation of this CIP.
- The Community Involvement Manager will be the main contact for the HPS community, making it easier to communicate with the Navy.
- The Community Involvement Manager will work with the regulatory agencies to gather feedback to assess the success of this updated involvement program. This could include feedback forms, a community survey every two years, and anecdotal feedback.

## Chapter 3: Community Involvement—Actions and Activities (continued)

### Linking Interview Feedback Themes With Community Involvement Program Actions

#### THEME 2: GENERAL INFORMATION ABOUT THE NAVY'S ENVIRONMENTAL CLEANUP PROGRAM AT HPS IS LACKING.

*The goal for these actions is to make general information about HPS more available to the community. This goal will be measured by obtaining feedback from the community and the regulatory agencies.*

##### Actions to address this theme:

##### **1. Prepare a General Fact Sheet**

- The fact sheet will include HPS history, basic overview of cleanup activities and timeline, how human health is evaluated and addressed, agency roles and responsibilities, FAQs, contact information, and repository locations.
- The fact sheet will be updated annually.
- The fact sheet will be distributed at community meetings, posted on Web site and social media outlets (Facebook), and posted in select neighborhood locations (community centers, churches, and local businesses).
- The fact sheet will be translated into Chinese (Cantonese) and Spanish (other languages to be considered based on need). Based on information provided by the Chinese-American community, Cantonese is the primary Chinese dialect spoken in San Francisco.

##### **2. Hold Regularly Scheduled Community Meetings**

- Meetings will be held bimonthly (every other month), or more frequently if deemed appropriate; possibly in various locations so people that live in different parts of the community can attend.
- Meeting will be facilitated and the agenda will consist of Navy presentations, regulatory agency update, discussion of action items from previous meetings, and public question-and-answer period. The Navy will solicit community input for future agenda items at each meeting.
- Meetings will have a facilitator, summary notes sent to the e-mail list and placed on the Web site, and a translation provided, if needed.
- The meeting will be an opportunity for two-way communication between the Navy, regulatory agencies, and the community.

##### **3. Prepare Progress Reports**

- Progress reports will be created quarterly, and will be distributed via mail and e-mail, at community meetings, posted on the Web site and social media outlets (Facebook), posted in select neighborhood locations, and handed out by established community members.
- The reports will be about two pages long, with an update on recent activities and future public comment opportunities.
- The reports will be translated into Chinese (Cantonese) and Spanish (other languages to be considered based on need). Based on information provided by the Chinese-American community, Cantonese is the primary Chinese dialect spoken in San Francisco.



## Chapter 3: Community Involvement—Actions and Activities (continued)

### Linking Interview Feedback Themes With Community Involvement Program Actions

#### THEME 3: THE HPS COMMUNITY IS DIVERSE, RESULTING IN VARIED CONCERNS, COMMUNICATION PREFERENCES, AND NEEDS.

*The goal for these actions is to communicate with broader segments of the community, include those with and without computer access, those who do not speak English, those who prefer meetings, and those who prefer written materials. This goal will be measured by obtaining feedback from the community and the regulatory agencies.*

##### Actions to address this theme:

##### 1. Participate in Local Radio Shows – multi-lingual

- Give a presentation and/or answer questions during call-in shows; translation will be provided as necessary

##### 2. Provide a Telephone Hotline

- A recorded message will provide an update of monthly HPS activities such as meeting times and locations. Additional information on specific cleanup actions may also be provided, if timely.
- Callers will be able to hear the message in English Spanish, or Cantonese
- Callers will also be able to leave a message if they have a specific question and their call will be returned.

##### 3. Create a New Web Site

- Community members specifically said the current Web site is difficult to use.
- New Web site will be enhanced for better usability and functionality. The current Web site cannot be enhanced because of Department of Defense restrictions, so a new Web site must be created.
- The Web site will be updated at least monthly (i.e., when technical documents are released, notices of upcoming community involvement opportunities, etc.).
- The Web site will have a searchable FAQ of cleanup and site information.

##### 4. Maintain a Social Media (Facebook) Page

- Intended to give quick access to information, and will direct viewers to the new Web site. Those who follow the page will be able to send questions and comments to the Navy.
- Regularly updated with information on cleanup activities, cleanup photos, and meeting notices.
- Noted as a good way to reach the younger segments of the community.

##### 5. Update Mailing and Email Lists

- An updated mailing list to reach the full community will be purchased.
- Anyone can sign up at meetings or on the Web site to be added.
- The mailing list will be updated after each mailing with any returns; addresses for elected officials and businesses will be checked annually.
- An email distribution list will be maintained and updated similar to the mailing list.

##### 6. Print Newspaper Editorial

- In interview feedback, use of a newspaper was suggested as a good way to reach the Chinese-American segments of the community, specifically using Sing Tao Daily newspaper.
- For required public notices, hardcopy newspapers that were highly recommended include the following: *San Francisco Examiner*, *Sing Tao Daily*, *The Potrero View*, and *Visitacion Valley Grapevine* (Note: this newspaper is not currently being published; however, it may be used if publishing resumes)

## Chapter 3: Community Involvement—Actions and Activities (continued)

### Linking Interview Feedback Themes With Community Involvement Program Actions

#### **THEME 4: THE DIFFERENCE BETWEEN THE NAVY'S HPS ENVIRONMENTAL CLEANUP PROGRAM AND THE SFRA'S REDEVELOPMENT OF HPS HAS NOT BEEN MADE CLEAR.**

*The goal for these actions is to explain the transfer process and clarify who community members can talk with about cleanup concerns versus redevelopment concerns.*

##### **Actions to address this theme:**

##### **1. Hold Bus Tours**

- Bus tours will be held for the larger community by advanced registration twice a year. Tours will show participants the environmental cleanup progress, provide an understanding of what belongs to the Navy and what belongs to SFRA, and provide an opportunity for dialogue.
- Tours will be advertised through the active community members, on the Web site, and at meetings, as well as posted on the calendar.

##### **2. Distribute Topic-specific Fact Sheets**

- Created bimonthly, these fact sheets will focus on one specific technical topic. The topic of the fact sheet will coincide with the community meetings.
- Technical fact sheets will not be mailed to the full mailing list. They will be distributed at community meetings, posted on the Web site, e-mailed, and made available at the information repository and by request.
- The fact sheet will be translated into Chinese (Cantonese) and Spanish (other languages to be considered based on need). Based on information provided by the Chinese-American community, Cantonese is the primary Chinese dialect spoken in San Francisco.

#### **THEME 5: HEALTH IS A PRIMARY CONCERN FOR MOST SEGMENTS OF THE COMMUNITY.**

*The goal for these actions is to provide the community with the resources to have their health concerns addressed. It is also to communicate the ways the environmental cleanup is intended to be protective of human health.*

##### **Actions to address this theme:**

##### **1. Provide Health Contact Information in this CIP**

- This CIP includes information regarding how health is addressed during a cleanup, a summary of the common health concerns, how the Navy protects the workers and community during active cleanup work, and health officials to contact for more information and assistance. See [Appendix A](#), Health-Related Information, Resources and Contacts.

##### **2. Use HPS Project Web site**

- Include health information in FAQ

##### **3. Hold Regularly Scheduled Community Meetings**

- The Navy will provide time, as needed, in meeting agendas for presentations by professional health organizations such as the Asthma Task Force for asthma education.

##### **4. Distribute Topic-specific Fact Sheets**

- Include health information in a general fact sheet that will be posted on the Web site and available at Navy events.

## Chapter 3: Community Involvement—Actions and Activities (continued)

### Linking Interview Feedback Themes With Community Involvement Program Actions

#### **THEME 6: COORDINATING WITH ESTABLISHED COMMUNITY MEMBERS TO CONDUCT INVOLVEMENT MAY BE A GOOD WAY TO REACH ALL SECTORS OF THE COMMUNITY.**

*The goal for these actions is to use community expertise and work together to communicate with the HPS community.*

##### **Actions to address this theme:**

##### **1. Use Grassroots Outreach**

- Activities will include having residents in the HPS community and community members hand out flyers, post meeting notices on community bulletin boards and at businesses, help improve the site mailing list, and share community feedback with the Navy and regulatory agencies.
- Grassroots outreach will be timed to coincide with distribution of flyers, fact sheets, or quarterly progress reports and/or the community meetings.

##### **2. Navy Presentations at Established Community-Organized Meetings**

- As invited, the Navy and regulators will give the “General Environmental Presentation” or other updates at an established group’s meetings. Advertisements for the meeting and the agenda would be the responsibility of the community group.
- Presentation will consist of general information with time for questions and answers and will focus on the interests of the specific group addressed.
- The presentation will be intended to reach specific audiences that can then disseminate information through expanded group. Groups could include Parent-Teacher Associations, tenants’ associations, Board of Supervisors, and business associations.
- Regular updates could be given to the San Francisco Citizens Advisory Committee (CAC) and the Project Area Committee (PAC) meetings.
- To be more transparent, the Navy will develop a FAQs list that will be updated after each meeting and shared as a handout at each event, in newsletters and on the Web site.

Note: Many actions address more than one theme. See the following table for a complete listing of all themes that an action is designed to address.

The purpose of these activities is to inform the community and engage them in cleanup decisions. The Navy will also distribute a survey to the mailing list to evaluate the program every two years. The findings of this survey will be documented in a memorandum that is included in the Administrative Record for HPS. The survey and documentation will comply with 32 CFR 202.10. The Navy will periodically review this CIP and update it accordingly. The goals for the activities will be evaluated on a yearly basis by the Navy’s Community Involvement Manager to ensure that they are being met.

Chapter 3: Community Involvement—Actions and Activities (continued)

Table of Navy’s Updated Community Involvement Actions and Activities

| Actions and Activities                                                                                                                                                                                                                                                | Delivered By                                                                   | Interview Theme Addressed            |                                                                                                 |                                                                                                 |                                                                                                                                  |                                         |                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                       |                                                                                | 1.<br>Communication<br>Not Effective | 2.<br>Available General<br>Information about<br>the Environmental<br>Cleanup Program<br>Lacking | 3.<br>Varied Concerns,<br>Communication<br>Preferences, and<br>Needs among<br>Diverse Community | 4.<br>Difference between the<br>Navy’s Environmental<br>Cleanup Program and the<br>SFRA Redevelopment has<br>Not Been Made Clear | 5.<br>Health is a<br>Primary<br>Concern | 6.<br>Coordination with Established<br>Community Members to<br>Conduct Involvement May be<br>A Good Way To Reach All<br>Sectors of the Community |
| <b>Calendar of Outreach Events, multi lingual:</b> Publish in January for calendar year ahead                                                                                                                                                                         | Mail, email, post<br>hardcopy, Web site                                        | X                                    | X                                                                                               | X                                                                                               |                                                                                                                                  |                                         |                                                                                                                                                  |
| <b>Community Involvement Manager:</b> Use a Navy staff member to focus solely on community involvement program activities                                                                                                                                             | N/A                                                                            | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                |                                         | X                                                                                                                                                |
| <b>General Fact Sheet, multi-lingual:</b> Overview of environmental cleanup program, roles and responsibilities, and schedule formatted into brief fact sheet                                                                                                         | Mail, e-mail, post<br>hardcopy, Web site                                       | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                |                                         |                                                                                                                                                  |
| <b>Regularly Scheduled Community Meetings:</b> Held every other month, technical presentations and updates from Navy and regulatory agencies (held at various locations)                                                                                              | In person at Navy-<br>coordinated venue                                        | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                | X                                       |                                                                                                                                                  |
| <b>Progress Reports:</b> Quarterly update on recent activities and upcoming opportunities to comment                                                                                                                                                                  | Mail, e-mail, post<br>hardcopy, post on Web<br>site                            | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                |                                         |                                                                                                                                                  |
| <b>HPS Project Web Site:</b> Searchable, with FAQ                                                                                                                                                                                                                     | Online                                                                         | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                | X                                       | X                                                                                                                                                |
| <b>Facebook Page:</b> Public relations firm creates and manages HPS page with regular updates on activities, cleanup photos, meetings, and responses to questions                                                                                                     | Web site, put links on<br>fact sheets                                          | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                | X                                       |                                                                                                                                                  |
| <b>Mailing List Update:</b> Current hardcopy mail and e-mail distribution lists will be reviewed for accuracy                                                                                                                                                         | E-mail, hardcopy                                                               | X                                    | X                                                                                               | X                                                                                               |                                                                                                                                  |                                         | X                                                                                                                                                |
| <b>Newspaper Notices and Editorial Column:</b> Public notices will be created to meet regulatory requirements and to announce community meetings; editorial columns will educate diverse community groups about the environmental cleanup progress                    | Hardcopy and<br>online newspapers                                              |                                      | X                                                                                               | X                                                                                               |                                                                                                                                  |                                         |                                                                                                                                                  |
| <b>Bus Tours:</b> Community-wide on a larger bus and for smaller groups with a van                                                                                                                                                                                    | In person at HPS                                                               | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                |                                         | X                                                                                                                                                |
| <b>Topic-Specific Fact Sheets, multi-lingual:</b> Brief update on a technical topic, meant to reach those who already know the basics about the project and want specific details                                                                                     | E-mail, hardcopy handout,<br>not mailed to full list                           |                                      |                                                                                                 | X                                                                                               | X                                                                                                                                | X                                       |                                                                                                                                                  |
| <b>Presentations to Existing Groups:</b> Attend an established group meeting and give an update relevant to their members (could include a church, homeowners association, civic group, school, etc.)                                                                 | Face-to-face presentation                                                      | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                |                                         | X                                                                                                                                                |
| <b>Grassroots Outreach:</b> Work with community members to hand out outreach materials, post flyers, and give basic information                                                                                                                                       | Face-to-face interaction<br>to promote trust between<br>the community and Navy | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                |                                         | X                                                                                                                                                |
| <b>Local Radio Shows, multi-lingual:</b> Give a presentation and/or answer questions during call-in shows.                                                                                                                                                            | Radio, internet via podcast<br>if available                                    | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                |                                         | X                                                                                                                                                |
| <b>Telephone Hotline:</b> Give a recorded update of activities, and allow callers to leave a message                                                                                                                                                                  | Telephone                                                                      | X                                    | X                                                                                               | X                                                                                               |                                                                                                                                  |                                         |                                                                                                                                                  |
| <b>General Environmental Presentation, multi-lingual:</b> Overview of environmental cleanup program in a 20-minute PowerPoint® presentation with time for questions and answers; appropriate for established community groups (this will also include an FAQ handout) | In person at group<br>meetings                                                 | X                                    | X                                                                                               | X                                                                                               | X                                                                                                                                |                                         | X                                                                                                                                                |

*Chapter 3: Community Involvement—Actions and Activities (continued)*

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Chapter 4: Navy’s Cleanup Program at Hunters Point Shipyard

To help the community understand the cleanup process at HPS better, this chapter discusses historical operations at HPS that resulted in contamination, presents a timeline of these past activities, and describes the current status of the Navy’s environmental cleanup program at HPS. Maps of HPS and its various parcels are also provided. The Navy will take requests for presentations about documents and cleanup actions. Providing these presentations will educate the community about topics of their interest, and will help the community to comment on the related documents.

HPS Timeline

HPS is located in southeastern San Francisco on a peninsula that extends east into the San Francisco Bay. The timeline to the right and paragraphs that follow provide an overview of the history of HPS since the mid-1800s.

From the mid-1800s until 1938, HPS was used as a commercial dry dock. In 1939, the Navy purchased the property. From 1945 to 1974, the Navy was one of the largest employers of the HPS community. HPS was mostly used as a repair facility for Navy ships and submarines, and was partially occupied by the Naval Radiological Defense Laboratory (NRDL) from 1948 to 1969. In 1974, the Navy ceased shipyard operations at HPS.

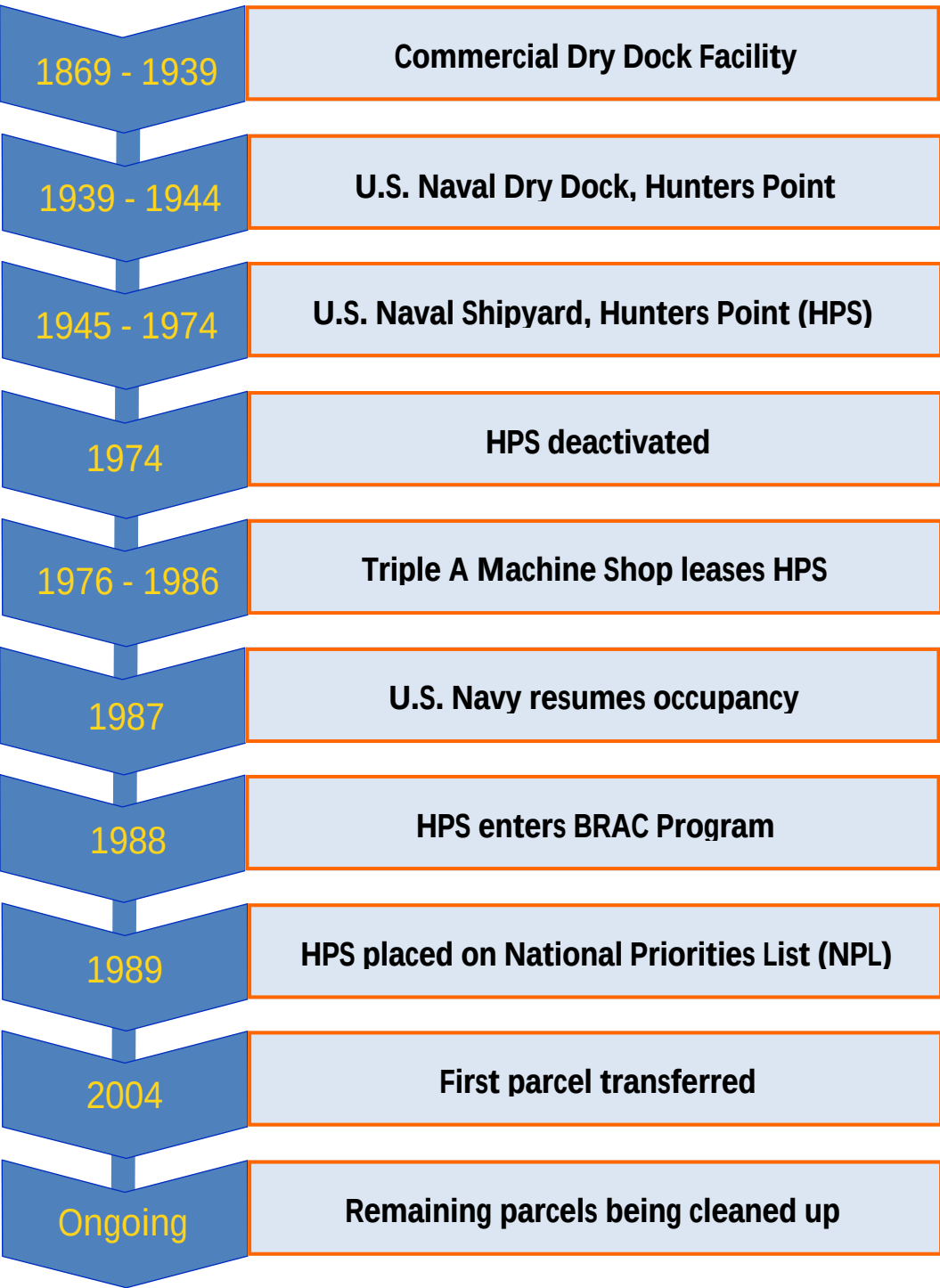
From 1976 until 1986, Triple A Machine Shop, Inc. leased 98 percent of HPS. Triple A Machine Shop was a private ship repair company that used the facility to repair commercial and naval vessels. It also subleased portions of the property to various other businesses for warehousing distribution centers and light industry.

HPS entered the BRAC Program in 1988 (which is the Navy’s program for cleaning up and transferring Navy properties that are no longer needed). The 934 acres at HPS were subsequently divided into parcels (see map on [Page 30](#)) as a way to organize the environmental investigation and cleanup. In 1989, HPS was evaluated by U.S. EPA and placed on its National Priorities List (NPL) based on the presence of hazardous materials from past Navy and private operations at the shipyard. NPL sites, also known as Superfund sites, are sites with hazardous contamination that are prioritized for long-term environmental study and cleanup supervised by U.S. EPA.

In 2004, environmental cleanup on one of the parcels, known as Parcel A, met all the necessary cleanup requirements for residential use and was successfully transferred to the San Francisco Redevelopment Agency. Since the transfer was completed, the SFRA has been responsible for redevelopment of Parcel A.

More information on the current status of other individual parcels and of the overall status of the environmental cleanup program at HPS begins on the following page.

USS Providence at HPS,  
June 24, 1965



*Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)*

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## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Status of the Environmental Cleanup at HPS

The parcels at HPS are in various stages of environmental cleanup. During community interviews, several interviewees asked why HPS is being cleaned up in various stages instead of cleaning up the entire shipyard and then transferring it all at once. The HPS property, some of which is offshore (underwater), has various types and levels of contamination at various locations. The Navy has taken this large cleanup project and divided it into smaller, more manageable tasks. This helps the Navy set priorities and focus on cleanup of sites when timing, regulatory approval, and funding are available to move forward. The Navy is working to prepare land for transfer as soon as possible to allow the SFRA to reuse the property for the benefit of the community (land is ready for transfer when it has been through the required environmental studies and cleanup activities, and has been approved by the Navy and the regulatory agencies as suitable for transfer). By completing the cleanup in stages, the Navy can transfer parts of HPS sooner than waiting for all areas to be done.

The environmental investigation and cleanup underway at HPS on the remaining parcels is grouped into the following three programs:

1. Residual Fuels Program: Focuses on spills and leaks of fuels (diesel and gasoline) and motor oil from former fuel distribution lines and storage tanks.
2. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)<sup>1</sup> Program-regulated Chemicals: The chemicals regulated under CERCLA include solvents, pesticides, metals (such as mercury and lead), and other chemicals listed on the table on the following page.
3. Radiological Program: Addresses a variety of low-level residual radiological (meaning radioactive) materials, including areas that contain buried World War II-era luminescent (glow-in-the-dark) dials and buttons, sewer and storm drain lines from buildings used for radiological research or maintenance, and these buildings themselves.

A site is placed in a particular environmental cleanup program based on the contaminants found at that location. Following is a table of some common contaminants and uses found at HPS. For more health-related information about these contaminants, go to [www.atsdr.cdc.gov/toxfaqs/index.asp](http://www.atsdr.cdc.gov/toxfaqs/index.asp) or call 1-800-CDC-INFO (232-4636). The link and number are the contacts for the Agency for Toxic Substances and Disease Registry (**ATSDR**), which is a federal government public health agency. Additional information on contaminants is also available from the U.S. EPA at [www.epa.gov/wastes/topics.htm](http://www.epa.gov/wastes/topics.htm).

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<sup>1</sup> See the diagram in [Appendix G](#) for an explanation of how the CERCLA process, which is also known as the Superfund process, works.



*Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)**Common Contaminants in Soil and Groundwater at HPS*

| Contaminant                             | Description                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Metals                                  | Includes arsenic, chromium, copper, lead, manganese, zinc, and others. These metals can occur naturally in the soil and rock at HPS. Metals are also often present because of the ships that were repaired or cleaned at HPS.                                                                                                                           |
| Pesticides                              | Chemicals designed to kill pests (rodents, insects, or unwanted plants). They may have been sprayed to control pests or weeds on the site.                                                                                                                                                                                                              |
| Polychlorinated Biphenyls (PCBs)        | A liquid used to cool or lubricate in electrical equipment because it does not burn easily and is a good insulator. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Electrical equipment (such as transformers) used before 1977 may have used PCBs. |
| Polycyclic Aromatic Hydrocarbons (PAHs) | Chemicals that are formed when items are burned, such as oil, gasoline, garbage, wood, or coal. Tar and asphalt also contain PAHs.                                                                                                                                                                                                                      |
| Radionuclides                           | A radioactive element, human-made or from natural sources, including radium, cesium, and strontium. Often occurring naturally in the soil in some areas, at HPS they may be present from paint that contained radionuclides so it would glow.                                                                                                           |
| Semi-volatile Organic Compounds (SVOCs) | Organic chemicals that do not evaporate as easily as VOCs (see below) and become liquid or solid at low temperatures. Kerosene is an example of an SVOC.                                                                                                                                                                                                |
| Total Petroleum Hydrocarbons (TPH)      | TPH is a mixture of chemicals, but they are all made mainly from hydrogen and carbon, called hydrocarbons. These chemicals originally come from crude oil and can be found in gasoline, kerosene, fuel oil, mineral oil, and asphalt.                                                                                                                   |
| Volatile Organic Compounds (VOCs)       | Organic chemicals that easily evaporate into the air and are often easy to smell. Common VOCs are paint thinners and automotive gasoline.                                                                                                                                                                                                               |

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

Following is a map of the region, followed by a map of the entire HPS showing its various parcel boundaries. The following pages provide an overview of the historical use, contamination, and current environmental investigations at each parcel.

### Regional Map





## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

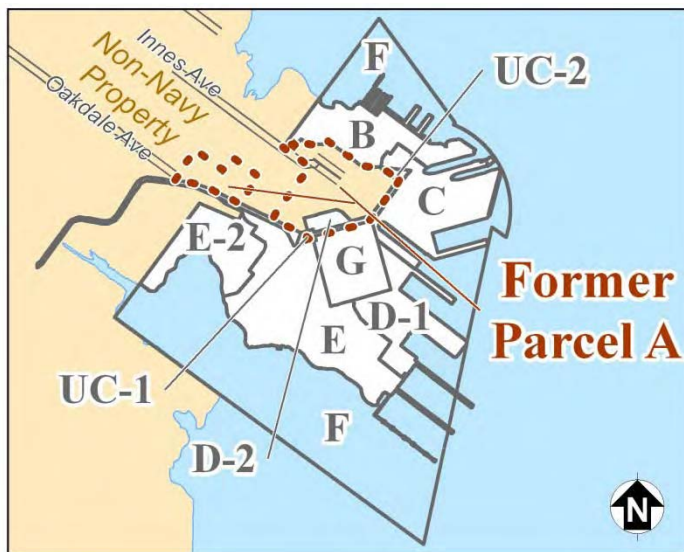
### Hunters Point Shipyard Map



## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel A

|                                                              |                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Residential housing                                                                                                                                                                                                                                                                                                    |
| <b>Contaminants at the site</b>                              | Low levels of residual fuels                                                                                                                                                                                                                                                                                           |
| <b>Status of the cleanup</b>                                 | The Navy completed the cleanup to residential standards and transferred the property to the SFRA in December 2004.                                                                                                                                                                                                     |
| <b>Next steps at this site</b>                               | <i>Parcel A is no longer Navy property.</i><br>The SFRA is working with developers selected by the SFRA to build housing, create parks, and have commercial uses at the former Parcel A location. The redevelopment must comply with standard City and State of California construction and dust control requirements. |

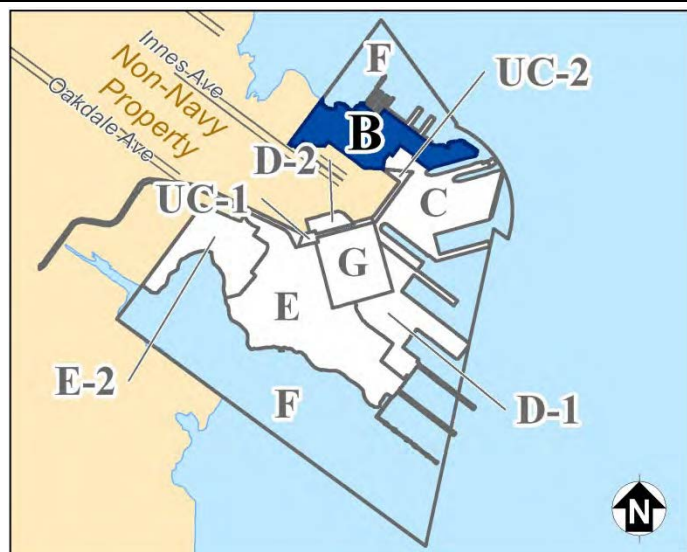


Location of Former Parcel A. For a detailed satellite view, see [Page 30](#).

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel B

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Shipping, repair, and maintenance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Contaminants at the site</b>                              | Metals, VOCs, SVOC, pesticides, PCBs, and radionuclides                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Status of the cleanup</b>                                 | <p>The Navy has completed the investigations and chosen the cleanup remedy with public input and agency concurrence. The remedy includes removing soil contamination and disposing off-site, placing cover material (e.g., clean soil or asphalt) over specified areas, cleaning up the groundwater plumes, and placing restrictions called land use controls. The land use controls make sure the remedy remains protective of human health and the environment.</p> <p>Over the years, the Navy has removed tens of thousands of cubic yards of contaminated soil and hauled that soil off HPS for disposal at landfill sites. The Navy built a protective wall along the shoreline to hold sediment in place and a protective soil cover has also been placed over a portion of the Parcel. The storm and sewer lines that had the potential to be contaminated with low levels of radiation have been removed and sent off site for disposal. Buildings have also been surveyed and any radiological contamination has been removed.</p> |
| <b>Next steps at this site</b>                               | Most of Parcel B is proposed for early transfer to the SFRA in 2011 and SFRA will complete the cleanup. The Navy is completing the cleanup of a smaller portion of Parcel B (IR 07/18) and transferring this portion to SFRA in 2011. The proposed reuse includes educational/cultural use, mixed use (residential and industrial), open space, and research and development.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

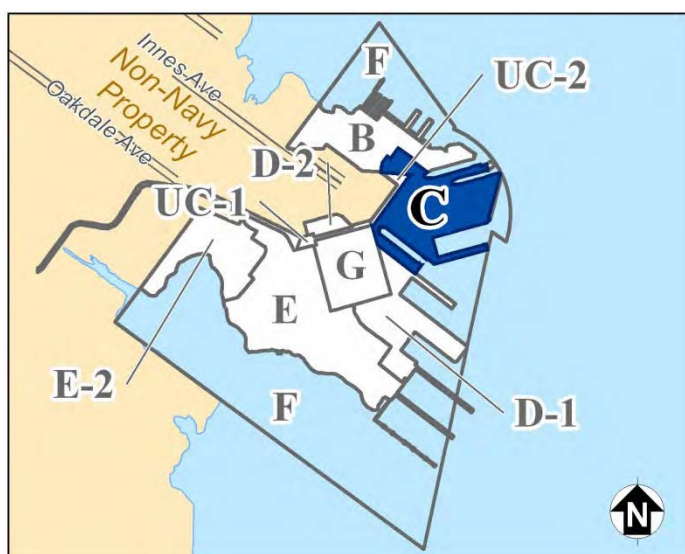


Location of Former Parcel B. For a detailed satellite view, see [Page 30](#).

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel C

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Ship repair, foundry, power plant, machine shops, paint shops, and radiological research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Contaminants at the site</b>                              | Metals, PAHs, PCBs, SVOCs, VOCs, pesticides, and radionuclides                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Status of the cleanup</b>                                 | <p>The Navy has completed the investigations and chosen the cleanup remedy with public input and agency concurrence. The remedy includes removing soil contamination and disposing offsite, placing cover material over the entire parcel, cleaning up the groundwater plumes, and placing land use controls. The land use controls make sure the remedy remains protective of human health and the environment.</p> <p>The Navy is in the process of developing the remedial design and remedial work plan and treating the groundwater contamination, and is in the process of removing storm and sewer lines that have the potential to be contaminated with low levels of radiation. The Navy will survey the buildings and remove any radiological contamination.</p> |
| <b>Next steps at this site</b>                               | The Navy anticipates the transfer of Parcel C to SFRA in 2013. The proposed reuse includes educational/cultural use, maritime/industrial, mixed use (residential and industrial), open space, and research and development.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



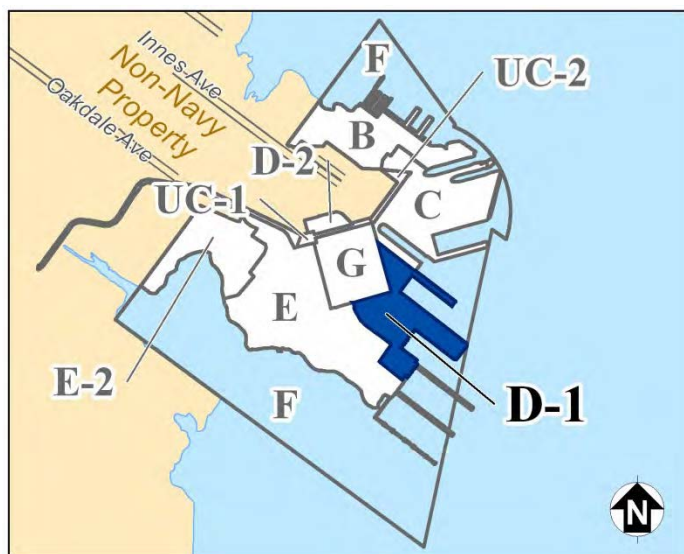
Location of Former Parcel C. For a detailed satellite view, see [Page 30](#).



## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel D-1

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Shipbuilding, repair, and maintenance and radiological research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Contaminants at the site</b>                              | Metals, PAHs, VOCs, and radionuclides                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Status of the cleanup</b>                                 | <p>The Navy has completed the investigations and chosen the cleanup remedy with public input and agency concurrence. The remedy includes removing soil contamination and disposing offsite, placing cover material over the entire parcel, cleaning up the groundwater plumes and placing land use controls. The land use controls make sure the remedy remains protective of human health and the environment.</p> <p>The Navy removed the soil contamination and disposed of it offsite and has treated the contaminated groundwater. The Navy is finalizing the remedial design and is in the process of removing storm and sewer lines that have the potential to be contaminated with low levels of radiation. The Navy is also cleaning up the piers from potential low level radiation.</p> |
| <b>Next steps at this site</b>                               | The Navy anticipates the transfer of Parcel D-1 to SFRA in 2012. The proposed reuse includes mixed use (residential and industrial) and industrial.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

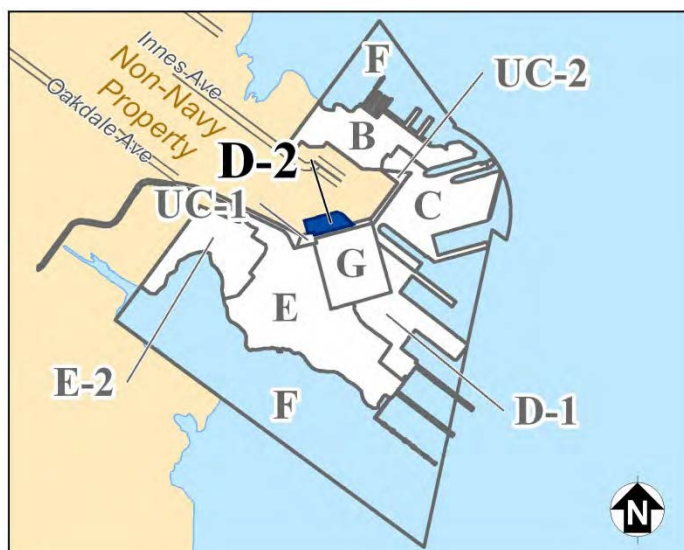


Location of Former Parcel D-1. For a detailed satellite view, see [Page 30](#).

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel D-2

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Radiological laboratory and former underground storage tank                                                                                                                                                                                                                                                                                                                                                            |
| <b>Contaminants at the site</b>                              | Radionuclides                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Status of the cleanup</b>                                 | The Navy has completed the investigations and with public input and agency concurrence determined that no further action is necessary. Portions of the combined storm and sanitary sewers were removed between 2006 and 2009. After final review of the status of the cleanup, the Navy and agencies concluded that there are no unacceptable risks from hazardous substances or radiological material in this parcel. |
| <b>Next steps at this site</b>                               | The Navy anticipates the transfer of Parcel D-2 to SFRA in 2011. The proposed reuse includes residential along with research and development.                                                                                                                                                                                                                                                                          |



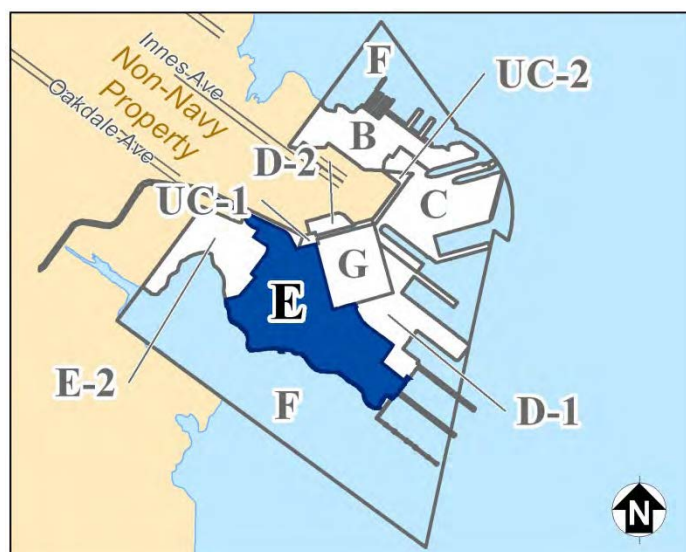
Location of Former Parcel D-2. For a detailed satellite view, see [Page 30](#).



## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel E

|                                                              |                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Ship repair and industrial operations                                                                                                                                                                                                                                                                      |
| <b>Contaminants at the site</b>                              | Metals, VOCs, PCBs, TPH, pesticides, and radionuclides                                                                                                                                                                                                                                                     |
| <b>Status of the cleanup</b>                                 | The Navy has completed the investigations and is in the process of completing the feasibility study. The feasibility study evaluates remedies specific to Parcel E. The Navy is also treating the groundwater in specific locations on Parcel E while performing studies on groundwater treatment methods. |
| <b>Next steps at this site</b>                               | The Navy will choose the cleanup remedy with agency concurrence and input from the public. The Navy anticipates the transfer of Parcel E to SFRA in 2014. The proposed reuse includes research and development and open space.                                                                             |

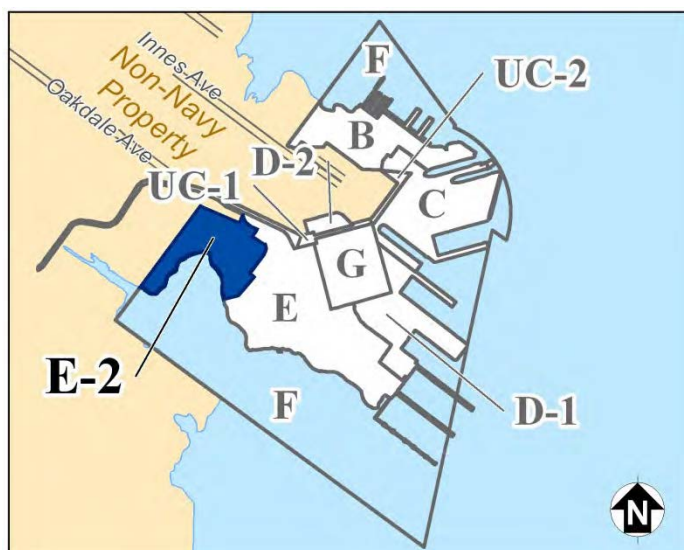


Location of Former Parcel E. For a detailed satellite view, see [Page 30](#).

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel E-2

|                                                              |                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Landfill for HPS industrial operations and construction activities                                                                                                                                                                                                                                                                         |
| <b>Contaminants at the site</b>                              | Metals, VOCs, PCBs, TPH, pesticides, and radionuclides                                                                                                                                                                                                                                                                                     |
| <b>Status of the cleanup</b>                                 | The remedial investigation and feasibility study is being finalized. The remedial investigation evaluates the contamination and potential risk to human health and the environment. The feasibility study evaluates remedies specific to Parcel E-2. The Navy is also currently removing contaminated soil and debris along the shoreline. |
| <b>Next steps at this site</b>                               | The Navy will choose the cleanup remedy with agency concurrence and input from the public. The Navy anticipates the transfer of Parcel E-2 to SFRA in 2017. The proposed reuse includes research and development and open space.                                                                                                           |

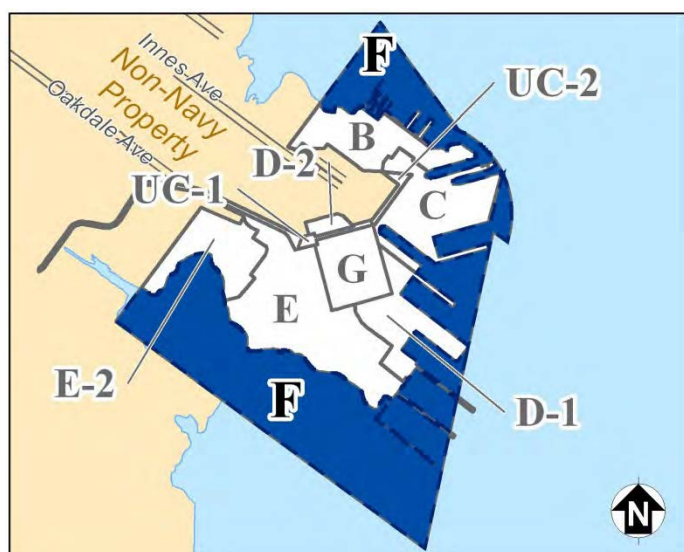


Location of Former Parcel E-2. For a detailed satellite view, see [Page 30](#).

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel F

|                                                              |                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Historical industrial operations (offshore areas)                                                                                                                                                                                                                                               |
| <b>Contaminants at the site</b>                              | Metals, PCBs, and radionuclides                                                                                                                                                                                                                                                                 |
| <b>Status of the cleanup</b>                                 | The investigation and feasibility study have been completed to address chemical contamination in the sediment. An investigation for evaluating the potential for low-level radiation in Parcel F is being conducted. Piers that pose a navigational hazard are in the process of being removed. |
| <b>Next steps at this site</b>                               | Once the radiological evaluation is completed, the Navy will choose the cleanup remedy with agencies' concurrence and input from the public. The Navy anticipates the transfer of Parcel F to SFRA in 2017.                                                                                     |

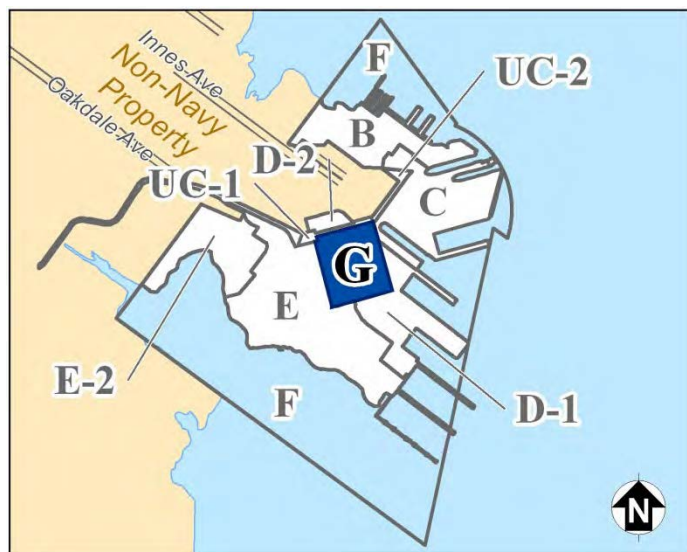


Location of Former Parcel F. For a detailed satellite view, see [Page 30](#).

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel G

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Shipbuilding, repair, and maintenance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Contaminants at the site</b>                              | Metals, PAHs, VOCs, and radionuclides                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Status of the cleanup</b>                                 | <p>The Navy has completed the investigations and has chosen the remedy with public input and agency concurrence. The remedy consists of removing soil contamination and taking the soil off HPS for disposal at landfill sites, placing cover material over specified areas, monitoring the groundwater, and placing restrictions called land use controls. The land use controls make sure the remedy remains protective of human health and the environment.</p> <p>The storm and sewer lines that had the potential to be contaminated with low levels of radiation have been removed and sent offsite for disposal. Buildings have also been surveyed and any radiological contamination has been removed.</p> |
| <b>Next steps at this site</b>                               | Parcel G is proposed for early transfer to the SFRA in 2011 and SFRA will complete the cleanup. The proposed reuse includes education/cultural, industrial and mixed use (residential and industrial) and open space.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

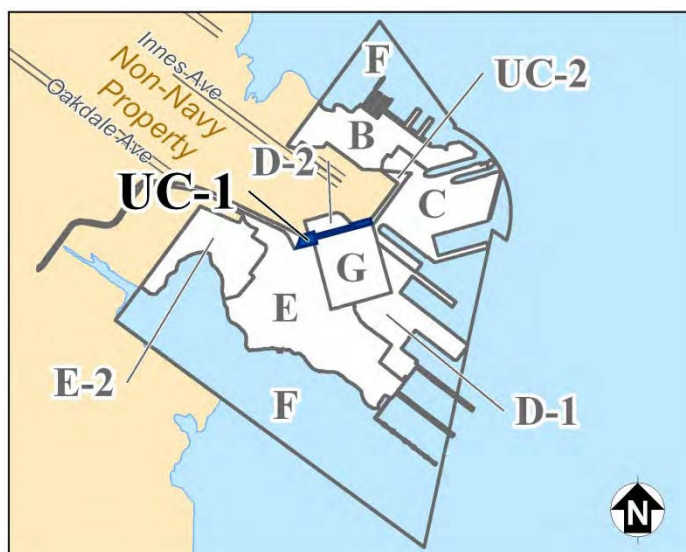


Location of Former Parcel G. For a detailed satellite view, see [Page 30](#).

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel UC-1

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Storm sewer and sanitary sewer                                                                                                                                                                                                                                                                                                                                                        |
| <b>Contaminants at the site</b>                              | Metals and radionuclides                                                                                                                                                                                                                                                                                                                                                              |
| <b>Status of the cleanup</b>                                 | The Navy has completed the investigations and has chosen the remedy with public input and agency concurrence. The remedy consists of placing a cover over the entire parcel. Land use controls are also included to make sure the remedy remains protective of human health and the environment. The Navy is finalizing the remedial design and radiological remediation is complete. |
| <b>Next steps at this site</b>                               | The Navy anticipates the transfer of Parcel UC-1 to SFRA in 2011. The proposed reuse includes mixed use (residential and industrial) and industrial.                                                                                                                                                                                                                                  |

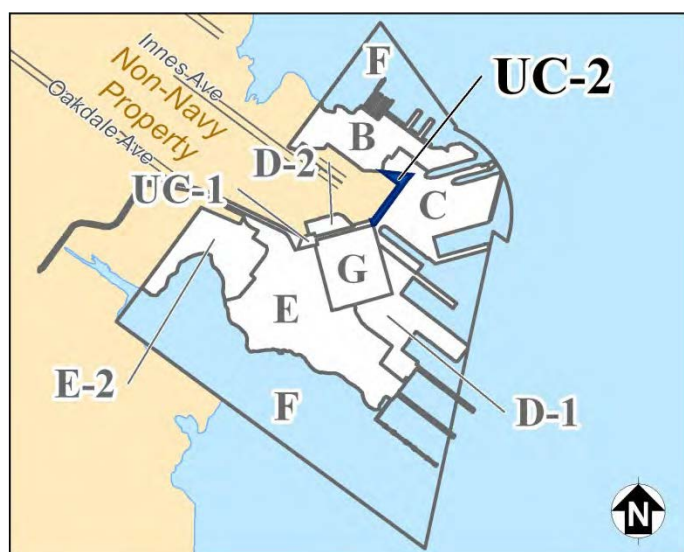


Location of Former Parcel UC-1. For a detailed satellite view, see [Page 30](#).

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Parcel UC-2

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical use<br/>(possible source of contamination)</b> | Storm sewer and sanitary sewer                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Contaminants at the site</b>                              | Metals, VOCs, and radionuclides                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Status of the cleanup</b>                                 | The Navy has completed the investigations and has chosen the remedy with public input and agency concurrence. The remedy consists of placing a cover over the entire parcel and groundwater monitoring to evaluate natural reduction of the contaminants in the groundwater. Land use controls are also included to make sure the remedy remains protective of human health and the environment. The Navy is finalizing the remedial design and radiological remediation is complete. |
| <b>Next steps at this site</b>                               | The Navy anticipates the transfer of Parcel UC-2 to SFRA in 2011. The proposed reuse includes mixed use (residential and industrial) and industrial.                                                                                                                                                                                                                                                                                                                                  |



Location of Former Parcel UC-2. For a detailed satellite view, see [Page 30](#).

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Opportunities for Public Involvement at HPS

In order to manage the multi-year environmental cleanup for the parcels at HPS, the Navy created a schedule of activities that includes the environmental investigations, remediation, and the delivery of technical documents. Below is the estimated schedule of activities and technical documents for each parcel. Opportunities for community involvement throughout these investigations will be announced through community meetings, fact sheets, public notices, and/or the Navy's Web site. Note that some documents have a required formal public review period during which the public can provide comments and input on the document, as per NCP requirements. Others are not required by the NCP to have a public comment period, but the Navy will provide that opportunity upon request.

#### *Schedule of Reports for Cleanup Activities at Each Parcel*

| Name of Report <sup>a</sup>                                                 | Issue Date         | Opportunities for Public Involvement                 |
|-----------------------------------------------------------------------------|--------------------|------------------------------------------------------|
| <b>Basewide</b>                                                             |                    |                                                      |
| Groundwater Monitoring Program Semiannual Report                            | Spring 2011        | Available upon request for public review and comment |
| Final Supplemental Environmental Impact Statement                           | Summer 2011        | Available upon request for public review and comment |
| Groundwater Monitoring Program Semiannual Report                            | Fall 2011          | Available upon request for public review and comment |
| Groundwater Monitoring Program Semiannual Reports                           | Two times per year | Available upon request for public review and comment |
| <b>PARCELS B, D-1, G, UC-2</b>                                              |                    |                                                      |
| Draft Soil Vapor Intrusion <sup>b</sup> Technical Memorandum                | Summer 2011        | Available upon request for public review and comment |
| Final Soil Vapor Intrusion <sup>b</sup> Technical Memorandum                | Fall 2011          | Available upon request for public review and comment |
| <b>PARCELS C and E</b>                                                      |                    |                                                      |
| Draft Work Plan for Soil Vapor Intrusion Survey - Parcels C and E           | Summer 2011        | Available upon request for public review and comment |
| Final Work Plan for Soil Vapor Intrusion Survey - Parcels C and E           | Summer 2011        | Available upon request for public review and comment |
| Draft Soil Vapor Intrusion Technical Memorandum - Parcels C and E           | Fall 2011          | Available upon request for public review and comment |
| Final Soil Vapor Intrusion Technical Memorandum - Parcels C and E           | Winter 2011        | Available upon request for public review and comment |
| <b>PARCELS B, D-1, G</b>                                                    |                    |                                                      |
| Draft Remedial Action Completion Report for Parcels B, D-1, and G Hot Spots | Summer 2011        | Available upon request for public review and comment |



## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### Schedule of Reports for Cleanup Activities at Each Parcel

| Name of Report <sup>a</sup>                                                                 | Issue Date  | Opportunities for Public Involvement                 |
|---------------------------------------------------------------------------------------------|-------------|------------------------------------------------------|
| Final Remedial Action Completion Report for Parcels B, D-1, and G Hot Spots                 | Fall 2011   | Available upon request for public review and comment |
| <b>PARCEL B</b>                                                                             |             |                                                      |
| Draft Remedial Action Completion Report for IR Site 07/18                                   | Fall 2011   | Available upon request for public review and comment |
| Final Remedial Action Completion Report for IR Site 07/18                                   | Fall 2011   | Available upon request for public review and comment |
| <b>Parcel B Petroleum Program</b>                                                           |             |                                                      |
| Final Total Petroleum Hydrocarbon Closure Report                                            | Spring 2011 | Available upon request for public review and comment |
| <b>PARCEL C</b>                                                                             |             |                                                      |
| Draft Remedial Design                                                                       | Spring 2011 | Available upon request for public review and comment |
| Draft Final Remedial Design                                                                 | Winter 2011 | Available upon request for public review and comment |
| Final Remedial Design                                                                       | Spring 2012 | Available upon request for public review and comment |
| Draft Remedial Action Work Plan (RU-C2)                                                     | Summer 2011 | Available upon request for public review and comment |
| Final Remedial Action Work Plan (RU-C2)                                                     | Summer 2011 | Available upon request for public review and comment |
| Draft Completion Report (RU-C2)                                                             | 2014        | Available upon request for public review and comment |
| Final Completion Report (RU-C2)                                                             | 2014        | Available upon request for public review and comment |
| <b>Parcel C Groundwater Treatability Studies</b>                                            |             |                                                      |
| Draft Final In Situ Anaerobic Bioremediation <sup>c</sup> Treatability Study Report (RU-C1) | Spring 2011 | Available upon request for public review and comment |
| Final In Situ Anaerobic Bioremediation <sup>c</sup> Treatability Study Report (RU-C1)       | Summer 2011 | Available upon request for public review and comment |
| Draft Groundwater Treatability Study Report (RU-C5)                                         | Fall 2011   | Available upon request for public review and comment |
| Draft Final Groundwater Treatability Study Report (RU-C5)                                   | Fall 2011   | Available upon request for public review and comment |
| Final Groundwater Treatability Study Report (RU-C5)                                         | Winter 2011 | Available upon request for public review and comment |



## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### *Schedule of Reports for Cleanup Activities at Each Parcel*

| Name of Report <sup>a</sup>                                | Issue Date  | Opportunities for Public Involvement                 |
|------------------------------------------------------------|-------------|------------------------------------------------------|
| <b>Parcel C Petroleum Program</b>                          |             |                                                      |
| Draft Total Petroleum Hydrocarbon Work Plan Addendum       | Summer 2011 | Available upon request for public review and comment |
| Final Total Petroleum Hydrocarbon Work Plan Addendum       | Summer 2011 | Available upon request for public review and comment |
| Draft Total Petroleum Hydrocarbon Closure Report           | 2012        | Available upon request for public review and comment |
| Final Total Petroleum Hydrocarbon Closure Report           | 2012        | Available upon request for public review and comment |
| <b>Parcel C Radiological Program</b>                       |             |                                                      |
| Draft Radiological Removal Action Closeout Report          | 2012        | Available upon request for public review and comment |
| Final Radiological Removal Action Closeout Report          | 2012        | Available upon request for public review and comment |
| <b>Parcel D-1</b>                                          |             |                                                      |
| <b>Parcel D-1 Radiological Program</b>                     |             |                                                      |
| Draft Radiological Removal Action Closeout Report          | 2012        | Available upon request for public review and comment |
| Final Radiological Removal Action Closeout Report          | 2012        | Available upon request for public review and comment |
| <b>Parcel E</b>                                            |             |                                                      |
| Draft Final Feasibility Study                              | Summer 2011 | Available upon request for public review and comment |
| Final Feasibility Study                                    | Fall 2011   | Available upon request for public review and comment |
| Draft Final Radiological Addendum to Feasibility Study     | Summer 2011 | Available upon request for public review and comment |
| Final Radiological Addendum to Feasibility Study           | Fall 2011   | Available upon request for public review and comment |
| Proposed Plan                                              | 2012        | Formal public review and comment required            |
| Draft Record of Decision with Responsiveness Summary       | 2012        | Available upon request for public review and comment |
| Draft Final Record of Decision with Responsiveness Summary | 2012        | Available upon request for public review and comment |
| Final Record of Decision with Signatures                   | 2012        | Available upon request for public review and comment |

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### *Schedule of Reports for Cleanup Activities at Each Parcel*

| Name of Report <sup>a</sup>                                        | Issue Date  | Opportunities for Public Involvement                 |
|--------------------------------------------------------------------|-------------|------------------------------------------------------|
| <b>Parcel E Groundwater Studies</b>                                |             |                                                      |
| Final Groundwater Treatability Study Technical Report              | Spring 2011 | Available upon request for public review and comment |
| Draft IR-03 Site Characterization and Treatability Study Work Plan | Summer 2011 | Available upon request for public review and comment |
| Final IR-03 Site Characterization and Treatability Study Work Plan | Fall 2011   | Available upon request for public review and comment |
| Draft IR-03 Site Characterization and Treatability Report          | 2012        | Available upon request for public review and comment |
| Final IR-03 Site Characterization and Treatability Study Report    | 2012        | Available upon request for public review and comment |
| <b>Parcel E Petroleum Program</b>                                  |             |                                                      |
| Draft Total Petroleum Hydrocarbon Closure Report                   | 2012        | Available upon request for public review and comment |
| Final Total Petroleum Hydrocarbon Closure Report                   | 2012        | Available upon request for public review and comment |
| <b>Parcel E Radiological Program</b>                               |             |                                                      |
| Draft Radiological Removal Action Closeout Report                  | 2012        | Available upon request for public review and comment |
| Final Radiological Removal Action Closeout Report with RTC         | 2012        | Available upon request for public review and comment |
| <b>Parcel E-2</b>                                                  |             |                                                      |
| Final Remedial Investigation/Feasibility Study                     | Spring 2011 | Available upon request for public review and comment |
| Final Radiological Addendum to Feasibility Study                   | Spring 2011 | Available upon request for public review and comment |
| Proposed Plan                                                      | Fall 2011   | Formal public review and comment required            |
| Draft Record of Decision with Responsiveness Summary               | Winter 2011 | Available upon request for public review and comment |
| Draft Final Record of Decision with Responsiveness Summary         | 2012        | Available upon request for public review and comment |
| Final Record of Decision with Responsiveness Summary               | 2012        | Available upon request for public review and comment |

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### *Schedule of Reports for Cleanup Activities at Each Parcel*

| Name of Report <sup>a</sup>                                                                      | Issue Date  | Opportunities for Public Involvement                 |
|--------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------|
| <b>Removal Action Reports for Parcel E-2</b>                                                     |             |                                                      |
| Draft Removal Action Closeout Report for the Phase II PCB Time-Critical Removal Action           | Fall 2011   | Available upon request for public review and comment |
| Draft Action Memorandum – Shipshielding <sup>d</sup> Time-Critical Removal Action                | Summer 2011 | Available upon request for public review and comment |
| Final Action Memorandum - Shipshielding <sup>d</sup> Time-Critical Removal Action                | Fall 2011   | Available upon request for public review and comment |
| Draft Work Plan - Shipshielding <sup>d</sup> Time-Critical Removal Action                        | Summer 2011 | Available upon request for public review and comment |
| Final Work Plan - Shipshielding <sup>d</sup> Time-Critical Removal Action                        | Fall 2011   | Available upon request for public review and comment |
| Draft Removal Action Completion Report - Shipshielding <sup>d</sup> Time-Critical Removal Action | 2012        | Available upon request for public review and comment |
| Final Removal Action Completion Report - Shipshielding <sup>d</sup> Time-Critical Removal Action | 2012        | Available upon request for public review and comment |
| Final Removal Action Closeout Report for the Phase II PCB Time-Critical Removal Action           | 2012        | Available upon request for public review and comment |
| <b>Design and Remediation Reports for Parcel E-2</b>                                             |             |                                                      |
| Draft Field Summary Report for Geotechnical Investigation                                        | Summer 2011 | Available upon request for public review and comment |
| Final Field Summary Report for Geotechnical Investigation                                        | Fall 2011   | Available upon request for public review and comment |
| Draft Remedial Design                                                                            | 2012        | Available upon request for public review and comment |
| Draft Final Remedial Design                                                                      | 2012        | Available upon request for public review and comment |
| Final Remedial Design                                                                            | 2013        | Available upon request for public review and comment |
| Draft Work Plans for Remedial Work                                                               | 2013        | Available upon request for public review and comment |
| Final Work Plans for Remedial Work                                                               | 2013        | Available upon request for public review and comment |
| Draft Remedial Action Closeout Report                                                            | 2015        | Available upon request for public review and comment |
| Draft Final Remedial Action Closeout Report                                                      | 2015        | Available upon request for public review and comment |
| Final Remedial Action Closeout Report                                                            | 2015        | Available upon request for public review and comment |

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### *Schedule of Reports for Cleanup Activities at Each Parcel*

| Name of Report <sup>a</sup>                                     | Issue Date  | Opportunities for Public Involvement                 |
|-----------------------------------------------------------------|-------------|------------------------------------------------------|
| Wetland Mitigation Completion Report                            | 2017        | Available upon request for public review and comment |
| Wetland Mitigation Completion Report                            | 2018        | Available upon request for public review and comment |
| <b>Parcel F</b>                                                 |             |                                                      |
| <b><i>Pier Removal Project</i></b>                              |             |                                                      |
| Draft Removal Action Completion Report for Pier Removal Project | Fall 2011   | Available upon request for public review and comment |
| Final Removal Action Completion Report for Pier Removal Project | Winter 2011 | Available upon request for public review and comment |
| <b><i>Sediment Reports and Investigations</i></b>               |             |                                                      |
| Final Radiological Data Gap Investigation Workplan              | Summer 2011 | Available upon request for public review and comment |
| Draft Radiological Data Gap Investigation Report                | 2012        | Available upon request for public review and comment |
| Draft Final Radiological Data Gap Investigation Report          | Fall 2011   | Available upon request for public review and comment |
| Final Radiological Data Gap Investigation Report                | Fall 2011   | Available upon request for public review and comment |
| Draft Radiological Addendum to Feasibility Study                | Winter 2011 | Available upon request for public review and comment |
| Draft Final Radiological Addendum to Feasibility Study          | 2012        | Available upon request for public review and comment |
| Final Radiological Addendum to Feasibility Study                | 2013        | Available upon request for public review and comment |
| Proposed Plan                                                   | 2013        | Formal public review and comment required            |
| Draft Record of Decision                                        | 2014        | Available upon request for public review and comment |
| Draft Final Record of Decision                                  | 2014        | Available upon request for public review and comment |
| Final Record of Decision with Signatures                        | 2014        | Available upon request for public review and comment |
| Draft Remedial Design                                           | 2014        | Available upon request for public review and comment |
| Draft Final Remedial Design                                     | 2014        | Available upon request for public review and comment |

## Chapter 4: Navy's Cleanup Program at Hunters Point Shipyard (continued)

### *Schedule of Reports for Cleanup Activities at Each Parcel*

| Name of Report <sup>a</sup>                   | Issue Date  | Opportunities for Public Involvement                 |
|-----------------------------------------------|-------------|------------------------------------------------------|
| Final Remedial Design                         | 2014        | Available upon request for public review and comment |
| Draft Work Plan for Remedial Action           | 2014        | Available upon request for public review and comment |
| Draft Final Work Plan for Remedial Action     | 2014        | Available upon request for public review and comment |
| Final Work Plan for Remedial Action           | 2014        | Available upon request for public review and comment |
| Draft Remedial Action Completion Report       | 2016        | Available upon request for public review and comment |
| Draft Final Remedial Action Completion Report | 2017        | Available upon request for public review and comment |
| Final Remedial Action Completion Report       | 2017        | Available upon request for public review and comment |
| <b>Parcel G</b>                               |             |                                                      |
| Draft Removal Action Completion Report        | Spring 2011 | Available upon request for public review and comment |

#### Notes:

- <sup>a</sup> Name of Report: A description of typical CERCLA reports is provided in [Appendix G](#).
- <sup>b</sup> Vapor Intrusion: When chemicals in soil or groundwater move into indoor air in buildings.
- <sup>c</sup> Bioremediation: Removing contamination by having microorganisms (such as bacteria) consume it. *In situ* means treating the contaminated material in place at the site, while *ex situ* means the contaminated material is removed and treated elsewhere.
- <sup>d</sup> Shipshielding: A former practice at the shipyard where the Navy tried various ways to shield ships from radiation.

## Chapter 5: Cleanup Roles and Responsibilities

The environmental cleanup of HPS is a complex process involving several key state and federal agencies. The state and federal regulatory agencies provide oversight to make sure the Navy's cleanup complies with existing laws and regulations (for more information on the laws and regulations, see [Appendix G](#)). This section describes the roles and responsibilities of the Navy, the regulatory agencies, and the key stakeholders involved with the environmental cleanup at HPS. To contact the Navy or any of the regulatory agencies for more information, see the contact list in [Appendix B](#).

### Roles and Responsibilities of the Navy



#### Navy

- Lead federal agency
- Responsible for environmental cleanup
- Primary decision maker

The Navy is the lead federal agency responsible for the environmental cleanup and community involvement program at HPS and is therefore the primary decision maker. The regulatory agencies oversee all key decisions about cleanup and community involvement to ensure that the activities are meeting cleanup laws and regulations.

The Navy's environmental cleanup program at HPS is ongoing. The Navy's ultimate goal of the HPS environmental cleanup program is to make property available for reuse by the San Francisco Redevelopment Authority. Once the Navy has completed cleanup at a parcel and the regulatory agencies have decided that cleanup meets the requirements to protect human health and the environment, the Navy can transfer the land to another landowner, such as the SFRA. The Navy's cleanup program is implemented in accordance with the SFRA's redevelopment plan for HPS. That plan designates the type of reuse planned – areas of residential, commercial, or recreational use – and the cleanup levels meet that reuse plan.

***Once land transfer is complete, the Navy is no longer in control of activities on that property. Redevelopment of transferred land, including hiring a land developer, is the responsibility of the new landowner, the SFRA.***

For example, in 2004, the Navy transferred Parcel A to SFRA. After the land was transferred, the Navy was no longer in control of activities on that property. Redevelopment of transferred land, including hiring a land developer, is then the responsibility of the new landowner; for Parcel A, it is the responsibility of the SFRA.

Sometimes property can be transferred prior to the completion of all environmental cleanup activities. As part of the Early Transfer process the Navy will prepare a Finding of Suitability for Early Transfer (FOSET), which will first be reviewed by U.S. EPA and the state regulators, and then made available to

## *Chapter 5: Cleanup Roles and Responsibilities (continued)*

the public for a 30-day comment period. The purpose of the FOSET is to present the Navy and regulatory agency findings that a parcel is environmentally suitable for transfer prior to completing all remedial action, pursuant to the deferral provisions of CERCLA Section 120(h)(3)(C) (for a graphic of the CERCLA process with early transfer, see [Appendix G](#)).

The FOSET will do the following:

- 1) Describe the remedial actions taken by the Navy, including excavation of “hotspots” of contamination and the treatment of the groundwater
- 2) Document regulatory approval of the Navy's completion of the excavation of all radiation associated with storm and sanitary sewer lines
- 3) Document the “free release” of all buildings where radiological contamination was identified, or which were suspected of having radiological contamination (Note: the Navy must meet the requirements of free release prior to issuing the FOSET as it is a condition of transfer)
- 4) Describe the proposed transfer and the mechanisms to ensure that the remaining elements of the remedial action are properly conducted
- 5) Describe the Administrative Order on Consent (**AOC**) under which U.S. EPA and the State of California will oversee the remaining remediation
- 6) Describe the restrictions which will be established to assure protection of human health and the environment during and after the redevelopment

After the public has commented on the FOSET, the Navy will revise the FOSET in response to comments received before formally presenting it to U.S. EPA and the State as part of the package officially requesting approval of the Early Transfer. The Early Transfer package is called the Covenant Deferral Request (**CDR**). The CDR must be approved by U.S. EPA and by the Governor of the State of California before title to the property can be transferred to the SFRA. See [Page 52](#) for an explanation of the SFRA's responsibilities.



## Chapter 5: Cleanup Roles and Responsibilities (continued)

### Roles and Responsibilities of the Regulatory Agencies



#### BRAC Cleanup Team (BCT)

- Composed of the Navy and members from the regulatory agencies
- Responsible for reviewing specific cleanup activities
- Oversees the Federal Facility Agreement (FFA) for HPS
- Can recommend additional actions for cleanup

Several regulatory agencies provide oversight of the Navy's environmental cleanup at HPS. In 1988, HPS entered the BRAC Program, which designated HPS for environmental cleanup and closure. The BCT is made up of Navy staff and several regulatory agencies. The BCT oversees specific environmental cleanup program activities and the environmental closeout process at HPS, which includes meeting legal requirements and regulations designed to protect human health and the environment. In addition to overseeing the environmental cleanup, the BCT ensures that the cleanup meets the legal requirements for public participation.

The primary regulatory agencies (and members of the BCT) actively involved at HPS, as well as their primary responsibilities, are as follows:

- U.S. EPA is the lead regulator agency and provides federal oversight for the environmental cleanup at HPS.
- DTSC is the lead state agency and provides oversight for the environmental cleanup at HPS.
- The Water Board supports DTSC and provides oversight for cleanup activities that affect water and the petroleum program.

The BCT signed a legal document, called the FFA, with the Navy that provides the enforcement mechanisms to do the following:

1. Ensure that the Navy has thoroughly investigated environmental impacts from past and current site activities.
2. Ensure that the Navy takes appropriate response action (such as cleanup activities) needed to protect public health, welfare, and the environment.
3. Ensure that the response actions comply with applicable laws and regulations.
4. Set up a framework and schedule for response actions.
5. Facilitate cooperation, exchange of information, and participation between the Navy and the regulatory agencies.



## Chapter 5: Cleanup Roles and Responsibilities (continued)

Other agencies are involved in the environmental cleanup process when cleanup affects resources they regulate. Those agencies include the California Department of Public Health, the California Department of Fish and Game, the U.S. Fish and Wildlife Service, the San Francisco Department of Public Health (SFDPH), and the San Francisco Bay Conservation and Development Commission.

### Roles and Responsibilities of the San Francisco Redevelopment Agency



#### San Francisco Redevelopment Agency (SFRA)

- Becomes landowner once cleanup is complete
- Is responsible for redevelopment

The San Francisco Redevelopment Agency, or its successors, is primarily responsible for redeveloping HPS. In 1997, after an extensive multi-year community planning effort, the SFRA adopted the Hunters Point Shipyard Redevelopment Plan. An amendment to the plan was adopted in August 2010.

According to the SFRA Web site, the City selected Lennar/Bayview Hunters Point (BVHP) Partners (now known as “HPS Development Co., LP”) as the master developer for HPS in March of 1999 ([www.sfredevelopment.org/index.aspx?page=57](http://www.sfredevelopment.org/index.aspx?page=57)).

Once a parcel meets the cleanup requirements, or an agreement for Early Transfer has been reached, it is transferred from the Navy to the SFRA (refer to the Navy’s responsibilities on [Pages 49-50](#) for more details about Early Transfer). After the piece of property has been transferred, the SFRA is fully responsible for redevelopment of the site, including selecting a developer and deciding how the land will be developed.

### Roles and Responsibilities of the City and County of San Francisco



#### City and County of San Francisco

- Provides input during cleanup as needed

SFDPH is one of the agencies providing input to the Navy’s environmental cleanup of HPS. The City is also able to provide input during the cleanup process if it determines that the cleanup activities will be detrimental to the property or in violation of City laws and codes. The City has several mechanisms in place that will require anyone who disturbs soil or other ground cover at HPS to comply with

## Chapter 5: Cleanup Roles and Responsibilities (continued)

requirements in the San Francisco Municipal Codes, specifically Health, Building and Public Works Codes. The City also will regulate the construction of new development through its Subdivision Code, which will require construction of public improvements in conjunction with subdivision of land for private development. The City and the SFRA have a formal process to confirm that the improvements were constructed as required by the permits. The City also has a process in its Building Code to confirm that structures are constructed to code. Permitted activities involving the disturbance of soil require the permit applicant to go through a special process set out under Article 31 of the Health Code. The Applicant is required to obtain approval of various plans under Article 31 from SFDPH to assure that environmental restrictions and conditions are appropriately taken into account during the permitted activities. Once the Applicant receives approval of the required plans and meets all other permit requirements the Applicant will receive approval for the building, grading or other permit and can begin grading or construction.

### Roles and Responsibilities of the Community



#### HPS Community

- Active participant in HPS cleanup process
- Provides input regarding human health and environmental concerns
- Provides input into preparation and revision of the CIP

One of the ways the HPS community plays an active role in the Navy's environmental cleanup program is by providing input to the BCT on cleanup alternatives and selection of the remedy. The community fulfills these roles by doing the following:

- Reviewing documents
- Providing comments
- Participating in meetings and other community involvement program activities
- Providing advice and solutions that can be incorporated into the cleanup process and decisions

In addition to any interested stakeholders being involved in the cleanup process through the various community involvement activities, U.S. EPA also offers a Technical Assistance Grant (**TAG**) Program. The U.S. EPA TAG Program awards one grant per site to an eligible citizen group that lives near a Superfund site. This group contracts with an independent technical advisor to help the community interpret and comment on site-related information. In August 2009, a 3-year, \$50,000 TAG was awarded to the India Basin Neighborhood Association (**IBNA**). IBNA recently contracted with Arc Ecology, Inc. as its technical advisor. The TAG grant administrator is Alex Lantsberg who can be contacted at (415) 938-6170. The U.S. EPA TAG project officer is Jackie Lane at (415) 972-3236 or e-mail [lane.jackie@epa.gov](mailto:lane.jackie@epa.gov).

## *Chapter 5: Cleanup Roles and Responsibilities (continued)*

The Navy's community involvement program activities, designed to engage the community, are described in [Chapter 3](#) of this document. The Navy plans to involve the IBNA and its technical advisor under the TAG Program in the cleanup process in the following ways:

- Technical advisors, as directed by IBNA, participate at Navy cleanup meetings with the regulators.
- The Navy will respond to technical advisor comments on Navy documents.
- The Navy will provide time on community meeting agendas for TAG updates and to make announcements. Technical advisor presentations can be arranged for when needed.

When it comes to concerns and interests related to the current or future redevelopment of property, the community can communicate directly with the SFRA. The City has set up several methods for doing this, including the Citizens Advisory Committee (CAC), which is made up of community members selected by the mayor to provide input to the redevelopment process, and the Project Area Committee (PAC), a community-based organization providing recommendations to SFRA. For contact information, see [Appendix B](#).

### **Conclusion**

The Navy is committed to providing information and listening to community concerns about the environmental cleanup plans and activities at HPS. Community review comments are incorporated into HPS cleanup-related documents and have had an impact on cleanup activities, such as looking into alternate technologies, increasing air monitoring, adjusting work hours, and varying truck routes.

This CIP is a resource for enabling the Navy to engage with the community better, as well as a tool for the community to use to get information on the environmental cleanup program and get involved in the process. The CIP contains resources for the community, including more detailed information listed in the appendices that follow. Every two years, the Navy will evaluate its community involvement program, and the need for a RAB, including distributing a survey to the community, to ensure that the actions that are implemented continue to meet the needs of the HPS community.

## Chapter 6: References

This chapter presents the sources for information referenced in this CIP document.

Agency for Toxic Substances and Disease Registry Web site. 2010.

<http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

California Department of Toxic Substances Control (DTSC). 2001. "Department of Toxic Substances Control Public Participation Manual." Online:

[http://www.envirolawyer.com/DTSC\\_PublicParticipationManual\\_10-01.pdf](http://www.envirolawyer.com/DTSC_PublicParticipationManual_10-01.pdf).

Department of the Army. June 2006. "Final Community Relations Plan Update Number 3, Fort Ord, California."

Department of Defense. 1994. "Restoration Advisory Board (RAB) Implementation Guidelines" Web site. Federal Facilities Restoration and Reuse Office (FFRRO). Online:

<http://www.epa.gov/fedfac/documents/rab.htm>.

Department of the Navy. February 1997. "Navy/Marine Corps Installation Restoration Manual." Naval Facilities Engineering Command, Alexandria, VA. Online:

<http://web.ead.anl.gov/ecorisk/basis/pdf/navymarineirmanual.pdf>.

Department of the Navy. August 2006. "Environmental Restoration Program Manual." Online:

[https://portal.navfac.navy.mil/portal/page/portal/navfac\\_navw\\_pp/navfac\\_nfesc\\_pp/environmental/erb/resourceerb/nerp\\_manual\\_2006\\_0.pdf](https://portal.navfac.navy.mil/portal/page/portal/navfac_navw_pp/navfac_nfesc_pp/environmental/erb/resourceerb/nerp_manual_2006_0.pdf).

Nielsen Claritas. 2010. Census information.

Office of the Secretary of Defense. March 2007. "Restoration Advisory Board Rule Handbook." Online:

[http://www.saw.usace.army.mil/campbutner/RAB%20Rule%20Handbook\\_23%20Jan%202007-v2.pdf](http://www.saw.usace.army.mil/campbutner/RAB%20Rule%20Handbook_23%20Jan%202007-v2.pdf).

San Francisco Department of Public Health Web site. 2010. Online:

<http://www.sfdph.org/dph/EH/default.asp>.

San Francisco Redevelopment Agency. July 1997. "Hunters Point Shipyard Redevelopment Plan."

San Francisco Redevelopment Agency. August 2010 (amended). "Hunters Point Shipyard Redevelopment Plan." Online:

<http://www.sfredevelopment.org/Modules/ShowDocument.aspx?documentid=2429>.

Tetra Tech EM Inc. April 2004. "Final Community Involvement Plan, Hunters Point Shipyard, San Francisco, California."

## *Chapter 6: References (continued)*

U.S. Environmental Protection Agency (U.S. EPA). April 2005 (Revision 4). "Superfund Community Involvement Handbook." Online:

[http://www.epa.gov/superfund/community/cag/pdfs/ci\\_handbook.pdf](http://www.epa.gov/superfund/community/cag/pdfs/ci_handbook.pdf).

U.S. EPA. 2005 (revised). "Superfund Community Involvement Toolkit." Online:

<http://www.epa.gov/superfund/community/toolkit.htm>.

U.S. EPA. October 2009. "Iron King Mine – Humboldt Smelter Site Community Involvement Plan, Dewey-Humboldt, Arizona."

## Appendix A: Health-Related Information, Resources, and Contacts

### Health Resources

Most of the people interviewed for this Community Involvement Plan (**CIP**)—at least 54 of 73—were concerned about health issues. They mentioned concerns for health of former workers, former and current residents who live near the site, and future residents who will live on the site. Many interviewees mentioned high rates of asthma and cancer in the Hunters Point Shipyard (**HPS**) community and their concern that the shipyard may affect these rates. A number of those interviewed have health problems and are curious whether the site caused or contributed to their compromised health.

The Department of the Navy recognizes that health is primary concern for the Bayview community and wants to help address this issue as best it can in this document. The Superfund Law driving the cleanup at HPS does not address health of individuals; but rather, it focuses narrowly on cleaning up contamination to levels that are no longer a threat to human health or the environment. Assistance for individual health concerns is provided through public health agencies and organizations whose missions are health-based. Nevertheless, to better assist the community, the Navy and regulators compiled pertinent health resource information that includes contact name, roles, and mission focus (see table below beginning on [page A-3](#)). Other ways the Navy protects present and future public health are described below.

### Health in the Environmental Cleanup Decision-Making Process

According to the U.S. EPA Superfund Law, the Navy is required to consider a number of factors when selecting environmental cleanup program actions to ensure the protection of human health and environment from the effects of contamination at the site. One of those factors is conducting a risk assessment to analyze contamination data from the site and develop a scientific estimate of the level of risk for people who might be exposed to these substances (present exposure and future land use). The risk assessment determines if these levels pose an unacceptable risk that could affect a person's health as defined by regulatory standards and requirements. This information is used to determine the types of environmental cleanup program actions that will reduce that risk. Conservative safety margins are built into this analysis; therefore, people will not necessarily become sick even if they are exposed to materials at higher dose levels than those estimated by the risk assessment. The most vulnerable people (e.g., children and the elderly) are carefully considered to make sure all members of the public will be protected.

### Dust Control at the Site

Interviewees also stated they are concerned specifically about dust control. The Navy has an approved Dust Control Plan in place to ensure the safety of workers and the HPS Community. Dust control is important to prevent people being exposed to dust that may contain contaminants of concern. Dust issues are addressed through the following methods:

- (1) To prevent dust, work sites and roadways are sprayed with water.
- (2) Stockpiles of soil are coated with a substance that works like glue to control windblown dust.

## Appendix A: Health-Related Information, Resources, and Contacts (continued)

- (3) Trucks carrying soil are covered before leaving the shipyard.
- (4) A 15 mile per hour speed limit is required for all vehicles on site, and a 5 mile per hour speed limit is required in work areas.
- (5) Air monitoring is done at HPS on a continuous basis during normal business hours and dust levels are monitored in real time—if dust is detected above approved concentrations, operations are immediately shut down and mitigation measures, such as spraying water, are promptly used.

### *Air Monitoring and Air Quality at the Site*

The Navy will continue to monitor air quality (both dust and contaminant levels) during the cleanup process. Should additional health information about air quality issues at HPS become available, the Navy will compile another fact sheet and be prepared to make presentations to the local community about this issue.

You can review air quality data for HPS on the Navy's Web site:

- Go to [www.bracpmo.navy.mil](http://www.bracpmo.navy.mil)
- Click on the Installations Map (on the right)
- Click on the state of California (on the map)
- Click on the label "NSY Hunters Point" (on the map). Now you are on the HPS specific Web page.
- Scroll down to "Air Monitoring Data". Click the "Air Monitoring Data" to expand the list. From there you can click on the link to view air data for various time periods.

***Local and federal agencies can answer your questions or give information about health or environmental conditions. See the following table for contacts related to health and asthma specifically, air quality, and health resources in the area.***

## Appendix A: Health – Related Information, Resources, and Contacts (continued)

### Health Contacts/Resources:

| Broader Health Concern                                                               | Contact Agency/ Organization                                                                 | Contact Information                                                                                                                                                                                                    | Details                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>City and County of San Francisco, Regional, and State Agencies</b>                |                                                                                              |                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                     |
| Asthma Concerns and Services                                                         | Asthma Task Force                                                                            | <a href="http://www.sfgov.org/asthma">www.sfgov.org/asthma</a>                                                                                                                                                         | Created to propose advocacy, legislative action, and citywide strategies to address the City's mounting asthma problem.                                                                                                                                                                                             |
| Environmental health concerns (including housing issues, asthma in-home assessments) | City of San Francisco<br>Department of Public Health (SFDPH)<br>Environmental Health Section | 1390 Market St., Suite 210<br>San Francisco, CA 94102<br>8:00 a.m. - 5:00 p.m., Monday - Friday<br>(415) 252-3800<br>FAX: 252-3875<br><a href="http://www.sfenvironmentalhealth.org">www.sfenvironmentalhealth.org</a> | Promotes health and quality of life in San Francisco by ensuring healthy living and working conditions in the City and County of San Francisco. For an in-home doctor referral form, go to <a href="http://www.sfdph.org/dph/EH/asthma/default.asp">www.sfdph.org/dph/EH/asthma/default.asp</a>                     |
| Report on health programs and recommendations for neighborhood residents             | SFDPH                                                                                        | Mitchell H. Katz, MD<br>Director of Health, SFDPH<br>101 Grove Street<br>San Francisco, CA 94102-4593<br>(415) 554-2600<br><a href="mailto:Mitchell.katz@sfdph.org">Mitchell.katz@sfdph.org</a>                        | <i>Health Programs in Bayview Hunter's Point &amp; Recommendations for Improving the Health of Bayview Hunter's Point Residents</i><br><a href="http://www.sfdph.org/dph/files/reports/StudiesData/BayviewHlthRpt09192006.pdf">www.sfdph.org/dph/files/reports/StudiesData/BayviewHlthRpt09192006.pdf</a>           |
| Transportation to medical services                                                   | Hunters Point Foundation for Community Improvement                                           | (415) 822-7500 ext. 22<br>E-mail: <a href="mailto:transportation@bayviewci.org">transportation@bayviewci.org</a><br><a href="http://www.bayviewci.org/transportation.html">www.bayviewci.org/transportation.html</a>   | Health access has been greatly increased by free hourly shuttle service from Hunters Point low-income housing areas (Alice Griffith and Hunters View Developments) to medical services, including Southeast Health Center, Bayview Child Health Clinic, San Francisco General Hospital, and several other locations |
| Maternal, Child, and Adolescent Health Coverage                                      | SFDPH – Maternal, Child and Adolescent Health Section                                        | (800) 300-9950                                                                                                                                                                                                         | English, Spanish, and Cantonese translation. Afterhours answering machine                                                                                                                                                                                                                                           |



**Appendix A: Health – Related Information, Resources, and Contacts (continued)****Health Contacts/Resources:**

| Broader Health Concern                                                                | Contact Agency/ Organization                  | Contact Information                                                                                                                    | Details                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Health Coverage for Uninsured San Francisco Adult Residents                           | Healthy San Francisco (operated by SFDPH)     | (415) 615-4500                                                                                                                         |                                                                                                                                                                                                                                                                                    |
| Outdoor Air Quality                                                                   | Bay Area Air Quality Management District      | 939 Ellis Street<br>San Francisco, CA 94109<br>(415) 771-6000 or (800) HELP –AIR<br><a href="http://www.baaqmd.gov">www.baaqmd.gov</a> | The BAAQMD is the public agency entrusted with regulating stationary sources of air pollution in the nine counties that surround San Francisco Bay—Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, southwestern Solano, and southern Sonoma Counties.   |
| <b>California Department of Public Health (CDPH) Programs in San Francisco County</b> |                                               |                                                                                                                                        |                                                                                                                                                                                                                                                                                    |
| Black Infant Health Program                                                           | San Francisco City & County Health Department | 30 Van Ness Avenue, Suite 260<br>San Francisco, CA 94102                                                                               | CDPH provides clinical, preventive, and outreach work<br>For more information about CDPH programs specifically in San Francisco County, see:<br><a href="http://www.cdph.ca.gov/services/Pages/SanFranciscoCounty.aspx">www.cdph.ca.gov/services/Pages/SanFranciscoCounty.aspx</a> |
| Childhood Lead Poisoning Prevention Program                                           | San Francisco City & County Health Department | 1390 Market Street, Suite 410<br>San Francisco, CA 94102                                                                               | CDPH provides clinical, preventive, and outreach work<br>For more information about CDPH programs specifically in San Francisco County, see:<br><a href="http://www.cdph.ca.gov/services/Pages/SanFranciscoCounty.aspx">www.cdph.ca.gov/services/Pages/SanFranciscoCounty.aspx</a> |

*Appendix A: Health – Related Information, Resources, and Contacts (continued)***Health Contacts/Resources:**

| Broader Health Concern   | Contact Agency/ Organization                                                                                              | Contact Information                                                                                                                                                                                                                                                                                                                                                             | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Federal Agencies</b>  |                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Hazardous waste exposure | U.S. Agency for Toxic Substances and Disease Registry (ATSDR) – Toxic Substance Regional Office and Local Contact for CDC | <p>75 Hawthorne Street, Suite 100-D<br/>San Francisco, CA 94803<br/>(415) 947-4323<br/><a href="mailto:Muza.susan@epa.gov">Muza.susan@epa.gov</a></p> <p>To request that ATSDR evaluate potential exposure in your community or neighborhood, call (800) CDC-INFO or visit<br/><a href="http://www.atsdr.cdc.gov/HAC/petition.html">www.atsdr.cdc.gov/HAC/petition.html</a></p> | <p>Federal public health agency whose mission is to prevent adverse human health effects that result from exposure to hazardous waste.</p> <p>ATSDR performed a “Public Health Assessment” for Hunters Point in September, 1994, located online at<br/><a href="http://www.atsdr.cdc.gov/HAC/pha/PHA.asp?docid=26&amp;pg=0#figures">www.atsdr.cdc.gov/HAC/pha/PHA.asp?docid=26&amp;pg=0#figures</a></p> <p>ATSDR also conducted a “Health Consultation: Parcel E Landfill Fire at Hunters Point Shipyard” in March, 2001, found online at<br/><a href="http://www.atsdr.cdc.gov/HAC/pha/PHA.asp?docid=25&amp;pg=0">www.atsdr.cdc.gov/HAC/pha/PHA.asp?docid=25&amp;pg=0</a></p> <p>ATSDR also conducted an asbestos study on Parcel A in September, 2008, found online at<br/><a href="http://www.atsdr.cdc.gov/HAC/pha/ParcelABayviewHuntersPoint/Parcel%20A_Bayview_Hunters_%20Point%20HC%209-30-2008.pdf">www.atsdr.cdc.gov/HAC/pha/ParcelABayviewHuntersPoint/Parcel%20A_Bayview_Hunters_%20Point%20HC%209-30-2008.pdf</a></p> |

## Appendix A: Health – Related Information, Resources, and Contacts (continued)

| Local Health Service Providers                                                   |                                                                          |                                                                                                                                                                                                                                                                    |                                                                  |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| <i>This is not an exhaustive list but these facilities have asthma expertise</i> |                                                                          |                                                                                                                                                                                                                                                                    |                                                                  |
| Pediatric and Adult Care                                                         | Southeast Health Center                                                  | 2401 Keith Street<br>San Francisco, CA 94124-3231<br>(415) 671-7000                                                                                                                                                                                                | SFDPH Clinic                                                     |
| Pediatric Care                                                                   | Bayview Children's Health Center                                         | 1335 Evans Avenue<br>San Francisco, CA 94124-1705<br>(415) 600-1990<br><a href="http://www.cpmc.org/about/e-health/2007/g2-Bayview.html">www.cpmc.org/about/e-health/2007/g2-Bayview.html</a>                                                                      | Affiliated with California Pacific Medical Center /Sutter Health |
| Adolescent Care                                                                  | Third Street Youth Center and Clinic                                     | 5190 Third Street<br>San Francisco, CA 94124<br>(415) 822-1707                                                                                                                                                                                                     | SFDPH Clinic                                                     |
| Adult Care                                                                       | Dr. Arthur H. Coleman Medical Center                                     | 6301 Third Street<br>San Francisco, CA 94124<br>(415) 467-1400                                                                                                                                                                                                     | Private Practice Clinic                                          |
| Pediatric Care                                                                   | San Francisco General Hospital and Trauma Center Pediatric Asthma Clinic | 1001 Potrero Avenue<br>San Francisco, CA 94110<br>(415) 206-3844 or 206-4345<br><a href="http://www.sfdph.org/dph/comupg/oservices/medSvs/SFGH/pediatricAsthmaClin/default.asp">www.sfdph.org/dph/comupg/oservices/medSvs/SFGH/pediatricAsthmaClin/default.asp</a> |                                                                  |

## Appendix B: Navy, Federal, State, and Local Government Contacts

The table below provides contact information for Navy and other agency personnel who are involved in the cleanup activities at Hunters Point Shipyard.

| Primary Contacts for Navy and Other Agencies Directly Involved with HPS Cleanup Activities |                                                               |                                                                                                                                                     |                                                                                                                               |
|--------------------------------------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Name                                                                                       | Title/Project Role                                            | Address                                                                                                                                             | Phone and E-mail                                                                                                              |
| <b>Department of the Navy</b>                                                              |                                                               |                                                                                                                                                     |                                                                                                                               |
| Keith Forman                                                                               | Base Realignment and Closure (BRAC) Environmental Coordinator | Department of the Navy<br>Base Realignment and Closure<br>Program Management Office West<br>1455 Frazee Road, Suite 900<br>San Diego, CA 92108-4310 | Phone: (619) 532-0913<br>Cell: (415) 308-1458<br>E-mail: <a href="mailto:keith.s.forman@navy.mil">keith.s.forman@navy.mil</a> |
| <b>United States Environmental Protection Agency (U.S. EPA)</b>                            |                                                               |                                                                                                                                                     |                                                                                                                               |
| Mark Ripperda                                                                              | Lead Remedial Project Manager                                 | U.S. EPA, (SFD-8-3)<br>75 Hawthorne Street<br>San Francisco, CA 94105-3920                                                                          | Phone: (415) 972-3028<br>E-mail: <a href="mailto:Ripperda.Mark@epa.gov">Ripperda.Mark@epa.gov</a>                             |
| Jackie Lane                                                                                | Community Involvement Coordinator                             | U.S. EPA, (SFD-6-3)<br>75 Hawthorne Street<br>San Francisco, CA 94105-3920                                                                          | Phone: (415) 972-3236<br>E-mail: <a href="mailto:Lane.Jackie@epa.gov">Lane.Jackie@epa.gov</a>                                 |
| <b>California Environmental Protection Agency</b>                                          |                                                               |                                                                                                                                                     |                                                                                                                               |
| Ryan Miya                                                                                  | Lead Remedial Project Manager                                 | Department of Toxic Substances Control (DTSC)<br>700 Heinz Avenue<br>Building F, Suite 200<br>Berkeley, CA 94710-2721                               | Phone: (510) 540-3775<br>E-mail: <a href="mailto:RMiya@dtsc.ca.gov">RMiya@dtsc.ca.gov</a>                                     |
| Ross Steenson                                                                              | Lead Remedial Project Manager                                 | San Francisco Bay Regional Water Quality Control Board (Water Board)<br>1515 Clay Street, Suite 1400<br>Oakland, CA 94612-1482                      | Phone: (510) 622-2445<br>E-mail: <a href="mailto:RSteenson@waterboards.ca.gov">RSteenson@waterboards.ca.gov</a>               |

**Appendix B: Navy, Federal, State, and Local Government Contacts (continued)**

| <b>Primary Contacts for Navy and Other Agencies Directly Involved with HPS Cleanup Activities</b> |                                       |                                                                                                                              |                                                                                                                 |
|---------------------------------------------------------------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Name</b>                                                                                       | <b>Title/Project Role</b>             | <b>Address</b>                                                                                                               | <b>Phone and E-mail</b>                                                                                         |
| <b>City of San Francisco</b>                                                                      |                                       |                                                                                                                              |                                                                                                                 |
| Amy Brownell                                                                                      | Engineer, Oversight Representative    | City of San Francisco<br>Department of Public Health<br>1390 Market Street, Suite 210<br>San Francisco, CA 94102-5404        | Phone: (415) 252-3967<br>E-mail: <a href="mailto:amy.brownell@sfdph.org">amy.brownell@sfdph.org</a>             |
| Thor Kaslofsky                                                                                    | Project Manager                       | City of San Francisco<br>Redevelopment Agency<br>One South Van Ness Avenue, 5th Floor<br>San Francisco, CA 94103             | Phone: (415) 749-2464<br>E-mail: <a href="mailto:Thor.Kaslofsky@sfgov.org">Thor.Kaslofsky@sfgov.org</a>         |
| Ed Harrington                                                                                     | General Manager                       | City of San Francisco<br>Public Utilities Commission<br>1155 Market Street, 11th floor<br>San Francisco CA 94103             | Phone: (415) 554-1600<br>E-mail: not available                                                                  |
| <b>Other Agencies and Organizations Involved with Environmental Cleanup</b>                       |                                       |                                                                                                                              |                                                                                                                 |
| Gino Yekta                                                                                        | Waste Management Engineer             | CalRecycle<br>1001 I Street<br>PO Box 4025<br>Sacramento, CA 95812                                                           | Phone: (916) 341-6354<br>E-mail: <a href="mailto:Gino.Yekta@CalRecycle.ca.gov">Gino.Yekta@CalRecycle.ca.gov</a> |
| Mike McGowan                                                                                      | Scientist and TAG's Technical Advisor | Arc Ecology<br>1331 Evans Avenue<br>San Francisco, CA 94124                                                                  | Phone: (415) 643-1190<br>E-mail: <a href="mailto:mikemcgowan@arcecology.org">mikemcgowan@arcecology.org</a>     |
| Laurie Sullivan                                                                                   | Scientist                             | National Oceanic and Atmospheric Administration<br>c/o U.S. EPA Region 9<br>75 Hawthorne Street<br>San Francisco, CA 94105   | Phone: (415) 972-3210<br>E-mail: <a href="mailto:Laurie.sullivan@noaa.gov">Laurie.sullivan@noaa.gov</a>         |
| James Haas                                                                                        | Scientist                             | U.S. Fish & Wildlife Service<br>Sacramento Fish and Wildlife Office<br>2800 Cottage Way, Room W-2605<br>Sacramento, CA 95825 | Phone: (916) 414-6740<br>E-mail: <a href="mailto:james_haas@fws.gov">james_haas@fws.gov</a>                     |

*Appendix B: Navy, Federal, State, and Local Government Contacts (continued)*

| Websites for Additional Information                                                             |                                                                                                                                                                                                                                                  |                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Federal</b>                                                                                  |                                                                                                                                                                                                                                                  |                                                                                                                                                                                    |
| <b>Navy</b>                                                                                     | The Navy's Base Realignment and Closure Web site                                                                                                                                                                                                 | <a href="http://www.bracpmo.navy.mil/basepage.aspx?baseid=45&amp;state=California&amp;name=hps">www.bracpmo.navy.mil/basepage.aspx?baseid=45&amp;state=California&amp;name=hps</a> |
| <b>U.S. EPA</b>                                                                                 | The U.S. EPA's Region 9 Web sites                                                                                                                                                                                                                | <a href="http://www.epa.gov/region09/HuntersPointNavalShipyard">www.epa.gov/region09/HuntersPointNavalShipyard</a>                                                                 |
| <b>State of California</b>                                                                      |                                                                                                                                                                                                                                                  |                                                                                                                                                                                    |
| <b>DTSC</b>                                                                                     | The California EPA DTSC Web site                                                                                                                                                                                                                 | <a href="http://www.dtsc.ca.gov">www.dtsc.ca.gov</a>                                                                                                                               |
| <b>Water Board</b>                                                                              | The California EPA Water Board Web site                                                                                                                                                                                                          | <a href="http://www.swrcb.ca.gov/rwqcb2/">www.swrcb.ca.gov/rwqcb2/</a>                                                                                                             |
| <b>City of San Francisco</b>                                                                    |                                                                                                                                                                                                                                                  |                                                                                                                                                                                    |
| <b>Bayview HPS Redevelopment</b>                                                                | The Hunters Point Web site giving information about redevelopment, maintained by the SFRA's selected redeveloper, Lennar.                                                                                                                        | <a href="http://www.hunterspointcommunity.com/">www.hunterspointcommunity.com/</a>                                                                                                 |
| <b>Citizens Advisory Committee (CAC)</b>                                                        | "...San Francisco community residents and business owners selected by the mayor to oversee the redevelopment process."                                                                                                                           | <a href="http://www.hpscac.com/">www.hpscac.com/</a>                                                                                                                               |
| <b>San Francisco Department of Public Health, Hunters Point Shipyard Redevelopment Web site</b> | Information on SFDPH oversight of Lennar Redevelopment Project at Parcel A (formerly Navy owned Parcel A)                                                                                                                                        | <a href="http://www.sfdph.org/dph/EH/HuntersPoint/">www.sfdph.org/dph/EH/HuntersPoint/</a>                                                                                         |
| <b>San Francisco Redevelopment Agency (SFRA)</b>                                                | "...incorporated August 10, 1948, [SFRA] is authorized and organized under the provisions of the California Community Redevelopment Law. Seven Commissioners appointed by the Mayor and approved by the Board of Supervisors govern the Agency." | <a href="http://www.sfredevelopment.org/">www.sfredevelopment.org/</a>                                                                                                             |
| <b>Project Area Committee (PAC)</b>                                                             | "A community-based organization serving the interests of the Bayview Hunters Point District of San Francisco... providing advice, recommendation, and direction to the San Francisco Redevelopment Agency."                                      | <a href="http://www.bvhp-pac.org/">www.bvhp-pac.org/</a>                                                                                                                           |

*Appendix B: Navy, Federal, State, and Local Government Contacts (continued)*

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## Appendix B: Navy, Federal, State, and Local Government Contacts (continued)

### Online Information

The Navy's Hunters Point Shipyard (HPS) Web site:

[www.bracpmo.navy.mil/basepage.aspx?baseid=45&state=California&name=hps](http://www.bracpmo.navy.mil/basepage.aspx?baseid=45&state=California&name=hps)

The following information is available on this Web site:

- A brief history of HPS and the environmental restoration program
- Updated information on the status of the environmental restoration program
- Access to Navy reference documents and links to related cleanup Web sites
- Fact sheets and quarterly newsletters regarding various topics for the environmental restoration program at HPS
- Recently published documents that are currently available for public review

**Note:** This is not the new HPS Web site that the Navy will create to involve the community, as discussed in the Actions and Activities section (Chapter 3). A new improved Web site will be created as part of the implementation of this CIP.

### Administrative Record Locations

The Administrative Record contains all documents considered or relied on during the process of making environmental cleanup decisions. Due to the large volume of documents required for the Administrative Record and space issues associated with the local Information Repositories, the Bayview/Anna E. Waden Branch Library and the San Francisco Main Public Library only contain the Administrative Records indexes and other pertinent documents for public view (see Pages H-13 and H-14 for addresses). The Bayview/Anna E. Waden Branch Library was closed in April 2011; however, a temporary location for the Information Repository has been established at the HPS Site Trailer, located across the street from the security entrance to the Shipyard.

The complete Administrative Record for HPS is maintained at the Naval Facilities Engineering Command offices in San Diego, California. Copies of documents located at the Information Repository are available for review by appointment only by contacting the Administrative Record Administrator:

**Diane Silva, NAVFAC SWDIV Code EV33**

NBSD Bldg 3519  
2965 Mole Road  
San Diego, CA 92136  
Phone: (619) 556-1280  
[diane.silva@navy.mil](mailto:diane.silva@navy.mil)

Administrative hours are 8:00 a.m. to 5:00 p.m., Monday through Friday. Documents may not be removed from the facility; however, they may be photocopied.

In addition, the U.S. EPA's Administrative Record is located at:

**U.S. EPA Superfund Records Center**

95 Hawthorne Street San Francisco, CA 94105  
Phone: (410) 536-2000  
(hours 8:00 a.m. to 5:00 p.m.)



*Appendix B: Navy, Federal, State, and Local Government Contacts (continued)*

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## *Appendix C: Community Interview Process and Summary*

### **Interview Process**

Conducting community interviews is a key part of preparing an updated Community Involvement Plan (CIP). The Department of the Navy began the interview process by compiling a large list of Hunters Point Shipyard (HPS) community stakeholders, who were contacted and invited to be interviewed. The Navy also hosted a community meeting in February 2010 to discuss a new CIP. During the meeting, the Navy received comments from the community on a proposed table of contents for the CIP and the interview questionnaire. Approximately 35 community members attended the meeting to discuss the CIP.

The Navy mailed a postcard to reach interested stakeholders, inviting all members of the community to participate in the interview process. The postcard was mailed on June 14, 2010, to more than 2,200 people within the HPS community. Those who responded were added to the list of potential interviews. The list also contained the following:

- Existing Navy and United States Environmental Protection Agency (U.S. EPA) distribution lists
- Web research conducted to locate appropriate groups
- Suggestions from other interviewees (each interviewee was asked who else they thought should be interviewed)

In total, from June 15 through September 9, 2010, the Navy conducted 73 interviews with people who live in, work in, or serve the HPS community—defined as ZIP codes 94107, 94124, and 94134 (see map in [Appendix D](#)). The Navy conducted 40 interviews for the previous HPS CIP, prepared in 2004. The Navy went to significant lengths in 2010 to ensure the most comprehensive survey practicable. Ten of the interviews were conducted via telephone and the rest were conducted in person. Although 73 people were interviewed, not every interviewee responded to every question. In addition, more than one response was offered for some questions; therefore, answers summarized in the following list do not always total 73 responses.

A Navy representative and a contractor who took notes were present at each interview. In all but one of the 73 interviews, at least one but as many as four regulatory agency representatives were also present.

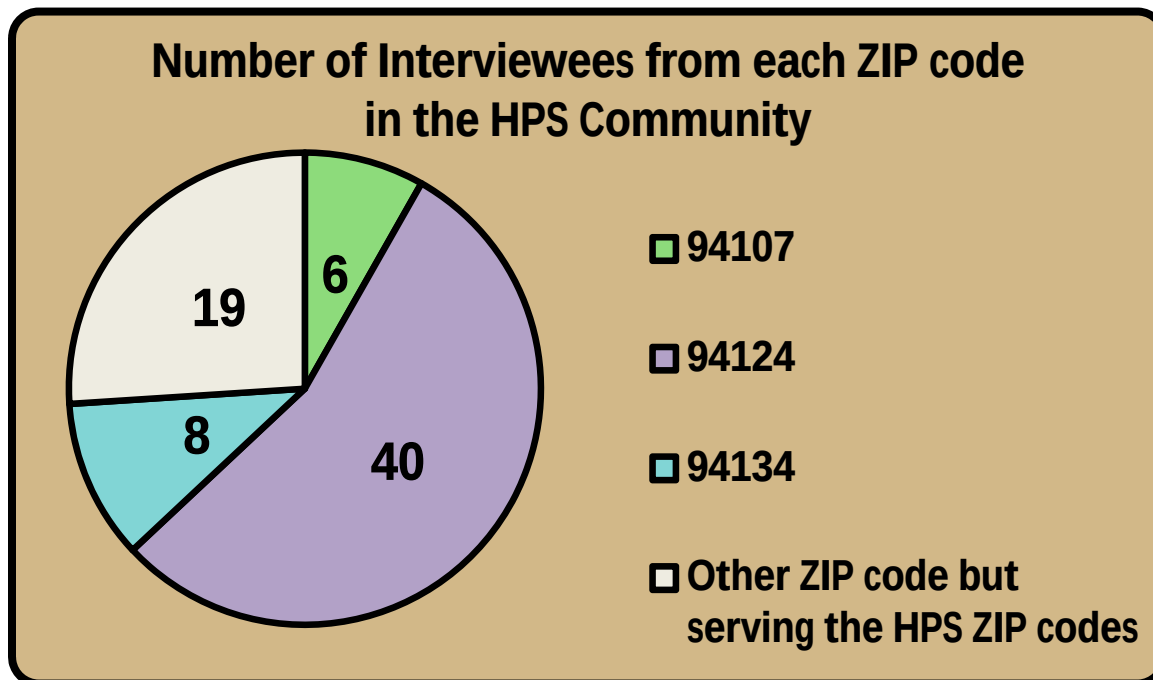
Categories of stakeholders interviewed, and the number from each group is listed as follows:

- |                                                        |                                         |
|--------------------------------------------------------|-----------------------------------------|
| • Civic Groups/ Clubs and Organizations – 34           | • Local Businesses – 11                 |
| • Local Residents – 31                                 | • Education and Childcare Providers – 6 |
| • Environmental Groups/Activists – 15                  | • Media – 3                             |
| • Former Restoration Advisory Board (RAB) Members – 12 | • Elected Officials – 1                 |
|                                                        | • Health Care Providers – 2             |

Many interviewees represented more than one of the abovementioned groups; therefore, the total representation is greater than 73 individuals interviewed.

### Appendix C: Community Interview Process and Summary (continued)

The Navy tried to interview stakeholders from all segments of the community. The following chart represents the breakdown of the 73 interviewees that work or reside in the 94124, 94107, and 94134 ZIP code areas.



For *Other ZIP code* designation, the physical address is outside of the 3 HPS community ZIP codes. However, the organizations service the 3 HPS ZIP codes. Of these, 7 are civic organizations, 5 are environmental organizations, 4 are media, and 3 are government or elected officials.

The table on the following page lists all of the affiliations of those interviewed, as noted by the interviewee. Some interviewees requested that their organization not be listed specifically by name. Note that most interviewees had numerous affiliations, so the total is more than 73.

*Appendix C: Community Interview Process and Summary (continued)*

| Affiliations of Interviewees                              |
|-----------------------------------------------------------|
| A. Philip Randolph Institute                              |
| African American Revitalization Consortium                |
| African Democratic Club                                   |
| AIDS Youth                                                |
| All Hallows Catholic Church                               |
| All Hollows Tenants Association                           |
| Alliance of Californians for Community Empowerment (ACCE) |
| American Friends Service Committee                        |
| American Legion, Cathay Post #384                         |
| An unnamed childcare association                          |
| An unnamed environmental advocacy organization            |
| An unnamed local union                                    |
| Arc Ecology                                               |
| Artist on Shipyard                                        |
| Asian Community                                           |
| Asian Pacific American Community Center                   |
| Association of Joint Ventures                             |
| Bay Area Youth Agency Consortium (BAYAC)                  |
| Bay Trail Project                                         |
| Bayview Beacon                                            |
| Bayview Heights Neighborhood Association                  |
| Bayview Hunters Point ( <b>BVHP</b> ) Community Advocates |
| BVHP Democratic Club                                      |
| BVHP Renaissance Center                                   |
| BVHP Beacon Center                                        |
| BVHP Foundation for Community Improvement                 |
| BVHP Renaissance Center                                   |
| BVHP Senior Services                                      |
| Bayview Merchants Association                             |
| Bayview Opera House                                       |
| Bayview Rotary Club                                       |
| Blue Green Way Task Force                                 |
| Board of San Francisco Tomorrow                           |
| Bret Harte Elementary School                              |
| California for Green Action                               |
| California Lawyers for the Arts                           |
| California Movement for Public Rights                     |
| Candlestick View Home Owners Association                  |
| Caring Loving Fathers Foundation                          |
| Central Democratic Club                                   |
| Chinatown Business Association                            |
| Chinatown Economic Development Group                      |
| Chinese American Democratic Club                          |
| Citizens Advisory Committee ( <b>CAC</b> )                |

*Appendix C: Community Interview Process and Summary (continued)*

| Affiliations of Interviewees                                |
|-------------------------------------------------------------|
| Cleanup in Bayview                                          |
| Coalition of Environmental and Environmental Justice groups |
| Communities of Opportunity                                  |
| Community First Coalition (CFC)                             |
| Community for a Better Environment                          |
| Council of Neighborhood Libraries                           |
| CSU African Initiative Program                              |
| Daniel Webster School                                       |
| Deep Solutions (local business)                             |
| Department of the Environment                               |
| Disaster Preparedness Group                                 |
| Double Rock Garden                                          |
| Elected official                                            |
| Environmental Justice Advisory Committee (EJAC)             |
| Environmental Justice Advocacy                              |
| Environmental Justice Coalition for Water                   |
| First Generation                                            |
| Friends of McClaren Park                                    |
| George Washington Carver Elementary School                  |
| Glide Foundation                                            |
| Glide Memorial United Methodist Church                      |
| Glide Youth Build                                           |
| Golden Gate Audubon                                         |
| Good Samaritan Family Resource Center                       |
| Green Action                                                |
| Green Depot – biodiesel service                             |
| Harvey Matthews BVHP Democratic Club                        |
| Hayes Valley Farm Project                                   |
| Health and Environmental Resource Center (HERC)             |
| Housing Rights Committee of San Francisco                   |
| Hunters Point Community Youth Park                          |
| India Basin Neighborhood Association (IBNA)                 |
| Infinity Productions Drama Group                            |
| Instituto Familiar de la Raza                               |
| Jamestown Homeowners Association                            |
| John Scott Consulting, Inc.                                 |
| Julani Home for Drug Addicted Pregnant Women                |
| KALX-FM Radio                                               |
| La Casa de las Madres                                       |
| La Salle Heights Home Owners Association                    |
| Literacy for Environmental Justice (LEJ)                    |
| Local politics (running for District 10 Supervisor)         |
| Mariners Village Homeowner's Association                    |
| Marine's Memorial Club                                      |
| Martin Luther King Jr. Middle School                        |

*Appendix C: Community Interview Process and Summary (continued)*

| Affiliations of Interviewees                         |
|------------------------------------------------------|
| Mission Bay Citizen's Advisory Committee             |
| Morgan Heights Homeowners Association                |
| Muwekma Ohlone People                                |
| National Rifle Association (NRA)                     |
| New America Media                                    |
| Omega Boys Club                                      |
| Osiris Coalition                                     |
| Project Area Committee                               |
| Pet Camp                                             |
| Portola Business Group                               |
| Positive Direction and Change                        |
| Potrero Hill Democratic Club                         |
| People Organized to Win Employment Rights (POWER)    |
| Providence Baptist Church                            |
| Public Arts Forum for Parcel A                       |
| PUC Citizens Advisory Committee                      |
| PUC Reaction Task Force for sewer digesters          |
| Quesada Gardens Initiative                           |
| Former RAB members                                   |
| Samoan Communities in Visitation Valley              |
| Samoan Community Development Center                  |
| San Francisco Bay Railroad                           |
| San Francisco Bay Sierra Club                        |
| San Francisco Bay View                               |
| San Francisco Department of Public Health            |
| San Francisco Foundation Faith Board                 |
| San Francisco Human Rights Commission (SFHRC)        |
| San Francisco Interfaith Council                     |
| San Francisco Municipal Transportation Agency (MUNI) |
| San Francisco Neighborhood Parks Council             |
| San Francisco Organizing Project (SFOP)              |
| San Francisco Permaculture Guild                     |
| San Francisco Ports Southern Waterfront Committee    |
| San Francisco State University                       |
| Senior Action Network                                |
| Senior groups in Bayview                             |
| Shipyard Trust for the Arts (STAR)                   |
| Southeast Jobs Coalition                             |
| Southeast Community Response Network                 |
| Southeast Food Access Working Group (SEFA)           |
| Southeast Jobs Coalition                             |
| Southeast Sector Community Development Corporation   |
| Southern Waterfront Advisory Committee (SWAC)        |
| St. Andrews Church                                   |
| St. Paul of Shipwreck Church                         |

**Appendix C: Community Interview Process and Summary (continued)**

| <b>Affiliations of Interviewees</b>         |
|---------------------------------------------|
| Starr King Elementary School                |
| Starr Ring Open Space                       |
| Sustainable Watershed Alliance (SWALE)      |
| Tabernacle Minister Development Cooperation |
| Technical Assistant Grantee                 |
| The Betterment Association                  |
| Transitioning AIDS Youth                    |
| True Hope Baptist Church                    |
| Union Lead for Stage Hands                  |
| United Council                              |
| Unity Foundation                            |
| Waste Solutions                             |
| Whitney Young Child Development Center      |
| Windows on the Shipyard                     |
| Women for Genuine Security                  |
| Young Men's Christian Association (YMCA)    |

**Interview Questionnaire and Responses**

Interviewees were asked approximately 29 questions that were created in advance with input from the regulatory agencies and community. The interviews were conducted in a discussion format. Each interviewee was encouraged to discuss his or her interests, concerns, and ideas during the interview, and so some questions were not answered. The interviewees were not handed the questionnaire to fill out; instead, questions were read by the interviewers and a contractor took notes to capture responses. Following are the questions that were asked.

\*\*\*\*\*

**HUNTERS POINT SHIPYARD COMMUNITY INVOLVEMENT PLAN (CIP)****INTERVIEW QUESTIONNAIRE****Background of Interviewee**

1. Do you work or live in the 94124, 94134, 94107, or in the Bayview Hunters Point area?
  - a. If yes, how long?
2. Do you belong to a community organization or group?
  - a. If so, which one(s)?
3. Have you given input or attended Navy/community outreach events for the environmental program at Hunters Point Shipyard?

**General Knowledge about Hunters Point Shipyard**

4. How much would you say you know about the Hunters Point Shipyard Environmental Restoration Program:
  - a. Nothing; a little bit, a lot

**Appendix C: Community Interview Process and Summary (continued)**

5. If you know a little bit or a lot, how did you get most of the information you know about Hunters Point Shipyard?
6. Do you have any interests or concerns regarding the base and the cleanup program?
  - a. If yes what are they?

**Your Information Needs and Resources**

7. Are you on the Navy's E-mail or mailing list?
  - a. Would you like to be?
8. Do you get Navy newsletters and/or fact sheets?
9. What topics are you most interested in receiving information and updates from the Navy about?
10. The Navy has provided information in various ways.
  - a. Have you gotten information by any of these means?
  - b. How do you like to receive information?

Choose all that apply or add your own:

| Outreach Method:                                                                                                      | Yes<br>I have received<br>info this way | Yes<br>I would like to receive<br>info this way |
|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------|
| Newsletters (4–8 pages on general topics)                                                                             |                                         |                                                 |
| Fact Sheets (2–4 pages on one specific topic or site)                                                                 |                                         |                                                 |
| Attend a public meeting                                                                                               |                                         |                                                 |
| Attend an open house                                                                                                  |                                         |                                                 |
| Attend a Navy presentation at a group meeting<br>(i.e., Homeowners Association meeting, Rotary Club<br>meeting, etc.) |                                         |                                                 |
| Visit a Web site to download information                                                                              |                                         |                                                 |
| Hardcopy announcements                                                                                                |                                         |                                                 |
| E-mail announcements                                                                                                  |                                         |                                                 |
| Bus Tour                                                                                                              |                                         |                                                 |
| Other                                                                                                                 |                                         |                                                 |

11. Do you prefer to receive items (such as fact sheets) by E-mail or hardcopy mail?
12. What is the best way for the Navy to provide information about environmental activities at Hunters Point Shipyard? (Something from the list above, or another idea)
  - a. How often should it be provided?
13. Have you contacted elected officials, the Navy, regulatory agencies, or community groups about the cleanup activities at Hunters Point Shipyard?
  - a. If so, what information were you trying to get?
  - b. What kind of response did you receive and was it helpful?
14. If you wanted to contact the Navy about an environmental cleanup question you have, would you know who to contact and how to reach them?
  - a. What is your preferred method for contacting the Navy? (E-mail/phone/in-person)



*Appendix C: Community Interview Process and Summary (continued)*

15. Are there local civic or service clubs that the Navy should contact to provide information to or speak with?
16. What newspaper(s) do you prefer to read for local information and/or news about Hunters Point Shipyard?
17. What websites do you look at for local information and/or news about Hunters Point Shipyard?

**The Community**

18. What do you think are the issues and concerns of the community, related to environmental cleanup?
19. Do you think the community has the information they need, or know where to get it?
  - a. If not, how can the Navy make information available to the community?
20. Are there other organizations providing answers to questions or providing information about Hunters Point Shipyard?

**Feedback**

21. How effective has the Navy's communication about the cleanup program been? (very effective/somewhat effective/not effective)
22. Do you have confidence in the Navy to adequately cleanup Hunters Point Shipyard?
  - a. Why or Why not?
  - b. If not, how can the Navy gain your confidence?
23. Do you have confidence in the U.S. Environmental Protection Agency (federal agency) to provide effective oversight of the cleanup activities?
  - a. Why or Why not?
  - b. If not, how can they gain your confidence?
24. Do you have confidence in the State of California Department of Toxic Substances Control (California EPA) to provide effective oversight of the cleanup activities?
  - a. Why or Why not?
  - b. If not, how could they gain your confidence?
25. Do you have confidence in the State of California San Francisco Bay Regional Water Quality Control Board to provide effective oversight of the cleanup activities?
  - a. Why or Why not?
  - b. If not, how could they gain your confidence?
26. Do you have confidence in the City of San Francisco to provide effective oversight of the cleanup activities?
  - a. Why or Why not?
  - b. If not, how could they gain your confidence?

**Thank You and Wrap up**

27. Is there anything you would like to add about how the Navy can improve their environmental cleanup program and related community outreach?
28. Who else should we contact for an interview?

## Appendix C: Community Interview Process and Summary (continued)

29. May we identify you as an interview respondent with the understanding that your name will be kept separate from your answers and comments?

\*\*\*\*

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### Interview Summary

Overall, interviewees felt the Navy's communication about the environmental cleanup has not been effective. See [Chapter 2](#), Community Interviews and Feedback, for additional summary information.

### Selected Interviewee Statements

To protect privacy, names and specific affiliations of the participants in the interviews are not published. Some selected statements, intended to show the general tone and variety of responses given during the interviews, are presented in the following subsections. They are not direct quotes, but instead represent a synopsis written during the interview. The category of the interviewee making the statement is included after the statement.

#### Health

- “If you are doing outreach to the community, they have to know that you care about their health. You will have to address health concerns.” —Local Resident, Church Representative, Education Provider
- “My grandkids have had headaches and nosebleeds, their mother died at 28 of cancer. I have concerns about the health of everyone in Hunters Point. Asthma is also a problem.” —Local Resident, Environmental Activist
- “People attribute health problems in the community with the shipyard. There are numerous problem sites in areas like Brownfields, but everyone points to the shipyard. It's complex, and hard to say what the Navy is responsible for. You need to clarify that for the community.” —Former RAB Member, Education Provider

#### Quality or Completeness of Cleanup

- “As a resident and environmental engineer, I want to make sure it is cleaned to best possible standards. I want the property cleaned so future use is not constrained too much. Have the land available for the best possible use beyond what is defined by the redevelopment authority.” —Former RAB Member, Local Business Owner
- “I'm concerned with how thoroughly it is cleaned. Parcel E-2 is the most crucial; I am interested in how it is cleaned and then developed and re-used.” —Former RAB Member, Local Resident
- “Did the Navy really clean it and how would the people in this community know? We have to take your word for it.” —Local Resident, Local Business Owner

## *Appendix C: Community Interview Process and Summary (continued)*

### Redevelopment

- “I’m concerned about property being transferred to a developer because they aren’t having a vested interest in the cleanup of contamination.” —Media
- “If the Navy had done better outreach to the community overall to explain the cleanup, people would be more comfortable with the idea of redevelopment.”  
— Civic Organizations/Group or Club

### Jobs/Economics

- “You may be doing a good job on paper, but I do not see efforts of the Navy to use local businesses and incorporate local contractors more in the cleanup. Have the right people in place to get contractors from the community who do not undermine the program. There are people who can make local contracting programs work, you need to engage them. There are good, strong companies in this area who will do a good job.” —Resident, Local Business

### Meetings and Getting Out Information

- “I like public meetings, but it depends on the atmosphere of the meeting. The last meeting I went to was so angry and confrontational that I haven’t been back.” —Shipyard Artist
- “Promote positive information; talk about all the milestones (minor and major) to the community.” —Education Provider
- “Sometimes the information that is provided is too technical and just not sufficient.” —Former RAB Member, Resident, Local Business
- “Figure out some way to have scheduled, uninterrupted presentations, followed by questions and answers. Then have a detailed technical meeting at a later date that is smaller, gets more into the ‘nitty gritty.’” —Former RAB Member, Local Business, Environmentalist
- “I only hear that the Navy is dragging their feet. I don’t hear directly from the Navy.” —Local Union Representative
- “To reach people, talk to people who already have a connection to those you are trying to reach.” —Local Business
- “Recreate the RAB; that is what the people want in the community. They value dialogue. A new format for the RAB is structured presentation, questions and answers, dialogue. Take dialogue when it is given. Need to reformat the RAB so information can get out there. Make sure people chosen for new RAB have open minds and can work within a new structure. This will build confidence in the community and get the Navy to the finish line faster.” —Environmental Activist
- “After the RAB dissolved, there were less newsletters and fact sheets coming out. The meetings are stacked with who’s running the meeting. The community could not really discuss what was happening. I got tired of the meetings. Whoever runs the meeting, they need to have the respect of the community.” —Media, Resident
- “Establish some kind of group, even if it’s just five people from the community. Does not have to be a RAB. I would be on that group. Have some meetings just with the group, then a larger

## Appendix C: Community Interview Process and Summary (continued)

group meeting. Have the group of five rotate, be in the group for awhile, and then get five new people.” —Resident, Local Business

- “Informality equals unaccountability. Keep a structure for and records of each meeting. The community should be able to say we do or don't like something or have certain concerns and have that be recorded. It's good to have one big meeting for a decision-making meeting specifically. Do not do that in smaller meetings.” —Environmental Activist

### General

- “This feedback from us will go into a report and never be addressed or considered again. We are real people who have been affected. We want action, to hold you accountable, and if we feel you are doing good, then we can advocate for you.” —Resident, Education Provider
- “The shipyard should be thoroughly cleaned. I don't want people getting sick in the future. In the World War II era, people didn't know the consequences of dumping stuff, but now we know. Families will be living out there, so it needs to be clean. San Francisco needs this to be redeveloped; it's no good to have that empty hole out there. It will be a brand new destination for tourists and will boost the economy.” —Civic Organizations/Group or Club
- “The community has a significant level of distrust of all agencies with the cleanup. It will take time to manage trust. There is general paranoia of government agencies and also bad experience with the HPS project.”  
—Resident, Civic Organizations/Group or Club
- “What is the status of the cleanup now? What is the current schedule?”  
—Numerous Interviewees

### Suggested Communication Methods from Interviewees

Interviewees were presented with a list of several communication methods that the Navy has used in the past to reach out to the community. The feedback on those methods is presented in [Chapter 2](#). Interviewees were also encouraged to suggest communication methods that they thought would be successful in informing and involving the community in the environmental cleanup program at HPS. The following table lists all of the methods that were suggested and notes with more details about the method.

## Appendix C: Community Interview Process and Summary (continued)

### Interviewee Feedback on Suggested Communication Methods

| Method                                                                                                | Interviewees' Critiques of Method                                                                                                                |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Prepare Calendar of Events</b>                                                                     | Cross-check against other local events to make sure no conflict                                                                                  |
|                                                                                                       | Publish far in advance                                                                                                                           |
|                                                                                                       | Include on flyers, fact sheets, and Web site                                                                                                     |
| <b>Prepare Progress Reports</b>                                                                       | Have professional company, such as Baycat, create them                                                                                           |
|                                                                                                       | Make simple and "cool"                                                                                                                           |
| <b>Use Local Churches</b>                                                                             | Good to reach Samoan and African American Communities                                                                                            |
|                                                                                                       | Use church bulletin boards to post print materials related to HPS cleanup                                                                        |
|                                                                                                       | Organize meetings with church groups                                                                                                             |
|                                                                                                       | Share information with pastors                                                                                                                   |
|                                                                                                       | Good venues for "town hall" meetings                                                                                                             |
| <b>Collaborate with Established Community Members to Convey HPS Environmental Cleanup Information</b> | Have local community members personally distribute flyers or door hangers                                                                        |
|                                                                                                       | Use young community developers to hire community members                                                                                         |
|                                                                                                       | Outreach to churches for interested members                                                                                                      |
|                                                                                                       | Hire Chinese-American contact to help reach Chinese community                                                                                    |
| <b>Distribute Flyers</b>                                                                              | Flyer content could be meeting announcement or brief messaging about general HPS information and Web site; could also be formatted as a postcard |
|                                                                                                       | Door-to-door; educate and train community members to be comfortable to discuss flyer content                                                     |
|                                                                                                       | Target churches, YMCA, childcare providers, local businesses (i.e., barber shops, beauty salons)                                                 |
|                                                                                                       | Insert in weekly Wednesday packets at Starr King Elementary School and other schools willing to participate                                      |
|                                                                                                       | Mail to every street address in 94124 (Note: also suggested personal distribution more effective than mail)                                      |

## Appendix C: Community Interview Process and Summary (continued)

### Interviewee Feedback on Suggested Communication Methods

| Method                                                                             | Interviewees' Critiques of Method                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Conduct Bus Tours</b>                                                           | Explain/advertise specific purpose in advance                                                                                                                                                                                                                                                                                 |
|                                                                                    | Hold technical information-oriented tours and basic information tours                                                                                                                                                                                                                                                         |
|                                                                                    | Include lunch                                                                                                                                                                                                                                                                                                                 |
|                                                                                    | Invite K–5 grade students with parents                                                                                                                                                                                                                                                                                        |
|                                                                                    | Invite high school students                                                                                                                                                                                                                                                                                                   |
|                                                                                    | Invite Health and Environmental Resource Center                                                                                                                                                                                                                                                                               |
|                                                                                    | Invite Chinese community (include translator)                                                                                                                                                                                                                                                                                 |
|                                                                                    | Detriments to Bus Tours: <ul style="list-style-type: none"> <li>• Cannot cross through neighborhoods because of safety concerns; not safe for members from certain neighborhoods to go into another neighborhood</li> <li>• Too dangerous for people to be on the Navy base</li> <li>• There is nothing to look at</li> </ul> |
| <b>Attend Community Events</b>                                                     | Unity Parade (Note: July and August annually)                                                                                                                                                                                                                                                                                 |
|                                                                                    | Host booth at Earth Day Event (Note: annually April)                                                                                                                                                                                                                                                                          |
| <b>Give Navy Presentation at Meeting Hosted by Organization or Community Group</b> | Project Area Committee (especially health and environment subcommittee)                                                                                                                                                                                                                                                       |
|                                                                                    | Bayview Childcare Association (meets quarterly)                                                                                                                                                                                                                                                                               |
|                                                                                    | Parent-Teacher Association                                                                                                                                                                                                                                                                                                    |
|                                                                                    | Block or neighborhood groups                                                                                                                                                                                                                                                                                                  |
|                                                                                    | West Point Residents Council                                                                                                                                                                                                                                                                                                  |
|                                                                                    | Bayview Merchants Association                                                                                                                                                                                                                                                                                                 |
|                                                                                    | Misc. groups within the China Town area of San Francisco to reach Chinese community; meeting size small to promote dialogue                                                                                                                                                                                                   |

## Appendix C: Community Interview Process and Summary (continued)

### Interviewee Feedback on Suggested Communication Methods

| Method                       | Interviewees' Critiques of Method                                                                                                                            |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hold a Public Meeting</b> | Open house-style includes poster board stations                                                                                                              |
|                              | Different meetings for different stakeholder groups                                                                                                          |
|                              | Bring facilitator to help keep meeting on track                                                                                                              |
|                              | Limit public comment time period                                                                                                                             |
|                              | Community Mapping Meeting—document community thoughts/issues by writing them on a map                                                                        |
|                              | Town hall meetings                                                                                                                                           |
|                              | Community forums                                                                                                                                             |
| <b>Create Advisory Board</b> | “Bring back the RAB!”                                                                                                                                        |
|                              | Have advisory board with technical experts from local colleges, such as University of California, Berkeley; University of San Francisco; San Francisco State |
|                              | Have small board made of community leaders with 1-year membership rotations                                                                                  |
| <b>Use Internet</b>          | Facebook and/or Twitter; Good outreach for Samoan community                                                                                                  |
|                              | Several U.S. EPA cleanup sites have Facebook and Twitter                                                                                                     |
|                              | Hire public relations firm to assist with messaging and monitoring posts                                                                                     |
|                              | Advertise meetings via Web site and e-mail                                                                                                                   |
|                              | Post work notices and traffic impacts that community should be aware of                                                                                      |
|                              | Live question-and-answer sessions                                                                                                                            |
|                              | Create online information repository with all current documents                                                                                              |
|                              | Current Web site too difficult to use with layers of links to access information; create more user-friendly platform                                         |
| <b>Use Radio</b>             | Commercials on popular stations to announce upcoming meetings                                                                                                |
|                              | Air on popular Chinese-American station (1450 AM)                                                                                                            |
|                              | Air on 30-minute radio show on KALX Radio (University of California, Berkeley) and KZSU (Stanford)                                                           |

## Appendix C: Community Interview Process and Summary (continued)

### Interviewee Feedback on Suggested Communication Methods

| Method                                 | Interviewees' Critiques of Method                                                                                                                                    |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Use Media Publications                 | Ensure that correct information getting to media                                                                                                                     |
|                                        | Newspapers do not have a lot of readership                                                                                                                           |
|                                        | Use San Francisco Examiner, San Francisco Bayview, The Potrero View, and Visitacion Valley Grapevine                                                                 |
| Use Telephone                          | Make local hotline number available and advertise (Note: local number currently available)                                                                           |
|                                        | Use phone bank to invite community to meetings                                                                                                                       |
|                                        | Text message announcements or meeting invites (Note: majority of community members have text capabilities)                                                           |
| Provide Audio Recordings               | Record executive summaries of technical documents and put on CDs for information repositories                                                                        |
| Create a DVD                           | Create DVDs with information about HPS environmental cleanup program                                                                                                 |
|                                        | Incentivize barber shops and beauty salons to show DVDs by purchasing televisions and DVD players and paying store for each showing                                  |
| Use Incentives to Increase Involvement | Give away backpacks with school supplies and HPS environmental cleanup information inside                                                                            |
|                                        | Provide food at any public event ( <b>Note: Navy rules do not allow taxpayer funds to be used to provide food or beverage service at public meetings or events</b> ) |
| Host Job Fair                          | Host a fair to help identify jobs                                                                                                                                    |
| Involve High-profile Scientists        | To help refute those who are "making a big deal about toxics that are not a big deal"                                                                                |
| Hire Public Relations Firm             | Use to manage Facebook                                                                                                                                               |
|                                        | Use to make "cool" factsheets and flyers                                                                                                                             |
|                                        | Use to train Navy on how to get their message out                                                                                                                    |



## Appendix C: Community Interview Process and Summary (continued)

### Postcard Mailed to Community Requesting Participation in the CIP Interview Process

#### Be a Voice of Your Community – Please Take Part!

We hope you will take part in a Community Involvement Plan interview with the Navy. The purpose of the interviews is to talk to various community members and groups to find out what people are interested in or concerned about when it comes to the environmental cleanup at Hunters Point. The Navy will use the feedback from the interviews to determine how to best involve you in the cleanup decision-making process. To be part of an interview, you DO NOT need to know a lot about Hunters Point Shipyard. **The Navy wants to talk to local residents, business owners, activists, and other interested parties. We are scheduling interviews this summer in-person or via telephone.**

If you would like to be interviewed, please provide your contact information and availability to:

Ms. Carolyn Hunter,  
Tetra Tech Community Involvement Manager  
carolyn.hunter@tetrattech.com, (510) 302-6297

About the Community Involvement Plan: Based on the feedback in the interviews, the Navy will outline how they will inform and involve the community in environmental cleanup decisions at Hunters Point. The document will provide background information about Hunters Point; a list of all environmental sites and their status; demographic information about the local community; a list of past community involvement activities; applicable regulatory requirements; and contact information for the cleanup team. This document will be made available to the public.



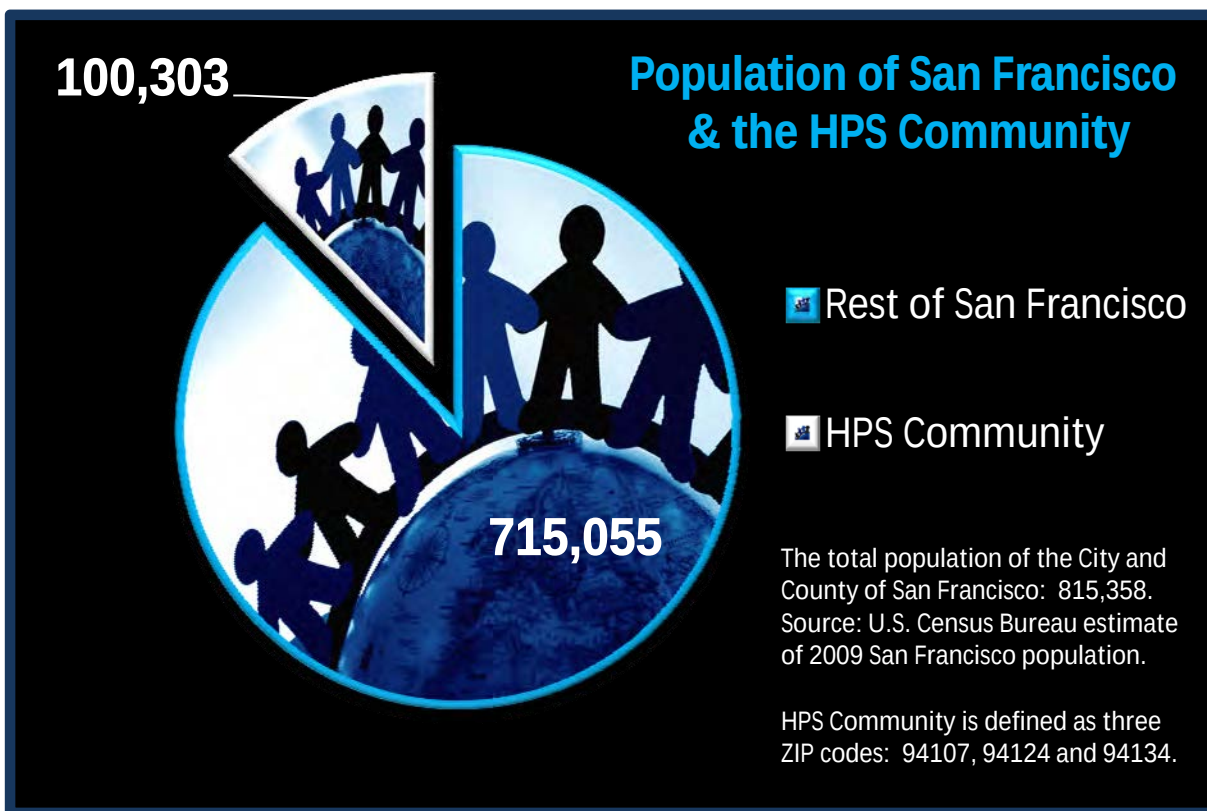
## Appendix D: Community Background

The Department of the Navy defines the Hunters Point Shipyard (**HPS**) community as ZIP codes 94107, 94124, and 94134. In 1939, the Navy purchased the HPS property. From 1945 to 1974, the Navy was one of the largest employers of the HPS community. At its peak employment level during the last months of World War II, the shipyard employed over 17,000 civilians. When the shipyard closed in the late 1970s, thousands of people lost their jobs.

Following is information on the population, race, ages, education, average income, employment, and housing for the HPS community. All of the demographic information presented was provided by the Nielsen Company, 2010, unless otherwise noted.

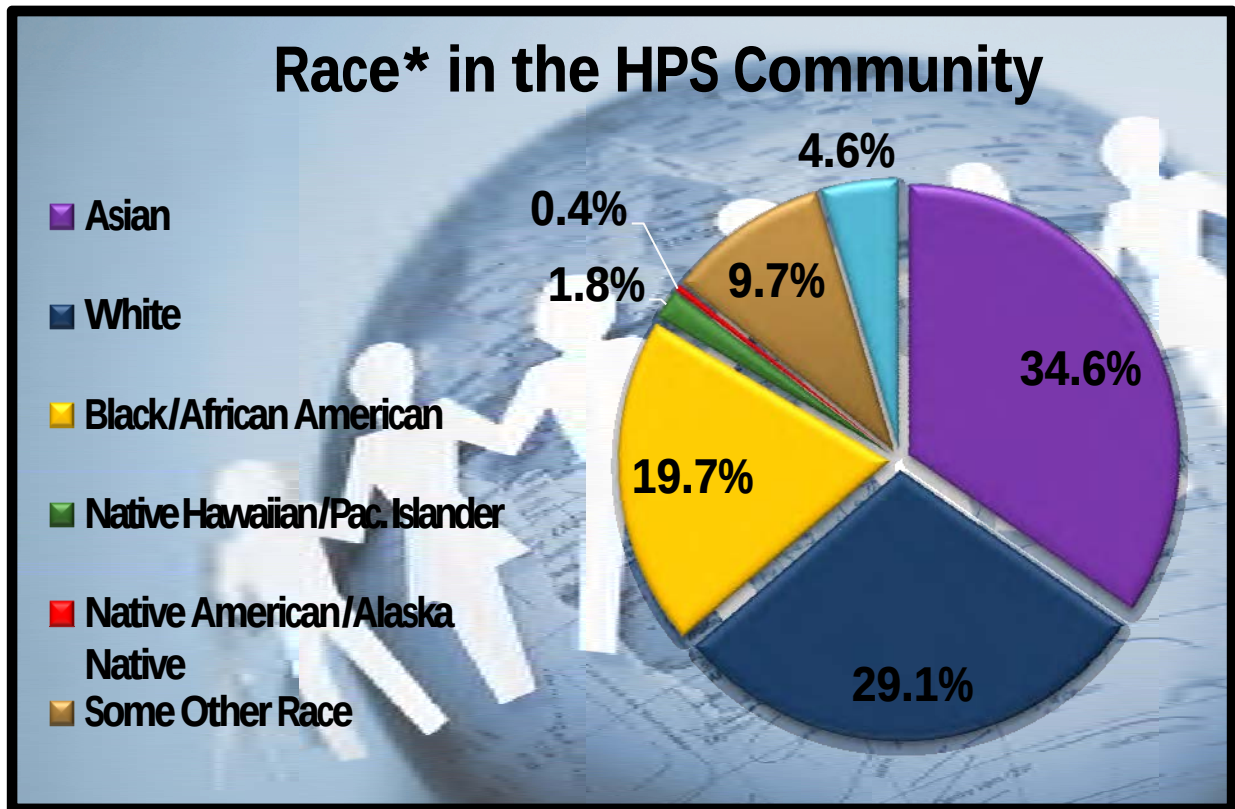
This information helped the Navy know more about the community when planning the involvement program. Age breakdown (see [PageD-3](#)) indicated that the Navy could reach the community through schools as well as senior centers. Furthermore, the Navy may choose to use youth-friendly involvement methods such as texting, along with retirement age-friendly daytime meetings.

The census information also indicates there is a high unemployment level, which reinforces concerns that jobs and economic impacts of the environmental cleanup are a top interest for the community. The Navy is addressing this concern by using local vendors, holding job fairs, and creating a fact sheet to direct people to potential hiring opportunities related to the cleanup.



| Population by ZIP Code | 94107  | 94124  | 94134  |
|------------------------|--------|--------|--------|
| Population             | 24,014 | 34,557 | 41,732 |

## Appendix D: Community Background (continued)



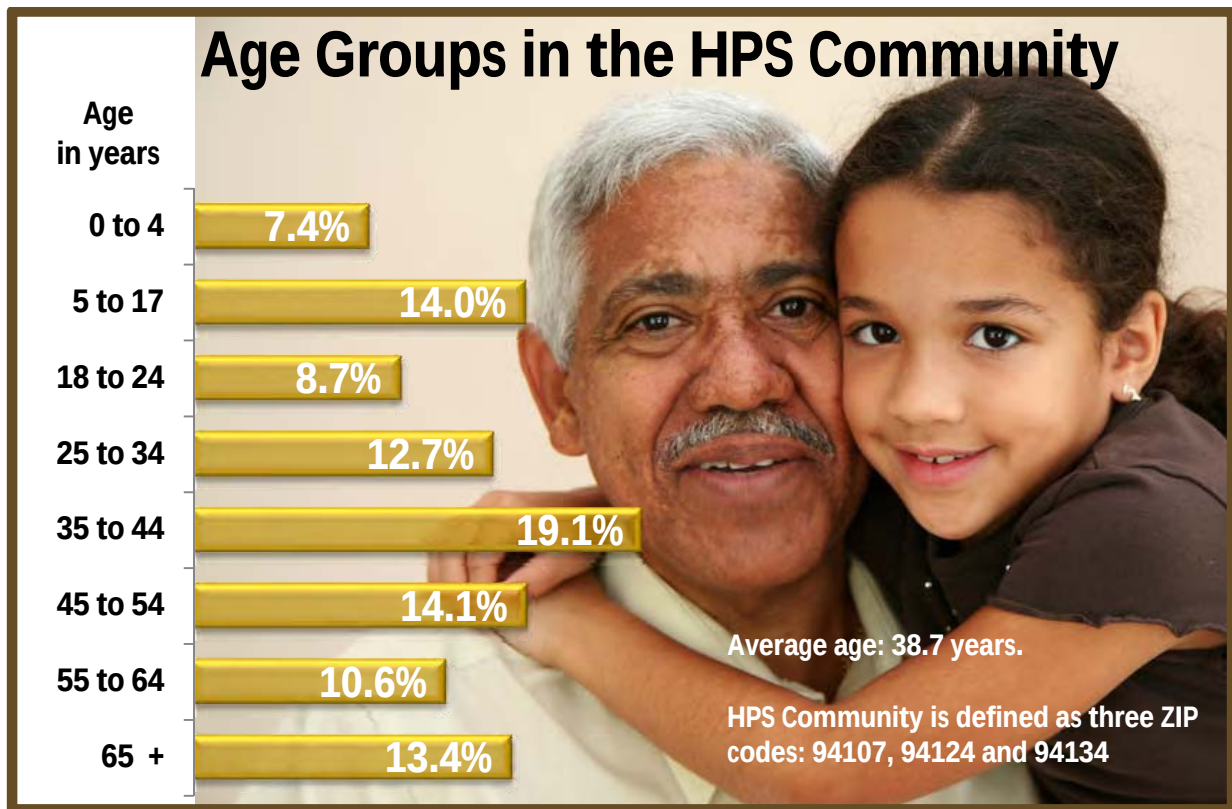
**Note:**

\* The U.S. Census Bureau considers the Hispanic/Latino designation an ethnicity, not a race. The population self-identified as “Hispanic/Latino” is also represented within the categories in the “Race” demographic. In the HPS community, 17.1% defined themselves as Hispanic/Latino.

HPS Community is defined as three ZIP codes: 94107, 94124 and 94134.

| Race By ZIP Code                 | 94107 | 94124 | 94134 |
|----------------------------------|-------|-------|-------|
| Asian                            | 19.1% | 29.2% | 55.5% |
| White                            | 60.1% | 11.0% | 16.4% |
| Black/African American           | 11.5% | 38.0% | 9.7%  |
| Native Hawaiian/Pacific Islander | 0.6%  | 3.2%  | 1.5%  |
| Native American/Alaska Native    | 0.5%  | 0.45% | 0.3%  |
| Some Other Race                  | 3.5%  | 13.6% | 12.0% |
| Two or More Races                | 4.7%  | 4.6%  | 4.6%  |
| <b>Ethnicity*</b>                |       |       |       |
| Hispanic/Latino                  | 8.5%  | 22.2% | 20.7% |

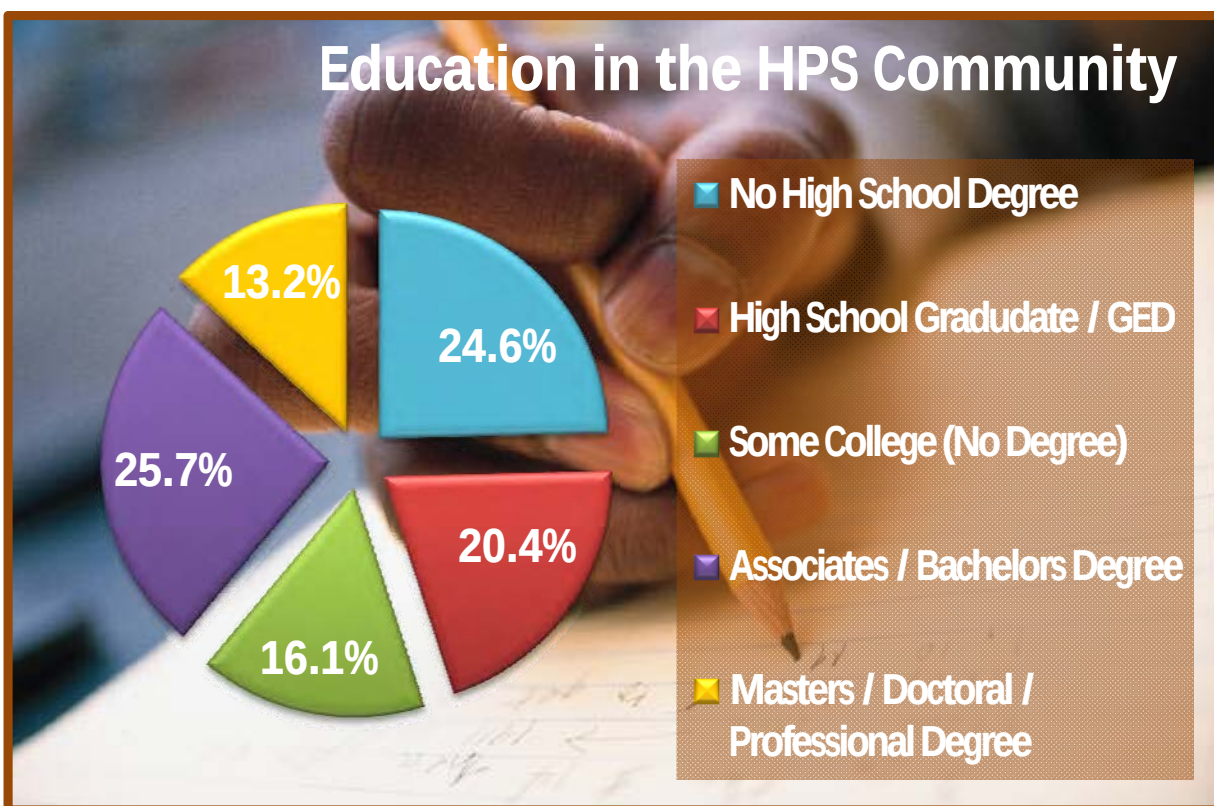
## Appendix D: Community Background (continued)



| Age Groups by ZIP Code | 94107      | 94124      | 94134      |
|------------------------|------------|------------|------------|
| 0 to 4 years           | 4.3%       | 9.6%       | 8.2%       |
| 5 to 17 years          | 8.5%       | 18.6%      | 15.0%      |
| 18 to 24 years         | 4.7%       | 11.6%      | 9.8%       |
| 25 to 34 years         | 16.3%      | 11.0%      | 10.7%      |
| 35 to 44 years         | 24.2%      | 15.6%      | 17.3%      |
| 45 to 54 years         | 15.7%      | 13.0%      | 13.6%      |
| 55 to 64 years         | 11.1%      | 9.8%       | 11.1%      |
| 65 + years             | 15.2%      | 10.8%      | 14.3%      |
| Average age            | 42.8 years | 34.9 years | 38.4 years |



## Appendix D: Community Background (continued)

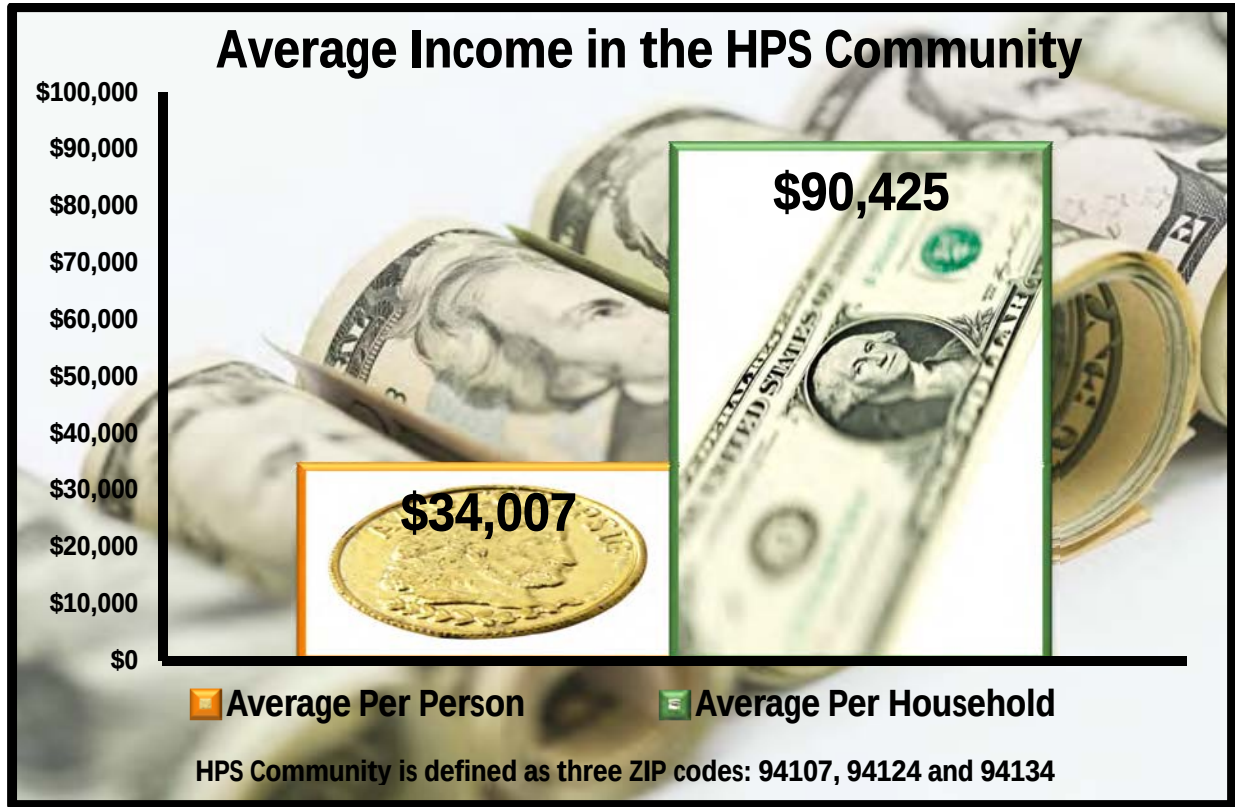


**Note:** Education level for population age 25 and older. Associates Degrees and Bachelor's Degrees: Typically 2 to 4 year degrees. Masters, Doctoral, and Professional Degrees: Graduate academic or professional degree programs composed of advanced studies. Includes but is not limited to MS, MA, PhD, EdD, DPH, MD, DDS, DSW, DO, JD, and ThD.

HPS Community is defined as three ZIP codes: 94107, 94124 and 94134.

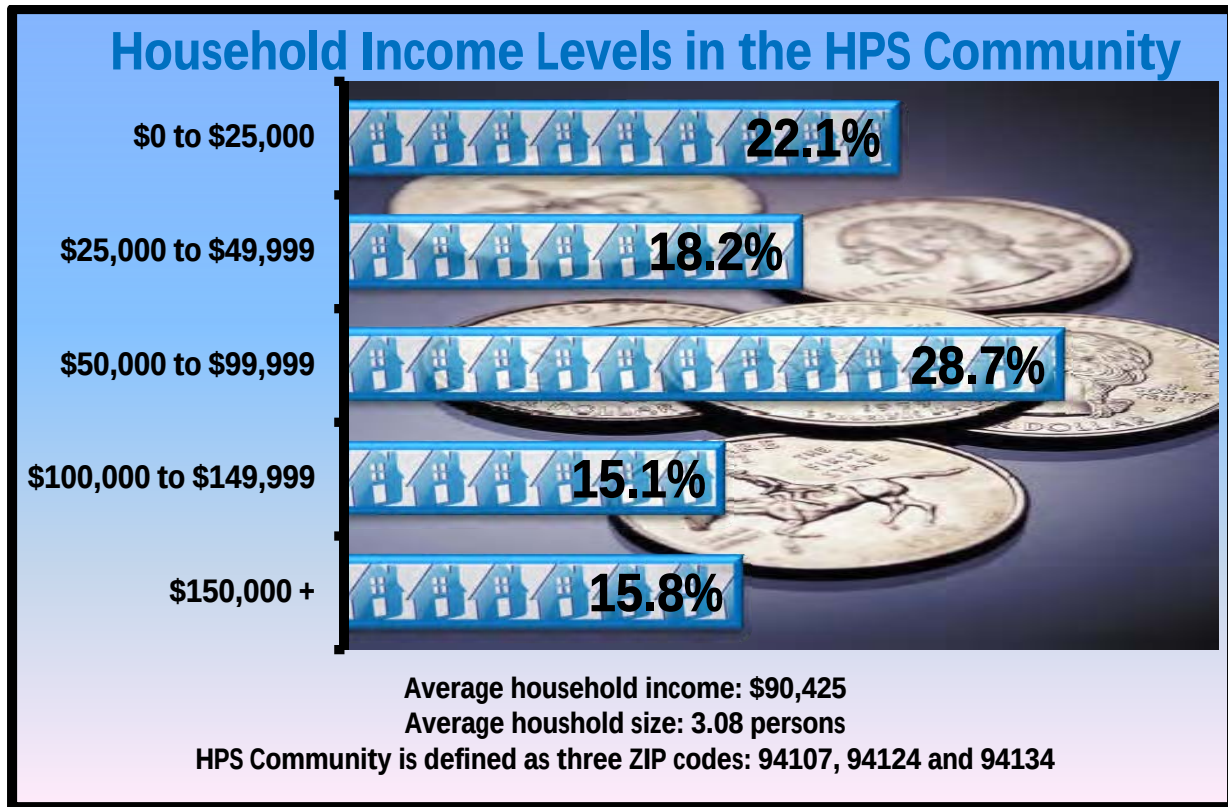
| Education by ZIP Code                              | 94107 | 94124 | 94134 |
|----------------------------------------------------|-------|-------|-------|
| No High School Degree                              | 10.8% | 31.6% | 31.4% |
| High School Graduate/GED                           | 11.2% | 26.3% | 23.7% |
| Some College (No Degree)                           | 11.6% | 20.4% | 16.2% |
| Associates/Bachelors Degree (2- to 4-year degrees) | 38.9% | 16.0% | 22.2% |
| Masters/Doctorate/Professional Degree              | 27.5% | 5.7%  | 6.5%  |

## Appendix D: Community Background (continued)



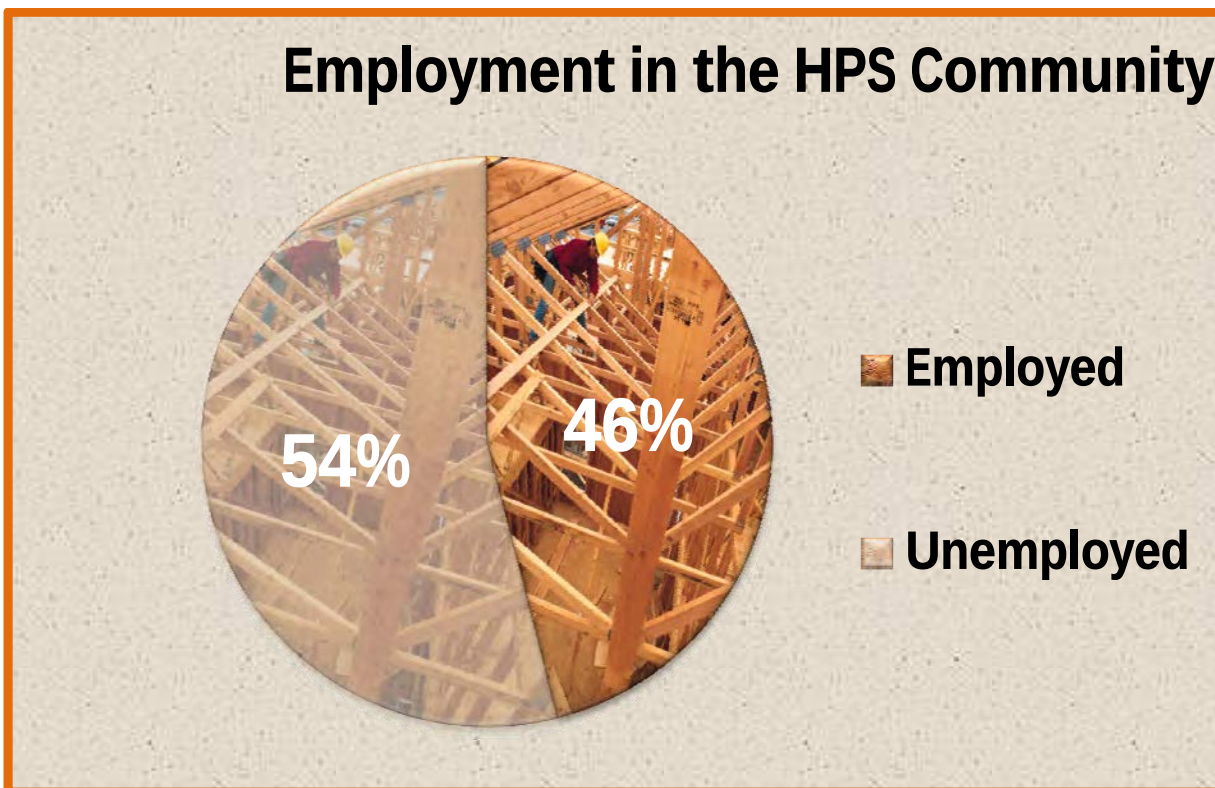
| Income by ZIP Code        | 94107     | 94124    | 94134    |
|---------------------------|-----------|----------|----------|
| Average Household Income  | \$112,344 | \$69,953 | \$88,979 |
| Average per Person Income | \$58,737  | \$19,761 | \$23,524 |

## Appendix D: Community Background (continued)



| Household Income by ZIP Code | 94107           | 94124           | 94134           |
|------------------------------|-----------------|-----------------|-----------------|
| \$0 to \$24,999              | 23.2%           | 27.4%           | 15.7%           |
| \$25,000 to \$49,999         | 16.4%           | 21.0%           | 17.3%           |
| \$50,000 to \$99,999         | 22.9%           | 28.7%           | 34.7%           |
| \$100,000 to \$149,999       | 13.0%           | 13.7%           | 18.6%           |
| \$150,000 +                  | 24.5%           | 9.2%            | 13.7%           |
| Average Household Size       | 1.87<br>persons | 3.58<br>persons | 3.80<br>persons |

## Appendix D: Community Background (continued)



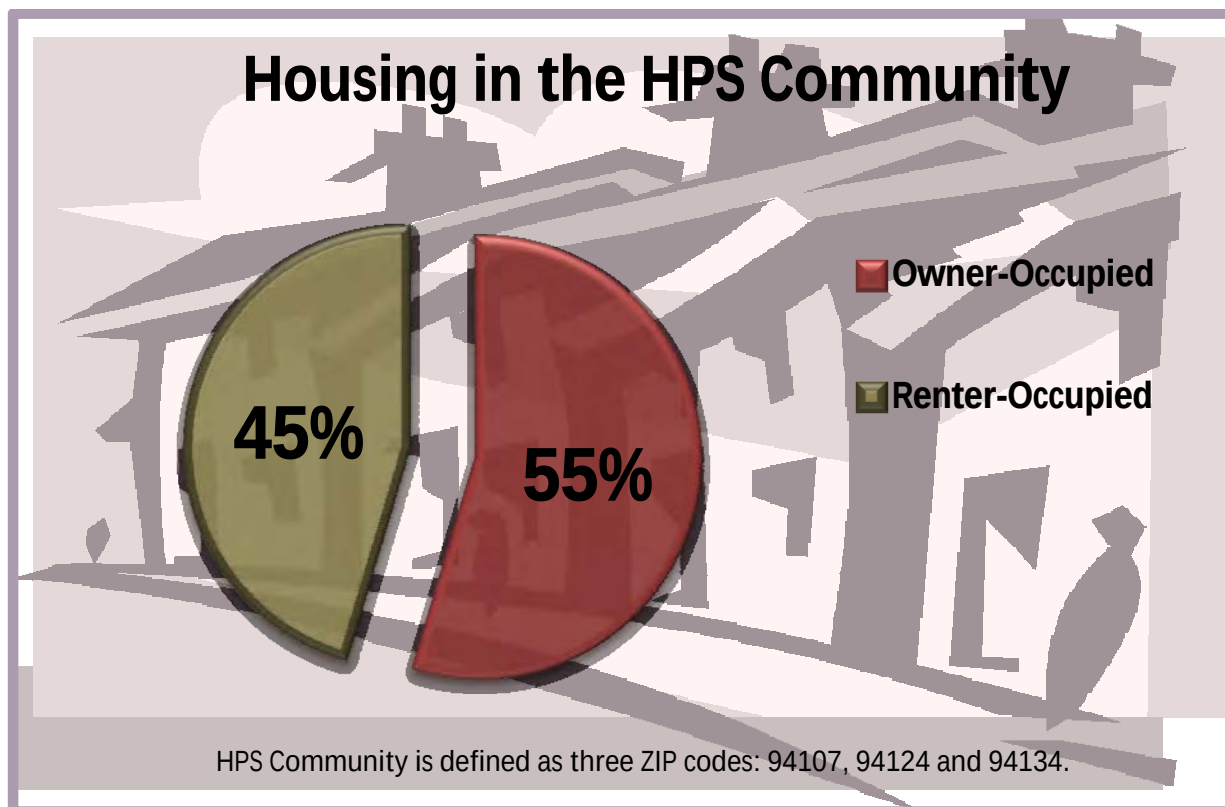
**Note:**

Employment percentage for population age 16 and older.

HPS community is defined as three ZIP codes: 94107, 94124, and 94134.

| Employment by ZIP Code | 94107 | 94124 | 94134 |
|------------------------|-------|-------|-------|
| Employed               | 59.3% | 35.2% | 43.7% |
| Unemployed             | 40.7% | 64.8% | 56.3% |

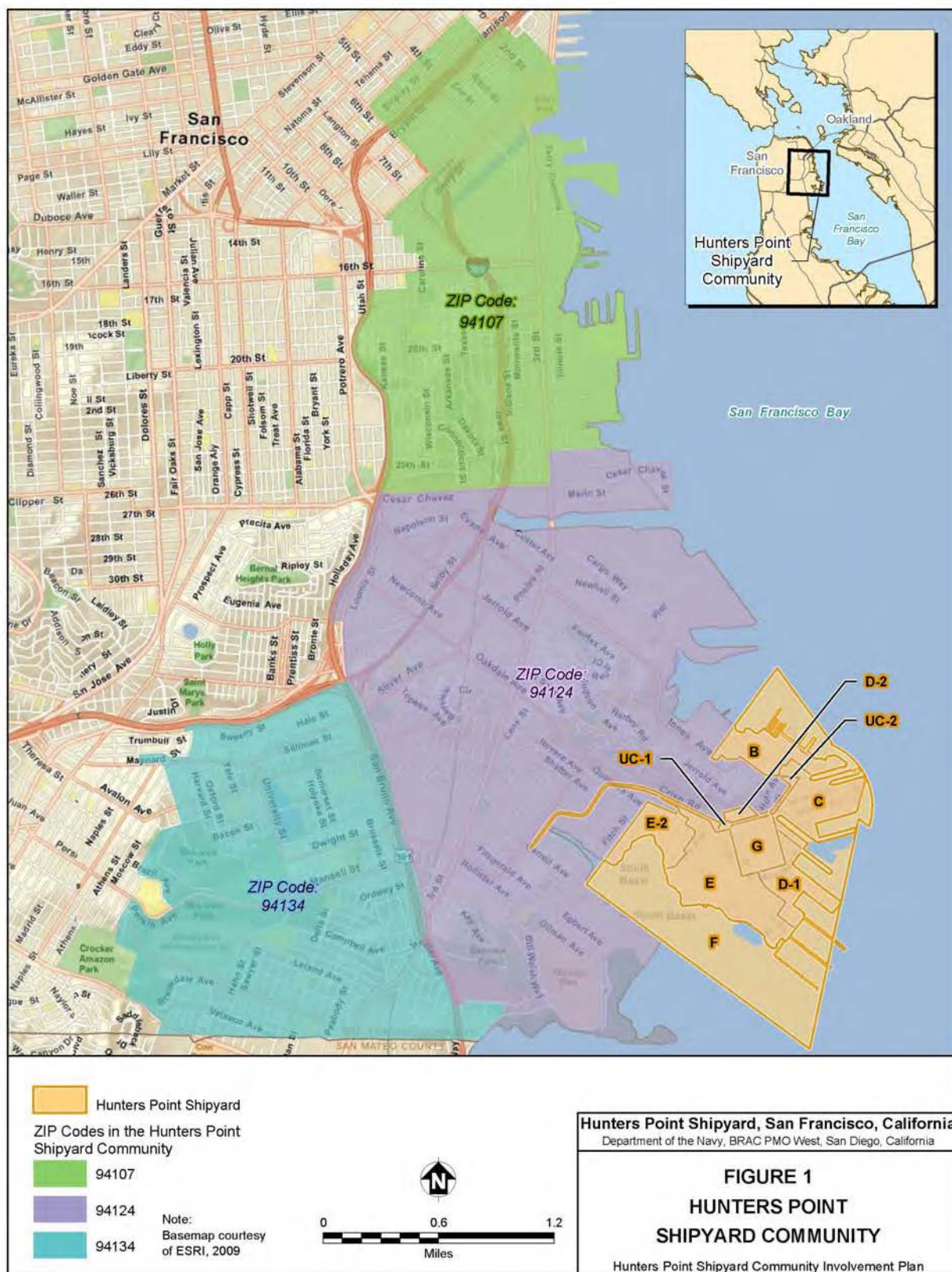


*Appendix D: Community Background (continued)*

| Housing by ZIP Code | 94107 | 94124 | 94134 |
|---------------------|-------|-------|-------|
| Home Owners         | 34.1% | 57.6% | 72.0% |
| Renters             | 65.9% | 42.4% | 28.0% |

## Appendix D: Community Background (continued)

### Map of the Hunters Point Shipyard Community



*Appendix D: Community Background (continued)*

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## *Appendix E: Former Restoration Advisory Board*

This appendix includes information on the Department of the Navy's former Restoration Advisory Board (**RAB**) at Hunters Point Shipyard (**HPS**). The HPS RAB was formed in 1994 and dissolved in 2009. The purpose of the RAB was to review and comment on environmental documents and to provide the Navy and regulatory agencies with input from the community on the environmental cleanup program. The Navy would like to take this opportunity again to acknowledge that service on the RAB was a voluntary effort on the part of community members and to thank those who participated and donated their time. Over the 15 years the RAB existed, there was helpful community input and productive dialogue between the Navy and regulatory agencies and the community. However, in 2009, it was determined that the RAB was no longer fulfilling its objective. This Community Involvement Plan (**CIP**) is a key step in the Navy's goal to explore other means to promote two-way communication with the HPS community.

A letter of intent to dissolve the RAB was issued on May 22, 2009, encouraging public comments on the letter (see [Page E-9](#)). The Navy HPS team began discussions with Navy management and the regulatory agencies to dissolve the RAB based on several factors, including the following:

- During RAB meetings, discussions turned into verbal arguments and focus was directed to items not within the scope of or related to the RAB. This resulted in many presentations and discussions about environmental cleanup not being completed.
- Some RAB members and community members who attended meetings confidentially stated they felt the meetings had a volatile tone that made them feel unwelcome and in some cases unsafe.
- The RAB did not provide comments on any Navy environmental documents.
- The RAB was not serving as a liaison between the Navy/regulatory agencies and the community, as it was designed to do.

On December 23, 2009, the Navy officially dissolved the RAB. The letter dissolving the RAB is presented on [Page E-15](#). Per the Department of Defense RAB Rule Handbook, Chapter 7, the Navy will continue to evaluate community interest in a RAB at least every 24 months after the board was dissolved.

Following is additional information, including graphs, presenting the attendance trends at RAB meetings until the last RAB meeting held in January 2009. In addition, information is presented on attendance at technical meetings the Navy has held subsequent to the last RAB meeting in order to continue communication with the HPS community.

Data for [Graphs 1 and 2](#) were compiled from the sign-in sheets for RAB meetings from 2006 (when the last CIP update was finalized) through the last meeting in 2009. In addition, the post-RAB meeting sign-in sheets from 2009 through 2010 were also compiled. Once the data was compiled all "paid" attendees including Navy, regulatory agency, City of San Francisco, and contractor employees were identified and removed from the data set. The resulting graphs represent community member attendees at the meetings. The graphs included RAB members (not eliminated by the previously listed categories) as community members.

Data for [Graphs 3 through 6](#) was compiled from sign-in sheets for RAB meetings from 2005 through 2008. The data set evaluated only included community RAB members.

## *Appendix E: Former Restoration Advisory Board (continued)*

### **Graph 1: Meeting Attendance over Time, 2006 through 2011**

[Graph 1](#) shows community members in attendance at meetings from 2006 through 2011. Meeting attendance in 2006 was relatively low until December 2006, when a large increase occurred. The trend for number of community members in attendance during 2007 was greater than 2006 and trended downward except in August 2007 when the meeting attendance was greatest. 2008 saw some increases and decreases in attendance throughout the year, with the final RAB meeting in January 2009 having a larger attendance than any meeting in 2008. Since the RAB was dissolved, meeting attendance in 2009 and 2010 has continued to be variable with an upward trend since the low during the July 2010 meeting. A few reasons that might have contributed to the variance in attendance during 2009 included the lack of regularly scheduled meetings and the variability in meeting locations.

One item that was not tracked during the meetings was the number of participants present at the end of the meetings. General observations from Navy contractors in attendance at the latter RAB meetings indicate that some participants left during the meetings. Furthermore, during three RAB meetings in September 2007, December 2008, and January 2009, the planned presentations were not given or finished due to disruptions during the meetings. Some individuals provided feedback to the Navy that they did not feel comfortable coming to future meetings because of the aggressive environment during these meetings.

### **Graph 2: Percentage of New and Existing Community Members at Meetings in 2009 through 2011**

[Graph 2](#) shows the percentage of community members who attended post-RAB meetings who had not been involved prior to the last RAB in January 2009. The graph indicates 64% of the meeting participants in 2009 through 2011 had not attended a prior RAB meeting. The post-RAB meetings appear to be reaching out to new members of the HPS community.

### **Graph 3: Percentage of RAB Members in Attendance from 2005 through 2008**

The number of community RAB members varied by month; therefore, the percentage of RAB members in attendance during RAB meetings is shown on [Graph 3](#).

### **Graph 4: Percentage of RAB Members in Attendance by Month from 2005 through 2008**

[Graph 4](#) shows the percentage of community RAB members by month during 2005 through 2008. No specific trends were observed in the graphs, but some decreases in July and September were observed.

### **Graph 5: RAB Members in Attendance from 2005 through 2008**

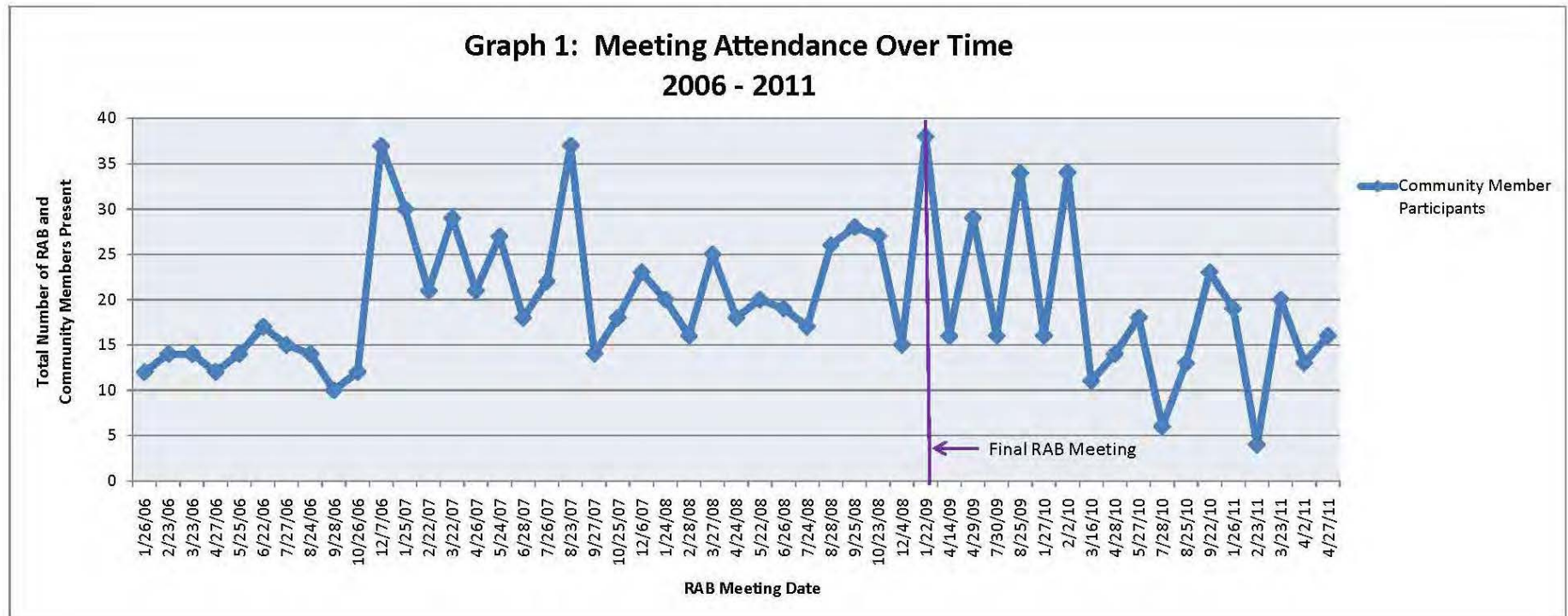
[Graph 5](#) indicates the actual number of community RAB members who attended RAB meetings from 2005 through 2008. In general, more RAB members were present in 2007 and 2008 than 2005 and 2006.

### **Graph 6: Number of New and Resigning RAB Members from 2005 through 2009**

[Graph 6](#) represents the number of new and resigning community RAB members during 2005 through 2009. The most people resigned in 2008 with four RAB members leaving. The most new community RAB members joined in during 2007 and 2009, when nine and seven new members joined, respectively.

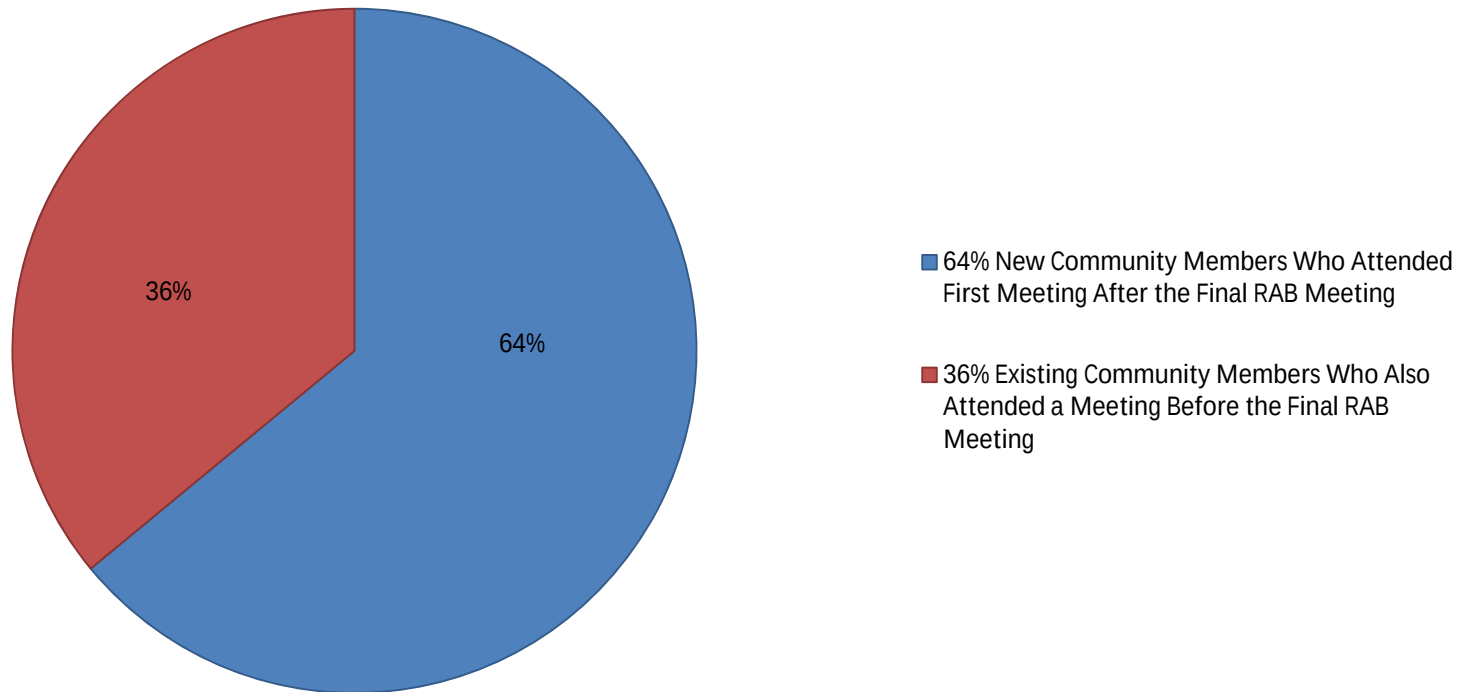


Appendix E: Former Restoration Advisory Board (continued)



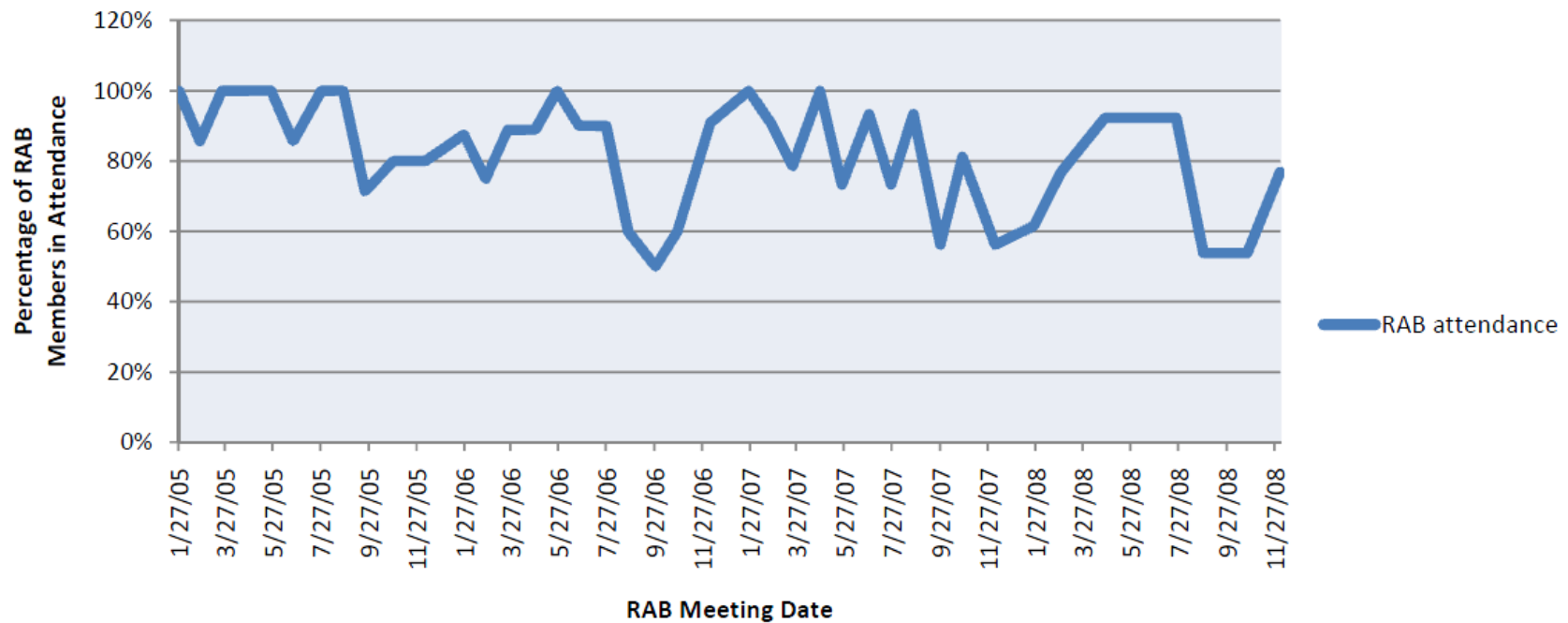
**Appendix E: Former Restoration Advisory Board (continued)**

**Graph 2: Percentage of New and Existing Community Members at Meetings in 2009 - 2011**

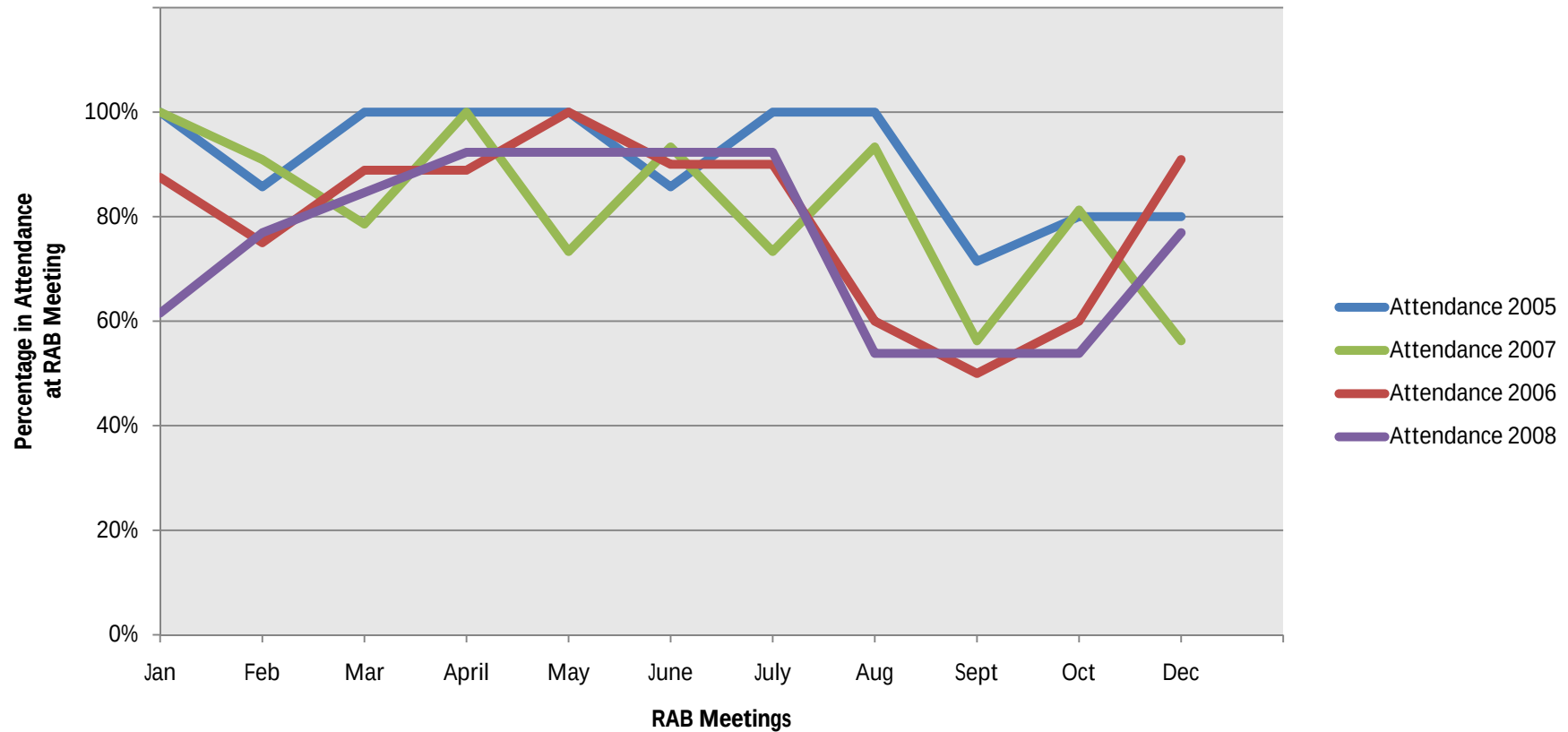


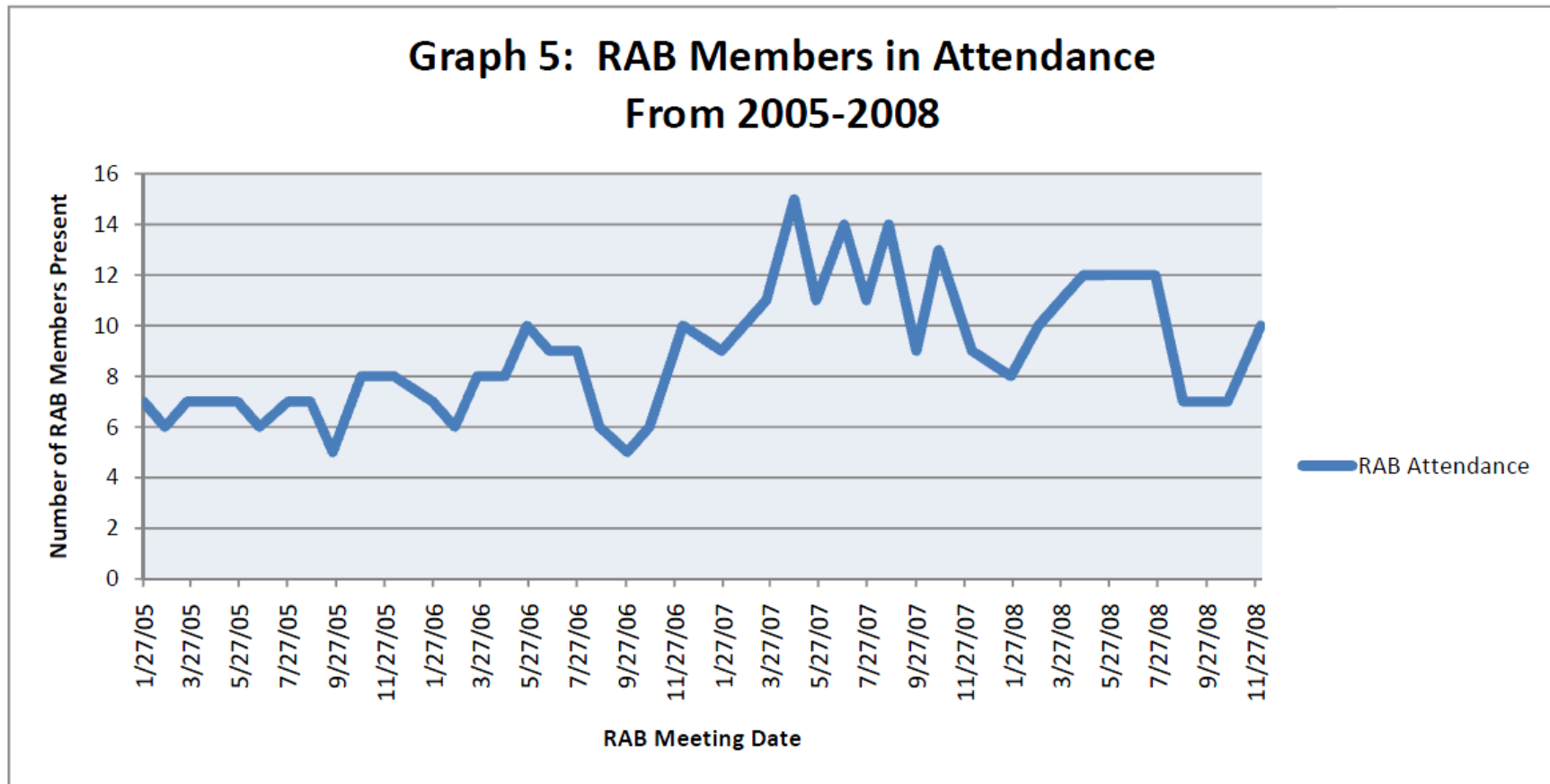
**Appendix E: Former Restoration Advisory Board (continued)**

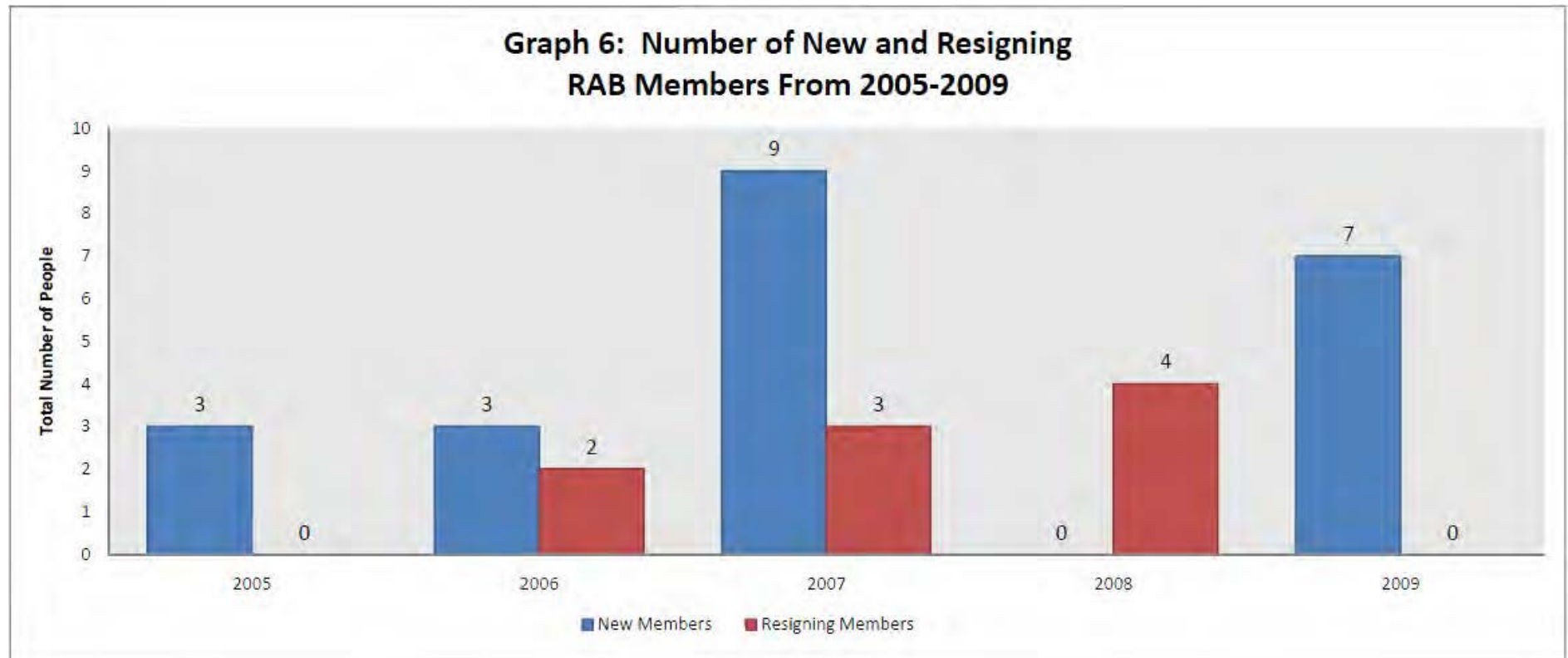
**Graph 3: Percentage of RAB Members in Attendance From 2005-2008**





**Appendix E: Former Restoration Advisory Board (continued)****Graph 4: Percentage of RAB Members in Attendance by Month From 2005-2008**

**Appendix E: Former Restoration Advisory Board (continued)**

**Appendix E: Former Restoration Advisory Board (continued)**



**DEPARTMENT OF THE NAVY**  
BASE REALIGNMENT AND CLOSURE  
PROGRAM MANAGEMENT OFFICE WEST  
1455 FRAZEE RD, SUITE 900  
SAN DIEGO, CA 92108-4310

Ser BPMOW.DG/0317  
MAY 22 2009

Dear Hunters Point Naval Shipyard RAB Community Co-Chair and RAB Members:

This letter serves as the Navy's notice of intent to dissolve the Hunters Point Naval Shipyard (HPS) Restoration Advisory Board (RAB) as provided by 32 Code of Federal Regulations (CFR) Part 202. My office has consulted with the Environmental Protection Agency, as well as State, and local government representatives about this proposal. The purpose of a RAB is to ensure community involvement in the environmental cleanup process whereby an open discussion and exchange of information occurs. The Navy fully supports the need for open, meaningful dialogue with the diverse Bayview Hunters Point Community regarding our environmental cleanup actions and decisions. However, the RAB is not fulfilling this objective. Therefore, we will be exploring other means to accomplish this important goal. As the Navy follows the RAB dissolution process (enclosed), my staff will be working with you, the greater Bayview Hunters Point Community, and our regulatory partners to find alternative means to meet these community involvement goals and requirements. I specifically request your ideas for an effective community involvement program which will reach a broad community audience and encourage effective two-way communication between the community and Navy regarding environmental cleanup issues at HPS.

My review of input from the RAB over the last 24 months regarding Navy environmental cleanup matters leads me to conclude that the HPS RAB should be dissolved. To continue holding meetings will not fulfill the RAB's purpose or mission. This conclusion is based on the following:

1. RAB meetings do not provide the diverse Bayview Hunters Point Community's input to the Navy's environmental cleanup program.
  - The Navy has issued over 80 documents for review over the last 24 months and only 3 have received formal written comments from RAB members.
  - The Navy has issued four different Proposed Plan/Record of Decision documents over the past year without receiving any formal written comment from RAB members.
  - RAB meetings are used to discuss non-Navy issues such as redevelopment actions. In fact, RAB members recently voted to stop all work on HPS due to concerns about work on an adjacent City-owned parcel.
  - RAB meetings are used to discuss contracting issues rather than the cleanup program. RAB members recently passed a resolution to pursue a civil grand jury investigation into economic issues at HPS.

While the Navy agrees that redevelopment and contracting issues are important to the community, they are outside the scope of the RAB and there are other appropriate forums for these topics. The Navy has repeated this point to the RAB without a change in RAB performance.

2. The RAB atmosphere is not productive to effective public discourse.

- Rules of order are often not followed during meetings; interruptions are common; and meeting facilitators are not respected.
- A number of RAB Community members have complained about the hostile tone of RAB meetings and decline to attend because of the unwillingness of other RAB members to listen to contrasting points of view and/or inability of the RAB to focus on environmental cleanup issues.
- At the January 22, 2009 RAB meeting, RAB members voted to request replacement of the City's representative, which is not an appropriate RAB function.
- At a February 18, 2009 "emergency meeting" RAB members voted to request replacement of the Navy RAB Co-Chair, which is not an appropriate RAB function.

As a consequence, valuable information from Navy and other state and Federal agency representatives has not been effectively presented. Instead of fostering discussion on the effectiveness of proposed Navy cleanup actions, RAB discussions focus on matters unrelated to the Navy's clean-up efforts.

3. Navy attempts to work with the Community to improve the RAB process have failed.

- Over the past 24 months, the Navy RAB Co-Chair and others have attempted to refocus RAB meetings with the help of a professional facilitator.
- The Navy RAB Co-Chair has had discussions outside of RAB meetings with RAB members to try to refocus the RAB on the environmental program.

These attempts have been unsuccessful in changing the atmosphere or inducing input on the environmental restoration program.

Though I believe the RAB should be dissolved, I remain fully committed to seeking community involvement and input for ongoing and future HPS cleanup actions. While we work through this RAB dissolution process, I will post information such as fact sheets and presentations on the Hunter's Point website ([www.bracpmo.navy.mil](http://www.bracpmo.navy.mil)), as well as provide informational mailings to elicit community member comments and questions.

Ser BPMOW.DG/0317  
MAY 22 2009

As stated earlier, the Navy fully supports the need for open, meaningful dialogue with the diverse Bayview Hunters Point Community regarding our environmental cleanup actions and decisions. Should the RAB be dissolved, the revised community involvement program may include community environmental forums, including using internet-based technology to more easily reach a diverse audience; expanded Monthly Progress Reports and facts sheets; and hosting technical discussions and tours of cleanup sites on HPS for interested community members. I solicit your comments on this letter of intent, as well as your ideas regarding more productive community involvement alternatives between the Bayview Hunters Point Community and the Navy. I request you provide your ideas and comments to HPS Base Closure Manager, Mr. Douglas Gilkey, at the address on the letterhead no later than 30 June 2009. Please feel free to contact Mr. Gilkey at (619)-532-0949 if you have any questions about this notice or the dissolution process.

During the interim period between my publishing of this intent letter and a final decision as to the RAB's dissolution, further meetings of the RAB are suspended.

I thank each of you for the effort you have made as a member of the HPS RAB. The Navy places a high priority on obtaining meaningful and timely input from the community in the course of its environmental cleanup activities and hope you will continue to participate in the HPS environmental restoration program in the future. Thank you for your contributions.

Sincerely,

  
LAURA DUCHNAK  
Director, BRAC PMO West

Encl: (1) 32 C.F.R Part 202.10

(b) *RAB dissolution*—(1) *Requirements for RAB dissolution*. An Installation Commander may recommend dissolution of a RAB when a RAB is no longer fulfilling the intended purpose of advising and providing community input to an Installation Commander and decision makers on environmental restoration projects as described in §202.1(b).

(2) *Dissolution procedures*. If the Installation Commander is considering dissolving the RAB, the Installation Commander shall:

(i) Consult with EPA, state, tribal and local government representatives, as appropriate, regarding dissolving the RAB.

(ii) Notify the RAB community co-chair and members in writing of the intent to dissolve the RAB and the reasons for doing so and provide the RAB members 30 days to respond in writing. The Installation Commander shall consider RAB member responses, and in consultation with EPA, state, tribal and local government representatives, as appropriate, determine the appropriate actions.

(iii) Notify the public of the proposal to dissolve the RAB and provide a 30-day public comment period on the proposal, if the Installation Commander decides to proceed with dissolution. At the conclusion of the public comment period, the Installation Commander will review the public comments, consult with EPA, state, tribal and local government representatives, as appropriate, and, if the Installation Commander still believes dissolution is appropriate, render a recommendation to that effect.

(iv) Send the recommendation, responsiveness summary, and all supporting documentation via the chain-of-command to the Military Component's Environmental Deputy Assistant Secretary (or equivalent) for approval or disapproval. The Military Component's Environmental Deputy Assistant Secretary (or equivalent) shall notify the Office of the Deputy Under Secretary of Defense (Installations & Environment) (or equivalent) of the decision to approve or disapprove the request to dissolve the RAB and the rationale for that decision.

(v) Document the recommendation, responsiveness summary, and the rationale for dissolution in a memorandum for inclusion in the Administrative Record, notify the public of the decision through written notice to the RAB members and through publication of a notice in a local newspaper of general circulation and describe other ongoing public involvement opportunities that are available, once the Military Component's Environmental Deputy Assistant Secretary (or equivalent) makes a final decision.

(c) *Reestablishing an adjourned or dissolved RAB.* An Installation Commander may reestablish an adjourned or dissolved RAB if there is sufficient and sustained community interest in doing so, and there are environmental restoration activities still ongoing at the installation or that may start up again. Where a RAB is adjourned or dissolved and environmental restoration activities continue, the Installation Commander should reassess community interest at least every 24 months. When all environmental restoration decisions have been made and required remedies are in place and are properly operating at an installation, reassessment of the community interest for reestablishing the RAB is not necessary. When additional environmental restoration decisions have to be made resulting from subsequent actions, such as long-term management and five-year reviews, the installation will reassess community interest for reestablishing the RAB. Where the reassessment finds sufficient and sustained community interest at previously adjourned or dissolved RABs, the Installation Commander should reestablish a RAB. Where the reassessment does not find sufficient and sustained community interest in reestablishing the RAB, the Installation Commander shall document in a memorandum for the record the procedures followed in the reassessment and the findings of the reassessment. This document shall be included in the Administrative Record for the installation. If there is interest in reestablishment at a previously dissolved RAB, but the Installation Commander determines that the same conditions exist that required the original dissolution, he or she will request, through the chain-of-command to the Military Component's Deputy Assistant Secretary, an exception to reestablishing the RAB. If those conditions no longer exist at a previously dissolved RAB, and there is sufficient and sustained interest in reestablishment, the Installation Commander should recommend to the Deputy Assistant Secretary that the RAB be reestablished. The Deputy Assistant Secretary will take the Installation Commander's recommendation under advisement and may approve that RAB for reestablishment.



(d) *Public comment.* If the Installation Commander intends to recommend dissolution of a RAB or reestablish a dissolved RAB, the Installation Commander shall notify the public of the proposal to dissolve or reestablish the RAB and provide a 30-day public comment period on the proposal. At the conclusion of the public comment period, the Installation Commander shall review public comments; consult with EPA and state, tribal, or local government representatives, as appropriate; prepare a responsiveness summary; and render a recommendation. The recommendation, responsiveness summary, and all supporting documentation should be sent via the chain-of-command to the Military Component's Environmental Deputy Assistant Secretary (or equivalent) for approval or disapproval. The Installation Commander shall notify the public of the decision.



**DEPARTMENT OF THE NAVY**  
OFFICE OF THE ASSISTANT SECRETARY  
(INSTALLATIONS AND ENVIRONMENT)  
1000 NAVY PENTAGON  
WASHINGTON DC 20350-1000

DEC 23 2009

**MEMORANDUM TO MS. LAURA DUCHNAK, DIRECTOR,  
BASE REALIGNMENT AND CLOSURE (BRAC) PROGRAM**

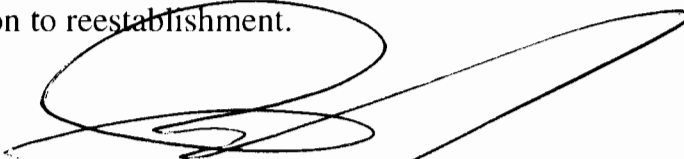
**SUBJECT: Hunters Point Restoration Advisory Board (RAB)**

I received your December 22, 2009 memorandum (Attachment 1) submitted pursuant to the Code of Federal Regulations (CFR) at Title 32, Section 202.10(b) along with the supporting materials, wherein you recommend the dissolution of the Hunters Point Shipyard (HPS) Restoration Advisory Board (RAB). In accordance with Title 32, I considered your recommendation and the content of the administrative record in reaching my decision. I also reviewed the process you undertook to make the public aware of your intentions, as well as attempts made by your staff to resolve issues affecting the RAB's effectiveness. Based on review of that information, I have determined the HPS RAB is unable to fulfill its intended purpose of advising Navy's Environmental Restoration program managers and decision makers, and I therefore approve your request to dissolve the HPS RAB.

The Department of the Navy (DON) establishes RABs to provide stakeholder involvement in the environmental restoration process at Department of Defense (DoD) installations. The RAB is an opportunity for parties who may be affected by environmental restoration activities to review program progress, and participate in a dialogue where they provide comment and advice to environmental restoration program managers and decision makers. I have reviewed documents within the administrative record. I paid particular attention to the minutes of various RAB meetings (Attch. 2, 13, 14 and 20). The meeting minutes revealed a RAB that at times was productive but more often was unproductive. While members of the RAB listened and provided insightful comments at one point, the next moment conversations devolved into acrimony and accusation on issues which had little or nothing to do with HPS environmental restoration. The meeting of January 2009 is a prime example of this inconsistency (Attch. 20). The RAB Community Co-Chair notes in Attachment 22 that the RAB is an advisory board for environmental clean-up decisions; however, in that same note, he demands initiation of a grand jury investigation on economic matters and immediate removal from the RAB of a San Francisco City regulator. Email by current and former members of the RAB was also telling of the wide dichotomy of views within the RAB regarding its continued value (Attach. 30, 34, 35, 37, 39, 40, 41 and 61). Reasonable steps were taken to resolve issues affecting the RAB's effectiveness, as seen by regular use of a meeting facilitator and numerous attempts by Navy personnel to work with RAB members on issues that are outside the RAB's purview (Attch. 62). Nevertheless, it appears clear to me that irresolvable internal issues prevent the HPS RAB from fulfilling its

intended purpose of advising the environmental restoration program managers and decision makers.

Since February 2009, you have taken numerous steps to seek out and implement enhanced community involvement in other forums and through internet technologies. While several actions have shown promise, others may not have been completely successful (Attch.6). I encourage you to continue to provide information to the public, seek their input on the environmental restoration program implementation, and continue to explore other opportunities for meaningful dialogue with the local community. I am directing you to monitor and reassess community interest in the RAB process at least every 24 months. If your reassessment finds sufficient and sustained community interest for reestablishing the HPS RAB, you should reestablish a RAB. However, if the same conditions occurring at the time of this RAB's dissolution still exist, you should notify this office through your chain of command and request an exception to reestablishment.

A large, stylized handwritten signature in black ink, appearing to read 'R. Mach, Jr.', is positioned above the typed name.

Richard G. Mach, Jr., P.E.

Acting Deputy Assistant Secretary of the Navy  
(Environment)

## *Appendix F: History of Recent Community Involvement*

| <b>Date of Meeting</b> | <b>Meeting Topic</b>                                            | <b>Type of Meeting</b>        |
|------------------------|-----------------------------------------------------------------|-------------------------------|
| February 11, 2009      | Parcel C Proposed Plan                                          | Public Meeting                |
| April 14, 2009         | Dust Control                                                    | Community Environmental Forum |
| April 29, 2009         | Basewide Update                                                 | Community Environmental Forum |
| July 30, 2009          | Parcel E Draft Feasibility Study                                | Community Technical Meeting   |
| August 25, 2009        | Open House                                                      | Open House                    |
| January 27, 2010       | Parcel E-2 Polychlorinated Biphenyls Hot Spot                   | Community Technical Meeting   |
| February 2, 2010       | Community Involvement Plan Meeting                              | Community Meeting             |
| March 16, 2010         | Navy Update of HPS Clean Up Activities                          | Community Technical Meeting   |
| April 28, 2010         | Parcel C Draft Record of Decision                               | Community Technical Meeting   |
| May 27, 2010           | Radiological Program Update                                     | Community Technical Meeting   |
| June 30, 2010          | Business Information                                            | Open House/Fair               |
| July 28, 2010          | Parcel C Groundwater Fieldwork                                  | Community Technical Meeting   |
| August 25, 2010        | Pier Demolition                                                 | Community Technical Meeting   |
| September 22, 2010     | Upcoming Radiological Work on Parcel D-1                        | Community Technical Meeting   |
| October 27, 2010       | Parcel B Remediation                                            | Community Technical Meeting   |
| November 18, 2010      | Environmental Cleanup Activities                                | Community Meeting             |
| December 1, 2010       | Year in Review – 2010 Environmental Cleanup                     | Community Meeting             |
| January 26, 2011       | Upcoming 2011 Environmental Cleanup Activities                  | Community Meeting             |
| February 23, 2011      | Upcoming 2011 Environmental Cleanup Activities                  | Community Meeting             |
| March 23, 2011         | Draft Community Involvement Plan and the Early Transfer Process | Community Meeting             |
| April 2, 2011          | Draft Community Involvement Plan                                | Community Meeting             |
| April 27, 2011         | Update of Environmental Field Projects and Public Involvement   | Community Meeting             |

***Appendix F: History of Recent Community Involvement (continued)***

| <b>Date of Fact Sheet</b>                | <b>Fact Sheet Topic</b>                                              |
|------------------------------------------|----------------------------------------------------------------------|
| January 22, 2009                         | Snapshot of HPS (Update on activities basewide)                      |
| January 23, 2009                         | Parcel C Proposed Plan                                               |
| February 27, 2009                        | Snapshot of HPS                                                      |
| March 31, 2009                           | Snapshot of HPS                                                      |
| May 29, 2009                             | Snapshot of HPS                                                      |
| June 26, 2009                            | Snapshot of HPS                                                      |
| August 28, 2009                          | Snapshot of HPS                                                      |
| March 14, 2011                           | Draft Community Involvement Plan                                     |
| <b>Date of Other Outreach Activities</b> | <b>Outreach Activity</b>                                             |
| July 12, 2010                            | Morgan Heights Homeowners Association<br>General Update Presentation |
| October 13, 2010                         | Community HPS Bus Tour                                               |
| February 22, 2011                        | Hunters Point Shipyard Citizen's Advisory Committee                  |
| February 23, 2011                        | Bayview Hunters Point Senior Center<br>General Update Presentation   |
| February 23, 2011                        | Sing Tao Chinese Radio<br>Interview Session                          |
| March 23, 2011                           | Sing Tao Chinese Radio<br>Interview Session                          |
| March 23, 2011                           | El Show de Carlos DeMarty Spanish Radio<br>Interview Session         |
| April 26, 2011                           | KPOO Community Radio Show<br>General overview                        |
| April 27, 2011                           | Sing Tao Chinese Radio<br>Interview Session                          |
| April 27, 2011                           | El Show de Carlos DeMarty Spanish Radio<br>Interview Session         |

## Appendix G: Regulations and Guidance for Community Involvement

The Department of the Navy's Installation Restoration Program is conducted in accordance with federal and state requirements, and its purpose is twofold—(1) to identify, investigate, and clean up or control releases of hazardous substances, and (2) to reduce the risk to human health and the environment. The Navy is the lead federal agency for the Installation Restoration Program at Hunters Point Shipyard (**HPS**). The figure on [Page G-2](#) presents the major phases of the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA**) process.

Federal and state environmental statutes and amendments require community involvement for hazardous waste sites, and guidance documents have been created to address these requirements. The United States Environmental Protection Agency (**U.S. EPA**) community involvement documents can be found at [www.epa.gov/superfund/community/involvement.htm](http://www.epa.gov/superfund/community/involvement.htm). The Department of Defense documents can be found at [https://portal.navfac.navy.mil/portal/page/portal/NAVFAC/NAVFAC\\_WW\\_PP/NAVFAC\\_NFESC\\_PP/ENVIRONMENTAL/ERB/COMINV](https://portal.navfac.navy.mil/portal/page/portal/NAVFAC/NAVFAC_WW_PP/NAVFAC_NFESC_PP/ENVIRONMENTAL/ERB/COMINV). The Navy's Community Involvement Plan (**CIP**) at HPS meets these requirements. The following state and federal environmental statutes and amendments require community involvement program activities for hazardous waste sites:

- Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA**) (Title 42, *United States Code*, Section 9601, and following sections), also known as Superfund
- Superfund Amendments and Reauthorization Act of 1986, which amended CERCLA
- Community Environmental Response Facilitation Act of 1992, which also amended CERCLA
- California Health and Safety Code, Division 20
- Title 22, California Code of Regulations, Division 4.5
- *California Public Resources Code*, Section 21000 and the sections that follow Section 21000 in the *Public Resource Code*

The guidelines for conducting community involvement, including preparing a CIP, are set forth in the following:

- "Superfund Community Involvement Handbook" (U.S. EPA, 2005)
- "Superfund Community Involvement Toolkit" (U.S. EPA, 2005)
- "Navy/Marine Corps Installation Restoration Manual" (Naval Facilities Engineering Command, 1997)
- "Department of Defense/EPA Restoration Advisory Board (**RAB**) Implementation Guidelines" (Department of Defense, 1994)
- "State of California Environmental Protection Agency Department of Toxic Substances Control (**DTSC**) Public Participation Manual" (DTSC, 2001)

In addition, the National Oil and Hazardous Substances Pollution Contingency Plan, also called the National Contingency Plan (NCP), contains the federal government's requirements for responding to

## Appendix G: Regulations and Guidance for Community Involvement (continued)

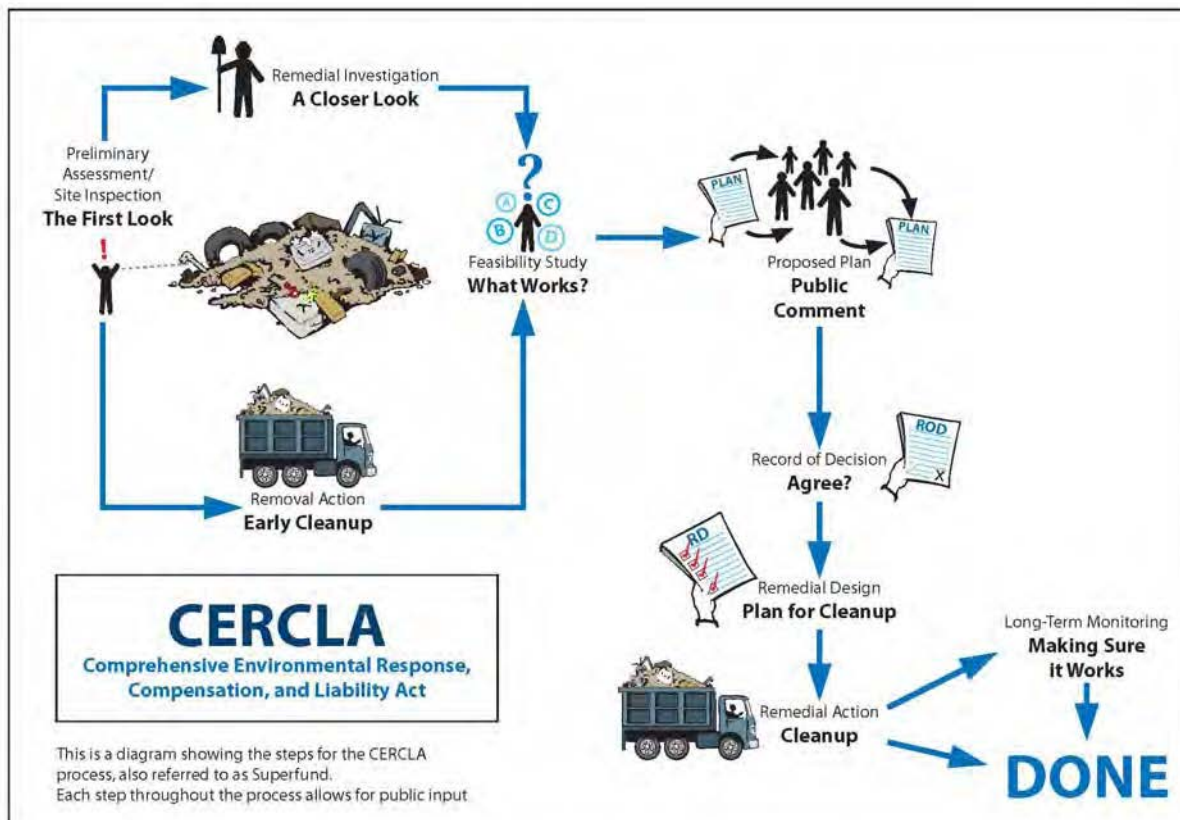
hazardous substance releases. The Navy meets all NCP requirements for public involvement. In addition, the Navy's Installation Restoration Program, described below, exceeds the NCP requirements for public involvement. The relevant text from the NCP (40 CFR 300.430) has been provided below beginning on [page G-7](#).

### Installation Restoration Program

The Department of Defense developed the Installation Restoration Program in 1981 to comply with CERCLA and other federal and state requirements at military facilities.

CERCLA requires that a remedial action or removal action process be selected specifically for each Installation Restoration Program site. A removal action is an environmental response that reduces threats to human health and the environment, such as fencing a site or excavating and removing contaminated soil. A removal action may be an interim action or may be the final cleanup for the site. A remedial action is the long-term final cleanup of a site, such as a groundwater treatment system or a landfill cap.

A remedial action or removal action is selected by evaluating the advantages and disadvantages of each alternative to clean up a site and selecting the one that best protects human health and the environment in a cost-effective manner. Illustrated in the following graphic and discussed on the following pages are the stages of each phase of CERCLA, including associated community involvement program activities.



*Appendix G: Regulations and Guidance for Community Involvement (continued)***Remedial Action Process**

The CERCLA remedial action process, as defined in Title 42 USC Section 9601 and the following sections, specifies the phases to thoroughly evaluate the nature and extent of contamination and to identify and evaluate cleanup alternatives. The various phases of the cleanup process are described below.

**Discovery and Notification** – Discovery occurs when a hazardous waste site is discovered or a release of hazardous materials into the environment is noticed. The installation Commanding Officer is responsible for notifying the U.S. EPA and state regulatory agencies of the hazardous waste site.

**Preliminary Assessment** – A preliminary assessment is conducted to evaluate whether current or past waste management practices have resulted in a release of hazardous substances. The preliminary assessment is completed through record searches and visual inspections of the area. This stage results in a list of potential areas of concern that warrant further investigation.

**Site Inspection** – The site inspection usually requires sampling and analysis of soil, surface water, groundwater, or any combination of the three. Based on the data that result, the site will be (1) slated for no action, (2) recommended for a removal action, or (3) investigated further in the remedial investigation phase. If the area will be investigated further, an Information Repository is established.

**Remedial Investigation** – The remedial investigation involves a comprehensive study of site soils, surface water, and groundwater to evaluate the lateral and vertical extent of contamination. Risks to human health and the environment are also assessed. Based on the estimated risk posed, the site could be (1) recommended for a removal action, (2) recommended for no action, or (3) entered into the next phase, the feasibility study.

**Feasibility Study** – The feasibility study uses the data collected during the remedial investigation to develop and evaluate cleanup alternatives. Cleanup alternatives are evaluated based on a variety of criteria, including technical feasibility, cost-effectiveness, and community acceptance.

**Proposed Plan** – The Proposed Plan is a fact sheet that is developed to describe cleanup alternatives and explain why the preferred alternative was chosen. *This is the key point at which community members are highly encouraged to provide comments.* The Navy considers all comments received on the Proposed Plan before a final decision is made. The Navy provides a reply to all significant comments in a responsiveness summary in the Record of Decision.

**Record of Decision** – The selected cleanup alternative is documented in the Record of Decision. The notice of availability of the Record of Decision is *publicized in a local newspaper of general circulation.*

**Remedial Design** – The design for the cleanup alternatives is prepared and a fact sheet is distributed before the Navy begins a remedial action (or cleanup). *The need for updating the CIP will also be assessed at this time.*

**Remedial Action** – The cleanup alternative is carried out and the *public is kept informed.* At a minimum, the community will have a point of contact who can be contacted to ask questions or raise concerns.



*Appendix G: Regulations and Guidance for Community Involvement (continued)*

**Post-Project Activities** – Post-project activities may include long-term monitoring. Long-term monitoring occurs at sites where hazardous substances, pollutants, or contaminants remain after the remedial action has been completed. Long-term monitoring is also used to confirm that previous site remediation continues to be effective. Every five years the Navy will conduct a review of cleanup where waste is left in place to ensure the remedy remains protective of human health and the environment.

**Site Closeout** – Site closeout occurs when all necessary remedial action activities are complete and the Navy and regulatory agencies agree no further action is appropriate at the site. Site closeout can also occur during the remedial action process.

### Removal Action Process

In some cases, the Navy may conduct a removal action of hazardous substances from a site. The removal action can be implemented at any time during the remedial action process. These removal actions are carried out in accordance with federal and state requirements. The Navy can conduct a removal action if there is an immediate or perceived threat to public health or the environment. Any one or more of the following criteria must be met to implement a removal action:

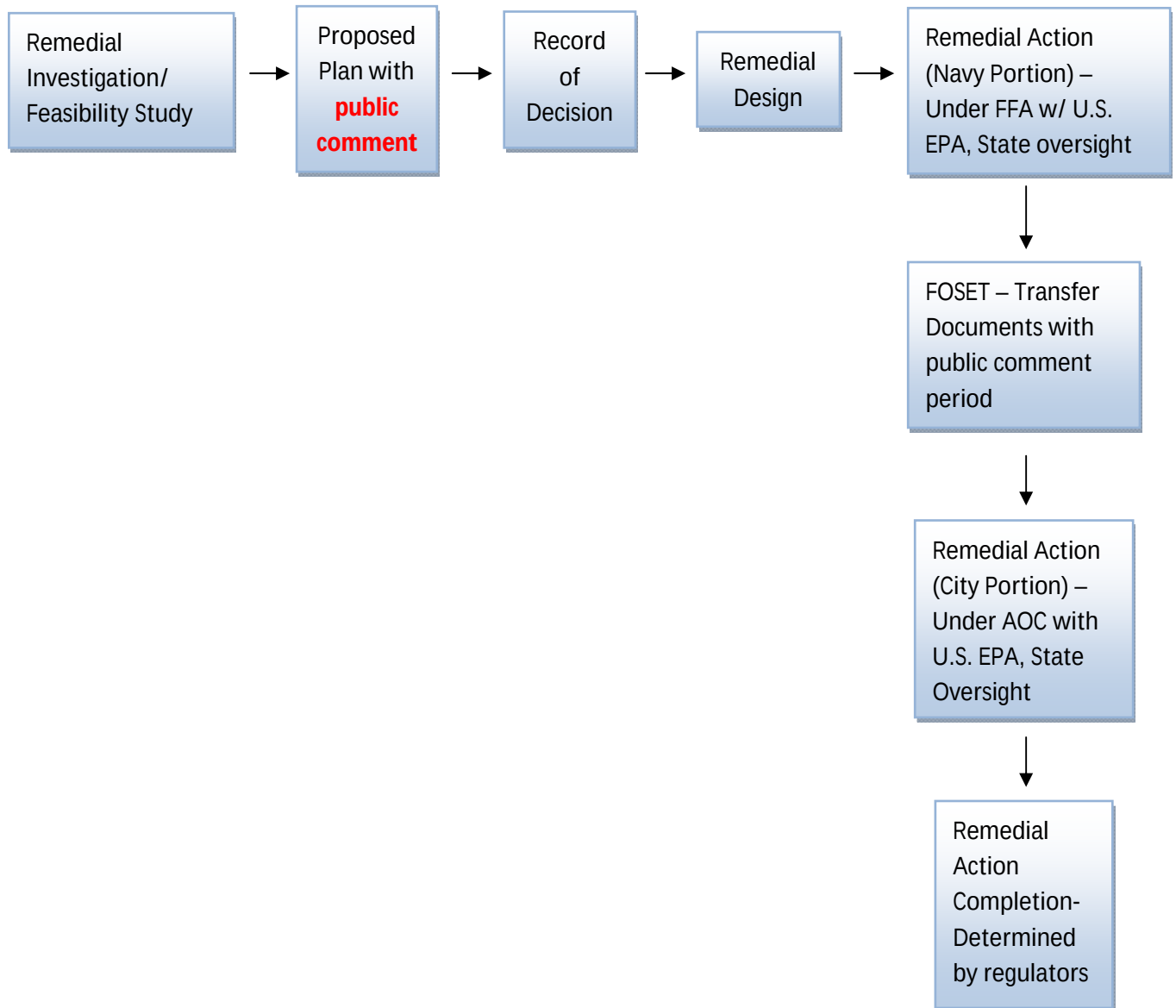
- An imminent threat to human health or the environment exists
- The source of the contamination can be removed quickly and effectively
- Access to contamination can be limited
- A removal action is the fastest way of remediating the site

The U.S. EPA has defined three types of removal actions—emergency, time-critical, and non-time-critical removals. These removal actions types and corresponding documentation are detailed as follows:

- **Emergency Removal Actions:** Emergency removal actions occur when cleanup must begin within 2 weeks after the lead agency concludes that a removal action is necessary.
- **Time-Critical Removal Actions:** Time-critical removal actions occur when cleanup can be initiated within 6 months after the lead agency concludes that a removal action is necessary.
- **Non-Time-Critical Removal Actions:** Non-time-critical removal actions occur when cleanup need not begin within 6 months after the lead agency concludes that a removal action is necessary. Non-time-critical removal actions require preparation of an Engineering Evaluation/Cost Analysis and an Action Memorandum.
- **Engineering Evaluation/Cost Analysis:** An Engineering Evaluation/Cost Analysis is the first step in the non-time-critical removal action process. The Engineering Evaluation/Cost Analysis document evaluates alternatives for cleanup and states the Navy's preferred cleanup alternative.
- **Action Memorandum:** The final decision about the removal action selected is documented in the Action Memorandum. The draft Action Memorandum is normally announced with the Engineering Evaluation/Cost Analysis in a public notice.

*Appendix G: Regulations and Guidance for Community Involvement (continued)*

*CERCLA Process with Early Transfer*



*Appendix G: Regulations and Guidance for Community Involvement (continued)**Pertinent Passages from the National Contingency Plan (40 CFR 300.430)*

The relevant NCP text from the Code of Federal Regulations pertaining to the requirements for community involvement has been provided on the following pages.

requirements of 29 CFR 1910.120 concerning use of an incident command system.

(b) In a response action taken by a responsible party, the responsible party must assure that an occupational safety and health program consistent with 29 CFR 1910.120 is made available for the protection of workers at the response site.

(c) In a response taken under the NCP by a lead agency, an occupational safety and health program should be made available for the protection of workers at the response site, consistent with, and to the extent required by, 29 CFR 1910.120. Contracts relating to a response action under the NCP should contain assurances that the contractor at the response site will comply with this program and with any applicable provisions of the Occupational Safety and Health Act of 1970 (29 U.S.C. 651 et seq.) (OSH Act) and state laws with plans approved under section 18 of the OSH Act.

(d) When a state, or political subdivision of a state, without an OSHA-approved state plan is the lead agency for response, the state or political subdivision must comply with standards in 40 CFR part 311, promulgated by EPA pursuant to section 126(f) of SARA.

(e) Requirements, standards, and regulations of the OSH Act and of state OSH laws not directly referenced in paragraphs (a) through (d) of this section, must be complied with where applicable. Federal OSH Act requirements include, among other things, Construction Standards (29 CFR part 1926), General Industry Standards (29 CFR part 1910), and the general duty requirement of section 5(a)(1) of the OSH Act (29 U.S.C. 654(a)(1)). No action by the lead agency with respect to response activities under the NCP constitutes an exercise of statutory authority within the meaning of section 4(b)(1) of the OSH Act. All governmental agencies and private employers are directly responsible for the health and safety of their own employees.

**§ 300.155 Public information and community relations.**

(a) When an incident occurs, it is imperative to give the public prompt, accurate information on the nature of

the incident and the actions underway to mitigate the damage. OSCs/RPMs and community relations personnel should ensure that all appropriate public and private interests are kept informed and that their concerns are considered throughout a response. They should coordinate with available public affairs/community relations resources to carry out this responsibility by establishing, as appropriate, a Joint Information Center bringing together resources from federal and state agencies and the responsible party.

(b) An on-scene news office may be established to coordinate media relations and to issue official federal information on an incident. Whenever possible, it will be headed by a representative of the lead agency. The OSC/RPM determines the location of the on-scene news office, but every effort should be made to locate it near the scene of the incident. If a participating agency believes public interest warrants the issuance of statements and an on-scene news office has not been established, the affected agency should recommend its establishment. All federal news releases or statements by participating agencies should be cleared through the OSC/RPM. Information dissemination relating to natural resource damage assessment activities shall be coordinated through the lead administrative trustee. The designated lead administrative trustee may assist the OSC/RPM by disseminating information on issues relating to damage assessment activities. Following termination of removal activity, information dissemination on damage assessment activities shall be through the lead administrative trustee.

(c) The community relations requirements specified in §§ 300.415, 300.430, and 300.435 apply to removal, remedial, and enforcement actions and are intended to promote active communication between communities affected by discharges or releases and the lead agency responsible for response actions. Community Relations Plans (CRPs) are required by EPA for certain response actions. The OSC/RPM should ensure coordination with such plans which may be in effect at the scene of a discharge or release or which may need to be developed during follow-up activities.

## § 300.415

## 40 CFR Ch. I (7–1–03 Edition)

federal environmental or state environmental or facility siting laws. Waivers described in § 300.430(f)(1)(ii)(C) may be used for removal actions. Other federal and state advisories, criteria, or guidance may, as appropriate, be considered in formulating the removal action (see § 300.400(g)(3)). In determining whether compliance with ARARs is practicable, the lead agency may consider appropriate factors, including:

- (1) The urgency of the situation; and
- (2) The scope of the removal action to be conducted.

(k) Removal actions pursuant to section 106 or 122 of CERCLA are not subject to the following requirements of this section:

(1) Section 300.415(a)(2) requirement to locate responsible parties and have them undertake the response;

(2) Section 300.415(b)(2)(vii) requirement to consider the availability of other appropriate federal or state response and enforcement mechanisms to respond to the release;

(3) Section 300.415(b)(5) requirement to terminate response after \$2 million has been obligated or 12 months have elapsed from the date of the initial response; and

(4) Section 300.415(g) requirement to assure an orderly transition from removal to remedial action.

(l) To the extent practicable, provision for post-removal site control following a CERCLA Fund-financed removal action at both NPL and non-NPL sites is encouraged to be made prior to the initiation of the removal action. Such post-removal site control includes actions necessary to ensure the effectiveness and integrity of the removal action after the completion of the on-site removal action or after the \$2 million or 12-month statutory limits are reached for sites that do not meet the exemption criteria in paragraph (b)(5) of this section. Post-removal site control may be conducted by:

(1) The affected state or political subdivision thereof or local units of government for any removal;

(2) Potentially responsible parties; or

(3) EPA's remedial program for some federal-lead Fund-financed responses at NPL sites.

(m) OSCs/RPMs conducting removal actions shall submit OSC reports to the RRT as required by § 300.165.

(n) *Community relations in removal actions.* (1) In the case of all CERCLA removal actions taken pursuant to § 300.415 or CERCLA enforcement actions to compel removal response, a spokesperson shall be designated by the lead agency. The spokesperson shall inform the community of actions taken, respond to inquiries, and provide information concerning the release. All news releases or statements made by participating agencies shall be coordinated with the OSC/RPM. The spokesperson shall notify, at a minimum, immediately affected citizens, state and local officials, and, when appropriate, civil defense or emergency management agencies.

(2) For CERCLA actions where, based on the site evaluation, the lead agency determines that a removal is appropriate, and that less than six months exists before on-site removal activity must begin, the lead agency shall:

(i) Publish a notice of availability of the administrative record file established pursuant to § 300.820 in a major local newspaper of general circulation within 60 days of initiation of on-site removal activity;

(ii) Provide a public comment period, as appropriate, of not less than 30 days from the time the administrative record file is made available for public inspection, pursuant to § 300.820(b)(2); and

(iii) Prepare a written response to significant comments pursuant to § 300.820(b)(3).

(3) For CERCLA removal actions where on-site action is expected to extend beyond 120 days from the initiation of on-site removal activities, the lead agency shall by the end of the 120-day period:

(i) Conduct interviews with local officials, community residents, public interest groups, or other interested or affected parties, as appropriate, to solicit their concerns, information needs, and how or when citizens would like to be involved in the Superfund process;

(ii) Prepare a formal community relations plan (CRP) based on the community interviews and other relevant information, specifying the community

relations activities that the lead agency expects to undertake during the response; and

(iii) Establish at least one local information repository at or near the location of the response action. The information repository should contain items made available for public information. Further, an administrative record file established pursuant to subpart I for all removal actions shall be available for public inspection in at least one of the repositories. The lead agency shall inform the public of the establishment of the information repository and provide notice of availability of the administrative record file for public review. All items in the repository shall be available for public inspection and copying.

(4) Where, based on the site evaluation, the lead agency determines that a CERCLA removal action is appropriate and that a planning period of at least six months exists prior to initiation of the on-site removal activities, the lead agency shall at a minimum:

(i) Comply with the requirements set forth in paragraphs (n)(3)(i), (ii), and (iii) of this section, prior to the completion of the EE/CA, or its equivalent, except that the information repository and the administrative record file will be established no later than when the EE/CA approval memorandum is signed;

(ii) Publish a notice of availability and brief description of the EE/CA in a major local newspaper of general circulation pursuant to § 300.820;

(iii) Provide a reasonable opportunity, not less than 30 calendar days, for submission of written and oral comments after completion of the EE/CA pursuant to § 300.820(a). Upon timely request, the lead agency will extend the public comment period by a minimum of 15 days; and

(iv) Prepare a written response to significant comments pursuant to § 300.820(a).

[59 FR 47448, Sept. 15, 1994]

#### § 300.420 Remedial site evaluation.

(a) *General.* The purpose of this section is to describe the methods, procedures, and criteria the lead agency shall use to collect data, as required, and evaluate releases of hazardous sub-

stances, pollutants, or contaminants. The evaluation may consist of two steps: a remedial preliminary assessment (PA) and a remedial site inspection (SI).

(b) *Remedial preliminary assessment.* (1) The lead agency shall perform a remedial PA on all sites in CERCLIS as defined in § 300.5 to:

(i) Eliminate from further consideration those sites that pose no threat to public health or the environment;

(ii) Determine if there is any potential need for removal action;

(iii) Set priorities for site inspections; and

(iv) Gather existing data to facilitate later evaluation of the release pursuant to the Hazard Ranking System (HRS) if warranted.

(2) A remedial PA shall consist of a review of existing information about a release such as information on the pathways of exposure, exposure targets, and source and nature of release. A remedial PA shall also include an off-site reconnaissance as appropriate. A remedial PA may include an on-site reconnaissance where appropriate.

(3) If the remedial PA indicates that a removal action may be warranted, the lead agency shall initiate removal evaluation pursuant to § 300.410.

(4) In performing a remedial PA, the lead agency may complete the EPA Preliminary Assessment form, available from EPA regional offices, or its equivalent, and shall prepare a PA report, which shall include:

(i) A description of the release;

(ii) A description of the probable nature of the release; and

(iii) A recommendation on whether further action is warranted, which lead agency should conduct further action, and whether an SI or removal action or both should be undertaken.

(5) Any person may petition the lead federal agency (EPA or the appropriate federal agency in the case of a release or suspected release from a federal facility), to perform a PA of a release when such person is, or may be, affected by a release of a hazardous substance, pollutant, or contaminant. Such petitions shall be addressed to the EPA Regional Administrator for

that conforms with 29 CFR 1910.120 (1)(1) and (1)(2).

(7) If natural resources are or may be injured by the release, ensure that state and federal trustees of the affected natural resources have been notified in order that the trustees may initiate appropriate actions, including those identified in subpart G of this part. The lead agency shall seek to coordinate necessary assessments, evaluations, investigations, and planning with such state and federal trustees.

(8) Develop sampling and analysis plans that shall provide a process for obtaining data of sufficient quality and quantity to satisfy data needs. Sampling and analysis plans shall be reviewed and approved by EPA. The sampling and analysis plans shall consist of two parts:

(i) The field sampling plan, which describes the number, type, and location of samples and the type of analyses; and

(ii) The quality assurance project plan, which describes policy, organization, and functional activities and the data quality objectives and measures necessary to achieve adequate data for use in selecting the appropriate remedy.

(9) Initiate the identification of potential federal and state ARARs and, as appropriate, other criteria, advisories, or guidance to be considered.

(c) *Community relations.* (1) The community relations requirements described in this section apply to all remedial activities undertaken pursuant to CERCLA section 104 and to section 106 or section 122 consent orders or decrees, or section 106 administrative orders.

(2) The lead agency shall provide for the conduct of the following community relations activities, to the extent practicable, prior to commencing field work for the remedial investigation:

(i) Conducting interviews with local officials, community residents, public interest groups, or other interested or affected parties, as appropriate, to solicit their concerns and information needs, and to learn how and when citizens would like to be involved in the Superfund process.

(ii) Preparing a formal community relations plan (CRP), based on the community interviews and other relevant information, specifying the community relations activities that the lead agency expects to undertake during the remedial response. The purpose of the CRP is to:

(A) Ensure the public appropriate opportunities for involvement in a wide variety of site-related decisions, including site analysis and characterization, alternatives analysis, and selection of remedy;

(B) Determine, based on community interviews, appropriate activities to ensure such public involvement, and

(C) Provide appropriate opportunities for the community to learn about the site.

(iii) Establishing at least one local information repository at or near the location of the response action. Each information repository should contain a copy of items made available to the public, including information that describes the technical assistance grants application process. The lead agency shall inform interested parties of the establishment of the information repository.

(iv) Informing the community of the availability of technical assistance grants.

(3) For PRP actions, the lead agency shall plan and implement the community relations program at a site. PRPs may participate in aspects of the community relations program at the discretion of and with oversight by the lead agency.

(4) The lead agency may conduct technical discussions involving PRPs and the public. These technical discussions may be held separately from, but contemporaneously with, the negotiations/settlement discussions.

(5) In addition, the following provisions specifically apply to enforcement actions:

(i) Lead agencies entering into an enforcement agreement with de minimis parties under CERCLA section 122(g) or cost recovery settlements under section 122(h) shall publish a notice of the proposed agreement in the FEDERAL REGISTER at least 30 days before the agreement becomes final, as required

by section 122(i). The notice must identify the name of the facility and the parties to the proposed agreement and must allow an opportunity for comment and consideration of comments; and

(ii) Where the enforcement agreement is embodied in a consent decree, public notice and opportunity for public comment shall be provided in accordance with 28 CFR 50.7.

(d) *Remedial investigation.* (1) The purpose of the remedial investigation (RI) is to collect data necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives. To characterize the site, the lead agency shall, as appropriate, conduct field investigations, including treatability studies, and conduct a baseline risk assessment. The RI provides information to assess the risks to human health and the environment and to support the development, evaluation, and selection of appropriate response alternatives. Site characterization may be conducted in one or more phases to focus sampling efforts and increase the efficiency of the investigation. Because estimates of actual or potential exposures and associated impacts on human and environmental receptors may be refined throughout the phases of the RI as new information is obtained, site characterization activities should be fully integrated with the development and evaluation of alternatives in the feasibility study. Bench- or pilot-scale treatability studies shall be conducted, when appropriate and practicable, to provide additional data for the detailed analysis and to support engineering design of remedial alternatives.

(2) The lead agency shall characterize the nature of and threat posed by the hazardous substances and hazardous materials and gather data necessary to assess the extent to which the release poses a threat to human health or the environment or to support the analysis and design of potential response actions by conducting, as appropriate, field investigations to assess the following factors:

(i) Physical characteristics of the site, including important surface features, soils, geology, hydrogeology, meteorology, and ecology;

(ii) Characteristics or classifications of air, surface water, and ground water;

(iii) The general characteristics of the waste, including quantities, state, concentration, toxicity, propensity to bioaccumulate, persistence, and mobility;

(iv) The extent to which the source can be adequately identified and characterized;

(v) Actual and potential exposure pathways through environmental media;

(vi) Actual and potential exposure routes, for example, inhalation and ingestion; and

(vii) Other factors, such as sensitive populations, that pertain to the characterization of the site or support the analysis of potential remedial action alternatives.

(3) The lead and support agency shall identify their respective potential ARARs related to the location of and contaminants at the site in a timely manner. The lead and support agencies may also, as appropriate, identify other pertinent advisories, criteria, or guidance in a timely manner (see § 300.400(g)(3)).

(4) Using the data developed under paragraphs (d)(1) and (2) of this section, the lead agency shall conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to ground water or surface water, releasing to air, leaching through soil, remaining in the soil, and bioaccumulating in the food chain. The results of the baseline risk assessment will help establish acceptable exposure levels for use in developing remedial alternatives in the FS, as described in paragraph (e) of this section.

(e) *Feasibility study.* (1) The primary objective of the feasibility study (FS) is to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented to a decision-maker and an appropriate remedy selected. The lead agency may develop a feasibility study to address a specific site problem or the entire site. The development and evaluation of alternatives



(8) The lead agency shall notify the support agency of the alternatives that will be evaluated in detail to facilitate the identification of ARARs and, as appropriate, pertinent advisories, criteria, or guidance to be considered.

(9) *Detailed analysis of alternatives.* (i) A detailed analysis shall be conducted on the limited number of alternatives that represent viable approaches to remedial action after evaluation in the screening stage. The lead and support agencies must identify their ARARs related to specific actions in a timely manner and no later than the early stages of the comparative analysis. The lead and support agencies may also, as appropriate, identify other pertinent advisories, criteria, or guidance in a timely manner.

(ii) The detailed analysis consists of an assessment of individual alternatives against each of nine evaluation criteria and a comparative analysis that focuses upon the relative performance of each alternative against those criteria.

(iii) *Nine criteria for evaluation.* The analysis of alternatives under review shall reflect the scope and complexity of site problems and alternatives being evaluated and consider the relative significance of the factors within each criteria. The nine evaluation criteria are as follows:

(A) *Overall protection of human health and the environment.* Alternatives shall be assessed to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site by eliminating, reducing, or controlling exposures to levels established during development of remediation goals consistent with § 300.430(e)(2)(i). Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

(B) *Compliance with ARARs.* The alternatives shall be assessed to determine whether they attain applicable or relevant and appropriate requirements under federal environmental laws and

state environmental or facility siting laws or provide grounds for invoking one of the waivers under paragraph (f)(1)(ii)(C) of this section.

(C) *Long-term effectiveness and permanence.* Alternatives shall be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that shall be considered, as appropriate, include the following:

(1) Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.

(2) Adequacy and reliability of controls such as containment systems and institutional controls that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative, such as a cap, a slurry wall, or a treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

(D) *Reduction of toxicity, mobility, or volume through treatment.* The degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume shall be assessed, including how treatment is used to address the principal threats posed by the site. Factors that shall be considered, as appropriate, include the following:

(1) The treatment or recycling processes the alternatives employ and materials they will treat;

(2) The amount of hazardous substances, pollutants, or contaminants that will be destroyed, treated, or recycled;

(3) The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specification of which reduction(s) are occurring;

(4) The degree to which the treatment is irreversible;

(5) The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents; and

(6) The degree to which treatment reduces the inherent hazards posed by principal threats at the site.

(E) *Short-term effectiveness.* The short-term impacts of alternatives shall be assessed considering the following:

(1) Short-term risks that might be posed to the community during implementation of an alternative;

(2) Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures;

(3) Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and

(4) Time until protection is achieved.

(F) *Implementability.* The ease or difficulty of implementing the alternatives shall be assessed by considering the following types of factors as appropriate:

(1) Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy.

(2) Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions);

(3) Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and availability of prospective technologies.

(G) *Cost.* The types of costs that shall be assessed include the following:

(1) Capital costs, including both direct and indirect costs;

(2) Annual operation and maintenance costs; and

(3) Net present value of capital and O&M costs.

(H) *State acceptance.* Assessment of state concerns may not be completed until comments on the RI/FS are received but may be discussed, to the extent possible, in the proposed plan issued for public comment. The state concerns that shall be assessed include the following:

(1) The state's position and key concerns related to the preferred alternative and other alternatives; and

(2) State comments on ARARs or the proposed use of waivers.

(I) *Community acceptance.* This assessment includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This assessment may not be completed until comments on the proposed plan are received.

(f) *Selection of remedy*—(1) Remedies selected shall reflect the scope and purpose of the actions being undertaken and how the action relates to long-term, comprehensive response at the site.

(i) The criteria noted in paragraph (e)(9)(iii) of this section are used to select a remedy. These criteria are categorized into three groups.

(A) *Threshold criteria.* Overall protection of human health and the environment and compliance with ARARs (unless a specific ARAR is waived) are threshold requirements that each alternative must meet in order to be eligible for selection.

(B) *Primary balancing criteria.* The five primary balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost.111(C) *Modifying criteria.* State and community acceptance are modifying criteria that shall be considered in remedy selection.

(ii) The selection of a remedial action is a two-step process and shall proceed in accordance with § 300.515(e). First, the lead agency, in conjunction with the support agency, identifies a preferred alternative and presents it to the public in a proposed plan, for review and comment. Second, the lead

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agency shall review the public comments and consult with the state (or support agency) in order to determine if the alternative remains the most appropriate remedial action for the site or site problem. The lead agency, as specified in §300.515(e), makes the final remedy selection decision, which shall be documented in the ROD. Each remedial alternative selected as a Superfund remedy will employ the criteria as indicated in paragraph (f)(1)(i) of this section to make the following determination:

(A) Each remedial action selected shall be protective of human health and the environment.

(B) On-site remedial actions selected in a ROD must attain those ARARs that are identified at the time of ROD signature or provide grounds for invoking a waiver under §300.430(f)(1)(ii)(C).

(1) Requirements that are promulgated or modified after ROD signature must be attained (or waived) only when determined to be applicable or relevant and appropriate and necessary to ensure that the remedy is protective of human health and the environment.

(2) Components of the remedy not described in the ROD must attain (or waive) requirements that are identified as applicable or relevant and appropriate at the time the amendment to the ROD or the explanation of significant difference describing the component is signed.

(C) An alternative that does not meet an ARAR under federal environmental or state environmental or facility siting laws may be selected under the following circumstances:

(1) The alternative is an interim measure and will become part of a total remedial action that will attain the applicable or relevant and appropriate federal or state requirement;

(2) Compliance with the requirement will result in greater risk to human health and the environment than other alternatives;

(3) Compliance with the requirement is technically impracticable from an engineering perspective;

(4) The alternative will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement,

or limitation through use of another method or approach;

(5) With respect to a state requirement, the state has not consistently applied, or demonstrated the intention to consistently apply, the promulgated requirement in similar circumstances at other remedial actions within the state; or

(6) For Fund-financed response actions only, an alternative that attains the ARAR will not provide a balance between the need for protection of human health and the environment at the site and the availability of Fund monies to respond to other sites that may present a threat to human health and the environment.

(D) Each remedial action selected shall be cost-effective, provided that it first satisfies the threshold criteria set forth in §300.430(f)(1)(ii)(A) and (B). Cost-effectiveness is determined by evaluating the following three of the five balancing criteria noted in §300.430(f)(1)(i)(B) to determine overall effectiveness: long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost-effective. A remedy shall be cost-effective if its costs are proportional to its overall effectiveness.

(E) Each remedial action shall utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This requirement shall be fulfilled by selecting the alternative that satisfies paragraph (f)(1)(ii)(A) and (B) of this section and provides the best balance of trade-offs among alternatives in terms of the five primary balancing criteria noted in paragraph (f)(1)(i)(B) of this section. The balancing shall emphasize long-term effectiveness and reduction of toxicity, mobility, or volume through treatment. The balancing shall also consider the preference for treatment as a principal element and the bias against off-site land disposal of untreated waste. In making the determination under this paragraph, the modifying criteria of state acceptance and community acceptance described

in paragraph (f)(1)(i)(C) of this section shall also be considered.

(2) *The proposed plan.* In the first step in the remedy selection process, the lead agency shall identify the alternative that best meets the requirements in § 300.430(f)(1), above, and shall present that alternative to the public in a proposed plan. The lead agency, in conjunction with the support agency and consistent with § 300.515(e), shall prepare a proposed plan that briefly describes the remedial alternatives analyzed by the lead agency, proposes a preferred remedial action alternative, and summarizes the information relied upon to select the preferred alternative. The selection of remedy process for an operable unit may be initiated at any time during the remedial action process. The purpose of the proposed plan is to supplement the RI/FS and provide the public with a reasonable opportunity to comment on the preferred alternative for remedial action, as well as alternative plans under consideration, and to participate in the selection of remedial action at a site. At a minimum, the proposed plan shall:

(i) Provide a brief summary description of the remedial alternatives evaluated in the detailed analysis established under paragraph (e)(9) of this section;

(ii) Identify and provide a discussion of the rationale that supports the preferred alternative;

(iii) Provide a summary of any formal comments received from the support agency; and

(iv) Provide a summary explanation of any proposed waiver identified under paragraph (f)(1)(ii)(C) of this section from an ARAR.

(3) *Community relations to support the selection of remedy.* (i) The lead agency, after preparation of the proposed plan and review by the support agency, shall conduct the following activities:

(A) Publish a notice of availability and brief analysis of the proposed plan in a major local newspaper of general circulation;

(B) Make the proposed plan and supporting analysis and information available in the administrative record required under subpart I of this part;

(C) Provide a reasonable opportunity, not less than 30 calendar days, for sub-

mission of written and oral comments on the proposed plan and the supporting analysis and information located in the information repository, including the RI/FS. Upon timely request, the lead agency will extend the public comment period by a minimum of 30 additional days;

(D) Provide the opportunity for a public meeting to be held during the public comment period at or near the site at issue regarding the proposed plan and the supporting analysis and information;

(E) Keep a transcript of the public meeting held during the public comment period pursuant to CERCLA section 117(a) and make such transcript available to the public; and

(F) Prepare a written summary of significant comments, criticisms, and new relevant information submitted during the public comment period and the lead agency response to each issue. This responsiveness summary shall be made available with the record of decision.

(ii) After publication of the proposed plan and prior to adoption of the selected remedy in the record of decision, if new information is made available that significantly changes the basic features of the remedy with respect to scope, performance, or cost, such that the remedy significantly differs from the original proposal in the proposed plan and the supporting analysis and information, the lead agency shall:

(A) Include a discussion in the record of decision of the significant changes and reasons for such changes, if the lead agency determines such changes could be reasonably anticipated by the public based on the alternatives and other information available in the proposed plan or the supporting analysis and information in the administrative record; or

(B) Seek additional public comment on a revised proposed plan, when the lead agency determines the change could not have been reasonably anticipated by the public based on the information available in the proposed plan or the supporting analysis and information in the administrative record. The lead agency shall, prior to adoption of the selected remedy in the ROD, issue a revised proposed plan, which

shall include a discussion of the significant changes and the reasons for such changes, in accordance with the public participation requirements described in paragraph (f)(3)(i) of this section.

(4) *Final remedy selection.* (i) In the second and final step in the remedy selection process, the lead agency shall reassess its initial determination that the preferred alternative provides the best balance of trade-offs, now factoring in any new information or points of view expressed by the state (or support agency) and community during the public comment period. The lead agency shall consider state (or support agency) and community comments regarding the lead agency's evaluation of alternatives with respect to the other criteria. These comments may prompt the lead agency to modify aspects of the preferred alternative or decide that another alternative provides a more appropriate balance. The lead agency, as specified in § 300.515(e), shall make the final remedy selection decision and document that decision in the ROD.

(ii) If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

(iii) The process for selection of a remedial action at a federal facility on the NPL, pursuant to CERCLA section 120, shall entail:

(A) Joint selection of remedial action by the head of the relevant department, agency, or instrumentality and EPA; or

(B) If mutual agreement on the remedy is not reached, selection of the remedy is made by EPA.

(5) *Documenting the decision.* (i) To support the selection of a remedial action, all facts, analyses of facts, and site-specific policy determinations considered in the course of carrying out activities in this section shall be documented, as appropriate, in a record of decision, in a level of detail appropriate to the site situation, for inclusion in the administrative record required under subpart I of this part.

Documentation shall explain how the evaluation criteria in paragraph (e)(9)(iii) of this section were used to select the remedy.

(ii) The ROD shall describe the following statutory requirements as they relate to the scope and objectives of the action:

(A) How the selected remedy is protective of human health and the environment, explaining how the remedy eliminates, reduces, or controls exposures to human and environmental receptors;

(B) The federal and state requirements that are applicable or relevant and appropriate to the site that the remedy will attain;

(C) The applicable or relevant and appropriate requirements of other federal and state laws that the remedy will not meet, the waiver invoked, and the justification for invoking the waiver;

(D) How the remedy is cost-effective, i.e., explaining how the remedy provides overall effectiveness proportional to its costs;

(E) How the remedy utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and

(F) Whether the preference for remedies employing treatment which permanently and significantly reduces the toxicity, mobility, or volume of the hazardous substances, pollutants, or contaminants as a principal element is or is not satisfied by the selected remedy. If this preference is not satisfied, the record of decision must explain why a remedial action involving such reductions in toxicity, mobility, or volume was not selected.

(iii) The ROD also shall:

(A) Indicate, as appropriate, the remediation goals, discussed in paragraph (e)(2)(i) of this section, that the remedy is expected to achieve. Performance shall be measured at appropriate locations in the ground water, surface water, soils, air, and other affected environmental media. Measurement relating to the performance of the treatment processes and the engineering controls may also be identified, as appropriate;

(B) Discuss significant changes and the response to comments described in paragraph (f)(3)(i)(F) of this section;

(C) Describe whether hazardous substances, pollutants, or contaminants will remain at the site such that a review of the remedial action under paragraph (f)(4)(ii) of this section no less often than every five years shall be required; and

(D) When appropriate, provide a commitment for further analysis and selection of long-term response measures within an appropriate time-frame.

(6) **Community relations when the record of decision is signed.** After the ROD is signed, the lead agency shall:

(i) Publish a notice of the availability of the ROD in a major local newspaper of general circulation; and

(ii) Make the record of decision available for public inspection and copying at or near the facility at issue prior to the commencement of any remedial action.

**§ 300.435 Remedial design/remedial action, operation and maintenance.**

(a) *General.* The remedial design/remedial action (RD/RA) stage includes the development of the actual design of the selected remedy and implementation of the remedy through construction. A period of operation and maintenance may follow the RA activities.

(b) *RD/RA activities.* (1) All RD/RA activities shall be in conformance with the remedy selected and set forth in the ROD or other decision document for that site. Those portions of RD/RA sampling and analysis plans describing the QA/QC requirements for chemical and analytical testing and sampling procedures of samples taken for the purpose of determining whether clean-up action levels specified in the ROD are achieved, generally will be consistent with the requirements of § 300.430(b)(8).

(2) During the course of the RD/RA, the lead agency shall be responsible for ensuring that all federal and state requirements that are identified in the ROD as applicable or relevant and appropriate requirements for the action are met. If waivers from any ARARs are involved, the lead agency shall be responsible for ensuring that the conditions of the waivers are met.

(c) *Community relations.* (1) Prior to the initiation of RD, the lead agency shall review the CRP to determine whether it should be revised to describe further public involvement activities during RD/RA that are not already addressed or provided for in the CRP.

(2) After the adoption of the ROD, if the remedial action or enforcement action taken, or the settlement or consent decree entered into, differs significantly from the remedy selected in the ROD with respect to scope, performance, or cost, the lead agency shall consult with the support agency, as appropriate, and shall either:

(i) Publish an explanation of significant differences when the differences in the remedial or enforcement action, settlement, or consent decree significantly change but do not fundamentally alter the remedy selected in the ROD with respect to scope, performance, or cost. To issue an explanation of significant differences, the lead agency shall:

(A) Make the explanation of significant differences and supporting information available to the public in the administrative record established under § 300.815 and the information repository; and

(B) Publish a notice that briefly summarizes the explanation of significant differences, including the reasons for such differences, in a major local newspaper of general circulation; or

(ii) Propose an amendment to the ROD if the differences in the remedial or enforcement action, settlement, or consent decree fundamentally alter the basic features of the selected remedy with respect to scope, performance, or cost. To amend the ROD, the lead agency, in conjunction with the support agency, as provided in § 300.515(e), shall:

(A) Issue a notice of availability and brief description of the proposed amendment to the ROD in a major local newspaper of general circulation;

(B) Make the proposed amendment to the ROD and information supporting the decision available for public comment;

(C) Provide a reasonable opportunity, not less than 30 calendar days, for submission of written or oral comments on the amendment to the ROD. Upon

timely request, the lead agency will extend the public comment period by a minimum of 30 additional days;

(D) Provide the opportunity for a public meeting to be held during the public comment period at or near the facility at issue;

(E) Keep a transcript of comments received at the public meeting held during the public comment period;

(F) Include in the amended ROD a brief explanation of the amendment and the response to each of the significant comments, criticisms, and new relevant information submitted during the public comment period;

(G) Publish a notice of the availability of the amended ROD in a major local newspaper of general circulation; and

(H) Make the amended ROD and supporting information available to the public in the administrative record and information repository prior to the commencement of the remedial action affected by the amendment.

(3) After the completion of the final engineering design, the lead agency shall issue a fact sheet and provide, as appropriate, a public briefing prior to the initiation of the remedial action.

(d) *Contractor conflict of interest.* (1) For Fund-financed RD/RA and O&M activities, the lead agency shall:

(i) Include appropriate language in the solicitation requiring potential prime contractors to submit information on their status, as well as the status of their subcontractors, parent companies, and affiliates, as potentially responsible parties at the site.

(ii) Require potential prime contractors to certify that, to the best of their knowledge, they and their potential subcontractors, parent companies, and affiliates have disclosed all information described in § 300.435(d)(1)(i) or that no such information exists, and that any such information discovered after submission of their bid or proposal or contract award will be disclosed immediately.

(2) Prior to contract award, the lead agency shall evaluate the information provided by the potential prime contractors and:

(i) Determine whether they have conflicts of interest that could significantly impact the performance of the

contract or the liability of potential prime contractors or subcontractors.

(ii) If a potential prime contractor or subcontractor has a conflict of interest that cannot be avoided or otherwise resolved, and using that potential prime contractor or subcontractor to conduct RD/RA or O&M work under a Fund-financed action would not be in the best interests of the state or federal government, an offeror or bidder contemplating use of that prime contractor or subcontractor may be declared non-responsible or ineligible for award in accordance with appropriate acquisition regulations, and the contract may be awarded to the next eligible offeror or bidder.

(e) *Recontracting.* (1) If a Fund-financed contract must be terminated because additional work outside the scope of the contract is needed, EPA is authorized to take appropriate steps to continue interim RAs as necessary to reduce risks to public health and the environment. Appropriate steps may include extending an existing contract for a federal-lead RA or amending a cooperative agreement for a state-lead RA. Until the lead agency can reopen the bidding process and recontract to complete the RA, EPA may take such appropriate steps as described above to cover interim work to reduce such risks, where:

(i) Additional work is found to be needed as a result of such unforeseen situations as newly discovered sources, types, or quantities of hazardous substances at a facility; and

(ii) Performance of the complete RA requires the lead agency to rebid the contract because the existing contract does not encompass this newly discovered work.

(2) The cost of such interim actions shall not exceed \$2 million.

(f) *Operation and maintenance.* (1) Operation and maintenance (O&M) measures are initiated after the remedy has achieved the remedial action objectives and remediation goals in the ROD, and is determined to be operational and functional, except for ground- or surface-water restoration actions covered under § 300.435(f)(4). A state must provide its assurance to assume responsibility for O&M, including, where appropriate, requirements for maintaining



Appendix H: News Media, Potential Event Locations, and Other Contacts

This table provides a list of potential media contacts that may be useful in reaching the Hunters Point Shipyard community. The contacts were compiled based on community interviews, input from other community members during community meetings, local research, and grassroots efforts.

| Local News Media Resources                           |                                                       |                              |                                   |                                                                                |                                                                                                                   |                         |                          |                                                                               |
|------------------------------------------------------|-------------------------------------------------------|------------------------------|-----------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------|-------------------------------------------------------------------------------|
| Name                                                 | Address                                               | City, State, ZIP Code        | Phone                             | E-mail                                                                         | Website                                                                                                           | Media Type              | Language/Audience        | Notes/<br>Distribution Frequency                                              |
| San Francisco Chronicle                              | 901 Mission Street                                    | San Francisco, CA 94103      | (415) 777-1111                    | Not Available                                                                  | <a href="http://www.sfgate.com">www.sfgate.com</a>                                                                | Newspaper and Internet  | English                  | Daily                                                                         |
| San Francisco Examiner                               | 988 Market Street                                     | San Francisco, CA 94102      | (415) 359-2600                    | Not Available                                                                  | <a href="http://www.examiner.com/san-francisco">www.examiner.com/san-francisco</a>                                | Newspaper and Internet  | English                  | Daily                                                                         |
| Sing Tao                                             | 625 Kearny Street                                     | San Francisco, CA 94108      | (415) 989-7111                    | <a href="mailto:sf@singtaousa.com">sf@singtaousa.com</a>                       | <a href="http://www.singtaousa.com">www.singtaousa.com</a>                                                        | Newspaper               | Chinese                  | Daily                                                                         |
| San Francisco Business Times                         | 275 Battery Street, Suite 940                         | San Francisco, CA 94111      | (415) 989-2522                    | <a href="mailto:sanfrancisco@bizjournals.com">sanfrancisco@bizjournals.com</a> | <a href="http://sanfrancisco.bizjournals.com/sanfrancisco/">http://sanfrancisco.bizjournals.com/sanfrancisco/</a> | Newspaper and Internet  | English                  | Weekly (available on Friday; submit ads by Tuesday)                           |
| San Francisco Bay Guardian                           | 135 Mississippi Street                                | San Francisco, CA 94107      | (415) 255-3100                    | <a href="mailto:listings@sfbg.com">listings@sfbg.com</a>                       | <a href="http://www.sfbg.com">www.sfbg.com</a>                                                                    | Newspaper               | English                  | Weekly (available on Wednesday; submit ads 2 weeks prior to publication date) |
| San Francisco Weekly                                 | 185 Berry Street, Lobby 5, Suite 3800                 | San Francisco, CA 94107      | (415) 536-8100;<br>(415) 536-8158 | Not Available                                                                  | <a href="http://www.sfweekly.com">www.sfweekly.com</a>                                                            | Newspaper               | English                  | Weekly (available on Wednesday; submit ad the Thursday before publication)    |
| Small Business Exchange                              | 703 Market Street Suite 1000                          | San Francisco, CA 94103      | (415) 778-6250                    | <a href="mailto:sbe@sbeinc.com">sbe@sbeinc.com</a>                             | <a href="http://www.sbeinc.com">www.sbeinc.com</a>                                                                | Newspaper and Internet  | English                  | Weekly (available on Thursday)                                                |
| Sun Reporter                                         | 1791 Bancroft Avenue                                  | San Francisco, CA 94124      | (415) 671-1000                    | <a href="mailto:sunmedia97@aol.com">sunmedia97@aol.com</a>                     | <a href="http://www.sunreporter.com">www.sunreporter.com</a>                                                      | Newspaper               | English/African American | Weekly (available Thursday)                                                   |
| Asian Week                                           | Unavailable                                           | Unavailable                  | Unavailable                       | Not Available                                                                  | <a href="http://www.asianweek.com">www.asianweek.com</a>                                                          | Newspaper               | Multiple/Asian           | Weekly                                                                        |
| El Tecolote                                          | 2958 24th Street                                      | San Francisco, CA 94110      | (415) 648-1045                    | <a href="mailto:rdaza@eltecolote.org">rdaza@eltecolote.org</a>                 | <a href="http://eltecolote.org/content/">http://eltecolote.org/content/</a>                                       | Newspaper               | Spanish/Latino           | Bi-weekly (every other Wednesday)                                             |
| San Francisco Bay View                               | 4917 Third Street                                     | San Francisco, CA 94124-2309 | (415) 671-0789                    | <a href="mailto:publisher@sfbayview.com">publisher@sfbayview.com</a>           | <a href="http://www.sfbayview.com">www.sfbayview.com</a>                                                          | Newspaper               | English/African American | Monthly                                                                       |
| The Potrero View                                     | 2325 3rd Street, Suite 344                            | San Francisco, CA 94107      | (415) 626-8723                    | <a href="mailto:editor@potreroview.net">editor@potreroview.net</a>             | <a href="http://potreroview.net/index.php">http://potreroview.net/index.php</a>                                   | Newspaper               | English                  | Monthly                                                                       |
| Visitation Valley Grapevine (not currently in print) | Visitation Valley Community Center, 50 Raymond Avenue | San Francisco, CA 94134      | (415) 467-9300                    | <a href="mailto:visvalley@earthlink.net">visvalley@earthlink.net</a>           | <a href="http://www.visvalleygrapevine.com">www.visvalleygrapevine.com</a>                                        | Newspaper and Internet  | English                  | Monthly                                                                       |
| The Western Edition                                  | 225 Bush Street, 16th Floor                           | San Francisco, CA 94104      | (415) 439-8319                    | <a href="mailto:editor@thewesternedition.com">editor@thewesternedition.com</a> | <a href="http://www.thewesternedition.com">www.thewesternedition.com</a>                                          | Newspaper               | English                  | Monthly                                                                       |
| Bayview Footprints                                   | Unavailable                                           | Unavailable                  | (415) 822-0800                    | <a href="mailto:info@quesadagardens.org">info@quesadagardens.org</a>           | <a href="http://www.bayviewfootprints.org">www.bayviewfootprints.org</a>                                          | Newsletter and Internet | English                  |                                                                               |
| Quesada Gardens                                      | 1747 Quesada Avenue                                   | San Francisco, CA 94124      | (415) 822-0800                    | Not Available                                                                  | <a href="http://www.quesadagardens.org">www.quesadagardens.org</a>                                                | Newsletter and Internet | English                  |                                                                               |



Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

| Local News Media Resources                             |                                                        |                         |                |                                                                        |                                                                                                                                                                                       |                                     |                                                      |                                                                                            |
|--------------------------------------------------------|--------------------------------------------------------|-------------------------|----------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Name                                                   | Address                                                | City, State, ZIP Code   | Phone          | E-mail                                                                 | Website                                                                                                                                                                               | Media Type                          | Language/Audience                                    | Notes/<br>Distribution Frequency                                                           |
| New America Media                                      | 275 9th Street                                         | San Francisco, CA 94103 | (415) 503-4170 | Not Available                                                          | <a href="http://newamericamedia.org/about/">http://newamericamedia.org/about/</a>                                                                                                     | Multi-Media Agency                  | Multi-lingual (Arabic, Spanish, Chinese, and Korean) |                                                                                            |
| KPOO – San Francisco 89.5 FM                           | 1329 Divisadero Street                                 | San Francisco, CA 94115 | (415) 346-5373 | Not Available                                                          | <a href="http://www.kpoo.com">www.kpoo.com</a>                                                                                                                                        | Radio                               | English                                              | Community Worker show every other Tuesday, 4:00 p.m. with Eric Smith and Roland Washington |
| Sing Tao Chinese Radio (1400 AM, 1450 AM, and 96.1 FM) | 625 Kearny Street                                      | San Francisco, CA 94108 | (415) 989-7111 | <a href="mailto:sf@singtaousa.com">sf@singtaousa.com</a>               | <a href="http://www.singtaousa.com">www.singtaousa.com</a> and <a href="http://www.sanfranciscochinatown.com/culture/radio.html">www.sanfranciscochinatown.com/culture/radio.html</a> | Radio                               | Cantonese and Mandarin/Asian                         |                                                                                            |
| KALX Radio, University of California, Berkeley         | University of California, 26 Barrows Hall #5650        | Berkeley, CA 94720-5650 | (510) 642-1111 | <a href="mailto:mail@kalx.berkeley.edu">mail@kalx.berkeley.edu</a>     | <a href="http://kalx.berkeley.edu">http://kalx.berkeley.edu</a>                                                                                                                       | Radio                               | English                                              |                                                                                            |
| Access San Francisco (Channel 29)                      | 1720 Market Street                                     | San Francisco, CA 94102 | (415) 575-4949 | <a href="mailto:info@accessf.org">info@accessf.org</a>                 | <a href="http://www.freepress.net/node/29931">www.freepress.net/node/29931</a>                                                                                                        | Public Access Television            | English                                              |                                                                                            |
| KTSF (Channel 26)                                      | 100 Valley Drive                                       | Brisbane, CA 94005      | (415) 468-2626 |                                                                        | <a href="http://www.ktsf.com">www.ktsf.com</a>                                                                                                                                        | Public Access Television            | Cantonese and Mandarin/Asian                         |                                                                                            |
| KRON (Channel 4)                                       | 1001 Van Ness Avenue                                   | San Francisco, CA 94109 | (415) 441-4444 | <a href="mailto:4listens@kron4.com">4listens@kron4.com</a>             | <a href="http://www.kron.com">www.kron.com</a>                                                                                                                                        | Network Television                  | English                                              |                                                                                            |
| The Usual Suspects                                     | Barbary Coast Consulting, 660 Market Street, 5th Floor | San Francisco, CA 94104 | (415) FOG-0000 | Not Available                                                          | <a href="http://www.sfusualsuspects.com">www.sfusualsuspects.com</a>                                                                                                                  | Website                             | English                                              |                                                                                            |
| India Basin Neighborhood Association (IBNA)            | P.O. Box 880953                                        | San Francisco, CA 94188 | Not Available  | <a href="mailto:info@indiabasin.org">info@indiabasin.org</a>           | <a href="http://www.indiabasin.org">www.indiabasin.org</a>                                                                                                                            | Website                             | English                                              |                                                                                            |
| City and County of San Francisco                       | 1 Dr. Carlton B. Goodlett Place                        | San Francisco, CA 94102 | (415) 701-2311 | Not Available                                                          | <a href="http://www.sfgov.org">www.sfgov.org</a>                                                                                                                                      | Website                             | English                                              |                                                                                            |
| The World Journal                                      | Not Available                                          | Not Available           | Not Available  | <a href="mailto:info@theworldjournal.com">info@theworldjournal.com</a> | <a href="http://www.TheWorldJournal.com">www.TheWorldJournal.com</a>                                                                                                                  | Website                             | English/students                                     |                                                                                            |
| Mission Local                                          | Not Available                                          | Not Available           | Not Available  | <a href="mailto:staff@missionlocal.org">staff@missionlocal.org</a>     | <a href="http://missionlocal.org/">http://missionlocal.org/</a>                                                                                                                       | Internet publication                | English and Spanish/Latino                           | Monthly                                                                                    |
| Bayview Hunters Point Home Blog                        | Not Available                                          | Not Available           | Not Available  | Not Available                                                          | <a href="http://bvhp.blogspot.com/">http://bvhp.blogspot.com/</a>                                                                                                                     | Blog                                | English                                              |                                                                                            |
| Twitter                                                | Not Available                                          | Not Available           | Not Available  | Not Available                                                          | <a href="http://www.twitter.com">www.twitter.com</a>                                                                                                                                  | Internet                            |                                                      |                                                                                            |
| Facebook                                               | Not Available                                          | Not Available           | Not Available  | Not Available                                                          | <a href="http://www.facebook.com">www.facebook.com</a>                                                                                                                                | Internet                            |                                                      |                                                                                            |
| Text Messages                                          | Not Available                                          | Not Available           | Not Available  | Not Available                                                          | Not Available                                                                                                                                                                         | Through individual cell phone lists |                                                      |                                                                                            |

Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

The table below provides contact information for organizations and venues located in or providing services to the Hunters Point Shipyard community. The Navy contacted these organizations and venues to determine whether they could help support the Navy’s community involvement actions. If an “X” is present in the column, the organization responded positively to that action. For example, some organizations indicated the Navy could come to one of their regularly scheduled meetings and provide a brief update or presentation. Other venues are included because they have space to hold a Navy meeting or places where Navy flyers could be posted. Other organizations indicated that the Navy could inform them about the Navy’s opportunities for community involvement and the organization would pass the Navy’s information along to its members.

| Venues and Organizations for Outreach Activities                                                                                                                                                                                                                                              |                                    |                                   |                         |                                                                     |                           |                                                                                                          |                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------|---------------------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Agency or Venue                                                                                                                                                                                                                                                                               | Outreach Action                    |                                   |                         |                                                                     | Venue Details             |                                                                                                          |                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                               | Navy Attend Organization’s Meeting | Use Venue for Navy Public Meeting | Location to Post Flyers | Inform of Upcoming Outreach Events so they can Invite their Members | Venue Capacity for Events | Fees                                                                                                     | Miscellaneous Comments                                                                                                                                                                                                                    |
| <b>APA Family Support Services</b><br>1337 Evans Avenue<br>San Francisco, CA 94124<br>(415) 824-1128                                                                                                                                                                                          |                                    |                                   | X                       | X                                                                   |                           |                                                                                                          |                                                                                                                                                                                                                                           |
| <b>Arc Ecology</b><br>1331 Evans Avenue<br>San Francisco, CA 94124<br>(415) 643-1190<br><a href="http://www.arcecology.org">www.arcecology.org</a>                                                                                                                                            |                                    |                                   | X                       | X                                                                   |                           |                                                                                                          | Contact Saul Bloom for more information on using this venue for public meetings.                                                                                                                                                          |
| <b>Asian Pacific American Community Center</b><br>2442 Bayshore Boulevard<br>San Francisco, CA 94134<br>(415) 587-2689<br>E-mail: <a href="mailto:apacc_1999@yahoo.com">apacc_1999@yahoo.com</a><br>E-mail: <a href="mailto:tantammy@live.com">tantammy@live.com</a>                          | X                                  | X                                 | X                       | X                                                                   | ~25                       | Yes (set when reservation is made)                                                                       | Contact Tammy Tan to make reservation. Refreshments provided.                                                                                                                                                                             |
| <b>Bayview/Anna E. Waden Branch Library</b><br>5075 3 <sup>rd</sup> Street<br>San Francisco, CA 94124<br>(415) 355-5757<br>Web: <a href="http://sfpl.org/index.php?pg=0100000401">http://sfpl.org/index.php?pg=0100000401</a><br>E-mail: <a href="mailto:baymgr@sfpl.org">baymgr@sfpl.org</a> |                                    | X                                 | X                       |                                                                     | 35                        | Yes, depending on needs (such as outside normal hours of operation, or rental of audio/visual equipment) | Note: Location currently closed for remodeling. Application for meeting space must be submitted no more than 6 months before the event, and no less than 1 week before the event. The library is scheduled for renovations in April 2011. |
| <b>Bayview Baptist Church</b><br>1509 Oakdale Avenue<br>San Francisco, CA 94124<br>(415) 822-4844                                                                                                                                                                                             |                                    |                                   | X                       | X                                                                   |                           |                                                                                                          | Rev. Milton H. Williams                                                                                                                                                                                                                   |
| <b>Bayview Hunters Point Beacon Center</b><br>Burton High School<br>400 Mansell Street<br>San Francisco, CA 94134<br>(415) 469-4550<br>Web: <a href="http://www.sfbeacon.org/BeaconCenters/Bayview-HuntersPoint/">http://www.sfbeacon.org/BeaconCenters/Bayview-HuntersPoint/</a>             |                                    | X                                 | X                       | X                                                                   |                           |                                                                                                          |                                                                                                                                                                                                                                           |

Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

| Venues and Organizations for Outreach Activities                                                                                                                                                                                                                                                                                |                                    |                                   |                         |                                                                     |                                              |      |                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------|---------------------------------------------------------------------|----------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Agency or Venue                                                                                                                                                                                                                                                                                                                 | Outreach Action                    |                                   |                         |                                                                     | Venue Details                                |      |                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                 | Navy Attend Organization's Meeting | Use Venue for Navy Public Meeting | Location to Post Flyers | Inform of Upcoming Outreach Events so they can Invite their Members | Venue Capacity for Events                    | Fees | Miscellaneous Comments                                                                                                                                                                                                                              |
| <b>Bayview Hunters Point Community Advocates</b><br>1579 Innes Avenue<br>San Francisco, CA 94124<br>(415) 648-6008                                                                                                                                                                                                              | X                                  |                                   | X                       | X                                                                   |                                              |      |                                                                                                                                                                                                                                                     |
| <b>Bayview Hunters Point Family Resource Center</b><br>1325 Evans Avenue<br>San Francisco, CA 94124<br>(415) 920-2850                                                                                                                                                                                                           | X                                  | X                                 | X                       | X                                                                   |                                              |      |                                                                                                                                                                                                                                                     |
| <b>Bayview Hunter's Point Foundation for Community Improvement</b><br>150 Executive Park Boulevard, Suite 2800<br>San Francisco, CA 94134<br>(415) 468-5100                                                                                                                                                                     | X                                  |                                   | X                       | X                                                                   |                                              |      |                                                                                                                                                                                                                                                     |
| <b>Bayview Hunters Point Senior Citizens Multipurpose Center</b><br>1706 Yosemite Avenue<br>San Francisco, CA 94124<br>(415) 822-1444<br>Web: <a href="http://www.bhpmss.org/">http://www.bhpmss.org/</a><br>E-mail: <a href="mailto:bhpmss1@aol.com">bhpmss1@aol.com</a>                                                       | X                                  | X                                 | X                       | X                                                                   | 75 to 80                                     |      | Contact Suzie Tyner to make reservations.                                                                                                                                                                                                           |
| <b>Bayview Hunters Point Youth</b><br>5015 3rd Street<br>San Francisco, CA 94124<br>(415) 822-1585                                                                                                                                                                                                                              | X                                  | X                                 | X                       | X                                                                   |                                              |      |                                                                                                                                                                                                                                                     |
| <b>Bayview Opera House/Ruth Williams Memorial Theater</b><br>4705 3rd Street<br>San Francisco, CA 94124<br>(415) 824-0386<br>Web: <a href="http://www.bayviewoperahouse.org/aboutUs/index.shtml">http://www.bayviewoperahouse.org/aboutUs/index.shtml</a><br>E-mail: <a href="mailto:info.bvoh@bvoh.org">info.bvoh@bvoh.org</a> |                                    | X                                 | X                       |                                                                     | 300-seat theater with a 45-foot indoor stage | Yes  | Chairs and tables available; overhead projector, screen and video player available. Full-sized movie screen with digital projector; outdoor stage in an enclosed garden courtyard, and a classroom for smaller meeting groups or breakout sessions. |
| <b>Bayview Tabernacle Baptist Church</b><br>1775 La Salle Avenue<br>San Francisco, CA 94124<br>(415) 641-5835                                                                                                                                                                                                                   |                                    |                                   | X                       | X                                                                   |                                              |      | Rev. Joe N. Sandles                                                                                                                                                                                                                                 |

Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

| Venues and Organizations for Outreach Activities                                                                                                                                                                                   |                                    |                                   |                         |                                                                     |                           |                         |                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------|---------------------------------------------------------------------|---------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Agency or Venue                                                                                                                                                                                                                    | Outreach Action                    |                                   |                         |                                                                     | Venue Details             |                         |                                                                                                                                                                                         |
|                                                                                                                                                                                                                                    | Navy Attend Organization's Meeting | Use Venue for Navy Public Meeting | Location to Post Flyers | Inform of Upcoming Outreach Events so they can Invite their Members | Venue Capacity for Events | Fees                    | Miscellaneous Comments                                                                                                                                                                  |
| <b>Bethel Cathedral Church of God in Christ</b><br>1229 Egbert Avenue<br>San Francisco, CA 94124<br>(415) 822-9936                                                                                                                 |                                    |                                   | X                       | X                                                                   |                           |                         | Pastor Garlin Bluford                                                                                                                                                                   |
| <b>Bret Harte Elementary School</b><br>1035 Gilman Avenue<br>San Francisco, CA 94124<br>(415) 330-1520<br>Web: <a href="http://www.sfbretharte.org/">http://www.sfbretharte.org/</a>                                               |                                    | X                                 | X                       | X                                                                   | 450                       | Yes                     | Call the main office phone line to check availability and to obtain a permit from the school. The fee depends on how many people and the room to be used.                               |
| <b>Calvary Hill Community Church</b><br>141 Industrial Street<br>San Francisco, CA 94124<br>(415) 647-5300                                                                                                                         | X                                  |                                   | X                       | X                                                                   |                           |                         | Large congregation, will allow the Navy to present.<br><br>Rev. Joseph Bryant                                                                                                           |
| <b>Carpenters Union Local #22</b><br>2085 3rd Street<br>San Francisco, CA 94107<br>(415) 355-1322<br>Web: <a href="http://www.local22.org">http://www.local22.org</a>                                                              |                                    |                                   |                         | X                                                                   |                           |                         |                                                                                                                                                                                         |
| <b>Double Rock Baptist Church</b><br>1595 Shafter Avenue<br>San Francisco, CA 94124<br>(415) 822-4566                                                                                                                              |                                    | X                                 | X                       | X                                                                   | 150                       | Yes, \$75 for the event | The basement is currently unavailable; however, the sanctuary can be rented if available. At least 1-month notice required when inquiring about specific dates. Rev. Victor L. Medearis |
| <b>Housing Rights Committee of San Francisco</b><br>427 South Van Ness Avenue<br>San Francisco, CA 94103<br>(415) 703-8634<br>Web: <a href="http://www.hrcsf.org/">http://www.hrcsf.org/</a>                                       | X                                  |                                   |                         | X                                                                   |                           |                         |                                                                                                                                                                                         |
| <b>Hunter's Point Community Youth Park</b><br>200 Middle Point Road<br>San Francisco, CA 94124<br>(415) 285-1415<br>Web: <a href="http://www.dcyf.org/GranteeDetail.aspx?id=918">http://www.dcyf.org/GranteeDetail.aspx?id=918</a> |                                    |                                   |                         | X                                                                   |                           |                         |                                                                                                                                                                                         |

Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

| Venues and Organizations for Outreach Activities                                                                                                                                                                                                                |                                    |                                   |                         |                                                                     |                           |      |                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------|---------------------------------------------------------------------|---------------------------|------|-------------------------------------------------------------------------------------------------|
| Agency or Venue                                                                                                                                                                                                                                                 | Outreach Action                    |                                   |                         |                                                                     | Venue Details             |      |                                                                                                 |
|                                                                                                                                                                                                                                                                 | Navy Attend Organization's Meeting | Use Venue for Navy Public Meeting | Location to Post Flyers | Inform of Upcoming Outreach Events so they can Invite their Members | Venue Capacity for Events | Fees | Miscellaneous Comments                                                                          |
| <b>India Basin Neighborhood Association</b><br>P.O. Box 880953<br>San Francisco, CA 94188<br>(415) 938-6170<br>Web: <a href="http://www.indiabasin.org/">http://www.indiabasin.org/</a><br>E-mail: <a href="mailto:info@indiabasin.org">info@indiabasin.org</a> | X                                  | X                                 | X                       | X                                                                   |                           |      |                                                                                                 |
| <b>Instituto Familiar de la Raza</b><br>2919 Mission Street<br>San Francisco, CA 94110<br>(415) 229-0500<br>Web: <a href="http://www.ifrsf.org/">http://www.ifrsf.org/</a>                                                                                      |                                    | X                                 | X                       | X                                                                   |                           |      | Convenient location for the Latino community.                                                   |
| <b>Islais Creek Scale</b><br>480 Amador Street<br>San Francisco, CA 94124<br>(415) 824-0390                                                                                                                                                                     |                                    |                                   |                         | X                                                                   |                           |      |                                                                                                 |
| <b>Joseph Lee Recreation Center</b><br>1395 Mendall Street<br>San Francisco, CA 94124<br>(415) 822-9040                                                                                                                                                         |                                    | X                                 | X                       |                                                                     |                           |      |                                                                                                 |
| <b>Laborer's Local Union 261</b><br>3271 18 <sup>th</sup> Street<br>San Francisco, CA 94110<br>(415) 826-4550                                                                                                                                                   |                                    |                                   | X                       | X                                                                   |                           |      | Oscar De La Torre, Business Manager<br>Laborer's Union 261 reaches out to the Latino community. |
| <b>La Raza Community Resource Center</b><br>474 Valencia, Suite 100<br>San Francisco, CA 94103<br>(415) 863-0764<br>Web: <a href="http://larazacrc.org/">http://larazacrc.org/</a><br>E-mail: <a href="mailto:info@larazacrc.org">info@larazacrc.org</a>        |                                    | X                                 | X                       | X                                                                   |                           |      | Convenient location for the Latino community.                                                   |
| <b>Milton Meyer Recreation Center</b><br>195 Kiska Road<br>San Francisco, CA 94124<br>(415) 695-5003                                                                                                                                                            |                                    | X                                 | X                       |                                                                     |                           |      |                                                                                                 |
| <b>New Home Baptist Church</b><br>1763 Newcomb Avenue<br>San Francisco, CA 94124<br>(415) 648-9344                                                                                                                                                              |                                    |                                   | X                       | X                                                                   |                           |      | Rev. Kenneth Sampson                                                                            |

Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

| Venues and Organizations for Outreach Activities                                                                                                                           |                                    |                                   |                         |                                                                     |                           |      |                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------|---------------------------------------------------------------------|---------------------------|------|--------------------------------------------------------------------|
| Agency or Venue                                                                                                                                                            | Outreach Action                    |                                   |                         |                                                                     | Venue Details             |      |                                                                    |
|                                                                                                                                                                            | Navy Attend Organization's Meeting | Use Venue for Navy Public Meeting | Location to Post Flyers | Inform of Upcoming Outreach Events so they can Invite their Members | Venue Capacity for Events | Fees | Miscellaneous Comments                                             |
| <b>Northridge Co-op Homes</b><br>1 Ardath Court<br>San Francisco, CA 94124<br>(415) 647-1124                                                                               |                                    |                                   |                         | X                                                                   |                           |      |                                                                    |
| <b>Olivet Baptist Church</b><br>1667 Revere Avenue<br>San Francisco, CA 94124<br>(415) 822-4049                                                                            |                                    |                                   | X                       | X                                                                   |                           |      | Rev. Steve Bailey                                                  |
| <b>Our Lady of Lourdes Catholic Church</b><br>1715 Oakdale Avenue<br>San Francisco, CA 94124<br>(415) 285-3377                                                             |                                    |                                   | X                       | X                                                                   |                           |      | Father Kirk Ullery                                                 |
| <b>Pet Camp Main Campground</b><br>525 Phelps Street<br>San Francisco, CA 94124<br>(415) 282-0700<br>Web: <a href="http://www.petcamp.com/">http://www.petcamp.com/</a>    |                                    |                                   |                         | X                                                                   |                           |      |                                                                    |
| <b>Portola Family Connections</b><br>2565 San Bruno Avenue<br>San Francisco, CA 94134<br>(415) 715-6746<br>Web: <a href="http://www.portolaafc.org">www.portolaafc.org</a> | X                                  | X                                 | X                       | X                                                                   |                           |      | Post one sign in English and one in Chinese on the bulletin board. |
| <b>Portola Library</b><br>380 Bacon Street<br>San Francisco, CA 94134<br>(415) 355-5660                                                                                    |                                    |                                   | X                       |                                                                     |                           |      | Post one sign in English and one in Chinese on the bulletin board. |
| <b>Potrero Hill Neighborhood House</b><br>953 De Haro Street<br>San Francisco, CA 94107<br>(415) 826-8025                                                                  | X                                  |                                   | X                       |                                                                     |                           |      |                                                                    |
| <b>POWER Bayview</b><br>4923 3rd Street<br>San Francisco, CA 94124<br>(415) 671-0911<br>Web: <a href="http://www.peopleorganized.org">http://www.peopleorganized.org</a>   | X                                  |                                   | X                       | X                                                                   |                           |      |                                                                    |



Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

| Venues and Organizations for Outreach Activities                                                                                                                                                                                                                                                                           |                                    |                                   |                         |                                                                     |                                               |      |                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------|---------------------------------------------------------------------|-----------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Agency or Venue                                                                                                                                                                                                                                                                                                            | Outreach Action                    |                                   |                         |                                                                     | Venue Details                                 |      |                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                            | Navy Attend Organization's Meeting | Use Venue for Navy Public Meeting | Location to Post Flyers | Inform of Upcoming Outreach Events so they can Invite their Members | Venue Capacity for Events                     | Fees | Miscellaneous Comments                                                                                                                                                   |
| <b>Providence Baptist Church</b><br>1601 McKinnon Avenue<br>San Francisco, CA 94124<br>(415) 641-8719                                                                                                                                                                                                                      |                                    |                                   | X                       | X                                                                   |                                               |      | Rev. Calvin Jones, Jr.                                                                                                                                                   |
| <b>Rebuilding Together San Francisco</b><br>Pier 28, The Embarcadero<br>San Francisco, CA 94105<br>(415) 905-1611<br>Web: <a href="http://www.rebuildingtogethersf.org">http://www.rebuildingtogethersf.org</a>                                                                                                            | X                                  |                                   | X                       |                                                                     |                                               |      |                                                                                                                                                                          |
| <b>Ridgeview Terrace Townhouses</b><br>140 Cashmere Street<br>San Francisco, CA 94124<br>(415) 821-7440                                                                                                                                                                                                                    | X                                  |                                   | X                       | X                                                                   |                                               |      |                                                                                                                                                                          |
| <b>Samoan Community Development Center</b><br>2055 Sunnydale Avenue<br>San Francisco, CA 94134-2611<br>Patsy Tito, (415) 841-1086<br>Web: <a href="http://samoancenter.org/">http://samoancenter.org/</a><br>E-mail: <a href="mailto:scdc_sf@pacbell.net">scdc_sf@pacbell.net</a>                                          | X                                  | X                                 | X                       | X                                                                   | 100+,<br>depending on<br>what room is<br>used | Free | Convenient location for the Samoan Community. The Samoan Community Development Center is located in a school in Visitacion Valley. Contact Patsy Tito to reserve a room. |
| <b>San Francisco Bayview Rotary Club</b><br>3801 Third Street, #1211<br>San Francisco, CA 94124<br>Web: <a href="http://sfbayview.clubwizard.com/">http://sfbayview.clubwizard.com/</a>                                                                                                                                    | X                                  | X                                 | X                       | X                                                                   |                                               |      |                                                                                                                                                                          |
| <b>San Francisco Bicycle Coalition</b><br>833 Market Street 10th Floor<br>San Francisco, CA 94103<br>(415) 431-BIKE<br>Web: <a href="http://www.sfbike.org/">http://www.sfbike.org/</a>                                                                                                                                    |                                    |                                   | X                       |                                                                     |                                               |      |                                                                                                                                                                          |
| <b>San Francisco District Bayview Police Station</b><br>201 Williams Street<br>San Francisco, CA 94124<br>(415) 671-2300<br>Web: <a href="http://sf-police.org/index.aspx?page=798">http://sf-police.org/index.aspx?page=798</a><br>E-mail: <a href="mailto:SFPDBayviewStation@sfgov.org">SFPDBayviewStation@sfgov.org</a> | X                                  | X                                 |                         | X                                                                   | 49                                            | Free | The police station currently conducts community meetings on the first Tuesday of the month starting at 6:00 p.m. Convenient location for the Asian community.            |



Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

| Venues and Organizations for Outreach Activities                                                                                                                                                                                                                                                                                                                                                                                                                             |                                    |                                   |                         |                                                                     |                           |                                                                              |                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------|---------------------------------------------------------------------|---------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Agency or Venue                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Outreach Action                    |                                   |                         |                                                                     | Venue Details             |                                                                              |                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Navy Attend Organization's Meeting | Use Venue for Navy Public Meeting | Location to Post Flyers | Inform of Upcoming Outreach Events so they can Invite their Members | Venue Capacity for Events | Fees                                                                         | Miscellaneous Comments                                                                                                                        |
| <b>San Francisco Housing Development Center/Corporation</b><br>4439 Third Street<br>San Francisco, CA 94124<br>(415) 822-1022<br>Web: <a href="http://www.sfhdc.org">http://www.sfhdc.org</a>                                                                                                                                                                                                                                                                                | X                                  |                                   | X                       |                                                                     |                           |                                                                              |                                                                                                                                               |
| <b>San Francisco Human Rights Commission</b><br>25 Van Ness Avenue, Room 800<br>San Francisco, CA 94102-6033<br>(415) 252-2500, (415) 252-2515<br>Web: <a href="http://www.sf-hrc.org/">http://www.sf-hrc.org/</a>                                                                                                                                                                                                                                                           |                                    |                                   | X                       |                                                                     |                           |                                                                              |                                                                                                                                               |
| <b>Shipyard Trust for the Arts</b><br>P.O. Box 880083<br>San Francisco, CA 94199<br>(415) 822-0922<br>Web: <a href="http://www.shipyardtrust.org/">http://www.shipyardtrust.org/</a>                                                                                                                                                                                                                                                                                         | X                                  |                                   |                         | X                                                                   |                           |                                                                              |                                                                                                                                               |
| <b>Shoreview Resident Association</b><br>35 Lillian Court<br>San Francisco, CA 94124                                                                                                                                                                                                                                                                                                                                                                                         | X                                  |                                   |                         | X                                                                   |                           |                                                                              |                                                                                                                                               |
| <b>Silver CDS, Community Development Solutions</b><br>P.O. Box 31925<br>Oakland, CA 94604<br>(510) 387-9249<br>Web: <a href="http://www.silvercds.com">www.silvercds.com</a>                                                                                                                                                                                                                                                                                                 |                                    |                                   |                         | X                                                                   |                           |                                                                              |                                                                                                                                               |
| <b>Sojourner Truth Foster Family Service Agency</b><br>150 Executive Park Boulevard, Suite 3300<br>San Francisco, CA 94134<br>(415) 330-6300                                                                                                                                                                                                                                                                                                                                 |                                    |                                   |                         | X                                                                   |                           |                                                                              |                                                                                                                                               |
| <b>Southeast Community Facility Commission – Alex L. Pitcher, Jr. Conference Room</b><br>San Francisco City College, Southeast Campus<br>1800 Oakdale Avenue, Suite B, Room 3<br>San Francisco, CA 94124<br>(415) 821-1534, (415) 821-0921<br>Web: <a href="http://www.ccsf.edu/Campuses/Southeast/Main.html">http://www.ccsf.edu/Campuses/Southeast/Main.html</a><br>Web: <a href="http://www.sfgov3.org/index.aspx?page=639">http://www.sfgov3.org/index.aspx?page=639</a> | X                                  | X                                 | X                       |                                                                     | 200                       | Yes (setup, take-down, cleaning fee and fee for monitor [\$14/hour] minimum) | Application required in advance of meeting; audio/visual equipment can be rented from its vendor list; payment due via check on day of event. |



Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

| Venues and Organizations for Outreach Activities                                                                            |                                    |                                   |                         |                                                                     |                           |      |                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------|---------------------------------------------------------------------|---------------------------|------|-----------------------------------------------------------------------------------------------|
| Agency or Venue                                                                                                             | Outreach Action                    |                                   |                         |                                                                     | Venue Details             |      |                                                                                               |
|                                                                                                                             | Navy Attend Organization's Meeting | Use Venue for Navy Public Meeting | Location to Post Flyers | Inform of Upcoming Outreach Events so they can Invite their Members | Venue Capacity for Events | Fees | Miscellaneous Comments                                                                        |
| <b>Southeast Health Center</b><br>2401 Keith Street<br>San Francisco, CA 94124<br>(415) 671-7000                            | X                                  |                                   | X                       |                                                                     |                           |      |                                                                                               |
| <b>Southeast Neighborhood Jobs Initiative Round Table</b><br>6620 Third Street<br>San Francisco, CA 94124<br>(415) 550-4150 | X                                  |                                   | X                       |                                                                     |                           |      |                                                                                               |
| <b>St. James Baptist Church</b><br>1470 Hudson Avenue<br>San Francisco, CA 94124<br>(415) 648-5995                          |                                    |                                   | X                       | X                                                                   |                           |      | Rev. Michael S. Williams                                                                      |
| <b>St. Lukes Baptist Church</b><br>343 Paul Avenue<br>San Francisco, CA 94124<br>(415) 467-4303                             |                                    |                                   | X                       | X                                                                   |                           |      | Rev. C. Smith                                                                                 |
| <b>St. Paul of the Shipwreck</b><br>1122 Jamestown Avenue<br>San Francisco, CA 94124<br>(415) 468-3434                      |                                    |                                   | X                       | X                                                                   |                           |      | Father James Goode                                                                            |
| <b>St. Paul Tabernacle Baptist Church</b><br>1789 Oakdale Avenue<br>San Francisco, CA 94124<br>(415) 642-4965               |                                    |                                   | X                       | X                                                                   |                           |      | Rev. Billy Ware                                                                               |
| <b>St. Peters Missionary Baptist Church</b><br>1606 Newcomb Avenue<br>San Francisco, CA 94124<br>(415) 648-4337             |                                    |                                   | X                       | X                                                                   |                           |      | Rev. Joseph P. Alexander                                                                      |
| <b>Supersave Market</b><br>4517 3 <sup>rd</sup> Street<br>San Francisco, CA 94124<br>(415) 282-3722                         |                                    |                                   | X                       |                                                                     |                           |      | Grocery store delivers groceries to seniors and will include a flyer for delivered groceries. |
| <b>Surfside Liquors</b><br>950 Innes Avenue<br>San Francisco, CA 94124<br>(415) 647-2677                                    |                                    |                                   | X                       |                                                                     |                           |      | Proprietor: Bob                                                                               |

Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

| Venues and Organizations for Outreach Activities                                                                                                                                       |                                    |                                   |                         |                                                                     |                           |      |                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------|---------------------------------------------------------------------|---------------------------|------|-------------------------------------------------------------------------------|
| Agency or Venue                                                                                                                                                                        | Outreach Action                    |                                   |                         |                                                                     | Venue Details             |      |                                                                               |
|                                                                                                                                                                                        | Navy Attend Organization's Meeting | Use Venue for Navy Public Meeting | Location to Post Flyers | Inform of Upcoming Outreach Events so they can Invite their Members | Venue Capacity for Events | Fees | Miscellaneous Comments                                                        |
| <b>Swords to Plowshares</b><br>1060 Howard Street<br>San Francisco, CA 94103<br>(415) 252-4788<br>Web: <a href="http://swords-to-plowshares.org/">http://swords-to-plowshares.org/</a> |                                    |                                   |                         | X                                                                   |                           |      |                                                                               |
| <b>The Point (auditorium on Base)</b><br>Hunters Point Shipyard, Building 101<br>San Francisco, CA 94124                                                                               |                                    | X                                 |                         |                                                                     |                           |      | Navy property; auditorium seating; no equipment; no street lights after dark. |
| <b>True Hope Church of God in Christ</b><br>950 Gilman Avenue<br>San Francisco, CA 94124<br>(415) 822-5626                                                                             | X                                  |                                   | X                       | X                                                                   |                           |      | Rev. Arelious Walker                                                          |
| <b>United Fathers Coalition</b><br>1595 Shafter Avenue<br>San Francisco, CA 94124<br>(415) 871-6812                                                                                    |                                    |                                   | X                       |                                                                     |                           |      |                                                                               |
| <b>Visitacion Chinese Baptist Church</b><br>57 Leland Avenue<br>San Francisco, CA 94134<br>(415) 333-4503                                                                              |                                    |                                   | X                       | X                                                                   |                           |      | Rev. Samson Wong                                                              |
| <b>Visitacion Valley Community Beacon</b><br>450 Raymond Avenue<br>San Francisco, CA 94134<br>(415) 452-4907                                                                           | X                                  | X                                 | X                       | X                                                                   |                           |      |                                                                               |
| <b>Visitacion Valley Community Center</b><br>50 Raymond Street<br>San Francisco, CA 94134<br>(415) 467-6400                                                                            |                                    |                                   | X                       |                                                                     |                           |      |                                                                               |
| <b>Visitacion Valley Library</b><br>45 Leland Avenue<br>San Francisco, CA 94134<br>(415) 355-2848                                                                                      |                                    |                                   | X                       |                                                                     |                           |      | Post two signs in English and two signs in Chinese on the bulletin boards.    |
| <b>Visitacion Valley Senior Center</b><br>66 Raymond Street<br>San Francisco, CA 94134                                                                                                 |                                    |                                   | X                       |                                                                     |                           |      |                                                                               |

Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)

| Venues and Organizations for Outreach Activities                                                                                                                                                                                                                                                                   |                                    |                                   |                         |                                                                     |                           |                                                                                                                    |                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------|---------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Agency or Venue                                                                                                                                                                                                                                                                                                    | Outreach Action                    |                                   |                         |                                                                     | Venue Details             |                                                                                                                    |                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                    | Navy Attend Organization's Meeting | Use Venue for Navy Public Meeting | Location to Post Flyers | Inform of Upcoming Outreach Events so they can Invite their Members | Venue Capacity for Events | Fees                                                                                                               | Miscellaneous Comments                                                                                                                                                                                    |
| <b>Whitney Young Child Development Center</b><br>100 Whitney Young Circle<br>San Francisco, CA 94124<br>(415) 821-7550, (415) 821-0573, (415) 821-1534<br>Web: <a href="http://www.whitneyyoungcdc.org/">http://www.whitneyyoungcdc.org/</a><br>E-mail: <a href="mailto:tmoses@sfwater.org">tmoses@sfwater.org</a> |                                    | X                                 | X                       |                                                                     | 450                       | Free Monday through Friday, 8:00 a.m. to 4:00 p.m. Small fee to use facility after business hours and on weekends. | Call or e-mail Dr. Moses to reserve space as soon as a need is identified. For 2011, reservations begin on December 4, 2010. The space books quickly and is used widely by the community and politicians. |
| <b>YMCA (Bayview Hunters Point Branch)</b><br>1601 Lane Street<br>San Francisco, CA 94124<br>(415) 822-7728<br>Web: <a href="http://www.ymcasf.org/bayview/">http://www.ymcasf.org/bayview/</a><br>E-mail: <a href="mailto:ialsalte@ymcasf.org">ialsalte@ymcasf.org</a>                                            |                                    | X                                 | X                       | X                                                                   |                           |                                                                                                                    | Contact Gina Fromer ( <a href="mailto:gfromer@ymcasf.org">gfromer@ymcasf.org</a> ) to reserve meeting space.                                                                                              |
| <b>Young Community Developers</b><br>1715 Yosemite Avenue<br>San Francisco, CA 94124<br>(415) 822-3491                                                                                                                                                                                                             | X                                  |                                   | X                       | X                                                                   |                           |                                                                                                                    |                                                                                                                                                                                                           |

*Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)***Community Mailing List**

The Hunters Point Shipyard (**HPS**) community mailing list is used to distribute information and updates via e-mail and hardcopies to the HPS community and other interested parties in the City of San Francisco. The e-mail list contains more than 500 members and the hardcopy mailing list has more than 3,000 addresses, including local residents; community organizations; local, state, and federal regulatory agencies; news media; elected officials; business associations; and other interested parties. Individuals on the list will receive fact sheets, meeting notifications, and other important information.

To create and maintain the mailing list, the Department of the Navy adds the following:

- Anyone who makes a telephone or e-mail request for HPS information
- Community Involvement Plan (**CIP**) interviewees
- Meeting attendees
- Local elected officials (updated annually)
- Anyone who asks to be added

The Navy also updates the list with mailing or e-mail returns, as required to update addresses or remove people from the lists. The mailing list will continue to be updated to ensure that the Navy is reaching all interested and concerned parties. If you want to be added to the Navy's e-mail or hardcopy mailing list, please contact Keith Forman at (415) 308-1458, (619) 532-0913, or [keith.s.forman@navy.mil](mailto:keith.s.forman@navy.mil).

**Key Mailing List Contacts**

The key contacts list is a subset of the community mailing list and includes Navy representatives, regulatory agency representatives, elected officials, and other government agencies for the area and state. Those individuals and organizations on the list will receive fact sheets, news releases, meeting notices, and other important information.

**Information Repository Locations**

The Information Repository contains the Administrative Record index plus site-related documents such as technical reports, sampling data, fact sheets, newsletters, and public meeting transcripts. The Information Repository is available at the following locations:

**San Francisco Main Public Library**

*Science, Technical, and Government Documents Room*

100 Larkin Street

San Francisco, CA 94102

(415) 557-4400

<http://sfpl.org/index.php?pg=0100000101>

**Hours:**

Mondays: 10:00 a.m. to 6:00 p.m.

Tuesdays, Wednesdays, and Thursdays: 9:00 a.m. to 8:00 p.m.

Fridays: 12:00 p.m. to 6:00 p.m.

*Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)*

Saturdays: 10:00 a.m. to 6:00 p.m.

Sundays: 12:00 p.m. to 5:00 p.m.

**Bayview/Anna E. Waden Branch Library**

5075 Third Street

San Francisco, CA 94124

(415) 355-5757

<http://sfpl.org/index.php?pg=0100000401>

**Hours:**

Mondays and Tuesdays: 10:00 a.m. to 6:00 p.m.

Wednesdays: 1:00 p.m. to 8:00 p.m.

Thursdays: 10:00 a.m. to 8:00 p.m.

Fridays: 1:00 p.m. to 6:00 p.m.

Saturdays: 10:00 a.m. to 6:00 p.m.

Sundays: 1:00 p.m. to 5:00 p.m.

\* The Bayview/Anna E. Waden Branch Library is scheduled for renovations in April 2011. While the library is closed, the Navy will have relocated the Information Repository to a temporary location at:

Hunters Point Shipyard Site Trailer (Located across the street from the security entrance to the Shipyard)

690 Hudson Avenue

San Francisco, CA 94124

**Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)**

The table below provides contact information for local and State of California government officials; however, these entities are not directly involved in the HPS cleanup.

| <b>City, County, and State Government Contacts</b> |                                                                                  |                                                                                                               |                                                                                                                         |
|----------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Name</b>                                        | <b>Title or Role</b>                                                             | <b>Address</b>                                                                                                | <b>Phone and E-mail</b>                                                                                                 |
| <b>City Council Members</b>                        |                                                                                  |                                                                                                               |                                                                                                                         |
| Edwin Lee                                          | City of San Francisco<br>Office of the Mayor                                     | City Hall, Room 200<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102                             | Phone: (415) 554-6160<br>E-mail: <a href="mailto:mayoredwinlee@sfgov.org">mayoredwinlee@sfgov.org</a>                   |
| Amy Brown                                          | City of San Francisco<br>Office of City Administrator                            | City Hall, Room 362<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102                             | Phone: (415) 554-4851<br>E-mail: <a href="mailto:city.administrator@sfgov.org">city.administrator@sfgov.org</a>         |
| Phil Ting                                          | City of San Francisco<br>Office of the Assessor-Recorder                         | City Hall, Room 190<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102-4698                        | Phone: (415) 554-5596<br>E-mail: <a href="mailto:assessor@sfgov.org">assessor@sfgov.org</a>                             |
| Jeff Adachi                                        | City of San Francisco<br>Office of the Public Defender                           | 555 Seventh Street<br>San Francisco CA 94103                                                                  | Phone: (415) 553-1671                                                                                                   |
| David Chiu                                         | City of San Francisco<br>Board of Supervisor President<br>Supervisor, District 3 | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102-4689                        | Phone: (415) 554-7450<br>E-mail: <a href="mailto:David.Chiu@sfgov.org">David.Chiu@sfgov.org</a>                         |
| Jose Cisneros                                      | City of San Francisco<br>Office of the Treasurer<br>and Tax Collector            | City Hall, Room 140<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102                             | Phone: (415) 554-4478<br>E-mail: <a href="mailto:treasurer.taxcollector@sfgov.org">treasurer.taxcollector@sfgov.org</a> |
| Michael Hennessey                                  | City of San Francisco<br>San Francisco's Sheriff's Department                    | City Hall, Room 456<br>1 Dr. Carlton Goodlett Place<br>San Francisco, CA 94102                                | Phone: (415) 554-7225<br>E-mail: <a href="mailto:sheriff@sfgov.org">sheriff@sfgov.org</a>                               |
| George Gascon                                      | City of San Francisco<br>Office of the District Attorney                         | Office of the City Attorney<br>City Hall, Room 234<br>1 Dr. Carlton Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-4700<br>E-mail: <a href="mailto:cityattorney@sfgov.org">cityattorney@sfgov.org</a>                     |

**Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)**

| <b>City, County, and State Government Contacts</b> |                                                  |                                                                                   |                                                                                                         |
|----------------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Name</b>                                        | <b>Title or Role</b>                             | <b>Address</b>                                                                    | <b>Phone and E-mail</b>                                                                                 |
| <b>San Francisco County Board of Supervisors</b>   |                                                  |                                                                                   |                                                                                                         |
| Eric Mar                                           | City of San Francisco<br>Supervisor, District 1  | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-7410<br>E-mail: <a href="mailto:Eric.L.Mar@sfgov.org">Eric.L.Mar@sfgov.org</a>         |
| Mark Farrell                                       | City of San Francisco<br>Supervisor, District 2  | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-7752<br>E-mail: <a href="mailto:Mark.Farrell@sfgov.org">Mark.Farrell@sfgov.org</a>     |
| Carmen Chu                                         | City of San Francisco<br>Supervisor, District 4  | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-7460<br>E-mail: <a href="mailto:Carmen.Chu@sfgov.org">Carmen.Chu@sfgov.org</a>         |
| Ross Mirkarimi                                     | City of San Francisco<br>Supervisor, District 5  | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-7630<br>E-mail: <a href="mailto:Ross.Mirkarimi@sfgov.org">Ross.Mirkarimi@sfgov.org</a> |
| Jane Kim                                           | City of San Francisco<br>Supervisor, District 6  | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-7970<br>E-mail: <a href="mailto:Jane.Kim@sfgov.org">Jane.Kim@sfgov.org</a>             |
| Sean Elsbernd                                      | City of San Francisco<br>Supervisor, District 7  | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-6516<br>E-mail: <a href="mailto:Sean.Elsbernd@sfgov.org">Sean.Elsbernd@sfgov.org</a>   |
| Scott Wiener                                       | City of San Francisco<br>Supervisor, District 8  | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-6968<br>E-mail: <a href="mailto:Scott.Wiener@sfgov.org">Scott.Wiener@sfgov.org</a>     |
| David Campos                                       | City of San Francisco<br>Supervisor, District 9  | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-5144<br>E-mail: <a href="mailto:David.Campos@sfgov.org">David.Campos@sfgov.org</a>     |
| Malia Cohen                                        | City of San Francisco<br>Supervisor, District 10 | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-7670<br>E-mail: <a href="mailto:Malia.Cohen@sfgov.org">Malia.Cohen@sfgov.org</a>       |

**Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)**

| <b>City, County, and State Government Contacts</b> |                                                                  |                                                                                   |                                                                                                                         |
|----------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Name</b>                                        | <b>Title or Role</b>                                             | <b>Address</b>                                                                    | <b>Phone and E-mail</b>                                                                                                 |
| John Avalos                                        | City of San Francisco<br>Supervisor, District 11                 | City Hall, Room 244<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102 | Phone: (415) 554-6975<br>E-mail: <a href="mailto:John.Avalos@sfgov.org">John.Avalos@sfgov.org</a>                       |
| <b>Other Local Government Agencies</b>             |                                                                  |                                                                                   |                                                                                                                         |
|                                                    | City of San Francisco<br>Chamber of Commerce                     | 235 Montgomery Street, 12th Floor<br>San Francisco, CA 94104                      | Phone: (415) 392-4520                                                                                                   |
|                                                    | City of San Francisco<br>Community Development                   | 1 S Van Ness Avenue, #500<br>San Francisco, CA 94103                              | Phone: (415) 701-5500                                                                                                   |
|                                                    | City of San Francisco<br>Planning Department                     | 1650 Mission Street, Suite 400<br>San Francisco, CA 94103                         | Phone: (415) 558-6378                                                                                                   |
|                                                    | City of San Francisco<br>Public Health Department                | 101 Grove Street, Room 100<br>San Francisco, CA 94102                             | Phone: (415) 554-2500                                                                                                   |
|                                                    | City of San Francisco<br>Recreation and Park Department          | 501 McLaren Lodge<br>San Francisco, CA 94117                                      | Phone: (415) 831-2782<br>E-mail: <a href="http://sfrecpark.org/ContactUs.aspx">http://sfrecpark.org/ContactUs.aspx</a>  |
|                                                    | City of San Francisco<br>Housing Authority                       | 1815 Egbert Avenue<br>San Francisco, CA 94124                                     | Phone: (415) 715-3280<br>E-mail: <a href="mailto:feedback@sfha.org">feedback@sfha.org</a>                               |
|                                                    | City of San Francisco Children,<br>Youth and Families Department | 1390 Market Street, Suite 900<br>San Francisco, CA 94102                          | Phone: (415) 554-8990<br>E-mail: <a href="mailto:Public@DCYF.org">Public@DCYF.org</a>                                   |
|                                                    | City of San Francisco<br>Department of the Environment           | 11 Grove Street<br>San Francisco, CA 94102                                        | Phone: (415) 355-3700<br>E-mail: <a href="mailto:environment@sfgov.org">environment@sfgov.org</a>                       |
|                                                    | City of San Francisco<br>Fire Department                         | Department Headquarters<br>698 - 2nd Street<br>San Francisco, CA 94107            | Phone: (415) 558-3403<br>E-mail: <a href="mailto:FireAdministration@sfgov.org">FireAdministration@sfgov.org</a>         |
|                                                    | City of San Francisco<br>Police Department                       | 850 Bryant Street, #525<br>San Francisco, CA 94103                                | Phone: (415) 553-1551<br>E-mail: <a href="mailto:sfpdcommunityrelations@sfgov.org">sfpdcommunityrelations@sfgov.org</a> |
|                                                    | City of San Francisco<br>Bayview Police Station                  | 201 Williams Avenue<br>San Francisco, CA 94124                                    | Phone: (415) 671-2300                                                                                                   |



**Appendix H: News Media, Potential Event Locations, and Other Contacts (continued)**

| <b>City, County, and State Government Contacts</b> |                                                      |                                                                                         |                                                                                                                                        |
|----------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Name</b>                                        | <b>Title or Role</b>                                 | <b>Address</b>                                                                          | <b>Phone and E-mail</b>                                                                                                                |
|                                                    | City of San Francisco<br>Public Works                | City Hall, Room 348<br>1 Dr. Carlton B. Goodlett Place<br>San Francisco, CA 94102       | Phone: (415) 554-6920<br>E-mail: <a href="mailto:dpw@sfdpw.org">dpw@sfdpw.org</a>                                                      |
|                                                    | City of San Francisco<br>Public Utilities Commission | 1155 Market Street, 11th Floor<br>San Francisco CA, 94103                               | Phone: (415) 554-3155<br>E-mail: <a href="http://www.sfwater.org">http://www.sfwater.org</a>                                           |
|                                                    | City of San Francisco<br>Redevelopment Agency        | 1 S Van Ness Avenue, 5th Floor<br>San Francisco, CA 94103                               | Phone: (415) 749-2400                                                                                                                  |
| <b>California State Senators</b>                   |                                                      |                                                                                         |                                                                                                                                        |
| Senator Mark Leno                                  | California State Senate<br>(District 3)              | 455 Golden Gate Avenue, Suite 14800<br>San Francisco, CA 94102                          | Phone: (415) 479-6612<br>E-mail: <a href="mailto:senator.leno@senate.ca.gov">senator.leno@senate.ca.gov</a>                            |
| Senator Leland Yee                                 | California State Senate<br>(District 8)              | 455 Golden Gate Avenue, Suite 14200<br>San Francisco, CA 94102<br>Phone: (415) 557-7857 | Phone: (415) 557-7857<br>E-mail: <a href="mailto:senator.yee@senate.ca.gov">senator.yee@senate.ca.gov</a>                              |
| <b>California State Assembly Representatives</b>   |                                                      |                                                                                         |                                                                                                                                        |
| Assembly Member<br>Tom Ammiano                     | California State Assembly<br>(District 13)           | 455 Golden Gate Avenue, Suite 14300<br>San Francisco, CA 94102                          | Phone: (415) 557-3013<br>E-mail:<br><a href="mailto:Assemblymember.Ammiano@assembly.ca.gov">Assemblymember.Ammiano@assembly.ca.gov</a> |
| <b>U.S. Senate</b>                                 |                                                      |                                                                                         |                                                                                                                                        |
| Senator Dianne Feinstein                           | U.S. Senate                                          | One Post Street, Suite 2450<br>San Francisco, CA 94104                                  | Phone: (415) 393-0707                                                                                                                  |
| Senator Barbara Boxer                              | U.S. Senate                                          | 1700 Montgomery Street, Suite 240<br>San Francisco, CA 94111                            | Phone: (415) 403-0100                                                                                                                  |
| <b>U.S. House of Representatives</b>               |                                                      |                                                                                         |                                                                                                                                        |
| Congresswoman<br>Nancy Pelosi                      | U.S. House of Representatives<br>(District 8)        | 90 7th Street, Suite 2-800<br>San Francisco, CA 94103                                   | Phone: (415) 556-4862                                                                                                                  |

## *Appendix I: Acronyms and Abbreviations*

|        |                                                                                            |
|--------|--------------------------------------------------------------------------------------------|
| AOC    | Administrative Order on Consent                                                            |
| ATSDR  | Agency for Toxic Substances and Disease Registry                                           |
| BCT    | BRAC Cleanup Team                                                                          |
| BRAC   | Base Realignment and Closure                                                               |
| BVHP   | Bayview Hunters Point                                                                      |
| CAC    | Citizens Advisory Committee                                                                |
| CDR    | Covenant Deferral Request                                                                  |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act                      |
| CFR    | Code of Federal Regulations                                                                |
| CIP    | Community Involvement Plan                                                                 |
| DTSC   | California Environmental Protection Agency, Department of Toxic Substances Control         |
| FAQ    | Frequently Asked Question                                                                  |
| FFA    | Federal Facility Agreement                                                                 |
| FOSET  | Finding of Suitability for Early Transfer                                                  |
| HPS    | Hunters Point Shipyard                                                                     |
| IBNA   | India Basin Neighborhood Association                                                       |
| IR     | Installation Restoration                                                                   |
| NCP    | National Oil and Hazardous Substances Pollution Contingency Plan/National Contingency Plan |
| NRDL   | Naval Radiological Defense Laboratory                                                      |
| NPL    | National Priorities List                                                                   |
| PAC    | Project Area Committee                                                                     |
| PAH    | Polycyclic aromatic hydrocarbons                                                           |
| PCB    | Polychlorinated biphenyl                                                                   |
| RAB    | Restoration Advisory Board                                                                 |
| SFDPH  | San Francisco Department of Public Health                                                  |
| SFRA   | San Francisco Redevelopment Agency                                                         |
| SVOC   | Semi-volatile organic compound                                                             |
| TAG    | Technical Assistance Grant                                                                 |
| TPH    | Total petroleum hydrocarbons                                                               |

*Appendix I: Acronyms and Abbreviations (continued)*

|             |                                                        |
|-------------|--------------------------------------------------------|
| U.S. EPA    | United States Environmental Protection Agency          |
| USC         | U.S. Code                                              |
| VOC         | Volatile Organic Compound                              |
| Water Board | San Francisco Bay Regional Water Quality Control Board |

## Appendix J: Responses to Comments on the Draft CIP

Comments from:

Jackie Lane, U.S. Environmental Protection Agency (U.S. EPA) Region 9, April 11, 2011

| Comment Number | Section/<br>Page                                                        | Comment                                                                                                                                                                                                                                                                        | Response                                                                                                                                                                                                                                                                                            |
|----------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.             | <b>Chapter 4, pg 40-41, Opportunities for Public Involvement at HPS</b> | The Navy may want to use "Available upon request" for informal review and "Formal Public Comment Needed" for required public comment documents.                                                                                                                                | The text has been revised to "Available upon request for public review and comment" and "Formal public review and comment required."                                                                                                                                                                |
| 2.             | <b>Chapter 4, pg 40-41, Opportunities for Public Involvement at HPS</b> | Delete reference to draft CIP and final CIP at the beginning of this section. The public will not get an opportunity to review the final CIP again and they have already reviewed the draft final.                                                                             | The two Community Involvement Plan (CIP) documents have been removed from the table and the schedule for other documents has been updated.                                                                                                                                                          |
| 3.             | <b>Chapter 4, pg 40-41, Opportunities for Public Involvement at HPS</b> | Delete the second "Removal" word in the title "Draft Action Memorandum – Shipshielding Time Critical Removal Action."                                                                                                                                                          | The text has been revised as requested.                                                                                                                                                                                                                                                             |
| 4.             | <b>Chapter 4, pg 40-41, Opportunities for Public Involvement at HPS</b> | Delete double entries of the draft and final document titles in the same section under "Removal Action Reports for Parcel E-2."                                                                                                                                                | The table was reviewed; however, no double entries were found. Several draft and final versions of the same document are listed, as is the case throughout this table.                                                                                                                              |
| 5.             | <b>Chapter 4, pg 40-41, Opportunities for Public Involvement at HPS</b> | You may want to add a glossary to this section so people will understand what the report means as it concerns the cleanup. For example, what is "Shipshielding?" The average citizen does not know most of the terms used or those expressed in the titles of these documents. | The table has been revised to include footnotes to define terms not commonly used and to refer readers to Appendix G for a glossary of the types of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) documents.                                                       |
| 6.             | <b>Chapter 5, pg 51 Cleanup Roles and Responsibilities</b>              | Paragraph 2, sentence 2: spell out CAC and PAC and what these groups do or support.<br>I could not find the contact reference for the groups in Appendix B as reference here.                                                                                                  | The acronyms Community Advisory Council (CAC) and Project Area Committee (PAC) are now spelled out and defined in Chapter 5. CAC and PAC are now listed in Appendix B, under Websites for Additional Information. In the table in Appendix B, a description of what these groups do has been added. |
| 7.             | <b>Appendix A</b>                                                       | Page A-1, move paragraph 4 to end of page A-2.                                                                                                                                                                                                                                 | The text has been revised as requested.                                                                                                                                                                                                                                                             |
| 8.             | <b>Appendix A</b>                                                       | "Dust Control at the Site" section: add a sentence that says why this action is important in protecting health                                                                                                                                                                 | A sentence has been added explaining why controlling dust is important for health. Text was also added to explain some of the actions the Navy implements to control dust.                                                                                                                          |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**Amy Brownell, P.E., on behalf of the City and County of San Francisco, and Lennar, April 11, 2011**

| Comment Number | Section/<br>Page                                                                       | Comment                                                                                                                                                                                                     | Response                                                                                                                                                                                                                                        |
|----------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.             | <b>General</b>                                                                         | When discussing the redevelopment, please change the references from City of San Francisco to “the San Francisco Redevelopment Agency” or “the San Francisco Redevelopment Agency or its successor agency”. | The text has been modified to “the San Francisco Redevelopment Agency” or SFRA where appropriate.                                                                                                                                               |
| 2.             | <b>Executive Summary, page 2, third paragraph, first sentence</b>                      | Please replace with “In addition, the San Francisco Redevelopment Agency, or its successor agency, is responsible for redeveloping HPS.”                                                                    | Redevelopment is not discussed in this section; therefore, the sentence was not replaced. The CIP has been reviewed and revised in all sections where redevelopment is discussed, to clarify that the SFRA is responsible for redeveloping HPS. |
| 3.             | <b>Executive Summary, page 2, fourth paragraph, last sentence:</b>                     | Please replace “the City” with “the San Francisco Redevelopment Agency”                                                                                                                                     | The text has been revised as requested.                                                                                                                                                                                                         |
| 4.             | <b>Chapter 3: Community Involvement-Actions and Activities, page 16, ninth bullet:</b> | Please reword first line to state “The Navy will designate a Navy contractor to be the Community Involvement Manager...”.                                                                                   | The text has been revised as requested.                                                                                                                                                                                                         |
| 5.             | <b>Chapter 3, Theme 1, bullet 7:</b>                                                   | “At meetings, an updated calendar of events and...”                                                                                                                                                         | The text has been revised as requested.                                                                                                                                                                                                         |
| 6.             | <b>Chapter 3, Community Involvement-Actions and Activities, page 18, Theme 4:</b>      | Please change title reference from “City of San Francisco Redevelopment” to “San Francisco Redevelopment Agency Redevelopment” and please change any references in text to correspond.                      | The text has been revised as requested.                                                                                                                                                                                                         |
| 7.             | <b>Chapter 4, Navy’s Cleanup Program, page 23, sixth paragraph:</b>                    | Please change references about Parcel A transfer and redevelopment from the City of San Francisco to the San Francisco Redevelopment Agency.                                                                | The text has been revised as requested.                                                                                                                                                                                                         |
| 8.             | <b>Chapter 4, Navy’s Cleanup Program, page 28, Shipyard Map:</b>                       | Please change legend for red-dashed line to “Former Parcel A, currently SFRA property”                                                                                                                      | The map has been revised as requested.                                                                                                                                                                                                          |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**Amy Brownell, P.E., on behalf of the City and County of San Francisco, and Lennar, April 11, 2011**

| Comment Number | Section/<br>Page                                                                                                                             | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Response                                                                                                                                                                                                   |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9.             | <b>Chapter 4, Navy's Cleanup Program, page 29, Parcel A table, next steps, 1st sentence:</b>                                                 | Please change to: "The San Francisco Redevelopment Agency is working with developers, selected by the SFRA, to build..."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | The text has been revised as requested.                                                                                                                                                                    |
| 10.            | <b>Chapter 4, Parcel G, Status of Cleanup, second sentence, page 37:</b>                                                                     | It currently reads "areas specified areas" – it should be "specified areas".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | The text has been revised as requested.                                                                                                                                                                    |
| 11.            | <b>Chapter 4, Opportunities for Public Involvement at HPS:</b>                                                                               | Shouldn't the Parcel B and Parcel G Findings of Suitability for Early Transfer and the FOSTs for other parcels be listed here?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Finding of Suitability to Transfer (FOST) and Finding of Suitability for Early Transfer (FOSET) are transfer documents rather than cleanup documents; therefore, they have not been added to the list.     |
| 12.            | <b>Chapter 5: Cleanup Roles and Responsibilities, page 47:</b>                                                                               | When referring to the transfer of land, please change all references when referring to transfer from the City of San Francisco to the San Francisco Redevelopment Agency or SFRA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | The text has been revised as requested.                                                                                                                                                                    |
| 13.            | <b>Chapter 5: Cleanup Roles and Responsibilities, Roles and Responsibilities of the City and County of San Francisco, starts on page 49:</b> | <p>You need to delete the second and third bullets in the blue box and all paragraphs except the last one which begins: "SFDPH is one..."</p> <p>You need to insert a new heading in front of this City and County of SF heading and titled it "Roles and Responsibilities of the San Francisco Redevelopment Agency or its successors" and then insert the second and third bullets from the blue box (i.e. becomes landowner... and is responsible for redevelopment). You also need to change the first two sentences to "The San Francisco Redevelopment Agency, or its successors, is primary responsible for redeveloping HPS. In 1997, after an extensive multi-year community planning effort, the SFRA adopted the Hunters Point Shipyard Redevelopment Plan." In the third paragraph, please change the references from the City to the SFRA. Delete the third paragraph from this section – it will be retained in CCSF roles – see Comment #13.</p> | The text has been revised as requested. The only exception is that the "or its successors" language was not include in the "Roles and Responsibilities of the San Francisco Redevelopment Agency" heading. |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**Amy Brownell, P.E., on behalf of the City and County of San Francisco, and Lennar, April 11, 2011**

| Comment Number | Section/<br>Page                                                               | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Response                                                                                |
|----------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 14.            | <b>Chapter 5: Cleanup Roles and Responsibilities, page 50:</b>                 | Please consider adding the following "The City has several mechanisms in place that will require anyone who disturbs soil or other ground cover at HPS to comply with requirements in the San Francisco Municipal Codes, specifically Health, Building and Public Works Codes. The City also will regulate the construction of new development through its Subdivision Code, which will require construction of public improvements in conjunction with subdivision of land for private development. The City and the San Francisco Redevelopment Agency have a formal process to confirm that the improvements were constructed as required by the permits. The City also has a process in its Building Code to confirm that structures are constructed to code. Permitted activities involving the disturbance of soil require the permit applicant to go through a special process set out under Article 31 of the Health Code. The Applicant is required to obtain approval of various plans under Article 31 from SFDPH to assure that environmental restrictions and conditions are appropriately taken into account during the permitted activities. Once the Applicant receives approval of the required plans and meets all other permit requirements the Applicant will receive approval for the building, grading or other permit and can begin grading or construction." | The text has been revised as requested.                                                 |
| 15.            | <b>Chapter 5: Cleanup Roles and Responsibilities, page 51, last paragraph:</b> | In last sentence, change "The City" to "The San Francisco Redevelopment Agency".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | The text has been revised as requested, using the acronym SFRA throughout the document. |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**Amy Brownell, P.E., on behalf of the City and County of San Francisco, and Lennar, April 11, 2011**

| Comment Number | Section/ Page                                                                    | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Response                                |
|----------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 16.            | <b>Appendix A: Health-Related Information, Resources, And Contacts:</b>          | Please include information on the SFDPH's work to assist the Bayview Hunters point neighborhood with health related prevention, treatment and education including reference to the following: Health Programs in Bayview Hunter's Point & Recommendations for Improving the Health of Bayview Hunter's Point Residents Mitchell H. Katz, MD, Director of Health, San Francisco Department of Public Health September 19, 2006<br>( <a href="http://www.sfdph.org/dph/files/reports/StudiesData/BayviewHlthRpt09192006.pdf">http://www.sfdph.org/dph/files/reports/StudiesData/BayviewHlthRpt09192006.pdf</a> ) | The text has been revised as requested. |
| 17.            | <b>Appendix B: Navy, Federal, State and Local Government Contacts, page B-3:</b> | Please add the San Francisco Department of Public Health, Hunters Point Shipyard Redevelopment website<br><a href="http://www.sfdph.org/dph/EH/HuntersPoint/">http://www.sfdph.org/dph/EH/HuntersPoint/</a><br>and the Citizens Advisory Committee; <a href="http://www.hpscac.com/">http://www.hpscac.com/</a>                                                                                                                                                                                                                                                                                                | The text has been revised as requested. |

Comments from:

**Michael F. McGowan, Ph.D, Arc Ecology, March 14, 2011**

| Comment Number | Section/ Page            | Comment                                                                                                                                                                | Response                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.             | <b>Executive Summary</b> | The Executive Summary starts right in with acronyms so please make them easier to find than in a distant Appendix. Perhaps right inside the front cover of the report? | Although most technical documents include an acronym list in the front, this document is designed to be more reader-friendly. The acronym list has been kept in the appendices with its own tab because it is easy to flip to in the hard copy and it is linked in the electronic file.<br><br>Acronyms are defined as they are used, so the reader will not have to refer to the acronym list for the definitions in the Executive Summary. |



## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**Michael F. McGowan, Ph.D, Arc Ecology, March 14, 2011**

| Comment Number | Section/<br>Page | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Response                                                                                                                                                                                                                                                                                                                 |
|----------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.             | General          | <ul style="list-style-type: none"> <li>This is a Community Involvement Plan, not a how-to on preparing a Community Development Plan. I recommend rearranging the sections so the plan's emphasis is on now and going forward, not so much demonstrating that the voice of the community has been heard in preparing the plan. The users of the plan are primarily going to want to know how to use it, secondarily how it came to be. Specifically: put Section 5.0 Cleanup Roles and Responsibilities right after the Introduction. Then put Section 4 on the cleanup program history and status, followed by Section 3 Community Involvement. After that can be the section documenting how the plan was arrived at and the References section and appendices. This arrangement is more logical because it introduces the plan and its purposes, it describes the process and regulatory responsibilities of the agencies, it describes the existing conditions that require a cleanup and community involvement, and then it presents the plan for give and take between the community and the Navy. Community members who wish to participate can then do so and can read the next section about how the plan was produced, if they want to, and can use the resources presented in the appendices. A statement about how thoroughly the community was involved in the preparation of the CIP is important to include, but it should not be the main focus of the CIP.</li> <li>The Executive Summary and Introduction should be edited to have a consistent arrangement of topics with the new arrangement of sections.</li> </ul> | The table of contents and outline for this document were developed in coordination with the U.S. Environmental Protection Agency (U.S. EPA) and are based on existing CIP examples provided by U.S. EPA. To avoid confusing the public by moving significant text in the final round, this request was not incorporated. |
| 3.             | Pie Charts       | Quantitative information should be displayed in bar charts or other ways but not pie charts in the view of experts on presenting data. Please use graphics other than pie charts wherever possible.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Most qualitative information has been revised to be presented in bar charts.                                                                                                                                                                                                                                             |
| 4.             | General          | Why does translating into Chinese equal translating into Cantonese and not Mandarin? Please provide a little explanation for this.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Based on information provided by the Chinese-American community, Cantonese is the primary Chinese dialect spoken in San Francisco. The Navy may provide other translations in the future if a specific need is identified.                                                                                               |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**Michael F. McGowan, Ph.D, Arc Ecology, March 14, 2011**

| Comment Number | Section/<br>Page                 | Comment                                                                                                                                                                                                                                                        | Response                                                                                                                                   |
|----------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 5.             | <b>Chapter 4 page 40</b>         | Two “time” per year should be “times” per year.                                                                                                                                                                                                                | The text has been revised as requested.                                                                                                    |
| 6.             | <b>Chapter 5 page 49</b>         | Change “DTSC that is” to “DTSC is”.                                                                                                                                                                                                                            | The text has been revised as requested.                                                                                                    |
| 7.             | <b>Chapter 5 page 49</b>         | Change “The City and County of San Francisco are” to “The city of San Francisco is”                                                                                                                                                                            | The text has been alternately revised to address City and County of San Francisco comments on the CIP.                                     |
| 8.             | <b>Chapter 5 pages 49 and 50</b> | Rearrange the paragraphs at the bottom of page 49 and the top of page 50 so they are in the logical order: 1. SFDPH is one... 2. Once a parcel meets... 3. The city of San Francisco... 4. According to the SFRA website (also change the W to w in “website”) | The text has been revised to address City and County of San Francisco comments on the CIP.                                                 |
| 9.             | <b>Appendix A page A-1</b>       | Change “See the following table...” and label the three separate kinds of content as Table A-1, Table A-2, and Table A-3. Change the one table to three with individual titles.                                                                                | The table has not been revised into three tables. It is relatively short, and to break it up would mean one table would have only one row. |
| 10.            | <b>Appendix A page A-1</b>       | Change “if air quality is recorded at above approved” to “if dust is detected above approved” or some other factually and grammatically correct statement.                                                                                                     | The text has been revised as requested.                                                                                                    |
| 11.            | <b>Appendix A page A-3</b>       | Explain here or previously why Cantonese translations and not Mandarin or other Chinese dialects. What is the basis for providing Spanish and Cantonese? Will the Navy provide other translations if requested?                                                | See response to comment number 4.                                                                                                          |
| 12.            | <b>Appendix A page A-4</b>       | Under Broader Health Concern for Bay Area Air Quality Management District insert, “Outdoor Air Quality”. The mandate of BAAQMD is outdoor air.                                                                                                                 | The text has been revised as requested.                                                                                                    |
| 13.            | <b>Appendix A page A-4</b>       | In the box for Federal Agencies Details include the 2008(?) review by ATSDR of the asbestos monitoring at the shipyard and Parcel A. There was a report, a workshop at the CAC, and a variety of correspondence.                                               | The text has been revised as requested.                                                                                                    |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**Michael F. McGowan, Ph.D, Arc Ecology, March 14, 2011**

| Comment Number | Section/ Page                             | Comment                                                                                                                                                                                                                                                               | Response                                                                                                                                                                                                                                           |
|----------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14.            | <b>Appendix A, pages A-4 and A-5</b>      | Federal and local agencies are included, but what about state agencies?                                                                                                                                                                                               | In general, the local agencies will provide more specific information than the state agencies. However, the document has been revised to include the California Department of Public Health, with a link to their San Francisco-specific programs. |
| 15.            | <b>Appendix B, page B-2</b>               | Change the street address of Arc Ecology to 1331 Evans Avenue. ZIP code remains 94124                                                                                                                                                                                 | The text has been revised as requested.                                                                                                                                                                                                            |
| 16.            | <b>Appendix B, page B-2</b>               | The email address for James Haas is not clear. Is there an underline between his first and last names, or?                                                                                                                                                            | An underscore is present between his first and last names. The text was revised to include a bolded underscore in his email address for clarity.                                                                                                   |
| 17.            | <b>Appendix B, page B-3</b>               | The website for U.S. EPA is formatted differently from all the rest                                                                                                                                                                                                   | The text has been revised to include a hyperlink, which also formats the website consistently.                                                                                                                                                     |
| 18.            | <b>Appendix C, page C-14</b>              | In the Use Radio box the entry should be edited to show that the University of California radio station is kalx, not Calx, Stanford's radio station is kzsx, and I don't think Lawrence Livermore Lab has a broadcast radio station. Please correct this information. | The text has been revised as requested, with radio station call letters capitalized.                                                                                                                                                               |
| 19.            | <b>Appendix C, page C-15</b>              | Do Navy rules prohibit food or beverages or just paying to have them at the meeting? Please clarify.                                                                                                                                                                  | The text has been revised to clarify the prohibition on using taxpayer funds to provide food and beverages during meetings.                                                                                                                        |
| 20.            | <b>Appendix C, page C-15</b>              | Please change the spelling "faire" to "fair" throughout the document.                                                                                                                                                                                                 | The text has been revised as requested.                                                                                                                                                                                                            |
| 21.            | <b>Appendix D, page D-2</b>               | Please change the format of the data in the table to 1 decimal place for all entries to facilitate comparisons.                                                                                                                                                       | The text has been revised as requested.                                                                                                                                                                                                            |
| 22.            | <b>Appendix D, page D-3, D-4, and D-6</b> | One decimal place in all data, please.                                                                                                                                                                                                                                | The text has been revised as requested.                                                                                                                                                                                                            |
| 23.            | <b>Appendix E, page E-1</b>               | Data "were", not "was".                                                                                                                                                                                                                                               | The text was revised as appropriate.                                                                                                                                                                                                               |
| 24.            | <b>Appendix E, page E-8</b>               | The 3-D bars do not help view the data and obscure the numbers above the bars. Please use 2-D bars for clarity.                                                                                                                                                       | Graph 6 has been revised as requested.                                                                                                                                                                                                             |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**Michael F. McGowan, Ph.D, Arc Ecology, March 14, 2011**

| Comment Number | Section/ Page                | Comment                                                                                                                                            | Response                                |
|----------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 25.            | <b>Appendix H, page H-3</b>  | Please include information for Arc Ecology in this table. Contact Saul Bloom about Arc's ability to host a meeting and other entries in the table. | The text has been revised as requested. |
| 26.            | <b>Appendix H, pages H-3</b> | Clarify "Attend Its Meeting" in column heading. Does this mean "Navy willing to Attend Organization's Meeting"?                                    | The text has been revised as requested. |

Comments from:

**Marlene Tran, spokesperson for Visitacion Valley Asian Alliance, during HPS Community Meeting, March 23, 2011**

| Comment Number | Section/ Page                                         | Comment                                                                                                                                                                                                                                                      | Response                                                                                                                                                                                                                |
|----------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.             | <b>Proposed Outreach: Dedicated Call-in line</b>      | For those who speak Cantonese, Spanish, or other languages, please have a dedicated phone number someone can call, get cleanup updates in their language and leave a message. This option is especially important for those people who lack internet access. | A dedicated call-in line has been added to the list of planned activities.                                                                                                                                              |
| 2.             | <b>Pie Charts</b>                                     | In the Draft CIP, the legends on the pie charts are too small. Please enlarge them so they can be read more easily.                                                                                                                                          | The charts have been modified as requested.                                                                                                                                                                             |
| 3.             | <b>Proposed Outreach: Translated materials</b>        | Make sure there is transparency in the Navy's program by sending translated information to the ethnic media.                                                                                                                                                 | The CIP includes sending translated materials to ethnic media. Chapter 3 was revised to include radio show presentations and call-in shows and other information that will be provided to the media in other languages. |
| 4.             | <b>Section 5.0 Cleanup Roles and Responsibilities</b> | The community needs clearer definitions of the roles of each party (Navy, regulatory agencies, city, Redevelopment agency). It's very unclear who is involved in the cleanup and what their role is.                                                         | Please refer to Chapter 5 of the CIP, which has been updated to clarify the roles of all the responsible parties.                                                                                                       |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

Jaron Browne, community member, during HPS Community Meeting, March 23, 2011

| Comment Number | Section/<br>Page                                    | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.             | <b>Proposed Outreach:<br/>Two-way communication</b> | <p>The Navy should have an elected body that provides input &amp; two-way communication. All the CIP activities are one-way communication.</p> <p>RAB was a body that was recorded &amp; could make recommendations, that is missing from the plan for new activities.</p> <p>The fundamental concern that POWER has with the CIP is that all of the action and activities are geared toward one-way communication from the Navy to community. The CIP lacks formal mechanisms for the community opinions and concerns to be recorded. The CIP absolutely must include a democratically elected community body that can vote and make formal decisions. Even if this body does not have power over the Navy's decisions – it would make a record of the community's democratic decision.</p> | <p>The need for a Restoration Advisory Board (RAB) or another such elected body will be reevaluated at least every 2 years.</p> <p>The current plan includes activities for two-way communication, such as:</p> <ul style="list-style-type: none"> <li>• Community meetings with question and answer (Q&amp;A) and break-out sessions</li> <li>• Radio call-in shows</li> <li>• Bus tours</li> <li>• Dedicated call-in line</li> <li>• Presentations at established group meetings</li> <li>• Use of a Community Involvement Manager</li> </ul> <p>In addition, community opinions and concerns are recorded by:</p> <ul style="list-style-type: none"> <li>• Writing community comments at meetings and reading them aloud to the group</li> <li>• Providing meeting summaries on the website</li> <li>• Saving radio shows as podcasts</li> <li>• Issuing formal responses to comments on documents</li> </ul> |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**Mishwa Lee, community member, during HPS Community Meeting, March 23, 2011**

| Comment Number | Section/ Page                                                     | Comment                                                                                                                                                                     | Response                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.             | <b>Proposed Outreach: Meeting with local groups/organizations</b> | Instead of community coming to you, go to them. Meet with their church groups, etc.<br>Find out what they know already, and then give them more information.                | The CIP includes plans for meeting with several community groups during the group's regular meetings (see Chapter 3). In addition, see the updated list of recent outreach activities in Appendix F.                                                                                                                                                                                                                           |
| 2.             | <b>Dissolution of the RAB</b>                                     | Does the Navy have the legal right to dissolve the RAB Board? Why is the Navy trying to appear to involve the community, when the Navy didn't abide by the community input? | Yes, the Navy has the legal right to dissolve the RAB. Please see Chapter 1 and Appendix E for more explanation on that process. The Navy strictly followed standing requirements in the <i>Restoration Advisory Board Rule Handbook</i> . Just because the Navy does not fully incorporate community input that does not mean the requirement for community acceptance is being ignored. Please see Chapter 1 and Appendix E. |

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/ Page            | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                   | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.             | <b>Generalized Theme</b> | <ul style="list-style-type: none"> <li>a) The dissolution of the RAB is driving the update of the CIP.</li> <li>b) There is an underlying unstated but nevertheless clear theme that the Navy is disinclined to undertake a new Restoration Advisory Board (RAB) process;</li> <li>c) The CIP is an attempt to reorganize public participation in the cleanup process to accommodate its disinclination to undertake a new RAB</li> </ul> | <ul style="list-style-type: none"> <li>a) The CIP was last updated in 2004; therefore, it was due for an update regardless of the dissolution of the RAB. It is accurate to state a new plan for the community involvement program was required; therefore, the CIP was updated.</li> <li>b) Based on feedback received in the 73 interviews, a RAB was not identified as the type of outreach that meets the needs of the community. The RAB was no longer serving its purpose, as detailed in Appendix E. This CIP outlines new and different activities designed to better reach the greater community and meet the needs identified in the CIP interviews.</li> <li>c) The CIP is designed to create an involvement program that uses more diverse involvement activities, per the needs of the community identified during the community interviews.</li> </ul> |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/<br>Page         | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.             | <b>Generalized Theme</b> | <p>By seeking to avoid creating another RAB the Navy has made decisions that could negatively impact meaningful public participation in the Navy Hunters Point Shipyard remedial program.</p> <ol style="list-style-type: none"> <li>1. The CIP has redefined community involvement as information, outreach, and education;</li> <li>2. The CIP fails to grasp important community involvement issues. Substituting outreach and education for engagement is the wrong strategy;</li> <li>3. The CIP has deemphasized dialogue and the creation of a process for developing an ongoing informed community analysis of the process of cleanup.</li> </ol> | <p>The CIP uses information gathered from the Hunters Point Shipyard (HPS) community to design a program that, in addition to meeting regulatory requirements for public involvement, meets the needs of the various sectors of the community through varied means of communication.</p> <ol style="list-style-type: none"> <li>1. Community involvement has not been redefined as only information, outreach, and education. Throughout the CIP, the desire to engage and involve the community in the cleanup process is described.</li> <li>2. For the community to provide input on the proposed cleanup actions during the formal public comment periods, it is necessary to provide opportunities to solicit input and to educate the HPS community. Activities in the CIP are designed to engage the HPS community in the cleanup process in ways community members have expressed are most suitable.</li> <li>3. The Navy has increased the variety of activities in the CIP allowing for dialogue/two-way communication, including: <ul style="list-style-type: none"> <li>• participating in multi-lingual radio call-in shows</li> <li>• holding community meetings that include formal question and answer sessions in addition to smaller break-out sessions where community members can talk one on one with the Navy and regulatory agencies' representatives</li> <li>• scheduling bus tours</li> <li>• giving presentations at established group meetings</li> <li>• using a local Community Involvement Manager</li> <li>• maintaining a multi-lingual hotline where people can leave messages and have the call returned.</li> </ul> </li> </ol> |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/ Page            | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.             | <b>Generalized Theme</b> | <p>The text of the CIP demonstrates an ongoing resistance to seat this program in the context of its regulatory requirements and guidance directions.</p> <ol style="list-style-type: none"> <li>1. In a number of the comments to follow we will raise ongoing concern with regard to the clear avoidance by the authors of the CIP to acknowledge or quote from regulatory requirement and guidance directions governing public participation;</li> <li>2. Furthermore the CIP has failed to list or otherwise acknowledge several guidances, orders, and an expression of community preference that would replace the general sense of the Navy's conferring of opportunity with meeting legal requirements.</li> </ol> | <ol style="list-style-type: none"> <li>1. The CIP has been modified to clearly identify the community involvement activities and opportunities for public comment that are specifically required per the National Contingency Plan (NCP). The CIP is intended to provide opportunities for public involvement above and beyond the required activities conducted at the project-level as part of the CERCLA process.</li> <li>2. Appendix G provides a list of the guidance documents pertaining to community involvement. An excerpt from the NCP explaining the regulatory requirements for community participation has been added to Appendix G.</li> </ol> |
| 4.             | <b>Chapter 1</b>         | <p>The first paragraph of Chapter 1 makes it appear as though the Navy and U.S. EPA were acknowledging conceptual rights and therefore conferring an opportunity to the public to participate. Public engagement is a regulatory responsibility not a conferred opportunity. The CIP should acknowledge the Navy's regulatory requirement to seek public engagement up front in the introduction.</p>                                                                                                                                                                                                                                                                                                                      | <p>The introductory paragraph is a positive statement describing the right of the community to be involved and the value of involvement. In addition, this is standard language found in other U.S. EPA-led Community Involvement documents, such as the Iron King Mine CIP. It has now been noted in Chapter 1 that there are regulatory requirements for public participation. In addition, an excerpt from the NCP explaining the regulatory requirements for community participation has been added to Appendix G.</p>                                                                                                                                     |
| 5.             | <b>Chapter 1</b>         | <p>Chapter 1 reference to Appendix G Regulations and Guidance appears as six words in its final paragraph which presents a guide to the entire document. The contents of Appendix G are mentioned without listing its letter designation or explaining the importance to understanding how public participation is governed. Appendix G is located in a part of the document members of the public might not read if its importance is not underscored in the introduction.</p>                                                                                                                                                                                                                                            | <p>The final paragraph of Chapter 1 has been expanded to include a more detailed description of all appendices, including Appendix G. In addition, an excerpt from the NCP explaining the regulatory requirements for community participation has been added to Appendix G.</p>                                                                                                                                                                                                                                                                                                                                                                                |



## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/<br>Page | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.             | <b>Chapter 1</b> | Given that the focus of the CIP is public participation, it would be appropriate for some of the space in Chapter 1 to be devoted to a discussion of the regulatory requirements and departmental guidances for public participation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | See response to comment 3. The last paragraph of Chapter 1 has been updated to include a more thorough description of what is included in each appendix, including Appendix G. In addition, an excerpt from the NCP explaining the regulatory requirements for community participation has been added to Appendix G.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 7.             | <b>Chapter 2</b> | Chapter 2 "Community Interviews and Feedback" provides useful information and is well organized however: <ul style="list-style-type: none"> <li>a) the resistance to specifying regulatory and guidance requirements within the text of the CIP analysis calls into question whether the information being fed back within the CIP was subjected to an institutional bias;</li> <li>b) the failure to provide a statistical analysis of interviewee feedback on each of the survey questions reinforces the concern about institutional bias when reviewing the summary of respondent themes;</li> <li>c) the underlying resistance to creating another RAB further undermines confidence in the interpretation of respondent data.</li> </ul> | <ul style="list-style-type: none"> <li>a) The purpose of Chapter 2 is to summarize the community interview purpose, process, and feedback. In addition, an excerpt from the NCP explaining the regulatory requirements for community participation has been added to Appendix G.</li> <li>b) Interviews were planned and conducted using the U.S. EPA's <i>Superfund Community Involvement Handbook</i> as guidance, referenced in Chapter 6. Interviews were not conducted with the intent of producing a statistical survey evaluation. Questions were open-ended and interviews were conversational to promote open communication, resulting in qualitative responses. A strictly statistical analysis of the feedback is not possible. Responses were quantified where possible, and themes in the feedback were identified after all of the responses were gathered.</li> <li>c) Please see response to comment number 1.</li> </ul> |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/<br>Page | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.             | <b>Chapter 2</b> | <p>The CIP fails to acknowledge the National Contingency Plan and the invocation of its Community Acceptance Criteria. The Navy summarizes its understanding of the cleanup objectives of the community in paragraph 5 of Page 7 in Chapter 2 as follows:</p> <p><i>“The community wants the cleanup to be completed in a way that protects the current community and all future users and neighbors of HPS. The Navy and regulators share this goal with the community and are committed to involving the community in the cleanup process.”</i></p> <p>While we appreciate this expression of the Navy's understanding, the community adopted a clear Community Acceptance Criteria for cleanup with the passage of Proposition P in 2000. Proposition P sought to establish the National Contingency Plan's (NCP) 9<sup>th</sup> Criterion on Community Acceptance. The NCP establishes nine criterions for a cleanup program. 87% of the electorate in San Francisco and 93% in the greater Bayview Hunters Point community voted for this criterion. While the 9<sup>th</sup> criterion is modifying and not mandatory, the criterion has nevertheless been established and the Navy must acknowledge its existence. There is no exemption within the NCP enabling an agency to simply ignore an NCP criterion or the existing establishment of a Community Acceptance criterion. This comment is related to the concern expressed in Comment III. The Navy should make specific reference to Proposition P here.</p> | <p>The NCP requirements have been added to Appendix G. The ninth NCP criterion is community acceptance of a specific remedy during the Proposed Plan.</p> <p>Chapter 2 of the CIP states a general understanding that all community members want a cleanup that protects the current community and future users of the site, regardless of providing specific comments on a remedy.</p> <p>Proposition P is better categorized as a recommendation on what level voters want HPS cleaned to. The Navy's cleanup is directly tied to the San Francisco Redevelopment Agency's redevelopment plan. The cleanup recommendation in Proposition P does not match the SFRA redevelopment plan.</p> <p>Though the Navy does not always follow all recommendations from the community that does not mean the requirement for community acceptance is being ignored. The Navy will continue to adhere to the NCP requirements to solicit public comment on each proposed plan for HPS.</p> |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/<br>Page | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9.             | Chapter 2        | <p>The Navy's resistance to the establishment of a new RAB has implications for the response reported in the portion of the respondent theme table presented on Page 12 as Public Meetings:</p> <p>Pro "<i>Many people are informed at once.</i>" &amp; Cons.... "<i>Many members of the community feel intimidated at a large, centralized meeting. It was stated that it is difficult to have individual questions addressed; there is no single venue where everyone in the community feels comfortable.</i>"</p> <p>Under existing regulation and guidance RABs and or other committees and meetings are one of many methods to be used when reaching out to a community. The above argument was incorporated into the Navy letters and memos discussing its rationale for disbanding the RAB and its appearance here seems to reinforce the impression that the Navy continues to be unwilling to consider creating a new RAB. The bias in this response is further emphasized by the fact that these conclusions are not fully representative of the range of results available through a meeting oriented process and specifically a RAB. The fact that such processes and bodies can result in the development of a group of community representatives conversant in the issues associated with the Shipyard's cleanup and capable of providing the Navy with useful guidance based upon knowledge and experience is completely ignored.</p> | <p>The column header for the last column of the table has been adjusted to read "Pros and Cons Noted by Interviewees." The pros and cons listed for each of the nine historical outreach methods were identified by the community during the interviews, not by the Navy. The Navy does not feel the response is biased.</p> <p>The Navy letters and memoranda included in Appendix E were written prior to and separately from this draft CIP. The Navy does not feel it was biased. The Navy is required to reevaluate the need for a RAB every 2 years, and will continue to do so.</p> |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/<br>Page              | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| 10.            | <b>Chapter 2,<br/>page 11</b> | <p>The table on Page 11 presents themes raised and by how many interviewees however there are problems with the presentation.</p> <p>a. It does not correspond to the questions asked in the survey which leads to questions with regard to how the responses were interpreted and presented by the Navy;</p> <p>b. The lack of correspondence of the findings presented in the Table to the actual questions presented in the survey creates questions about how the survey data is being interpreted;</p> <p>c. For example there was no question on the Navy's survey form regarding whether an interviewee had an opinion on the status of the RAB, nevertheless the table on Page 11 indicates that less than 5 individuals raised the lack of a RAB as a concern. Table gives the appearance that the RAB issue was surveyed. The problem the table creates is that we can't tell whether the size of the response is a function of a lack of interest or lack of a question in the survey;</p> <p>It would have been more useful for the Navy to have been presented with a matrix providing a summary and numerical scoring of the community responses to the specific survey questions. This way it would have been easier to know how many respondents felt a particular way about the issue raised and there would be less question about the potential for Navy bias in interpreting the data.</p> | <p>As noted in the response to comment number 7, the interview format included many open ended questions. Responses in the table on page 11 were in response to the open-ended question: <i>Do you have any interests or concerns regarding the base and the cleanup program? If yes, what are they?</i></p> <p>This question offered the interviewees an opportunity to raise any concern or interest they have, not to review a list that the Navy would have had to develop.</p> <p>The introductory sentence to the table on page 11 has been revised to read: <i>Interviewees were asked an open-ended question about whether they have concerns or interests related to the base and the cleanup program, and what all of their concerns and interests might be.</i></p> <p>After feedback was received, it was reviewed for themes developed after feedback was received.</p> |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/<br>Page                                                              | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| 11.            | <b>Chapter 3<br/>Community<br/>Involvement<br/>Actions and<br/>Activities</b> | Chapter 3 Community Involvement Actions and Activities is the portion of the CIP wherein the Navy changes the emphasis of past CIPs from public participation and engagement to information, outreach and education. While we have no objection to the activities discussed, it is the overall effect that we are concerned about. It is our view that the proposed plan substitutes superficial involvement to the type of detailed engagement consistent with CIPs including RAB and other committees wherein the focus is developing a group of advisors capable of contextualizing their reviews based on prior experience and providing the Navy with informed opinions with regard to the management of the IR program. | <p>Engage is a synonym for involve. The activities outlined in the draft CIP are designed to get information to the broader community and involve them in the cleanup. Feedback received during interviews is that many people are lacking basic information about the cleanup. The Navy seeks to inform and educate the community about the cleanup in order to involve and engage the community in discussions about cleanup decisions during formal public comments periods as well as during informal community involvement activities.</p> <p>No single activity fits the needs of all HPS community members. The plan has included activities for those who want minor updates all the way to those who wish to read and comment on technical documents and contact the Navy or regulatory agencies directly.</p> <p>In the past, the reach of the RAB was relatively narrow, and it was the primary means of involvement. By relying heavily on the RAB as the primary means of involvement, the Navy was unable to engage members of the community who were unable to attend regular meetings, or who had a negative experience at the RAB and were unwilling to attend another meeting. The new plan offers numerous and diverse ways of involving the public, including the use of radio and newspapers as well as other media. Holding regular meetings continues to be an activity in the CIP.</p> |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/<br>Page                           | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| 12.            | <b>Chapter 3<br/>Opening<br/>Statement</b> | <p>The reference to Fort Ord and McClellan Air Force Base emphasizes that the overriding theme of the new CIP is life without a RAB. Both Fort Ord and McClellan Air Force Base had RABs that were shuttered after the local Base commander determined that the committees were no longer meeting their objectives. Both Fort Ord and McClellan's RAB dissolutions were subject to extended litigation. In the case of Fort Ord, the litigation there led directly to the promulgation of the RAB rule of 2007. In the case of McClellan Air Force base the concerns that drove the disagreement – that the site was more radiologically contaminated than the Air Force was willing to admit – was later verified by subsequent remedial research. In both instances the RABs became fractious however records show that the dysfunctionality of both RABs were as much the responsibility of the local base and environmental commands and regulators as they were RAB members. Many members of the respective communities were unhappy with the disbanding of the RABs and the replacement CIPs. As such reference herein is discomforting. Community engagement at both sites has been dramatically curtailed and the benefit to the ongoing cleanup is debatable. Iron Mountain on the other hand is a private site on the NPL in Arizona. There is no military involvement. Nor are there any BRAC conditions on the Site. The analogy to the Hunters Point Shipyard therefore may be more tenuous than not and more likely close to a brownfield. As to public participation specifically, there is a community coalition playing a prominent role in providing feedback to the U.S. EPA, this model is not likely to be applicable to the greater Bayview Community owing to the wide diversity of opinion here.</p> | <p>The CIPs for Fort Ord and McClellan Air Force Base were reviewed as resources because they are both sites in California that are on the National Priorities List, and because these sites do not have a RAB. It is noted that the Navy's plan in this CIP is not a copy of any other outreach program, but was designed to meet the needs of the HPS community.</p> <p>The Iron King Mine CIP was provided by U.S. EPA as an example of a CIP with a format that is user-friendly and a model for other plans. There was no intention to draw a parallel between the cleanup programs at Iron King Mine and HPS.</p> <p>The text in the second sentence has been modified to remove any implication that the Iron King Mine site is in California.</p> |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/ Page    | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| 13.            | <b>Chapter 3</b> | Theme Two – Hold Regularly Scheduled Meetings. We question whether having the bi-monthly meetings without a commitment to the close coordination involved in a RAB or RAB like entity will result in a different outcome than was the case with the previous RAB. It seems more likely that without addressing the causes of the dysfunctionality experienced with the prior RAB the Navy process will be unsuccessful. We also wonder whether bi-monthly meetings are insufficient to keep up with the schedule presented in the CIP. | Although the CIP identifies bi-monthly meetings, the Navy is currently holding monthly or even twice monthly meetings to reach different segments of the community. The CIP has been revised to acknowledge that the Navy may hold meetings more frequently when appropriate. Various meeting formats are being used to foster more participation and engagement, including sending agendas ahead of time, having small break-out sessions for people to speak directly with the Navy and regulatory agencies, and holding meetings in various locations and on different days and times.                                                                                                                                                                                            |
| 14.            | <b>Chapter 4</b> | Chapter 4, The Navy's Cleanup Program at the Hunters Point Shipyard provides a useful and excellent summary of the Shipyard program, however: it is not relevant within the context of a description of a community involvement plan. The material presented in Chapter 4 should have been placed in an Appendix, and the space devoted to a greater explanation of the regulatory requirements of the Navy CIP.                                                                                                                       | The CIP was prepared using guidance from U.S. EPA's Superfund Community Involvement Handbook, and with collaboration from U.S. EPA.<br><br>Based on feedback gathered in the interviews, the community requested more general information about the Navy's cleanup program. Placing the site cleanup summary in the main text of the CIP provides the reader with the context for the community involvement activities described in the CIP.<br><br>Additional feedback gathered in the interviews indicated a need for more information about the roles and responsibilities of the regulatory agencies, along with the Navy and other entities involved in the cleanup. Information to address this concern has also been included in the main text of the document, in Chapter 5. |
| 15.            | <b>Chapter 4</b> | Ordinarily we would be very appreciative of such a well thought out and clear summary of the Navy's cleanup activities. We were particularly pleased to see the schedule of documents, however this is not a document focused on the cleanup itself but rather how the Navy will engage the public in cleanup decision making.                                                                                                                                                                                                         | The CIP was prepared using guidance from U.S. EPA's Superfund Community Involvement Handbook and with collaboration from U.S. EPA. It is a standard format for a CIP to present an overview of the installation and information about the status of the cleanup. Chapter 4 may educate readers who are not inclined to read more technical documents, and it also provides context for the types of cleanup projects about which they may review and submit comments.                                                                                                                                                                                                                                                                                                                |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/<br>Page              | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| 16.            | <b>Chapter 4,<br/>Page 23</b> | The historical presentation presented on Page 23 is also interesting although highly abbreviated and of questionable utility. It would have been more useful, if the Navy was of a mind to present a relevant history, it could have provided an overview of the evolution of public participation in cleanup decision making and the crafting of the Navy CIP process. These points would include a review of the public participation components of regulations including NEPA, the NCP, 1986 SARA, as well as a summary of the key point from the Federal Facilities Environmental Dialogue Committee report, a review of the Clinton/ Perry Executive Order on RABs and the Clinton Executive Order on Environmental Justice, the Bush Administration RAB rule and other related issues. | The CIP is not intended to be a primer about regulations and guidance pertaining to public involvement. This document is specific to HPS, and as such provides basic information about the shipyard, including a general timeline. Please see the response to comment number 3.                                                                                                                                                                                                                                                                                      |
| 17.            | <b>Chapter 4</b>              | As indicated above, we appreciate the presentation of the document schedule, however the table includes references <u>to informal and formal comment periods without defining the difference between the two</u> . This distinction is of the utmost importance and represents a significant failing in the goal of the CIP to inform the public. <u>The formal comment periods associated with the Proposed Plans are the only time during the CERCLA review process when the Administrative Record is open to public comment because an action is being contemplated. As such not providing a description of the difference and its import anywhere in this document represents a significant omission.</u>                                                                                | An introduction has been added to the table to explain the difference between the informal and formal comment periods. In addition, Appendix G has been revised to highlight in red the opportunities for required public comment on page G3 and G4 and in the CERCLA graphic on page G-5.<br><br>Please note that one distinction between the NCP requirements and the Department of Defense (DoD) Installation Restoration program is that the DoD provides significant additional opportunities for formal comment, which are added to the administrative record. |



## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/ Page     | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| 18.            | <b>Chapter 5</b>  | <p>Chapter 5 Cleanup Roles and Responsibilities/ Responsibilities of the City and County of San Francisco fails to cite existing critical agreements between the City and the Navy;</p> <p>The City's capacity to accept Navy property for transfer is conditioned upon the meeting of the criteria agreed upon within the Conveyance Agreement of 2004. A clear City role in this process is determining whether Conveyance Agreement criteria have been met. This agreement is not cited.</p> <p>Proposition P is City policy and cited within the Conveyance Agreement, yet it is also not cited in the CIP. It is also the 9th criteria for cleanup established by the citizens of San Francisco in accordance with the National Contingency Plan which governs the Shipyard cleanup. While the 9th criterion of the NCP is a modifying criterion the Navy nevertheless must address conformance with Prop P when finalizing a cleanup plan.</p> | <p>The nine evaluation criteria listed in the NCP, 40 Code of Federal Regulations (CFR) 300.430(e)(9)(iii) are used to evaluate cleanup alternatives for a given site or project. Community acceptance is the ninth criterion and is gauged based on community comments provided on the Proposed Plan document. The Navy is required to provide the Proposed Plan and a minimum 30-day public comment period and address public comments in the Record of Decision. The Navy will continue to meet these requirements.</p> <p>The text in Chapter 5 has been modified to cite the 2004 conveyance agreement between the Navy and SFRA. The Navy will meet those conveyance agreements.</p> <p>However, Proposition P is not the guiding authority for the Navy's cleanup. Proposition P is a recommendation to the Navy to clean up to certain standards, but is not enforceable policy.</p> <p>In 2011, the SFRA issued new redevelopment plan. This document helps guides the Navy on the cleanup levels based on future reuse.</p> |
| 19.            | <b>Appendix C</b> | <p>This Appendix is somewhat confusing. On Page C2 the graphic pie chart caption states that the Navy team conducted 73 interviews and that these many of those interviewed had multiple affiliations which is why the list beginning on Page C3 had 151 affiliations listed. It is unclear however whether individuals with multiple affiliations are representative of the views of each of the organizations they belong to. As such the value of presenting the list is unclear. Is the list intended to show organizational interest or the potential for information resonance in the community? The use of the list is therefore troubling because the CIP does nothing to document either interest or resonance. This being the case it raises we believe a justifiable concern that the list merely serves to inflate the reach of the survey.</p>                                                                                          | <p>Individuals self-identified the organizations they belong to and were asked if the document could note that they were interviewed as a member of that organization before the organization's name was included in the document. Interviewees were not asked to state that they represent the views and opinions of any group in any formal manner. In addition, responses are kept separate from interviewees' names.</p> <p>The goal was to talk with a wide variety of individuals who have varied experiences, interests, and needs. The listing of organizations is an indication of the wide variety of people interviewed.</p>                                                                                                                                                                                                                                                                                                                                                                                               |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/ Page     | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| 20.            | <b>Appendix C</b> | <p>If affiliation was a driver in the selection of individuals surveyed we are curious about the selection of entities interviewed. Of the 151 affiliations listed, perhaps as many as 58% would appear to be organizationally disinterested in the details or issues associated with the Shipyard's cleanup. With no disrespect intended the interest of The National Rifle Association, the Good Samaritan Family Resource Center, and Friends of McClaren Park in the subject is unclear as is the interest of 84 other organizations of the 151 entities listed. Of the remaining 42% of organizations and entities it seems likely that no more than perhaps half have had any experience with the HPS cleanup. Including duplicated affiliations by different names (Arc Ecology and Community Window for example), 26% or just 40 entities might possess more than a cursory opinion about the cleanup sufficient to provide an informed view of the engagement process.</p> <p>While we recognize that such external views are very useful, we frankly question the balance because of its potential for view shopping. In the past, instances of view shopping lead the Navy to the mistaken notion that residents of Bayview Hunters Point would accept the lowest standard of cleanup if it would hasten the creation of jobs. This view was shown to be in error when 93% of the voting residents of the district voted for Proposition P.</p> | <p>As noted above, people self-identified the groups they belong to. Often, individuals were asked for an interview because of one or two of their affiliations, and then during the interview they identified additional affiliations they wished to have included on the list.</p> <p>The purpose of interviews was not just to talk to people who have already had experience with the HPS cleanup, but also to reach local community members and groups who may want information and were underserved in the past.</p> <p>The list of potential interviewees was reviewed by the regulatory agencies. According to the U.S. EPA Superfund Community Involvement Handbook, listed as a reference in Chapter 6, most CIPs rely on 15 to 25 interviews. The 2004 HPS CIP included 40 interviews, and this CIP includes 73 interviews. The interviews for this document represent a diverse sampling and an enormous effort. The Navy believes it far exceeded previous efforts on this base and other bases in which to form a richer more complete picture of the HPS community.</p> |
| 21.            | <b>Appendix D</b> | <p>Appendix D reinforces the concerns expressed in VII by clearly demonstrating why Bayview Hunters Point is an environmental justice community but never referring to it as such,</p> <p>1. Neither the phrase nor reference to the Executive Order on Environmental Justice appears in the text of the CIP; 2. The failure to include reference to EJ guidances calls into question whether the Navy intends to incorporate this concern into its deliberations over cleanup and public participation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>A description of environmental justice (EJ) has been added to the introduction.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/ Page     | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| 22.            | <b>Appendix E</b> | This Appendix recounts the reasons why the RAB was discontinued. While it was the opinion of the author of this memo that the RAB Guidance gave the Navy sufficient authority to dissolve the HPS RAB, it was nevertheless difficult to observe so little self examination on the part of the Navy for its role in creating the situation.                                                                                                                                                                                                                                                                                                     | The Navy is focused on the current cleanup and creating an inclusive ongoing community involvement program moving forward.<br><br>The Navy continues to believe the arguments for dissolving the RAB are appropriately captured in the letter of December 23, 2011, in Appendix E.                                                                                                                                                                                                                                                                                                                        |
| 23.            | <b>Appendix E</b> | The issues of employment, mistrust, insulting and raucous behavior, and the inability of contractors and Navy personnel to complete entire presentations have been part and parcel of the culture of this body since it was created. Misbehavior was endemic to this RAB from the very beginning and frequently encouraged by Navy personnel and contractors. If the minutes of the HPS RAB beginning in 1994 were scrutinized against the criteria utilized for its dissolution in 2009, the RAB would have been disestablished in 1995. In truth, the RAB has only had brief periods of geniality breaking up its overall fractious history. | The Navy seeks to have a community involvement program moving forward that allows for the two-way exchange of information in a manner that is safe, welcoming, and inclusive of the diverse HPS community.<br><br>The Navy disagrees that misbehavior at RAB meetings was ever encouraged by Navy personnel or contractors. The Navy also believes that the level of discord and ineffectiveness of the RAB did vary from year to year; however, what is important is that the end-state of the RAB in the 2008/2009 time period was, despite Navy efforts, an ineffective community involvement vehicle. |
| 24.            | <b>Appendix E</b> | The reason for this situation was insufficient up front training of RAB members starting in 1994. It was unrealistic on the part of the Navy to presume that individuals residing in a community with long term socio economic, environmental and equality disadvantages to immediately give over their trust to an entity whose actions in 1974 helped drive the community into poverty.                                                                                                                                                                                                                                                      | The Navy disagrees with the assumptions listed in this comment regarding reasons that the RAB was ineffective. The Navy has never stated that a goal of the RAB is for community members to "give over their trust" to the Navy.                                                                                                                                                                                                                                                                                                                                                                          |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/ Page     | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| 25.            | <b>Appendix E</b> | Another contributing factor was that the Navy failed to take advantage of City-based efforts to assist the RAB's management. In 1995, the Hunters Point Shipyard Citizens Advisory Committee created its Environment and Reuse Subcommittee to address matters the Navy considered outside of the scope of the HPS RAB. These issues include questions regarding cleanup employment and contracting and non CERCLA environmental concerns. The Navy BEC at the time, Michael McClellan, and the Western Division Commander were informed that the Subcommittee was being created to in part take the pressure off the RAB by providing an alternative forum for these views. The Navy was invited to participate. Had the Navy partnered with the Subcommittee as was proposed, the RAB might not have been burdened by these questions over the past sixteen years. | The Navy disagrees with the idea that if it had invested more time in the CAC subcommittee that the RAB would have been more effective.                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 26.            | <b>Appendix E</b> | It was also unrealistic for the Navy to assume that a community with long-term socio-economic, environmental and equality disadvantages would not see environmental remedial activity as a source of employment and be frustrated by the Navy's segmentation of its hiring, contracting and remedial activities. However valid the Navy's process from its own point of view, the Navy mission centered viewpoint was as destructive to the goals of that mission as counter insurgency methods were to our national campaigns prior to the Petraeus doctrine of engagement.                                                                                                                                                                                                                                                                                         | The Navy disagrees with the assumption stated in this comment.<br><br>Page 11 of the CIP indicates that during interviews jobs were identified as a primary concern for the community. The Navy will continue to provide information for obtaining jobs through the City's CityBuild Information Line. A handout has been prepared in multiple languages that describes the use of local vendors in the Navy's cleanup. Additionally, a vendor sign-up sheet is provided at each meeting in English, Chinese, and Spanish for any community member who wants to provide contact information. |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/ Page     | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| 27.            | <b>Appendix E</b> | By viewing external sources of expertise as competitors or agent provocateurs rather than individuals lending their expertise to help the Navy through its cleanup effort, the Navy failed to build the necessary external technical support mechanism in the RAB that would have brought the non environmental professional members of the Board along when there was agreement on remedial strategies. The use of local academic technical expertise would have over the long term built a strong community/ Navy team working on mutual goals around the remedial program each gaining understanding and concessions from the other. | The Navy disagrees with the assumptions contained within this comment. The Navy has historically reached out to a number of individuals, not only to try to increase RAB membership, but also to provide more opportunities for involvement.                                                                                                                                                                                                                                                                                                     |
| 28.            | <b>Appendix E</b> | The lack of internal introspective analysis regarding the Navy's role in the failure of the RAB significantly undermines the credibility of the analysis presented in Appendix E.                                                                                                                                                                                                                                                                                                                                                                                                                                                       | The Navy disagrees with this statement. The Navy believes reasons articulated in the letter dated December 23, 2009, accurately reflect the Navy's decision to dissolve the RAB.<br><br>No further "internal introspective analysis" would have added value to this document.                                                                                                                                                                                                                                                                    |
| 29.            | <b>Appendix G</b> | Appendix G should have been Chapter 1 or 2 of the CIP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | The format for this CIP is not uncommon and was developed in cooperation with U.S. EPA. Chapter 1 provides a reader-friendly introduction to the document, and Chapter 2 delves into the feedback received during interviews, which is the cornerstone for the plan outlined in Chapter 3.<br><br>Regulations can be confusing and the information can be overwhelming to the non-technical reader. General information has been provided, with references for those who wish to review the detailed guidance. See response to comment number 3. |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/<br>Page               | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Response                                                                                                                                                                                                                                              |
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| 30.            | <b>Appendix G,<br/>Page G1</b> | <p>The statement appearing in the second paragraph of Appendix G:</p> <p>“Federal and state environmental statutes and amendments require community involvement for hazardous waste sites...”</p> <p>should have been the first paragraph of a chapter devoted to explaining these requirements. Such a chapter should appear as either the 1st or 2nd chapter of the CIP to provide the reader with a context for the requirements and expectations of Congress and successive federal and state administrations for the conduct of public engagement activities.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Please see response to comment number 29.                                                                                                                                                                                                             |
| 31.            | <b>Appendix G</b>              | <p>The first paragraph of Appendix G should have been the second paragraph of the chapter described above in VII.1</p> <p><i>“The Department of the Navy’s Installation Restoration Program is conducted in accordance with federal and state requirements, and its purpose is twofold---(1) to identify, investigate, and clean up or control the releases of hazardous substances and (2) to reduce the risk to human health and the environment. The Navy is the lead federal agency for the Installation Restoration Program at Hunters Point Shipyard (HPS). The figure on Page G---2 presents the major phases of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.”</i> Appendix G, Page G1</p> <p>To this the Navy should add: CERCLA includes guidance with regard to the provision of public involvement activities found in 42 USC, Section 9601 and following; The Navy could then present a summary of the relevant CERCLA and SARA provisions or cite that the relevant sections of those laws are presented in a new Appendix G.</p> | The format for this CIP is not uncommon and was developed in cooperation with U.S. EPA. A thorough explanation of regulations is provided in Appendix G, and an additional chapter specific to regulations is not deemed necessary for this document. |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/ Page                              | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Response                                                                                                                                                                                                                        |
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| 32.            | <b>Appendix G</b>                          | <p>Although the CIP provides Appendix G which contains a good overview of the regulations governing public participation, this section is not cited elsewhere in the document and the relevant sections of the regs are not quoted.</p> <p>The Navy goes into significant detail about matters regarding the cleanup that are not specific to the issue of public participation (these issues such as those presented in Chapter 4) however it fails to provide equal description to matters of specific relevance to the CIP and public participation such as providing the public participation requirements in each regulation, guidance and other directives in whole or summarized anywhere in the document;</p> | A more thorough description of Appendix G has been added to Chapter 1. Please see response to comment number 3.                                                                                                                 |
| 33.            | <b>Appendix G</b>                          | This comment corresponds with and expands upon Comment [32]. The Navy has couched the CIP in such a ways as to de-emphasize its regulatory requirement to conduct a community involvement process. This clear trend within the document is worrisome.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | The Navy disagrees that the CIP in any way deemphasizes regulatory requirements to conduct community involvement. In fact, the Navy is proposing a program that far exceeds any minimum requirements for community involvement. |
| 34.            | <b>General observation/ recommendation</b> | While there are genuinely many useful concepts in the CIP, the document is undermined by its unstated but obvious antipathy to the full acknowledgement of the requirements of regulation and guidance. The document would be far richer, more informative, and useful if the rules and guidances were fully presented and discussed.                                                                                                                                                                                                                                                                                                                                                                                 | Please see response to comment number 16.                                                                                                                                                                                       |
| 35.            | <b>General observation/ recommendation</b> | The Navy should acknowledge its own role in the dysfunctionality of the RAB. We refer the Navy to the comments provided on Appendix E [above].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | The Navy disagrees with the accuracy and relevance of this comment. Furthermore, the CIP is not meant to focus on the past but to provide a path forward for the future.                                                        |

## Appendix J: Responses to Comments on the Draft CIP (continued)

Comments from:

**India Basin Neighborhood Association, Technical Assistant Grant Technical Advisor, May 8, 2011**

| Comment Number | Section/<br>Page                               | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Response                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 36.            | <b>General observation/<br/>recommendation</b> | The Navy should reconsider creating a new RAB. RABs can play important and useful roles if utilized well and organized appropriately. Particular care must be given to balancing community representation with technical expertise from non military academic and environmental sources because doing so will ultimately serve to educate the full membership of the Board and help it make better recommendations in a more professional collegial environment. | Navy acknowledges that RABs on most Base Realignment and Closure (BRAC) bases do play important and useful roles. However the circumstances described in this comment capture an ideal situation that did not exist at HPS.<br><br>Although a RAB or other advisory board is not currently part of the planned community involvement activities, as noted in Appendix E, the need for a RAB will be assessed at least every 2 years, as required. |



*Appendix J: Responses to Comments on the Draft CIP (continued)*

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# FACT SHEET

## Hunters Point Naval Shipyard

### Summary of the Proposed Plan for Parcels E and UC-3



February 2013

This fact sheet provides a summary of the Proposed Plan for Parcels E and UC-3 on the Hunters Point Naval Shipyard (HPNS), included in this mailing. The Proposed Plan and other information on Parcels E and UC-3 may be viewed on the Internet by visiting the Navy's website at [www.bracpmo.navy.mil](http://www.bracpmo.navy.mil) (detailed instructions on Page 4).

#### How to comment on the Proposed Plan

The Navy is requesting public comment on the Proposed Plan in writing, addressed to Keith Forman, no later than March 15, 2013 (contact information on Page 4). Comments can also be submitted in person at a 6:00 pm public meeting on February 28, 2013, in the Alex L. Pitcher, Jr. Conference Room at the Southeast Community Facility Commission, located at 1800 Oakdale Avenue in San Francisco, California.

#### Hunters Point Naval Shipyard History

HPNS is located in the southeastern portion of the City of San Francisco and is adjacent to San Francisco Bay. Though HPNS is now closed, when active, it had many uses, including as a commercial dry dock from 1869 until it was purchased by the United States Navy in 1939. From 1945 until 1974, HPNS was used for shipbuilding, repair, and maintenance of Naval ships. It was also the site of the Naval Radiological Defense Laboratory (NRDL), which operated from 1948 through 1969. The former Shipyard was closed in 1974 and remained vacant until 1976, when Triple A Machine Shop, Inc. (Triple A) began a lease of the property that continued until 1986. In the years since Triple A left the former Shipyard, several buildings have been leased by artists and others. Since 1991, the Navy has conducted hundreds of studies, excavations, and groundwater treatment actions in an effort to clean up the Shipyard. This fact sheet focuses on the proposed remedy of two parts of the Shipyard, known as Parcel E and Parcel UC-3 (Figure 1).

#### History of Parcel E

Parcel E is a 128-acre area in the southwestern portion of HPNS and includes a former industrial support area, consisting of supply and public works facilities. Parcel E also includes shoreline areas historically used to store and dispose of industrial waste and construction debris.

NRDL used several Parcel E buildings during the 1950s and 1960s for radiological testing. While leasing the property, Triple A allegedly disposed of hazardous wastes at various locations at HPNS, including the possible transport of waste oil within Parcel E using below-ground fuel and steam lines. Since 1984, the Navy has performed many environmental investigations at Parcel E and has collected thousands of soil and groundwater samples to identify where cleanup needs to occur. In addition, the Navy has performed several early cleanup actions to minimize potential exposure to hazardous chemicals. Although there was no immediate risk to the public, the Navy decided to take early action to address areas on Parcel E that contained the most considerable contamination.

#### History of Parcel UC-3

Parcel UC-3 was formerly part of Parcel E; however, it is now designated as a separate parcel for the proposed remedy selection. Parcel UC-3 is made up of 11 acres in the western portion of HPNS, directly north of Parcel E. It includes Crisp Avenue and a railroad right-of-way, which were used to transport materials and equipment to and from the former Shipyard. The railroad right-of-way is about 30 feet wide and extends about 3,200 feet west from the end of Crisp Avenue (near the intersection of Palou Avenue and Griffith Street). The chemical contamination at Parcel UC-3 likely resulted from miscellaneous spills while the Navy operated and maintained the railroad.

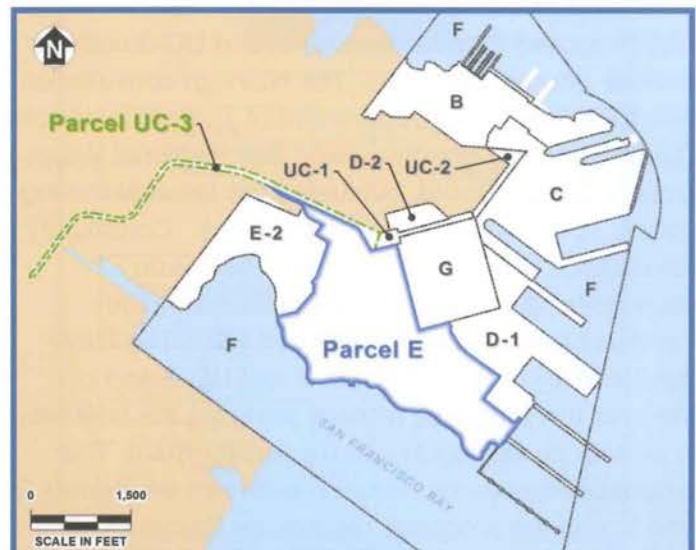


Figure 1: Location of Parcels E and UC-3



## Contaminants on Parcels E and UC-3

The chemicals found in soil and groundwater at Parcel E include metals (such as lead and zinc), chlorinated solvents, pesticides, polychlorinated biphenyls (PCBs), and petroleum-related compounds. In addition, radioactive chemicals were found in soil at several locations in Parcel E, but radioactive chemicals were not found in groundwater at levels that could impact people or wildlife in San Francisco Bay.

The chemicals found in soil and groundwater at Parcel UC-3 include metals (such as copper and lead), chlorinated solvents, and petroleum-related compounds.

## Site Risks

"Risk" is the likelihood or probability that a hazardous chemical, when released to the environment, will cause effects (such as cancer or other illnesses) on exposed humans or wildlife. The Navy evaluated the risk to humans and wildlife from exposure to contaminated soil, shoreline sediment, and groundwater. Results from tests in Parcels E and UC-3 determined that there may be some risk if people are directly exposed to contaminated soil, shoreline sediment, or groundwater. The Navy's proposed remedy for these areas will create permanent results that will protect people and the environment. The Navy's proposal allows the property to be developed by the City of San Francisco for multiple uses, including residential, industrial, and recreational (open space).

## Proposed Remedy for Parcels E and UC-3

The Proposed Plan for Parcels E and UC-3 outlines several cleanup remedies. The Navy, in consultation with EPA, California Department of Toxic Substances Control, and the San Francisco Bay Regional Water Quality Control Board, evaluated the remedies using criteria specified by federal regulations. Community acceptance will also be evaluated based on comments received from the public during the comment period for this Proposed Plan. The Navy has carefully studied Parcels E and UC-3 and believes the proposed remedy provides the best way to protect public health and the environment. The proposed remedy for Parcel E is shown on Figures 2 and 3, and the proposed remedy for Parcel UC-3 is



Figure 2: Parcel E Proposed Remedy for Soil

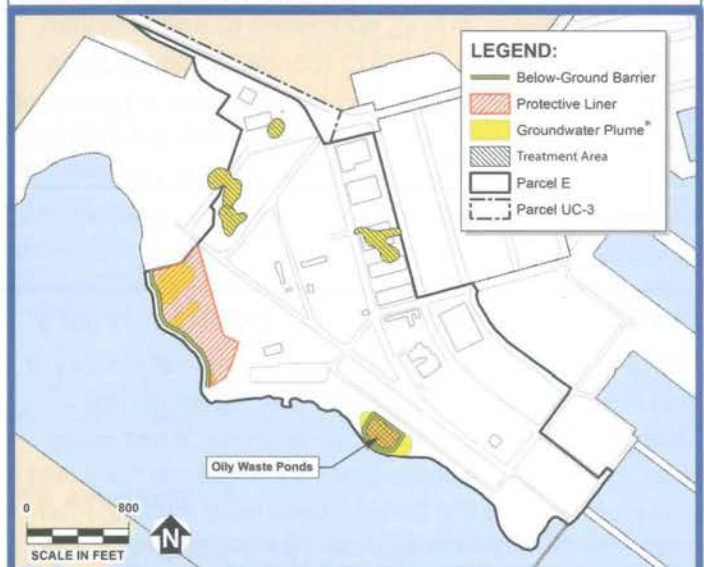


Figure 3: Parcel E Proposed Remedy for Groundwater



Figure 4: Parcel UC-3 Proposed Remedy for Soil and Groundwater

\*Areas with groundwater contamination are identified as groundwater plumes.



shown on Figure 4. The proposed remedy for Parcel UC-3 includes only a few of the components of the proposed remedy for Parcel E, as noted below.

### **Soil and Shoreline Sediment**

- Remove and dispose of contaminated soil in selected areas of Parcels E and UC-3
- Clean and close buried steam and fuel lines
- Install soil and asphalt covers as appropriate across all of Parcel E and parts of Parcel UC-3
- Place rock and sand on Parcel E's shoreline and slopes to prevent erosion
- Install a system (in Building 406) to remove and treat contaminated soil gas and vapors
- Use technologies to remove or treat the oil source at the Former Oily Waste Ponds
- Monitor to ensure that chemicals in soil gas are not present at concentrations greater than those considered safe for humans

### **Groundwater**

- Install groundwater treatment systems in selected areas of Parcels E and UC-3
- Install below-ground barriers and protective liners to limit groundwater access to the bay
- Perform long-term monitoring to track the cleanup progress in both Parcels E and UC-3

### **Residual Radiological Contamination**

- Scan the entire area for radioactivity
- Remove and dispose of residual radiologically contaminated soil
- Install a soil cover to limit future exposure to contaminated soil

The proposed remedy will protect human health and the environment. When the Navy designs the remedy, the design will also take into account future sea-level rise, extreme weather conditions, and earthquakes.

## **Maintaining Parcels E and UC-3 after Cleanup Actions**

After performing the actions described above, regular inspections will be performed to make sure the cleanup actions are working properly. Maintenance activities and Institutional Controls (ICs) will ensure that the public and the environment are protected from any possible exposure to contamination.

## **Estimated Cost**

The combined estimated cost of the proposed remedy at Parcels E and UC-3 is \$105.5 million.

## **Community Involvement**

### **Public Comment Period**

The Proposed Plan for Parcels E and UC-3 was released to the public on February 12, 2013. You are invited to comment on the Proposed Plan for Parcels E and UC-3 at a Public Meeting on February 28, 2013, at the Southeast Community Facility Commission Building in the Alex L. Pitcher, Jr. Room, located at 1800 Oakdale Avenue, San Francisco, California. Written comments will also be accepted no later than March 15, 2013. Comments should be addressed to Keith Forman, as listed on Page 4 of this fact sheet.

To comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Navy considers all comments before selecting a final remedy (see Figure 5). Once the final decision is made, the chosen remedy must be approved by federal and state regulatory agencies, after which it will be described in a document called a Record of Decision (ROD). The ROD will include a summary of comments received and the Navy's responses, including how the comment may have influenced aspects of the final decision.

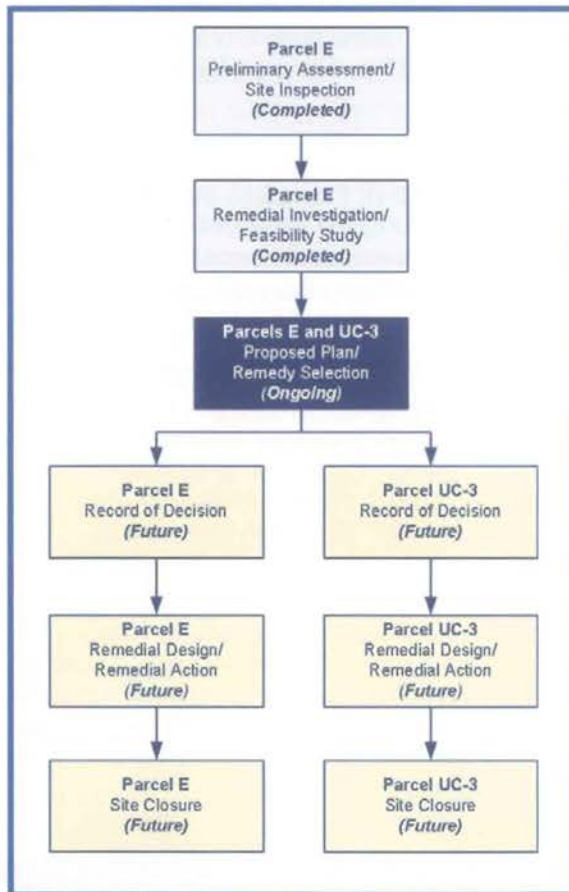


Figure 5: Parcels E and UC-3 CERCLA Process



## How to comment on the Proposed Plan for Parcels E and UC-3

**1. Provide written comments no later than March 15, 2013 by one of the following methods:**

**Email:** keith.s.forman@navy.mil

**Fax:** (619) 532-0995

**Mail: Keith Forman**

Base Environmental Coordinator

Navy Base Realignment and Closure

1455 Frazee Road, Suite 900

San Diego, CA 92108-4310

**2. Attend the public meeting and provide verbal or written comments:**

February 28, 2013

6:00 p.m. to 8:00 p.m.

Southeast Community Facility Commission Building

Alex L. Pitcher, Jr. Room

1800 Oakdale Avenue

San Francisco, California

### For general information on Hunters Point Naval Shipyard, contact:

**Matt Robinson**

Community Involvement Manager

HPNS Community Outreach

P.O. Box 885474

San Francisco, CA 94188-5474

Office Telephone: (415) 295-4645

HPNS Information Line: (415) 295-4742

Email: info@sfhpnns.com

### Where can I get more information about the Parcels E and UC-3 cleanup at Hunters Point Naval Shipyard?

Navy documents and reference materials about Hunters Point Naval Shipyard are available to the public at the City of San Francisco Main Library and the Hunters Point Naval Shipyard Site Trailer. The downtown San Francisco library contains a nearly complete record of all documents related to the investigation and cleanup actions under way at Hunters Point Naval Shipyard. Information is also available on the Navy's Hunters Point Naval Shipyard website: [www.bracpmo.navy.mil](http://www.bracpmo.navy.mil).

Click "Prior BRAC" at the bottom of the page, click on "Prior BRAC Installations" drop-down menu and select "Former NSY Hunters Point," and then click on "View/Hide All Documents" and select "Parcels E and UC-3".

### Information is also available at:

**City of San Francisco Main Library**

100 Larkin Street, 5th Floor

Government Information Ctr.

San Francisco, CA 94102

(415) 557-4400

**Hunters Point Naval Shipyard Site Trailer**

(near HPNS security entrance)

690 Hudson Avenue

San Francisco, CA 94124

**Hours of Operation:**

Monday: 10:00 a.m. to 6:00 p.m.

Tuesday through Thursday: 9:00 a.m. to 8:00 p.m.

Friday: 12:00 p.m. to 6:00 p.m.

Saturday: 10:00 a.m. to 6:00 p.m.

Sunday: 12:00 p.m. to 5:00 p.m.

**Hours of Operation:**

Monday - Friday: 8:00 a.m. to 5:00 p.m.

*While the Main Library contains a nearly complete record of all documents related to cleanup at HPNS, the site trailer has a more limited set of current documents.*

The complete Administrative Record for Hunters Point Naval Shipyard is maintained at the Naval Facilities Engineering Command (NAVFAC) offices in San Diego, California. Because of the volume of documents required for the Administrative Record, all documents may not be in the local Information Repository.

**Administrative Record  
Naval Facilities Engineering Command**

c/o Diane Silva

Code EVR-FISC Bldg. 1, 3rd Floor

NAVFAC Southwest

Phone: (619) 532-3676 / Fax: (619) 532-3546

Email: [diane.silva@navy.mil](mailto:diane.silva@navy.mil)

Administrative hours are 8:00 a.m. to 5:00 p.m. Monday through Friday. Documents may not be removed from the facility; however, they may be photocopied. An appointment is required. A copy of the complete Administrative Record index and documents are available at the Information Repository located at the San Francisco Main Public Library.

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CERTIFICATE OF REPORTER

I, CHRISTINE M. NICCOLI, Certified  
Shorthand Reporter of the State of California, do hereby  
certify that this 115-page transcript of the foregoing  
meeting was reported by me stenographically to the best  
of my ability at the time and place aforementioned and  
meets the Minimum Transcript Format Standards pursuant  
to California Code of Regulations Title 16, Division 24,  
Article 8, Section 2473, as mandated by the California  
Court Reporters Board..

IN WITNESS WHEREOF, I have hereunto set my hand  
this 26th day of March, 2013.

  
CHRISTINE M. NICCOLI, C.S.R. NO. 4569

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HUNTERS POINT NAVAL SHIPYARD  
PARCELS E AND UC-3 PROPOSED PLAN  
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REPORTER'S TRANSCRIPT OF PUBLIC MEETING

FEBRUARY 28, 2013

City College of San Francisco  
Southeast Campus  
Alex Pitcher, Jr., Community Room  
1800 Oakdale Avenue  
San Francisco, California

Reported by Christine M. Niccoli, RPR, C.S.R. No. 4569

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NICCOLI REPORTING  
619 Pilgrim Drive  
Foster City, CA 94404-1707  
(650) 573-9339

CERTIFIED SHORTHAND REPORTERS SERVING THE BAY AREA  
ARBITRATION \* DEPOSITION \* HEARING \* MEETING \* TRIAL

A T T E N D E E S

FACILITATOR:

MATT ROBINSON - Circlepoint

PRESENTER:

KEITH S. FORMAN - United States Navy

REGULATOR SPEAKERS:

RYAN MIYA, PH.D. - Department of Toxic Substances  
Control (DTSC)

TINA LOW - San Francisco Bay Regional Water Quality  
Control Board

CRAIG COOPER - U.S. Environmental Protection Agency  
(EPA)

CONSULTANTS & REGULATORS

DOUG BIELSKIS - Engineering/Remediation Resources Group,  
Inc. (ERRG)

AMY D. BROWNELL - San Francisco Department of Public  
Health

JAMIE HAMM - KCH

LESLIE LUNDGREN - CH2M HILL

CLYDE SMITH - Corporate Media Systems



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PUBLIC AUDIENCE

JEFF AUSTIN - Geosyntec  
SAUL BLOOM - Arc Ecology  
JOHN BILLINGS - SAN FRANCISCO EXAMINER  
PENELOPE BLAIR  
ANDREW BOZEMAN - Southeast Sector Community Development  
Corporation  
JARON BROWNE - People Organized to Win Employment Rights  
(POWER)  
CHRISTIAN CHAPA - Community member  
RON CONNAY - SLY  
FRANCISCO DA COSTA - Environmental Justice Advocacy  
(EJA)  
EDNA GODOY - Y-CAT  
CATI HAWKINS-OKORIE - BHRLCSF  
DR. ESPANOLA JACKSON - Muwekma Ohlone, Bayview-Hunters  
Point  
ETTA M. JONES - Y-CAT  
KEVIN LAWSON - Lawson Trucking  
ANTONIO M. - Costanoan Rumsen Ohlone Tribe  
JOHN MBURU NJOROGI - Providence Church  
HARRISON PaKERX  
LINDA RICHARDSON  
CYNTHIA RUDES - Community member

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PUBLIC AUDIENCE [Cont.]:

GLEN SMITH - AECOM

SHIRLEY SMITH - BHRL SF

ESSELENE STANCIL

REX TARONA - J. Consultants

RAYMOND J. TOMPKINS, PH.D. - Former RAB member

ANN WALKER - Y-CAT

MARCUS WELLS - Worker

---oOo---

1       SAN FRANCISCO, CALIFORNIA, THURSDAY, FEBRUARY 28, 2013

2                               6:18 P.M.

3                               ---oOo---

4               MR. MATT ROBINSON:   Good evening.   We're about

5       to get started this evening.   Take your seats, get the

6       meeting underway.

7               All right.   Thank you very much.   If you

8       haven't yet, please sign in the back and grab some of

9       the handouts that we have for you.

10              I'd like to thank you for attending tonight's

11      meeting on the plan -- Proposed Plan for Parcel E and

12      UC-3 at the Hunters Point Naval Shipyard.

13              Now, before we can get started, the Navy would

14      like to take a moment, if we could, to express our

15      condolences to Mrs. Espanola Jackson and her family over

16      the recent loss of the death of her daughter.

17              Mrs. Jackson, the Navy and its staff would like

18      to offer their condolences to you and your family at

19      this time.

20              ESPANOLA JACKSON:   Dr. Espanola Jackson.

21              MR. ROBINSON:   So sorry.   I'm sorry, ma'am.

22              Dr. Jackson and her family.

23              DR. JACKSON:   Thank you.

24              MR. ROBINSON:   Thank you.

25              DR. JACKSON:   I accept.

1 MR. ROBINSON: Okay.

2 So tonight, folks, this is a very formal  
3 meeting, unlike our previous ones with our community  
4 meetings. We have a court reporter tonight that will be  
5 present, and everything you say will be transcribed as  
6 part of the Record of Decision for tonight's meeting.

7 We also, if we can, want to introduce really  
8 quickly for you some of the regulators who are working  
9 with the Navy as -- on this project. I would like to  
10 introduce first Craig Cooper from the U.S. EPA and Ryan  
11 Miya from the Department of Toxic Substances Control and  
12 Tina Low from the State Water Board.

13 Now, the purpose of tonight's meeting, as I  
14 said, is to go over the Proposed Plan for Parcel E and  
15 C -- UC-3. We also are going to accept public comments  
16 on this proposal.

17 Now, the Navy -- go over to tonight's agenda.  
18 Tonight we will be hearing from Keith Forman talking  
19 about the parcel plan, the Proposed Plan. After his  
20 presentation, we will take a break, and then we will  
21 have the regulators that I just introduced come up and  
22 give their perspectives on this Proposed Plan.

23 Then afterwards we will be answering clarifying  
24 questions to the presentation. This will be the only  
25 time that the Navy will be able to respond, and it will

1 be to your questions about the presentation that  
2 Mr. Forman will be giving tonight.

3 After we have the clarifying questions, then we  
4 will also have the -- all of you can come up and give  
5 public comment on the Proposed Plan.

6 As -- I want to go over a couple of issues.  
7 For the clarifying questions, the Navy will be only able  
8 to respond tonight to those questions; and for this  
9 portion, we ask that everyone will line up at the  
10 microphone and limit to yourself to one question at a  
11 time. We want to make sure everybody has a chance to  
12 ask a question.

13 After everyone has had a chance to ask a  
14 question, then you will be able to come up for a second  
15 question if you'd like.

16 After the question period ends, we're going to  
17 hold this for about 15 minutes, and then we will go into  
18 our formal comment portion.

19 The introduction for the formal comment  
20 portion, this format the Navy will not be able to  
21 respond. We will just take your questions from --  
22 through our court reporter. If you don't have any  
23 questions at the time, you will also be able to write  
24 down your questions and submit them at a later date.

25 Now, when we have this portion, please, again,

1 line up at the microphone and limit to yourself to your  
2 statement to three minutes. At -- During this time, I  
3 will give you then a two-minute and a one-minute warning  
4 and then 30 seconds.

5 And then after you have asked your questions,  
6 we ask that you have a seat and let everyone who wants  
7 to ask a question be able to ask a question. After that  
8 has been done, you will be able to come up again and ask  
9 a second question.

10 Our general meeting format rules, of course, we  
11 also would like you to respect each other, and please  
12 hold your questions till the end of the presentation.  
13 We will ask that you speak one at a time so our court  
14 reporter can get what you are saying.

15 And then there will be time for everyone to  
16 make comments, either spoken or written. Of course,  
17 like I said, there will be a three-minute time limit  
18 during your first round of questions. And then the  
19 speaker, like I said, will be able to ask a second  
20 question afterwards.

21 And also, we have handouts back there, as I  
22 said before. Please grab a handful, help you follow  
23 what's going on as well as give you some light reading  
24 for tonight.

25 So what are we going to talk about tonight?

1 Sorry. The outline for tonight, basically we are going  
2 to discuss the location and history of both parcels.

3 And then we'll also discuss the early cleanup  
4 actions that the Navy has performed to this point and  
5 how the Navy has worked with the regulatory agencies to  
6 develop and evaluate different options, options that  
7 we're calling the remedial alternatives as part of the  
8 cleanup effort.

9 We will also conclude by describing the  
10 preferred alternatives which are proposed to be the  
11 final set of cleanup actions for Parcel E and UC-3.

12 After the presentation, there will be a time to  
13 ask questions, as I've said before, to clarify what you  
14 don't understand and also to ho- -- ask that you hold  
15 your questions till the end.

16 Now I'm going to turn it over to Keith Forman  
17 who will be giving you his presentation on this Proposed  
18 Plan.

19 PRESENTATION

20 BY KEITH FORMAN:

21 All right. Good evening, everybody. Thank you  
22 for coming tonight. We have got a lot to go over.

23 This -- this area, Parcel E and Parcel Utility  
24 Corridor 3, comprise a large part of -- of the base,  
25 Parcel E being 128 acres and Utility Corridor 3 being

1 about 11.

2 Thanks. Okay.

3 I'm going to be just referring to make sure --  
4 I want to make sure that I tackle this right going over  
5 some of these pages.

6 Okay. So Utility Cor- -- oops. Excuse me.

7 Utility Corridor 3 is here [indicating] and  
8 extends out from Crisp Road, if you know the base, out  
9 to about Carrolls [sic] Avenue and Ingalls.

10 And then this is Parcel E [indicating], major  
11 portion of the base here. And there's a lot that went  
12 on in the history of this portion of the base; and we'll  
13 talk a little bit about that today.

14 Okay. Let's start off with the history of  
15 Parcel E. Parcel E was used as an industrial support  
16 area. There was a lot that went on here from the late  
17 1940s until the base closed in 1974.

18 There's one building in particular,  
19 Building 406, which was a warehouse. That's a special  
20 site in Parcel E that we need to tackle using a  
21 different kind of technology, and we'll go into that  
22 tonight.

23 There -- The contamination there is in two  
24 places. It's deep under the building in the groundwater  
25 in a very limited area but it's there in the



1 groundwater. And also there's some chemicals that are  
2 in the soil column between the bottom of the groundwater  
3 and the surface.

4           There's also a very special site called the  
5 former oily waste ponds. This is where the Navy used to  
6 intentionally pump its old bilge fuels off of the ships  
7 into giant ponds, and then they would use chemicals to  
8 reclaim the fuel and reuse it in the fleet.

9           This was the Na- -- The Navy started this sort  
10 of recycling practice back in the 1940s. They were a  
11 little ahead of their time at that point. But the end  
12 result was that there are oily waste ponds left there  
13 that have contaminants that are perched on the shoreline  
14 that the Navy must address.

15           And then there's some shorelines themselves  
16 where construction and industrial debris were disposed.  
17 And as I'll show you in a few slides, we'd already taken  
18 some actions on those. But this area was composed of  
19 fill and fill material. And in addition to that, during  
20 Navy activities, this was a site where much debris was  
21 disposed of.

22           And then last, but not least, there were  
23 buildings here used, a quite a number of them, by the  
24 Naval Radiological Defense Laboratory. And the special  
25 thing about this command, this was a tenant command to

1 the shipyard.

2 As many of you know, the main mission of the  
3 shipyard was to repair and maintain the pacific fleet  
4 ships. That was its main mission.

5 But it did a have small command that o- -- that  
6 operated from 1948 to 1969 that dealt with radioisotopes  
7 on the base and various aspects of those, including  
8 research and development and things like that. There's  
9 definitely buildings that were used by this command; and  
10 because of that, the Navy has to address -- address  
11 that.

12 Utility Corridor 3. Again, this is Crisp  
13 Avenue, Crisp Avenue [indicating] heading off of the  
14 base towards Palou, and then the remainder of this  
15 corridor, which is about 30 feet wide and about  
16 3200 feet long, and it's where the railroad used to go.

17 It was the Navy's -- The federal property was  
18 to support the Navy's clearances to operate a railroad,  
19 which they did, and you can still to this day see the  
20 railroad tracks coming down through here.

21 That property, along with the rest of the base,  
22 ultimately will be transferred to the City of San  
23 Francisco. In order to do that, of course, we have to  
24 look at the parcel, gather samples; and where there's  
25 contamination that needs cleanup or any other solutions,

1 the Navy has to do that before it can transfer this  
2 section [indicating] of the base or any section of the  
3 base over to the City of San Francisco.

4 So this parcel -- we call it UC-3, Utility  
5 Corridor 3 -- consists of Crisp Road and, again, the  
6 railroad right-of-way. And there is chemical  
7 contamination that likely resulted from the railroad  
8 operations, and that's to be expected.

9 One of the tools we use -- When we're  
10 determining the sites and where to go down and sample  
11 groundwater and where to take soil samples and where to  
12 do our investigations to get all this data to determine  
13 how to clean up and where to clean up, one of the tools  
14 we use are aerial photographs.

15 And this aerial photograph here I -- I've  
16 included this in the presentation from 1969 because it  
17 gives you a great snapshot of some of the activities  
18 that were going on in the parcel. Again, this  
19 [indicating] is Parcel E, big parcel; and this  
20 [indicating] is Crisp Road, Utility Corridor 3. It  
21 hangs out about 3200 feet. We call it pigtail of the  
22 base.

23 So Building 406 that I talked about that used  
24 to be a warehouse, it had chlorinated solvents. That's  
25 a fancy term for just a bunch of chemicals that are --

1     that have carbon and organic compounds were stored  
2     there.

3             And when over the years you have a warehouse  
4     that stores chemicals in drums, what happens over the  
5     years? Eventually there are some spills, and indeed  
6     that's what happened here in this warehouse. And we've  
7     been able to document where the spills are, and now  
8     we're going to tell you tonight what the Navy's proposal  
9     is to clean up those spills.

10            And then we have buildings formerly used by  
11     this Navy Radiological Defense Laboratory in this area  
12     [indicating] of the base and over in this area  
13     [indicating] of the base. They also operated in general  
14     areas here and here [indicating].

15            In addition to that, the oily waste ponds I  
16     talked about where the Navy tried to reclaim fuel oil,  
17     those operations were done here [indicating].

18            And then we completed a number of years ago --  
19     you may know -- you may remember this. I gave a  
20     presentation a number of years ago with Laurie Lowman  
21     from the Navy's RASO office.

22            This was the radium dial disposal area, and  
23     this is where a lot of these low-level radiological  
24     markers and night lights that used radium paint and deck  
25     markers on ships that used radium paint and dials in

1 cockpits of aircraft and on bridges of ships, they were  
2 all dumped in this area. And the Navy did major  
3 excavation and did an inventory of everything they  
4 found. There were -- Over 3200 commodities were  
5 removed during that dig.

6 Then in addition to that, there's quite a  
7 spider web of steam lines and fuel lines, sewer lines,  
8 and storm drain lines throughout the parcel; and that's  
9 part of the cleanup operation that I'll talk about.

10 So before we get to tonight, it's only fair  
11 that we go back a little ways and say that the Navy's  
12 already done a lot of cleanup on Parcel E and on UC-3,  
13 Utility Corridor 3. And I just wanted to go over and  
14 give the Navy a little credit for some of the cleanup  
15 that's already been done.

16 All this cleanup contributes to the overall  
17 proposed cleanup options or solutions that we want to  
18 talk to you tonight about.

19 So here are some of the numbers that I just  
20 wanted to show you here. We have removed and screened  
21 over 60,000 cubic yards of soil debris with potential  
22 radiological contamination from the two shoreline  
23 areas. So we have completed that.

24 Where we did find radiological contamination I  
25 can tell you; and if you've listened to me before, it's

1 at extremely low levels. But we have extremely  
2 stringent cleanup standards on Hunters Point Shipyard,  
3 and it still had to be dug out and carted off.

4 We have also installed a protective liner on  
5 the former oily waste ponds that I talked about; and we  
6 put in a barrier, a 900-foot-long barrier, of corrugated  
7 steel around the outer perimeter to separate the oily  
8 waste ponds from San Francisco Bay. I believe we did  
9 that in 1997.

10 In addition to that, we have removed and  
11 cleaned up 8 underground storage tanks that contained  
12 chemicals and fuel and 12 aboveground storage tanks that  
13 did as well.

14 And then we did major removal and cleanup of  
15 rad contamination throughout Parcel E and completely  
16 throughout Utility Corridor 3.

17 But despite all of the efforts that the Navy  
18 did, we still have a lot more to do. So I just want you  
19 to take in mind this: Sometimes people -- it's easy to  
20 forget everything that the Navy's done in about the last  
21 near, oh, about 20 years now of cleanup, investigations  
22 and cleanup, on Parcel E and UC-3. We've done quite a  
23 bit. We just have a lot more to do.

24 Okay. So to date, what have we done on the  
25 radiological cleanup? This is Site 2, this large area

1 [indicating]. We haven't really tackled much of this  
2 yet other than we did a major dig in this area  
3 [indicating]; and that was as we've shown you earlier  
4 presentations on maps labeled the "radium dial disposal  
5 area."

6 We have also done a cleanup here [indicating].  
7 That was a metal debris reef that had a lot of metal  
8 pushed off onto the shoreline. It had some radium dials  
9 that we found there too that were actually part of  
10 molten metal that was there that was left on the  
11 shoreline. And that molten metal, it was basically  
12 extra metal from the shipyard's foundry.

13 When they would actually create metal parts for  
14 ships, they would actually pour molten metal into molds  
15 and create parts when they needed to when they couldn't  
16 order them from the supply system. And they did this  
17 often. And over the years, you have spill and extra  
18 metal, and this extra metal is basically scrap; and they  
19 put it in this area.

20 The Navy has cleaned up this area, and when we  
21 can on our bus tours we always come by here because it's  
22 a nice beautiful sandy beach now that's been restored by  
23 the Navy, and we did that about now seven years ago.

24 Okay. And there's also buildings and a --  
25 large areas that the Navy's investigating and cleaning

1 up. This [indicating] is called the triangle area for  
2 obvious reasons here.

3 The Navy Radiological Defense Laboratory did a  
4 lot of research in this area, and this is also where  
5 some of the animal pens were when they did research with  
6 animals and things. So we did very, very thorough  
7 sampling and presented the data to the regulators and  
8 have since then identified where the low-level  
9 radioactivity is, and we have dug it up and removed it.

10 We went into buildings here also and basically  
11 inspected them, took samples, located if there was any  
12 contamination. And there -- if there was any  
13 contamination, we removed it. And we are, I'd like to  
14 say, about 80 percent done with all of our low-level  
15 radiological removals that we need to do on this  
16 parcel.

17 In addition to this, just like every other  
18 parcel at Hunters Point, if there were sanitary sewer  
19 lines or storm drain lines that carried the storm water  
20 from rains, we have investigated them; and by  
21 investigating them, we've had to dig them out and remove  
22 them.

23 So the Navy is leaving this base without  
24 permanent storm drains and sewer lines anymore because  
25 we investigated them; and to do that, we had to dig in



1 and remove them -- very expensive process -- in order to  
2 test them to see if there was any rad there.

3 If there was rad there, it's appropriately  
4 disposed of off of the base. But even if there isn't  
5 rad there in many cases, we've -- we had to test it and  
6 dispose of it for other reasons, for other metals and  
7 such that were in the soil.

8 I'd like to just remind you of where we're at.  
9 We're at the Proposed Plan stage. The Proposed Plan  
10 stage when the federal law was written was one of the  
11 most important steps in the process, and that's because  
12 this is the principal time that the public can comment  
13 on the Navy's proposed cleanup options that we're  
14 talking to you tonight about.

15 How do you do this? You can read the handouts  
16 that were at the back table. You can also go to our Web  
17 site and read the Proposed Plan, or you can just listen  
18 to me and read the Fact Sheet about the Proposed Plan.  
19 But in any event, tonight is your night to come to the  
20 microphone and to make your official comments.

21 And these comments become part of the official  
22 record with Christine here. That's why it's important  
23 when you do so is to speak clearly, state your name so  
24 that she can identify you in your comment and so that  
25 your comment can be recorded for all time in the

1 records.

2 Also, when you do that, that puts an obligation  
3 on the Navy because the Navy must respond to all of  
4 those comments. And when we do respond to all of them,  
5 we put them in the Record of Decision, which is the next  
6 step in the process.

7 But right now we are in the middle of the  
8 comment period here, and this public meeting is  
9 virtually in the middle of this comment period.

10 Okay. So let's now go to some of the remedial  
11 cleanup alternatives. Fancy words again. To remediate  
12 is just to take care of something, right? But let's  
13 just call this cleanup options for tonight.

14 There's various choices, various alternatives,  
15 that environmental cleanup professionals have when they  
16 tackle a site. So what we have done in our Proposed  
17 Plan that you'll see, there's different areas on these  
18 two parcels where we laid out what the options are, and  
19 I'm about to go over these options with you.

20 And then the Navy selected what they think is  
21 the best option. And that's what you can comment on  
22 tonight, and that's what you can talk to the regulators  
23 about as well.

24 And again, this is a Proposed Plan. We don't  
25 actually get to the decision process until the next step

1 in the Record of Decision.

2 Okay. So the Navy has these cleanup options,  
3 and they involve different kinds of things to clean up.  
4 In this parcel, it's going to be regular soil, which of  
5 course is what the base, the land part of the base, is  
6 made of, and then soil along the shoreline, sand and  
7 such like that. We call that sediment, but really it's  
8 the kind of stuff that you're used to seeing on  
9 shorelines.

10 And then there's groundwater. Groundwater is  
11 not something you see. It's below the surface of the  
12 land. And it's across the base at varying depths.  
13 Anywhere from about 5 feet to 15 feet or so you'll find  
14 groundwater.

15 Much of this base, as you know, was created by  
16 the Navy as it expanded the base out into the bay over  
17 the decades. So much of it is fill material, and that  
18 greatly influences what we are seeing in the  
19 groundwater, where it flows and how it flows and so  
20 forth.

21 But we do have some problems in the  
22 groundwater, and the Navy is going to tell you tonight  
23 what we propose to do about it.

24 Then there's this special case, oily waste  
25 ponds that I showed you, where the Navy used to recycle

1     their fuel oil for ships and try and use it again and  
2     mix it up. And that was basically -- that is also known  
3     as Site 3, for those of you who have studied the base.  
4     And we have a whole set of choices there that we are  
5     going to go over.

6             And then again the radiological contamination  
7     at Parcel E. We're going to talk to you -- much of it  
8     is done, that's true, but the Navy's still required to  
9     go through the options and present to you and to the  
10    regulators what we feel is the best option to go  
11    forward.

12            Okay. So the Navy doesn't do any of this in a  
13    vacuum. We work very closely with a lot of different  
14    regulators, including the United States EPA and  
15    California's version of EPA, and their branch that we  
16    most deal with is DTSC. Dr. Ryan Miya is here tonight  
17    for Cal/EPA DTSC, and Tina Low is here for the Water  
18    Board.

19            And again, we deal a lot with San Francisco Bay  
20    and the shoreline, and we deal a lot with groundwater.  
21    And the Water Board, of course, is the guardians of San  
22    Francisco Bay and are the water -- both groundwater and  
23    surface water experts.

24            Okay. And when we go through some of these  
25    alternatives, I really want to spend most of my time on

1     what the Navy thought was the best alternative and not  
2     just go through all of them. But again, these were  
3     evaluated from a range from not taking any more action  
4     at all or any action at all to extensive cleanup  
5     action.

6             So as in anything when you're looking at  
7     choices you make in your own life on anything, there's a  
8     spectrum of things you do. There -- and there's -- and  
9     this -- this range of options is what -- is what you'll  
10    see.

11            Okay. So let's look at some choices for the  
12    soil and the shoreline sediment. Again, we have to  
13    evaluate. When you see this, don't be alarmed by seeing  
14    "No Action." The law requires us to examine the  
15    no-action alternative. It is rarely picked at any site  
16    when you're examining sites, and it's not picked  
17    anywhere at Hunters Point. We always have some actions  
18    that come out of our CERCLA process and our documents.

19            We have an option that says cover and protect  
20    the shoreline and then and removing and disposal of some  
21    locations of contamination, which we call Tier 1, and  
22    I'll explain that a little bit later, and then removing  
23    and disposal of Tier 2, which is a different type of  
24    contamination in its intensity, and then also doing some  
25    special cleanup in the soil beneath Building 406, which

1 is that warehouse I talked about where the chemicals  
2 were stored.

3 Okay. So we have split up -- when we looked at  
4 all the data and we spread this out with the regulators  
5 and we poured over it and gathered more data, and  
6 leading up to this night tonight over the years we have  
7 done different rounds of gathering of groundwater data  
8 but in this case soil data.

9 And when we saw that, it was -- it -- and you  
10 map it out, there's some data that falls into sort of  
11 greater than 10 times the remediation goal, which is  
12 basically a cleanup goal. It's a screening tool of a  
13 certain level to clean up to.

14 We -- we tend to use cleanup goals, screening  
15 cleanup goals, to start looking at things. We get those  
16 from Region 9, U.S. EPA, and then we also look at  
17 California EPA because sometimes California EPA modifies  
18 some of the screening goals presented by the federal  
19 EPA.

20 And Tier 2 is greater than five times. So  
21 basically if you've got, say, a metal in the soil that's  
22 at elevated levels, it can exceed a goal, and then the  
23 Navy has to decide what option to take. But some of  
24 them exceed five times the goals, and some of them  
25 exceed ten times the goals.

1           That can influence what you do in a particular  
2           location. It depends what depth that contaminant might  
3           be at, and it depends again on what the level of the  
4           contaminant is. And that's basically the concept I want  
5           to get across to you.

6           In addition to that, there's different types of  
7           contaminants that really fall into the fuel oil and  
8           gasoline type of category.

9           Now, as you know, on a shipyard -- on many Navy  
10          bases, but particularly on a shipyard, there's many,  
11          many little spills of oil and gasoline over the decades  
12          of ship operations. And Hunters Point's no exception to  
13          that. There's a lot of places where we have spills of  
14          petroleum. We have to tackle them even though they have  
15          a slightly different set of rules.

16          The Water Board tends to be the lead on a lot  
17          of these petroleum sites, but really it's also part of  
18          the program as well.

19          In this case in Parcel E, we have petroleum  
20          that's co-located with metals and volatile organic  
21          compounds and things like that. And when that is the  
22          situation, as it is in some places here, then we tackle  
23          both at the same time.

24          So part of what we're proposing tonight is we  
25          are going to remove a lot of different contaminated soil

1 at a lot of different locations. The thought is that we  
2 will remove the most significant sources of  
3 contamination and significantly reduce the risk to  
4 humans and wildlife.

5 The remaining contamination, it will be lower  
6 level; and although it will be over large surface areas,  
7 which make it very difficult to get rid of all of it  
8 down to these goals, there's other ways to tackle the  
9 lower-level stuff.

10 And you'll see that, again, no surprise, I  
11 think we have been very successful at proposing  
12 parcelwide soil covers or at least barriers in some  
13 places to separate any use, any future use, of that land  
14 and the low-level remaining metals or contaminants that  
15 might be left in the soil.

16 So the Navy's making a clear distinction in  
17 between those low-level things and higher-level things  
18 where it looks like in most cases removal is going to be  
19 the proposed alternative.

20 So here on this map -- again, this is Parcel E  
21 that we're concentrating on now -- the pink areas have  
22 the higher elevated contaminants. And for purposes of  
23 this discussion, it doesn't really matter what they  
24 are. They could be copper, lead, or manganese. It  
25 could be PCBs or PAHs, which is another family of



1 chemicals, or it could be any other kind of organic  
2 compounds that were used as cleaning solvents and things  
3 like that that just happened to spill in the soil.

4 So these pink areas are future excavation  
5 areas.

6 In addition to that, we have smaller areas that  
7 are Tier 2. Remember, Tier 2 is less intensity, less  
8 elevated levels of these very same chemicals. And these  
9 are the areas [indicating] that they are located in.  
10 And you can see, they're fairly widely distributed over  
11 the parcel.

12 And again, I really have to emphasize, when it  
13 comes to these, these are the remaining areas. The  
14 Navy's done a lot of work since about 1994 and removed a  
15 lot of soil.

16 Now, you also have -- can you see in this inset  
17 [indicating]? This is this 30-foot-wide, 3200-foot-long  
18 railroad track that goes out here on the base; and you  
19 can see there's some excavation areas we are proposing  
20 there. Those have chemicals that are related to  
21 railroad operations that you'd expect to see that  
22 were -- that kind of collected along the railroad  
23 tracks, and we're proposing to go out there and clean  
24 those up as well.

25 Okay. Now, we also have something called

1 groundwater, which is located beneath the surface,  
2 right?

3 And how does contamination get to groundwater  
4 beneath the surface? If you have sumps or tanks or if  
5 you have anything else that spilled over time, it can  
6 drill its way down from the surface to the belowground  
7 surface. And eventually, depending upon where you are  
8 on the base, right -- 5 feet down, 7 feet down, 8 feet  
9 down, 10 feet down -- it will reach groundwater.

10 And when it does, a lot of chemicals, when they  
11 do drill down and reach groundwater, will then hit the  
12 groundwater and become soluble in the groundwater.  
13 They'll become part intermixed with the groundwater and  
14 spread.

15 Now, as they spread, their concentration level  
16 may go down, but the area that's impacted by that  
17 chemical, the area that in these cases needs to be  
18 cleaned up, that area increases. So though that  
19 concentration level goes down, there's still a very  
20 large area to deal with.

21 Okay. So here's again some of the options.  
22 Again, we have to consider no action.

23 Long-term monitoring means that when you --  
24 many of you that have been on the bus tour have seen a  
25 lot of the groundwater-monitoring wells. They have the

1 little yellow posts that protect them -- some of them  
2 do; others don't -- that are really all of over the  
3 base. There's hundreds of them.

4 And we use these wells. And at certain  
5 frequencies, either every 3 months or every 6 months or  
6 every 12 months, depending upon what's there, we go out  
7 and we actually monitor what's in the groundwater. We  
8 have tubes that go down into the groundwater, and we can  
9 actually take samples, take them to a sophisticated lab,  
10 and find out what's in the groundwater.

11 And that's a big part of our program. We have  
12 a whole network of these wells across the base to tell  
13 us what our groundwater looks like.

14 One of the options is -- and sometimes this is  
15 the right thing to do -- is you're at certain levels of  
16 contaminants where if you monitor them and they are not  
17 very mobile, they are not active and going anywhere,  
18 then maybe that's the right thing to do.

19 In other cases, it's not. So we have other  
20 options, like long-term monitoring plus groundwater  
21 containment and active treatment; and we'll discuss both  
22 of these different approaches in the next few slides.

23 So for this parcel, we considered this and  
24 this, and then we added on this [indicating]. And then  
25 for Groundwater Alternative 4, we added on a completely

1 different technology for the groundwater that has  
2 contamination under Building 406, which again is the  
3 warehouse where they stored the chemicals on the base.

4           Okay. So this, again, is a map to help you,  
5 and I'm hoping we can talk about this later, and you can  
6 look at our nice blowups that Mr. Bielskis has provided  
7 us tonight of the parcel here. I'm hoping when I show  
8 you a map of Parcel E it means a little something to you  
9 about where you are at on the base and where these  
10 things are relative to each other.

11           So Building 406 is right here. This is  
12 Parcel G, by the way, which, as you know, is this  
13 rectangular parcel that was originally part of a  
14 proposal for a potential 49er stadium back a few years  
15 ago. We've done extensive cleanup there. But  
16 Building 406 is just on the other side of that, and  
17 here's the groundwater plume here.

18           We also have some metals and PCB groundwater  
19 plumes very close to the shore. And then we have the  
20 oily waste ponds, which are very thick, thick mix, a  
21 thick soup of petroleum products and PCBs and some  
22 metals. They are also perched along the shoreline.

23           Now, in this Proposed Plan, we are -- we're  
24 putting these groundwater plumes into two different  
25 categories, and we'd like to hear your opinion on this.

1           We are -- we are saying that the gr- -- the  
2 groundwater plumes that are closer to the shore, because  
3 of what's in them and how they are not very mobile, can  
4 be treated a little differently than the inland plumes  
5 here.

6           These have chlorinated solvents in them, which  
7 are basically like cleaning fluid type spills that are  
8 in the groundwater here [indicating] and here  
9 [indicating] and here [indicating]; and this is, of  
10 course, in Utility Corridor 3, Crisp -- this is Crisp  
11 Avenue and then again Building 406, these plumes.

12           And we are going to propose here that these  
13 plumes are treated a little bit differently than these  
14 [indicating]. And this [indicating], of course, will be  
15 in its own category.

16           Okay. So for the oily waste ponds, again, no  
17 action and then containment. Containment is currently  
18 the option that has been used out there.

19           We do have a soil cover over it currently, and  
20 we do have a belowground barrier there, although that  
21 belowground barrier -- we've looked at it, and it's not  
22 of a high enough quality durability to be a part of a  
23 permanent remedy. And then couple that with some  
24 long-term monitoring, which again involves what?  
25 Groundwater-monitoring wells, going out there and

1 monitoring and seeing if this stuff is moving at all.

2           At the oily waste ponds, the good news is, this  
3 is very thick mix of petroleum products that are like  
4 sludge oil that you see sometimes in your car at the  
5 very bottom of the oil pan. It looks a lot like that  
6 when you bring it up. It's very thick, what they call  
7 viscous material. It's like a very, very thick  
8 milkshake, and it doesn't go anywhere. It's not very  
9 mobile. That's the good news about it. And it's been  
10 sitting there for decades.

11           So another -- I'm sorry. Another alternative  
12 here is removing and treating the contaminated oil and  
13 then doing some active groundwater treatment and then  
14 removing all of the contaminated soil above the  
15 groundwater, which would be an extraordinarily large  
16 project, and then removal of all contaminated oil  
17 followed by long-term monitoring.

18           Those are our different choices, our different  
19 cleanup options.

20           All right. And then finally -- so we've done  
21 soil, and then we have done the sediment near the  
22 shoreline, the sandy parts. And then we've just talked  
23 about the groundwater plumes, right, the contamination  
24 that's in the groundwater, and then the special case of  
25 the oily waste ponds because it's special.

1           And now finally, the final thing that we had a  
2    slate of choices on is rad, is the radiological  
3    contamination. Again, this is low-level radiological  
4    contamination; but the Navy is obligated to inspect  
5    these places, sample them, test them, look at it, look  
6    at what's there, and then clean up what they find.

7           So one option is to clean up the contamination  
8    not already addressed by the early cleanup actions, and  
9    that would consist of doing a lot on the shoreline areas  
10   in the storm drain and sewer lines, but that would also  
11   consist of removing and disposing of contamination in  
12   Site 2 and Site 3 and then constructing a 2-foot soil  
13   cover.

14          And then the alternative is a lot like the  
15   second alternative, only we examined -- would it make  
16   sense to construct an even thicker soil cover of these  
17   two sites? Would it really be worth it, or is it  
18   protective enough to construct 2-foot-thick cover?

19          Okay. So for all of these things, if you can  
20   stay with me on this -- I know there's a lot of  
21   different things here: There's soil; there's sediment;  
22   there's groundwater; there's those oily waste ponds; and  
23   there's the radiological contamination, the rad. For  
24   all of those, we have to select them based on criteria,  
25   common criteria to use. And these fall in different

1 categories. There's nine of them.

2 And when you look at your Fact Sheet or you  
3 look at the whole Proposed Plan that you can find at the  
4 back table -- I won't go into great detail of that  
5 because you'll see a lot of charts where you can  
6 visually look at the comparison of the different choices  
7 for each of these things against these common criteria.

8 But I will tell you this: They fall into three  
9 different categories.

10 And the threshold criteria, without getting too  
11 into it, is stuff you've got to do -- you've got to do  
12 in order to be in compliance with the law. There's no  
13 choice about it.

14 And so anything that the Navy selects and that  
15 the regulators would ever bless or approve would have to  
16 meet this criteria, no matter what. It would have to be  
17 complying with all the regulations and laws of the land,  
18 both the State of California regulations and the federal  
19 regulations and the regional regulations and so forth.

20 And then there's other criteria that are called  
21 balancing criteria. That's where you weigh the pros and  
22 the cons of things, how long will the remedy last, how  
23 easy is it to actually put the remedy in; in the short  
24 term how good is it of protecting people and the long  
25 term how good is it protecting people, things like



1     that.

2             And then the modifying criteria include you  
3     'cause Criteria 8 and 9 include the acceptance of the  
4     State of California. Even though this is a federal site  
5     where the remedy is ultimately selected by the U.S.  
6     Navy, which is federal, and the U.S. EPA, which is  
7     federal, critical parts of this must be approved by and  
8     are part of the criteria are for the State of  
9     California.

10            And so state regulators play a good role in  
11     this. We have to measure and tell the public our  
12     selections have gathered what level of acceptance from  
13     these state agencies.

14            In addition to that, community acceptance has  
15     to be considered. So before we make a decision, which  
16     is our next step, right, after this Proposed Plan,  
17     after -- before we make a decision, we have to tell the  
18     world that we evaluated and gauge what is the level of  
19     acceptance in the community based on the proposals that  
20     you're hearing tonight. And so that's a part of it, a  
21     part of the process.

22            Okay. And again, these are just the specific  
23     criteria -- you can see them in your Fact Sheet again --  
24     that talk about the things I was talking about: how  
25     long term protective it is, how short term protective it

1 is.

2           How much it cost is an element that you have to  
3 consider and, again, certainly something that the Navy  
4 never ignores because you do need to consider that these  
5 are taxpayer dollars and taxpayer-funded cleanups. And  
6 so you need to be wise with how you spend taxpayer  
7 dollars.

8           State acceptance and again community  
9 acceptance, which we are here tonight to gather.

10          Okay. So what we select. Let's go through  
11 what the Navy is proposing to you and to the regulators  
12 and to the world. All right.

13          We selected S-4, which is excavation and  
14 off-site disposal of the Tier 1 and the Tier 2 soil  
15 locations. So anywhere we gather data and there's  
16 contaminants that are ten times and five times the  
17 screening goals provided us by the U.S. EPA and  
18 sometimes modified by the State of California we are  
19 proposing to excavate and dump -- and take off site.

20          We're also proposing to put on a cover. In  
21 some parts of the parcel, the cover will be asphalt or  
22 concrete. It would be hardscape. In other parts of the  
23 parcel, it will be soil with vegetation on it, that  
24 vegetation to prevent erosion in the future.

25          Also followed by doing some soil vapor

1 extraction. The soil vapor extraction would be in that  
2 warehouse I was telling you about, Building 406, for the  
3 contamination not that's in the groundwater but the  
4 contamination that's between the bottom of the warehouse  
5 and the top of the groundwater, all the soil you have to  
6 get to to get to the groundwater. That's what we're  
7 planning on doing there.

8 And then putting in something called  
9 institutional controls and shoreline protection.  
10 Institutional controls is a very large word, which just  
11 means restricting the use of the future land so that it  
12 can be protective and restricting the activities that  
13 can go on that land where the proposals are still  
14 protective of human health and the environment.

15 So it's all gauged on of the Navy proposing,  
16 and we proposed institutional controls virtually  
17 everywhere on this base, including these two parcels.

18 That these controls, these land-use controls  
19 and activity restrictions, would ensure that what goes  
20 on as the land is developed over the years is compatible  
21 with whatever cleanup option we choose and then put into  
22 place.

23 Now, another part of that -- I won't dwell on  
24 that because we've talked about this. Many of you that  
25 I know, we've talked about this at length over the

1 years.

2 Another element to this is: The Navy not only  
3 can't make these selections in a vacuum without  
4 consulting the regulators, but we also have to consult  
5 the City of San Francisco. The Congress has required us  
6 to do that. Under the base realignment and closure  
7 protocols, we have to do that.

8 So anything we select must be compatible with  
9 what the City of San Francisco wants to do after the  
10 property is transferred to them and it's developed. So  
11 we have to keep that in mind.

12 And these play a key role, these controls --  
13 These land-use controls and activity restrictions play a  
14 key role in ensuring that what we put in place is  
15 protective but at the same time it's compatible with  
16 what the future vision of the City of San Francisco is  
17 for that particular location.

18 Okay. And this includes shoreline protection.  
19 Shoreline protection can include a lot of things,  
20 including putting the rocks, the riprap, along the  
21 shoreline and putting rock armor on the shoreline and  
22 putting sand over it, things like that.

23 Okay. So let's look at what we selected for  
24 the groundwater, and we picked -- it's in blue --  
25 Groundwater Option 3: groundwater containment, some in

1 situ treatment -- another fancy word I'll explain in a  
2 minute -- and then some monitoring and again some  
3 restrictions on the property about what you can do.

4 When you're dealing with groundwater in the  
5 city and county of San Francisco, there's always going  
6 to be these kind of restrictions, really, because  
7 there's already county ordinances in place that say you  
8 shouldn't be putting groundwater wells, you know, here  
9 within the city and county of San Francisco and using it  
10 for drinking water and so forth.

11 But we'll have -- we'll have controls like that  
12 to make sure that the groundwater isn't used for that  
13 purpose. It really isn't meant for this purpose on this  
14 base, and we want to make sure that it isn't used for  
15 that purpose.

16 So, well, let's go back and talk a little bit  
17 about this still. Do you remember I was talking about  
18 those plumes that were on the base? What the Navy is  
19 proposing is that we do containment for those portions  
20 of the groundwater -- we call them plumes -- where  
21 there's metals and there's PCBs and there's heavy  
22 material that don't move much.

23 Those up-against-the-shoreline plumes we feel  
24 that we can effectively put -- put in belowground  
25 barriers and aboveground covers and put in sentinel

1 wells, guardian wells, and monitor those. And we  
2 believe that the -- those chemicals will best be left in  
3 place and will remain in place and not threaten the  
4 bay.

5 They are perched -- They are near the  
6 shoreline, as I showed you on an earlier map, and that's  
7 one of -- one of the primary goals of this is they are  
8 not -- these aren't posing any risk to human beings.  
9 They are belowground surface in the groundwater.  
10 They've been there for a long time.

11 But they are -- ultimately -- the question that  
12 the Navy has to ask is -- could pose a threat to the bay  
13 if that groundwater eventually moves into the bay and  
14 carries the contaminants with it. In this case, we  
15 don't believe that's the case. It hasn't been the case  
16 over the decades since these contaminants have been  
17 there, and that's going to be our proposal.

18 Now, in stark contrast to that, the many more  
19 plumes that are inland that I showed you we are going to  
20 do active treatment on.

21 And that active treatment falls into two basic  
22 camps. We are either going to zap it with iron, an iron  
23 compound, that we talked about and have used across the  
24 base that breaks down the chemicals. Either that, or  
25 we're going to provide nutrients to the bacteria under

1 ground that will then eat the contamination. We have  
2 done that pretty extensively on this base too.

3 So we're using proven methods over the years in  
4 different parts of the base. We're bringing those to  
5 Parcel E and saying, those groundwater contaminants in  
6 these plumes that are inland, we are going to use  
7 basically one of those two types of technologies to  
8 clean up the plume, and that's what we mean by "active  
9 cleanup."

10 Okay. And another key goal that I have to show  
11 you here is monitored natural attenuation. Sometimes  
12 that's not -- That's again another big fancy phrase.  
13 What does that really mean? That means professionally  
14 managing and professionally monitoring these plumes,  
15 whether they are inshore or on the shoreline.

16 And what does that mean? That means using  
17 groundwater-monitoring wells and at regular intervals  
18 going out and checking on these just to make sure they  
19 are still where we think they are and that the remedy is  
20 in place and that everything is protected. And that's a  
21 key element of our selection here, our -- of selecting  
22 this option.

23 Okay. Now, again, the oily waste ponds that I  
24 talked about where the Navy did fuel reclamation back in  
25 the day and let these -- this thick sludgy material

1 behind. It's very deep, and it doesn't move much at all  
2 except it sinks a little because it's so darn heavy over  
3 time, but it hasn't even done that much of that. But it  
4 is down at fairly lar- -- fairly deep levels, and it's  
5 been sitting there on the shoreline.

6 Now, remember, the Navy's already taken some  
7 significant actions there. We put a nice flat soil  
8 cover on top. We did some limited digging of anything  
9 that was perched on the shoreline back in 1997, and then  
10 we put in a sheet-pile wall barrier.

11 What we're recommending that we do is we are  
12 going to do more excavation. That's called source  
13 removal, in other words, going to that goopy stuff and  
14 digging it up. We're going to do some of that.

15 And we are also going to use different  
16 technologies to treat some of the groundwater there.  
17 And then we're also going to build a much better  
18 belowground barrier than we built in 1997 that we think  
19 is going to be more long-term protective.

20 So we're going to do all of these things at the  
21 oily waste ponds, and we're going to continue to  
22 professionally manage and monitor it and put some  
23 restrictions there.

24 Okay. And finally, what's our final category?  
25 All the radioactivity, the low-level radioactivity, the



1 residual radioactivity that's on the base, what are we  
2 going to do there?

3 Well, we are going to survey, remove, and  
4 dispose of all of it with the exception of in these  
5 large areas that are considered rad impacted, Site 2 and  
6 Site 3, where we are going to put a 2-foot-thick soil  
7 cover over it. We are going to do surveys on the  
8 surface. We are going to remove anything that we find  
9 that's left if there is anything left, and then we're  
10 going to put a soil cover over these areas.

11 Part of the reason for that is, these areas are  
12 different than going into a building or going into a  
13 sanitary sewer system or examining a pit that has some  
14 low-level radium in it or anything. These are very  
15 large sites. And everything that we knew to remove we  
16 have removed. So we don't -- we aren't knowingly  
17 leaving any low-level rad there.

18 But these are large sites that are fill  
19 material that go down very deep, and it's nearly  
20 impossible -- I would like to say "impossible," but it's  
21 not good to just use that word -- nearly impossible in  
22 order to prove a negative that there's nothing there.

23 But what do we know? We know that the Navy's  
24 gone there and did a huge dig-and-haul back a few years  
25 ago. We know that we removed over 3200 items that were

1 in the area. We know that we have removed other items,  
2 because we did a survey of the shoreline; and wherever  
3 we found anomalies, hits, we did removals.

4 So what we're planning on doing in these large  
5 areas, again, is to do another survey of the surface,  
6 take out anything that's there if there is anything left  
7 there. I'm not sure we'll find anything left. But if  
8 we do, we will remove it and then put on a 2-foot-thick  
9 soil cover.

10 Part of the discussion here is, is 2 feet -- in  
11 this condition is 2 feet thick protective, or do you  
12 really need 3 feet thick?

13 And after analyzing it and evaluating it, we  
14 believe 2-foot-thick cover is certainly robust enough to  
15 take care of any remaining concerns after we do a  
16 surface survey.

17 And that surface survey will not only be the  
18 surface. It will go down 12 inches, okay, a foot. And  
19 anything we find there we will remove. So we'll be able  
20 to certify to everybody that that 12 inches is clean.  
21 And then we're going to put another 2 feet on top of  
22 that, which adds up to 3 feet.

23 Okay. So here's just a map that shows you some  
24 of the really -- our selected choices for soil and  
25 sediment. And you can see that -- remember I said when

1 we do a parcel-like cover, parts of it are going to be  
2 asphalt cover or building footprints? That is all  
3 hardscape: concrete, asphalt, things like that.

4 This will be a soil cover. So it will be  
5 softer. When -- and this cover's [indicating] put in  
6 place.

7 Okay. And this is basically what we're  
8 proposing, these lines here [indicating]. That's  
9 basically the dividing line between the two.

10 Now, when we transfer this to the City over the  
11 years, can this change? Sure it can. This is a  
12 hardscape remedy. This is soft scape, soil with  
13 vegetation. But both are considered valid choices.

14 So as the years go on, the City can -- with  
15 approval from the regulators, they will be able to make  
16 other choices as to the type of cover there. Okay.

17 This is -- I just want to show you some of  
18 what this looks like. This might be familiar to you.  
19 This is a soil cover that we put on on Site 7 and 18.

20 When you go down to the very end of Innes and  
21 you enter the base and you have to make a hard left and  
22 enter the base, that is the site that you see that's  
23 now -- has a fence around it and in the spring at least  
24 beautiful wildflowers. And that has a soil cover on it,  
25 and we planted -- we hydroseeded these flowers and took

1 care of them as measure to prevent erosion and to  
2 minimize dust because of the root balls from each of  
3 these -- all this vegetation holds the soil in place.

4 We've done that at the base. You can go and  
5 see it anytime just by going down to the end of Innes  
6 again and looking down on it. It's the field that's  
7 across the street from the Morgan Heights condos.

8 And here's just another picture of us  
9 constructing it. Before it looked like this  
10 [indicating], it looked like this [indicating]. We put  
11 down -- We surveyed the surface, made sure it was  
12 clean. We added clean soil on top of that, and we also  
13 put in a nice demarcation layer.

14 Okay. So we are talking about up around the  
15 shoreline. Rock revetment is one alternative. On  
16 Parcel E, we have 2400 feet of shoreline. So what the  
17 Navy, what the regulators, and with your input is going  
18 to decide in the future out of that 2400 feet, where  
19 does it really demand something more robust like this  
20 rock revetment, and where is it more appropriate to put  
21 in sand with underlying rock armor?

22 "Underlying rock armor" is just a fancy term  
23 that -- it's basically rocks that look a lot like this.  
24 Sometimes they look -- they are a little smaller, and  
25 they're just covered over by sand.

1           So we're going to have to -- one of the  
2   decision thi- -- points in the future is going to be out  
3   of that 2400 long [sic] shoreline, where is it  
4   appropriate to do this [indicating] versus where is it  
5   appropriate to do that [indicating]?

6           Okay. And here's a little drawing. Again, I  
7   don't want to overly complicate things. But when you --  
8   when you have a building -- a warehouse like  
9   Building 406, this i- -- let's pretend this [indicating]  
10   is like a big warehouse instead of a nice little  
11   house -- part of what we do is here's the surface.  
12   Here's the soil underneath the surface that you can dig  
13   into; and if you dig down far enough, you hit the water,  
14   the water table.

15           So at Building 406, we have contaminants,  
16   chlorinated contaminants. They were cleaning compounds  
17   and things, solvents that are in the groundwater. But  
18   we also have some contaminants that are in the soil  
19   column.

20           So what we're proposing at Building 406 at the  
21   warehouse is -- we've done a lot to clean up the  
22   contamination in the groundwater. We are now going to  
23   go after the contamination in the soil column. And we  
24   do this by something called soil vapor extraction. It's  
25   a system we put in.

1           We are also using it at another part of the  
2 base on Parcel B where we're doing the same kind of  
3 thing when we have something that is a volatile chemical  
4 that we have found in the soil column beneath the  
5 ground.

6           Okay. And so again, we want to do containment,  
7 robust containment, and monitoring in this -- in this  
8 area, these plumes. Excuse me. Obviously, the oily  
9 waste ponds is its own category in thi- -- on these  
10 plumes. And we want to do active treatment here and  
11 here and here [indicating].

12           Okay. And this is just a drawing, kind of a  
13 cross section of what active groundwater treatment can  
14 look like. We do two different types on this base  
15 typically. There's all different types. But the two  
16 that we found really effective: We inject iron into the  
17 groundwater, and what that iron does is very quickly  
18 break up the contaminants into chemical compounds that  
19 aren't as toxic.

20           And we also inject nutrients into the ground  
21 when we know that there's bacteria in there that lives  
22 and thrives, lives and thrives. And what that does is  
23 it increases the population of the bacteria, and the  
24 bacteria naturally eats the contaminants.

25           When it eats the contaminant, it then lets go

1 of the contaminants and breaks them down. So you can  
2 use these with chemicals that are kind of complex  
3 molecules, and the bacteria will break them down once  
4 they eat them, digest them, and excrete them.

5 So we have done both on the base, and both work  
6 depending upon what the contaminant is and where it's  
7 located.

8 Now, what about containment for some of those  
9 plumes that are near the shoreline? This [indicating]  
10 is the wall, the belowground barrier. In addition to  
11 that, you have shoreline protection that I've shown you,  
12 and then you also have a soil cover.

13 That is a typical -- This is a typical design  
14 [indicating] for containing contaminants that are in  
15 this area near the groundwater level. So -- and now the  
16 exact details of what we do in those locations will be  
17 worked out at a later time when we do the design.

18 So we're -- again, we're at the process where  
19 we're showing you what we're -- we are proposing to do,  
20 in the next step will make a decision on what we are  
21 going to do. And then once we all make a decision on  
22 what we are going to do, then we have to provide the  
23 details of the design on what specifics we're going to  
24 do. And so that comes down a little later.

25 Now, let's quickly go to Utility Corridor 3.

1 It's very thin, as I said. I mean, it consists of this  
2 bit of land here [indicating], Crisp Avenue, and then it  
3 heads out in 30 foot wide, 3200 feet long down to about  
4 Ingalls, I believe, and Carroll Avenue. It's got some  
5 contamination too. Railroad tracks run through here.

6 If you ever hike it, it's very hard to hike it  
7 because over the years people have extended their  
8 property onto it. They put up fences. They've stored  
9 things on the land. The Navy hasn't used it for  
10 decades. So that's going to be one of the challenges  
11 when we go out.

12 Certain areas we have done samplings, and we do  
13 know that there's areas where we need to excavate; in  
14 other words, go there, find the chemicals that were  
15 probably releases associated with railroads, dig them  
16 up, and dispose of them. And that's what we're going to  
17 do there.

18 Now, there is some contamination in the  
19 groundwater here [indicating], some of what's left.  
20 That's already been treated to some degree.

21 Let me see. Oh, okay.

22 I want -- and in addition to that, this  
23 [indicating] was rad impacted, this whole Crisp Avenue.  
24 It was rad impacted because it had a sanitary sewer  
25 system combined with the storm drain system that went



1 down beneath the ground surface.

2 So what we had a company do is they had to  
3 investigate that and dig it all up. And you might  
4 recall, in the last two years, that's exactly what was  
5 done. And he had to dig, I believe, as deep as 27 feet  
6 down below the ground surface to get everything out.

7 Now, there -- it turned out that there wasn't  
8 much contamination there, extraordinarily low levels.  
9 But now we have documented that, and it's not there  
10 anymore. And we have actually gotten from the State of  
11 California free release of this site. So we have  
12 already earned that free-release certification from  
13 them. So we've done everything we need to do when it  
14 comes to that on this parcel.

15 Okay. And just to recap, why did we -- why did  
16 the Navy propose these? Well, they have to meet certain  
17 standards: protecting human health and the environment,  
18 people and wildlife, from exposure to contamination that  
19 pose unacceptable risk. That's really the bedrock  
20 foundation of what we have to do. No matter what  
21 proposal we intend to select, it has to meet that  
22 criteria.

23 In this case, we feel the removing -- on  
24 Parcel E the removing and disposing of contaminants that  
25 poses the greatest risk to people, anything that's

1 spread out over a large area that can be covered up  
2 with -- that can be under a cover to prevent exposure in  
3 the future to it in those areas we are proposing that.  
4 We are treating groundwater that propose -- that poses  
5 the greatest risk.

6 But we are also installing -- we're basically  
7 following containment for those areas of contamination  
8 that we feel we can properly contain so that they don't  
9 migrate into San Francisco Bay, but they are also not  
10 bothering anybody else.

11 And each of our proposals also includes  
12 long-term monitoring and maintenance.

13 Okay. And again, this is another couple of  
14 reasons why we believe that our proposed solution works  
15 and that it's protective and that it's really the best  
16 choice when you weigh all the pros and cons.

17 And basically it comes down to this: The  
18 remaining contamination that we are not going to  
19 excavate is going to be low-level contamination that  
20 consist of chemicals that don't move around.

21 And if you can contain a chemical and it's  
22 beneath the ground surface and you don't have any  
23 exposure to it, you don't have any risk to it because  
24 with no exposure to it, there isn't any risk to it as  
25 long as it's properly covered and that cover's

1 maintained.

2           Okay. And again, the bottom-line standards we  
3 use is protective of people and wildlife; "human health  
4 and the environment" is the phrase you often hear. It's  
5 consistent with all the laws and regulations and  
6 national policies, but it's also consistent with the  
7 City and County of San Francisco's anticipated reuse and  
8 redevelopment of the property.

9           Much of the fringes of Parcel E are going to be  
10 open space, and everything we proposed for those areas  
11 along the bay is compatible with this; and we've worked  
12 pretty closely with the City to make sure that all the  
13 other alternatives are compatible with the City's reuse  
14 and redevelopment as well.

15           Okay. Some of the next steps I believe Matt is  
16 going to handle.

17           MR. ROBINSON: All right. Thank you.

18           MR. FORMAN: Sure.

19           MR. ROBINSON: All right. So the next steps  
20 for this process, the public comments are due by  
21 March 15th. So even if you have comments you want to  
22 say today, you still have time to write them down, and  
23 you can E-mail them or mail them or fax them. We will  
24 give you the information for that a little bit later.

25           This will then go for the Record of Decision.

1 The RODs will be included with the responses from your  
2 public comments, and the RODs will also identify the  
3 final remedy for Parcels E and UC-3. And there will be  
4 two separate RODs that will be prepared: one for  
5 Parcel E and one for Parcel UC-3.

6 Now, then, there will be a design and build of  
7 the final remedies for Parcel E and Parcel UC-3, the  
8 remedial design and remedial action as it's known.

9 And so I said earlier, you can write down your  
10 comments tonight, or you can tell us to them verbally.  
11 And your comments, again, will be a part of the Record  
12 of Decision. You can mail them or E-mail them or send  
13 your faxes to Keith Forman, and here is the address.  
14 There's -- Also if you have your information in your  
15 Proposed Plan, you can look up information. It is there  
16 as well. Again, March 15th is the deadline.

17 Also, in terms of who also is working on this  
18 project, earlier I introduced Craig Cooper, Dr. Ryan  
19 Miya, and Miss Tina Low. They are the regulators who  
20 are working to oversee the Navy -- Navy's effort on this  
21 project.

22 And also, if you want to get more information,  
23 we have repositories at the San Francisco Main Library  
24 as well as the office trailer at the Hunters Point Naval  
25 Shipyard. You can stop by and look at the Prosed Plan

1 when it's there as well as the other pieces of  
2 information that the Navy has on the entire project.

3 You can also look at the Proposed Plan which  
4 will be on the Navy's BRAC Web site at this E-mail  
5 address, bracpmo.navy.mil.

6 So now we're going to take a quick break, a  
7 ten-minute break, allow our court recorder to take a  
8 break; and we'll come back at 7:35. If you want to also  
9 talk with the regulators during this break, please feel  
10 free to do so. Thank you.

11 *(Whereupon, a recess is taken from*  
12 *7:26 p.m. to 7:40 p.m.)*

13 MR. ROBINSON: We'll get back to our meeting.

14 Coming up will be the regulators from the U.S.  
15 EPA, the State Water Board, and the California  
16 Department of Tox- -- Substan- -- Toxic Su- -- Ryan  
17 Miya.

18 DR. MIYA: Toxic --

19 MR. ROBINSON: Department of --

20 DR. MIYA: I can say it. I can say it.

21 MR. ROBINSON: Yes, please do.

22 Cal/EPA we like to call it.

23 Okay. Did you want to . . . ? Yeah. Sorry.

24 Come on up, Craig and Tina.

25 We will have our regulators and their

1 perspective, and then after that we will then go to our  
2 clarifying questions of the presentations.

3 So now I'm going to turn it over to Ryan Miya.

4 DTSC'S PERSPECTIVE

5 BY DR. MIYA:

6 Hi. I'm Ryan Miya with the State Department of  
7 Toxic Substances Control. It's a mouthful. DTSC.

8 And I don't want to take up a lot of time, but  
9 I just wanted to give sort of the regulatory perspective  
10 a little bit on the remedies that were proposed. The  
11 main reason that we're here is to hear public comments.  
12 So I don't want to take of up much of your time, but  
13 just some additional information that I think would be  
14 useful.

15 So I'm going to break it down by just going  
16 through the -- some of the -- the general categories,  
17 the first with the soil and the sediment proposed  
18 excavations.

19 You know, each of those -- those squares up  
20 there, those -- it was actually over a hundred little  
21 squares there. And just emphasizing that each of those  
22 squares were generated because of sampling that was  
23 done, and not just one sample, but sometimes four or  
24 five around them to get the size of those boxes correct;  
25 and they are correct based on the information that we

1 know now.

2 But we're still going to make the Navy do  
3 confirmation samples at the bottom of those holes to --  
4 to have testing at the bottom of the holes to make sure  
5 that they have gotten everything there.

6 So that's just preliminarily what the areas  
7 are, but they're very likely to expand a little bit more  
8 once when we actually get out there and get some data,  
9 but they are not going to be done with those areas until  
10 they have demonstrated that they've gotten it all.

11 And then also with the shoreline remedies, I  
12 wanted to emphasize that I think early on we've also  
13 been stating that because it's such a large area and  
14 Keith mentioned that it's about 2400 feet long, the  
15 remedies for some of these areas are actually going to  
16 be very ecologically friendly. They are going to be  
17 really pretty and more aesthetically pleasing than the  
18 rock revetments that you've seen the Navy install.

19 There's definitely going to be portions of  
20 those rock revetments that are still there in the areas  
21 that are maybe steeper, you know, and -- so it needs to  
22 be steep because it's -- kind of stabilizes that. You  
23 don't slide into the ocean.

24 But emphasizing that this is a large -- a  
25 large -- a large portion of the parcel is actually

1 bordering the -- the Yosemite Slough there and the bay.  
2 And so our hope is to try to get as much of that remedy  
3 be more ecologically friendly so birds and other animals  
4 will find it more pleasing than -- than just the rocks  
5 there.

6 And then also he touched on the -- that oily  
7 waste pond area, and that really is going to be a  
8 challenge. It's something we're going to be keeping our  
9 eye on very closely, because it's a -- it's a pretty  
10 large area.

11 And the way I like to look at it is it's really  
12 like molasses stuff and to -- and it's really deep  
13 too. So -- and it's right next to the bay.

14 So I know he -- Keith did a really good job of  
15 summarizing each of these things, but I just wanted to  
16 sort of point out particular areas that we're taking a  
17 close look at and highlighting some slightly different  
18 things than what he did.

19 With respect to the groundwater treatment,  
20 he al- -- Keith also stated that, yeah, these are in  
21 fact technologies that have been used elsewhere  
22 successfully on the base, and so it makes sense to  
23 continue using them. But even in those situations, we  
24 still have and are going to require monitoring to make  
25 sure that it's working at that particular spot in



1 Parcel E and UC-3.

2 And as with any of these technologies, there's  
3 going to be monitoring to make sure that not only  
4 that -- that what they are proposing to do and how they  
5 implement it is actually working, but that in the future  
6 if something happens and it maybe goes sideways a little  
7 bit, we will have information to indicate that we maybe  
8 need to do something more, but the idea being that even  
9 after they have implemented it, we're still going to be  
10 there and making sure that it's not -- it's not going  
11 sideways.

12 And then with respect to the radiological  
13 remediation that was proposed, I think there was a  
14 figure where a portion of the Parcel E was for the most  
15 part completed. But actually, we as a regulatory  
16 community are still in the process of reviewing the  
17 documentation for it and also analyzing confirmation  
18 samples.

19 So while the majority of the field work in  
20 those areas is done, it's still -- we haven't signed off  
21 on it yet, and we're still in process of closing that  
22 out. And this is just with respect to the radiological  
23 program.

24 But UC-3, as Keith mentioned, they did -- we  
25 did get to radiological free release. And so that's --

1 now they can focus on the chemical components moving  
2 forward.

3 And then ultimately one of the main things that  
4 I want to say is that we have been involved up to this  
5 point and we are still going to be involved as they do  
6 the implementation. And then after they implement it  
7 and they leave and the transferee gets the property,  
8 regulators are still going to be involved. So we are  
9 not going anywhere.

10 And even though -- it will always be -- State  
11 of California DTSC will still have ongoing requirements  
12 of monitoring as well as inspections; and like if  
13 something happens in the future, we're going to be  
14 there. And so just to emphasize that. And even though  
15 we are in -- right now in part of a larger process, no  
16 matter what happens, we are still going to -- still  
17 going to be there.

18 So thank you for your time. Appreciate it.

19 MR. ROBINSON: All right. Next up is Tina Low  
20 from the Water Quality Control Board.

21 WATER BOARD'S PERSPECTIVE

22 BY TINA LOW:

23 Hi, everyone. I'm Tina Low. I'm a remedial  
24 project manager in the groundwater cleanup division at  
25 the San Francisco Bay Regional Water Quality Control

1 Board, "Water Board" for short.

2 So I wanted to just make four brief points  
3 tonight. And the first is that in looking at the ways  
4 that are available to protect people and the environment  
5 from the risk on the site, they were going to treatment,  
6 removal, containment, monitoring. And what really makes  
7 sense about the Proposed Plan is that it contains a  
8 sound suite of all these different ways of dealing with  
9 the risk.

10 The second point that I want to make is, being  
11 the Water Board, we look at water quality in terms of  
12 groundwater and impacts to aquatic life in the bay. So  
13 that's the lens in which we review the Navy's work.

14 And with respect to the proposed remedies,  
15 particularly with the groundwater alternatives, there's  
16 a good dose of removal and treatment. And that's  
17 usually our preference when we are talking about risk.  
18 There is containment and monitoring, which is also very  
19 appropriate for the site.

20 And the treatment alternatives that are -- The  
21 treatment technologies for groundwater, the in situ  
22 treatments being the in situ, bio, and the ZVI, those  
23 are proven technologies that have been successful at  
24 similar sites.

25 But the last point that I want to make is that

1 while these are proven technologies that have worked at  
2 other sites, we don't just rely on these past case  
3 histories to know that or to make sure that it would  
4 work on this site.

5 So while the Proposed Plan has an approach,  
6 there are other steps along the way to make sure that  
7 these ideas will be designed and implemented and  
8 monitored appropriately to make sure that it is in fact  
9 protective.

10 So right now we're at the Proposed Plan stage.  
11 There are other studies along the way that are  
12 concurrently happening to test out a lot of these  
13 technologies on the site.

14 And along the way there's also the Record of  
15 Decision and the Remedial Design, and these are also  
16 points where the regulators review the works to make  
17 sure that what is proposed is indeed going to be  
18 designed, implemented, and ultimately protective.

19 So that's the last of my points.

20 MR. ROBINSON: The next up is Craig Cooper from  
21 the U.S. EPA.

22 U.S. EPA'S PERSPECTIVE

23 BY CRAIG COOPER:

24 Hello, everybody. My name is Craig Cooper. I  
25 work for the federal EPA.

1           And Ryan and Tina and I really coordinate a  
2     lot. We want you to know that we have been, you know,  
3     monitoring the Navy's cleanup work here for many years,  
4     and we are going to continue to do so, as Ryan said.

5           With respect to the proposed cleanup plan for  
6     Parcel E and UC-3, EPA generally supports the direction  
7     the Navy's going. If we didn't support it, this meeting  
8     wouldn't be happening. We'd be in negotiations,  
9     hammering out, you know, our comments.

10          So at this point, we've reached a point where  
11     we're in general agreement with the direction that the  
12     Navy's going.

13          We want to hear what the community has to say  
14     about these cleanup recommendations.

15          And I we will a say this, though, that why we  
16     recommend support for these cleanups is that the  
17     Superfund law that EPA is watching the Navy implement,  
18     it talks about that for the high-concentration  
19     contaminants, you do active treatment. And that's what  
20     Keith was talking about.

21          Yes, covers are a remedy, and I've heard people  
22     from the community say, Oh, covers; they're just  
23     covering it up.

24          The heart of these cleanups, where it's safe we  
25     do active treatment. And I think that cannot -- you

1 know, that is really important. We're going to dig it  
2 up and haul it away, or we're going to find ways to  
3 neutralize the contamination in place.

4 And that is -- that's where you -- that's, I  
5 think, the most important thing about my job is to  
6 really encourage the Navy to undertake active treatment  
7 so then we can get rid of as much of the  
8 high-concentration contamination as possible.

9 And then the covers are the last element for  
10 the lower concentration stuff to make sure that people  
11 are safe.

12 So now we want to hear and now I think it's  
13 time to turn it over for community input. We're really  
14 interested on everything you have to say, both positive  
15 and negative, criticisms, questions, comments. We're  
16 all going to stay here. I'll be here after the meeting  
17 as well if you have questions for me.

18 Thank you.

19 MR. ROBINSON: Thank you, Craig.

20 Okay. Now, folks, it's your turn. What we are  
21 going to ask is -- This is the clarifying questions  
22 portion of the presentation; and because this is going  
23 on to be on the Record of Decision, we are asking that  
24 you all form a line at that microphone so that our court  
25 reporter can capture your statements.

1           So first before we get started, I want to let  
2   you know, we want you to please, as I say, get in line,  
3   and everybody has a chance to ask one question. And  
4   then we'll open it up -- after everyone has had a chance  
5   to ask the first question, open up for a second round of  
6   questions.

7           And then after the question period ends, the  
8   rest of the meeting will be dedicated to the formal  
9   comments portion of the Proposed Plan.

10          So now before we turn it over to you, we ask  
11   that you also state your name and spell it for our court  
12   reporter because we want to make sure that we get your  
13   name as well as your comment correct.

14          So please go ahead with your first question.

15          LINDA RICHARDSON: Linda Richardson, L-i-n-d-a,  
16   R-i-c-h-a-r-d-s-o-n. I am a long-time resident of  
17   Bayview-Hunters Point, and I've attended all the  
18   community presentations and most of the site tours.

19          My question to you, Mr. Forman -- and again,  
20   thank you for a detailed presentation. For the  
21   long-time obligations, I believe that you be  
22   transferring some of the long-time obligations like the  
23   monitoring and maintenance. You indicated in some of  
24   the med alerts you will be having -- let me rephrase my  
25   question.

1 MR. FORMAN: Sure.

2 MS. RICHARDSON: You indicated that for areas  
3 that will have containment, active treatment, that will  
4 also be long-time -- long-term monitoring and  
5 maintenance.

6 MR. FORMAN: Yes.

7 MS. RICHARDSON: Yeah, monitoring and  
8 maintenance.

9 MR. FORMAN: And maintenance, right.

10 MS. RICHARDSON: And so for those long-term  
11 obligations that you're going to be transferring, I  
12 believe, to our city government, is the Navy going to be  
13 providing funds and resources to enable the receiving  
14 agency -- in this case, the City and County of San  
15 Francisco -- to be able to have the capacity and the  
16 resources to be able to carry out those long-term  
17 obligations?

18 And I think I represented to Mr. Miya from the  
19 DTSC was alluding to this earlier. So could you please,  
20 sir, answer those questions.

21 MR. FORMAN: Yes. Excellent -- excellent  
22 question.

23 So the question was concerning these -- the  
24 long-term monitoring costs money, and the long-term  
25 operations for the site costs money. In CERCLA when you



1 have continuing costs like that, that is still an  
2 obligation of the Navy. For the dollar amount, that is  
3 a required negotiation to occur between the City of San  
4 Francisco and the Department of the Navy.

5 So if you look at the BRAC program as a whole,  
6 right, for DoD across the country, what typically  
7 happens is that a local reuse authority like the City of  
8 San Francisco and a DoD agency like the Navy get  
9 together and negotiate a certain dollar amount, and they  
10 base it on -- on, obviously, the site and estimated  
11 cost. But there is a negotiation process. So that will  
12 occur.

13 And then, not always, but often across the  
14 country, a lump sum is involved that's either paid up  
15 front or in a number -- a predetermined number of years  
16 to help support that.

17 But yes, that will go on, and it does need to  
18 be paid for, and it is a legal obligation of the Navy  
19 because the CERCLA liability does not go away for the  
20 Navy in this case either pre or post transfer.

21 MS. RICHARDSON: Thank you, sir.

22 MR. FORMAN: Sure.

23 RAYMOND TOMPKINS: Could you get me Slide 31  
24 and 33. Okay, you could stay -- 33.

25 MR. ROBINSON: Three?

1 DR. TOMPKINS: And could I have 31 first,  
2 please. I'm sorry.

3 MR. ROBINSON: That's good.

4 DR. TOMPKINS: That's --

5 MR. ROBINSON: What you want.

6 DR. TOMPKINS: Okay.

7 MR. FORMAN: Okay.

8 DR. TOMPKINS: Sorry I don't have a pointer, so  
9 I --

10 MR. FORMAN: Okay.

11 DR. TOMPKINS: In previous documents we  
12 submitted to the Navy --

13 How do I get the red dot?

14 I didn't do it. It wasn't me.

15 How do I get the red dot up there so I can show  
16 you what I'm talking about? I'll walk up.

17 MR. ROBINSON: The top one?

18 DR. TOMPKINS: Top one?

19 MR. FORMAN: Yeah, the top one.

20 DR. TOMPKINS: Keith, when we submitted -- and  
21 Dr. Palmer, Dr. White, and Dr. Grist submitted our  
22 documents on E-2, which was referred to as a Superfund,  
23 now, see, E-2 is over here, and that's not the  
24 Superfund. Where is the Superfund site located? I  
25 thought it was in this region [indicating] --

1 MR. FORMAN: Okay.

2 DR. TOMPKINS: -- of the landfill. And I want  
3 clarity on that, because then I have another --

4 MR. FORMAN: Right.

5 DR. TOMPKINS: Once -- 'cause I'm confused on  
6 the document. I don't --

7 MR. FORMAN: Got it.

8 DR. TOMPKINS: -- understand it.

9 MR. FORMAN: Okay. Thank you for asking one  
10 question at a time so you don't -- so I don't get  
11 confused. That's good.

12 DR. TOMPKINS: I need a clarity on that.

13 MR. FORMAN: Sure.

14 DR. TOMPKINS: Then I have a question.

15 MR. FORMAN: This is a great question because  
16 there's a lot of confusion even amongst people who do  
17 this for a living sometimes.

18 The defi- -- The legal definition of the  
19 National Priorities List site, NPL site, okay, which  
20 is the slang for the Superfund site, so it's okay to say  
21 that; the legal definition of the Superfund site is the  
22 entire site, all the shipyard. Every one of the  
23 446 land acres and 490-something acres of San Francisco  
24 Bay is -- comprises one site. It's all a Superfund  
25 site, an NPL site.

1 DR. TOMPKINS: Keith, when we submitted --

2 MR. FORMAN: Yes.

3 DR. TOMPKINS: -- in our comments during that  
4 period in two oh seven -- 2007, it was --

5 MR. FORMAN: Okay.

6 DR. TOMPKINS: -- for this area, the Superfund  
7 site, and it was though designated as E-2 that time; and  
8 that "E," that -- now E-2 is referred to over on this  
9 side that you already did the cleanup and not the  
10 Superfund.

11 So if somebody would look at the old documents  
12 and then look at our comments just doing on your  
13 current --

14 MR. FORMAN: Okay.

15 DR. TOMPKINS: -- coding, this would cause --

16 MR. FORMAN: Okay.

17 DR. TOMPKINS: -- confusion, and everybody  
18 think we're crazy.

19 MR. FORMAN: Okay. Okay.

20 DR. TOMPKINS: I need that clarity in terms of  
21 would you go back then and change the records --

22 MR. FORMAN: Right.

23 DR. TOMPKINS: -- to reflect the new labeling  
24 that you have so that --

25 MR. FORMAN: Well --

1 DR. TOMPKINS: -- people could follow the --

2 MR. FORMAN: Yeah.

3 DR. TOMPKINS: -- what we're talking about?

4 MR. FORMAN: Yeah. Okay. So thank you,  
5 Dr. Tompkins. I think I can provide some clarity to  
6 that.

7 It is true -- and this can be confusing, and I  
8 think in our information repository, you have to look at  
9 all the documents as part of a continuum of documents  
10 over time.

11 It's absolutely true what you said,  
12 Dr. Tompkins. We have changed parcels and subparcelized  
13 over time. This [indicating] used to be all of "E."  
14 And then we -- I think wisely everybody said Split off  
15 E-2 from "E," and that was predominantly the landfill  
16 area and the Panhandle area. And this [indicating]  
17 remained "E."

18 DR. TOMPKINS: Then at one point, two oh seven  
19 [sic], it was E-2, because we wrote our comments in a  
20 letter submitted to you --

21 MR. FORMAN: Okay.

22 DR. TOMPKINS: -- about E-2 --

23 MR. FORMAN: Okay.

24 DR. TOMPKINS: -- which was a Superfund.

25 MR. FORMAN: Yes.

1 DR. TOMPKINS: So if you please go back and  
2 have it reflected in the record when people review what  
3 actually is currently labeled what is a Superfund and  
4 that our comments will correctly relate it to the  
5 Superfund and not what you have labeled as "E-2" because  
6 it's --

7 MR. FORMAN: Okay.

8 DR. TOMPKINS: -- two different pieces --

9 MR. FORMAN: But --

10 DR. TOMPKINS: -- of land.

11 MR. FORMAN: But -- Right, it's two  
12 different -- if I may clarify. Thank you. If I may  
13 clarify, it's two different parcels, Parcels E-2 and  
14 Parcel E.

15 Parcels are an administrative way of the Navy  
16 breaking up a big site so that it's workable and so  
17 that -- in our case, we have a team. We have a team of  
18 five project managers, and a lot of them get their own  
19 parcel and get to work it.

20 But this is purely administrative. If you talk  
21 to a regulator -- Mr. Cooper, Dr. Miya, Ms. Low -- it is  
22 one site. Hunters Point Shipyard is a National  
23 Priorities List site, period. It's one site. And  
24 however we change the lines of the parcels or create new  
25 parcels to make it easier to work, to them it's all one

1 site. It's all under the Superfund. It's all a CERCLA  
2 site, no matter what. So that's the good thing.

3 But I do agree with you, and let me just ponder  
4 that, because over time it does get confusing.

5 We've created, for instance, Parcel G out of  
6 what used to be Parcel D, and there is no "D" anymore.  
7 There's "G" and there's D-1 and D-2. So it does get  
8 very confusing.

9 We've tried with fact sheets and things over  
10 the years to try and put that out. But I do agree with  
11 you that it's confusing.

12 And let me ponder that about ways to make a --  
13 maybe make it a little less confusing as the years go on  
14 because you're right, from when I came on the program  
15 2002 to 2007, like you're saying to now it's 2013, it  
16 has changed. I agree with you. The contours of the  
17 parcels have changed, and the labeling of the parcels  
18 have changed. I do agree.

19 But rest assured, it's all part of one CERCLA  
20 site, and that CERCLA site's on the National Priorities  
21 List, and it's all Superfund.

22 DR. TOMPKINS: Okay.

23 MR. FORMAN: Okay.

24 MR. ROBINSON: Next question.

25 DR. TOMPKINS: Hold on. I was standing in

1 line.

2 MR. FORMAN: Okay.

3 FRANCISCO DA COSTA: I was listening to you  
4 very carefully on the charac- -- characteristics that  
5 you were describing.

6 MR. FORMAN: Okay.

7 MR. DA COSTA: And nowhere did you mention the  
8 address impacts that a company like Triple A did on the  
9 Navy sites.

10 MR. FORMAN: Okay.

11 MR. DA COSTA: And --

12 MR. FORMAN: Do you want me to do that now?

13 MR. DA COSTA: No, no.

14 MR. FORMAN: Oh.

15 MR. DA COSTA: No, no.

16 And the other thing is, linked to that, we need  
17 to know the exact type of work IT [sic] did, the exact  
18 type of work Tetra Tech did, the exact type of work Shaw  
19 did. And we don't find a document like that.

20 So you can come here and say so many times of  
21 this was removed, that was removed, whatever was  
22 removed. We want to know really, as you were trying to  
23 explain partially, about what really is adversely  
24 impacting the community and what exactly was done by all  
25 the companies that tried to do some abatement and



1 mitigation. We don't have a report.

2 MR. FORMAN: Well, okay. Thank you for that.  
3 Okay. Let me just summarize that.

4 When a company -- We have different  
5 companies. We happen to have -- ERRG here is one of  
6 our companies. We have Tetra Tech. We have Shaw, as  
7 you mentioned. We have ITSI. We have different  
8 companies.

9 The way the Navy thinks about it and, quite  
10 frankly, because the companies work for the Navy, the  
11 way the regulators would think about it is: It's the  
12 Navy. It's the Navy's problem, and it's the Navy's  
13 company that's doing it.

14 When these Navy companies produce documents,  
15 they're Navy documents. They do -- and it is good.  
16 They do have the company labels on each of their  
17 documents; that's true. But they also have the Navy  
18 logos and the Navy labels. And rest assured, it's all  
19 100 percent accountable to the Navy, not to any  
20 company.

21 Now, having said that, when we did these early  
22 actions -- I think you touched on a good point. I talk  
23 about all these early actions that I already wanted to  
24 give us credit for that we've done, even though we  
25 haven't really done the final permanent remedy yet.

1 Every time we've done one of those early actions, we're  
2 required, we're forced, to document that.

3 And that's -- it's documented in -- in  
4 reports. Each of these actions that we did early that  
5 we have already done is documented in something called a  
6 Removal -- Removal Completion Report. Wait a minute.

7 MR. COOPER: Close enough.

8 MR. FORMAN: I'm tired.

9 Pardon? Yeah.

10 No. I'm sorry. A Removal Action Completion  
11 Report. Sorry. I'm getting tired. An R.A.C.R., a  
12 RACR, a Removal Action Completion Report.

13 So each one of these actions that we did, like  
14 the action here [indicating] and the action here  
15 [indicating] and when we dug out things here  
16 [indicating] and when we dug out things here at the  
17 metal debris reef; and when we did this action in 1997,  
18 those were all removal actions. And each one of those  
19 is documented in a Removal Action Completion Report.

20 And I can show you those in -- In the  
21 information repository, I believe, on Third Street used  
22 to have a complete set of them. And each one of those  
23 has its binder. And if you go to that binder, you'll  
24 know which company did them for the Navy. It's still  
25 the Navy, but you'll see the company logo.

1                   But I -- rest assured, every one of those  
2                   actions requires that completion report. Okay.

3                   MR. ROBINSON: Next question.

4                   JOHN NJOROGGE: Hi. My name is John Mburu  
5                   Njoroge; that's J-o-h-n, M-b-u-r-u, N-j-o-r-o-g-e. I  
6                   often make comments at the San Francisco Board of  
7                   Supervisors.

8                   I came here today to find out more about the  
9                   naval shipyard and how you're going to be using it.  
10                  This is not Camp Pendleton. I have studied some  
11                  admiralty and maritime law.

12                  My question is when -- at what point the Bible  
13                  comes in. We've heard of Keith Meinhold and Zoe  
14                  Dunning. They were employees of the Navy or the -- of  
15                  the Marines. And then when they came on land and sought  
16                  work, they were having -- they had problems finding  
17                  employment here. I just wanted to comment -- you to  
18                  comment on that while I read this section from James in  
19                  the Bible.

20                  Look here, you rich men, now is the time  
21                  to cry and groan with anguished grief because  
22                  of all the terrible troubles ahead of you.

23                  Your wealth is even now rotting away, and  
24                  your fine clothes are becoming mere moth-eaten  
25                  rags.

1 MR. ROBINSON: Sorry, sorry.

2 THE COURT REPORTER: I have to see this person.

3 MR. ROBINSON: Sorry. Sorry.

4 Sir, I'm sorry. Did you have a question? This  
5 is time for questions.

6 MR. NJOROGGE: Oh. I wanted to read a section  
7 of the -- of James from the Bible just to encourage the  
8 use and the utility of the Bible, especially when you're  
9 making contracts.

10 MR. ROBINSON: Well, right now we're not doing  
11 the statement portion. This is -- If you have a  
12 question of the presentation, go ahead and do that, and  
13 then afterward we're doing statements. But this is just  
14 for questions on --

15 MR. NJOROGGE: Oh.

16 MR. ROBINSON: -- if you have a question that  
17 needs to be, you know, answered by Keith Forman.

18 MR. NJOROGGE: My question was employment  
19 contracts.

20 MR. ROBINSON: Okay. And what's that question  
21 again? Do you have a . . . ?

22 MR. NJOROGGE: Yeah. When it comes to question  
23 of employment contracts, people like Zoe Dunning and  
24 Keith Meinhold when they came off the seas and they  
25 landed on shore and were seeking employment, they had

1 problems somehow finding employment.

2 And I just wanted to -- for you to comment on  
3 where the marine -- or the naval employee comes onshore  
4 and then finds a problem seeking employment, even though  
5 they're still seeking employment, you know, with the  
6 same organization.

7 MR. ROBINSON: We didn't discuss employment on  
8 this proposal. We are just talking about what was going  
9 on with each -- "E" and Parcel UC-3. So we really  
10 didn't discuss any employment.

11 MR. NJORGE: Oh. On the remediation issues  
12 and covers and soil erosion, that sorts of things where  
13 people would have to come in onto -- onto the land, I  
14 thought -- I just wondered whether you would be  
15 seeking -- what sort of employment, what sort of  
16 employment issues would be coming up at that point, and  
17 when in fact does the Bible help and assist in that, in  
18 that sort of employment drive?

19 MR. FORMAN: Okay. We have -- Every December  
20 we do a year-end review presentation which shows the  
21 community different aspects of our program and the  
22 impact it has on local employment and the supplies that  
23 our contractors buy and so forth.

24 I -- The 2012 year-end review is posted to our  
25 Web site, and I can show you that after -- after the

1 meeting if you want to go there and look at it, at the  
2 statistics. But that shows you the impact that we  
3 have.

4 But we take it very seriously to try and employ  
5 local workers in the -- particularly those folks that  
6 live in the three ZIP Codes adjoining the base. And we  
7 take -- and over the years have taken that very  
8 seriously.

9 We also really encourage our primary  
10 contractors to use subcontractors that are in the area  
11 and that have their subcontractors buy supplies from the  
12 immediate neighborhood surrounding the base. And I  
13 think we do -- we do a fine job of that.

14 MR. ROBINSON: Next. Any other first-time  
15 questions? No?

16 Then Dr. Tompkins.

17 DR. TOMPKINS: I'm James Brown; it's Part B and  
18 Part C too. Can I borrow --?

19 MR. FORMAN: Sure. Questions or -- or comments  
20 now?

21 MR. ROBINSON: Questions.

22 DR. TOMPKINS: Questions. I keep on tabs.

23 MR. FORMAN: No problem.

24 DR. TOMPKINS: Okay. Here -- and could you  
25 flip to --

1 MR. FORMAN: Put your --

2 DR. TOMPKINS: First could you show me on the  
3 diagram that you have --

4 MR. FORMAN: Which one?

5 DR. TOMPKINS: -- the parcel --  
6 This one here.

7 MR. FORMAN: Okay.

8 DR. TOMPKINS: Where is the Superfund site that  
9 got it classified that has the landfill, the deep  
10 landfill, that when we were -- used to meet at the  
11 police station, and we had -- some of the old surviving  
12 black workers gave testimony. We had a stenographer  
13 taking record --

14 I don't know if you were there or not.

15 -- that they dumped the animals and many other  
16 things that were dumped there.

17 So where on this map, so I could better get an  
18 appreciation in the audience, of the solvent, the  
19 plumes? Are they underneath the landfill that got this  
20 classified as a Superfund site?

21 MR. FORMAN: Okay.

22 DR. TOMPKINS: Clarity.

23 MR. FORMAN: Okay.

24 DR. TOMPKINS: But at the specific site where  
25 they had it.

1 MR. FORMAN: Yes. Okay. Many things are  
2 running through my mind. That's -- that's quite a  
3 question.

4 Okay. When it became a Superfund site, it had  
5 to go through something with the EPA called the Hazard  
6 Ranking System, the HRS. The Hazard Ranking System is  
7 actually -- this is an interesting thing about Superfund  
8 sites. It's actually addition.

9 So there's two ways to become -- There's two  
10 kind of obvious ways to become a Superfund site. One,  
11 you can either have one site that's really, really bad;  
12 it gets a really high score for toxicity. Or -- and  
13 this is the case of Hunters Point -- you don't have a  
14 site that's really, really high in toxicity, but you  
15 have -- it's an additive function; you have many sites.

16 So when they did the hazard ranking score in  
17 the late 1980s, they actually totaled up seven different  
18 sites that had been identified, and that score  
19 exceeded a -- there's an arbitrary scale. It's --  
20 exceeded, I believe, 28.5 on the scale. And when that  
21 function exceeds 28.5, it automatically kicks it to a  
22 S- -- what you're calling a Superfund site.

23 So in this case, it was seven original sites  
24 that were identified that added together created a score  
25 that made Hunters Point a Superfund site.



1 Now, one of the sites that was added in was  
2 Site No. 1, which is the landfill, you're right.

3 DR. TOMPKINS: Okay.

4 MR. FORMAN: That's just one of the sites.

5 DR. TOMPKINS: But my question is --

6 MR. FORMAN: Yes.

7 DR. TOMPKINS: -- the landfill that you've just  
8 discussed --

9 MR. FORMAN: Yes.

10 DR. TOMPKINS: -- is that where you had the  
11 plumes? And that is where I'm leading to then --

12 MR. FORMAN: Okay. The landfill is --

13 DR. TOMPKINS: -- ground.

14 MR. FORMAN: The landfill is here, sir. The  
15 landfill's here.

16 DR. TOMPKINS: It's not to the right but there.

17 MR. FORMAN: No, it is not to the right.

18 DR. TOMPKINS: Okay. That's what I'm trying to  
19 get to --

20 MR. FORMAN: Oh, okay. So this is --

21 DR. TOMPKINS: -- realize, you know --

22 MR. FORMAN: Yes, sir. This is "E"  
23 [indicating].

24 DR. TOMPKINS: -- my geography correct.

25 MR. FORMAN: This is "E" [indicating]. This is

1 E-2 [indicating]. The relative contours of the landfill  
2 are, like, here [indicating].

3 DR. TOMPKINS: Good. Where I look at the land  
4 cap to smother out the fire is then on E-2 and not on  
5 this part here, correct?

6 MR. FORMAN: Correct, correct.

7 DR. TOMPKINS: Okay. So the ground plume is  
8 adjacent --

9 MR. FORMAN: The what?

10 DR. TOMPKINS: -- or partially --

11 MR. FORMAN: I'm sorry. The ground --

12 DR. TOMPKINS: The plume --

13 MR. FORMAN: -- water plume?

14 DR. TOMPKINS: IR --

15 Yes, for solvent plume --

16 MR. FORMAN: Okay.

17 DR. TOMPKINS: -- it is partially on E-2? Am I  
18 correct?

19 MR. FORMAN: Oh, yes, yes, yeah -- I mean,  
20 you're saying this, the Site 12 plume?

21 DR. TOMPKINS: Right.

22 MR. FORMAN: Yeah. Now, that's a Site 12  
23 plume, yes. It is partially on -- well, it's  
24 partially --

25 DR. TOMPKINS: Is it your --?

1 MR. FORMAN: -- on there, yeah.

2 DR. TOMPKINS: Is it your theory that the  
3 Superfund site is contributing to the pollution, the  
4 under groundwater plume and the pollution?

5 MR. FORMAN: No.

6 DR. TOMPKINS: Where --? What's the source,  
7 then, for that one?

8 MR. FORMAN: For the Site 12 --?

9 DR. TOMPKINS: Yes, sir.

10 MR. FORMAN: Let me defer to Mr. Bielskis here.  
11 Do you know off the top, is Site 12 groundwater  
12 plume -- what are -- what the actual source?

13 MR. DOUG BIELSKIS: There were soil and  
14 groundwater samples collected outside of the landfill to  
15 the east of the landfill but before the Parcel E/E-2  
16 boundary.

17 MR. FORMAN: Yeah.

18 MR. BIELSKIS: And there was actually some  
19 recent excavation work that the Navy performed.

20 DR. TOMPKINS: When you said "east,"  
21 Mr. Forman --

22 MR. BIELSKIS: Sorry.

23 DR. TOMPKINS: -- was pointing to the --

24 MR. FORMAN: Well, this is east.

25 DR. TOMPKINS: -- to the left.

1 MR. FORMAN: Well, this is --

2 DR. TOMPKINS: Is that east? So I'm trying to

3 get an idea.

4 MR. FORMAN: This is -- this is the eastern --

5 MR. BIELSKIS: West.

6 MR. FORMAN: -- portion of the E-2.

7 MR. BIELSKIS: West.

8 DR. TOMPKINS: Isn't that western?

9 MR. BIELSKIS: West.

10 MR. FORMAN: No.

11 MR. BIELSKIS: Yes.

12 DR. TOMPKINS: Where you're pointing is west,

13 Keith.

14 MR. FORMAN: Right there.

15 DR. TOMPKINS: East would be going towards the

16 docks --

17 MR. FORMAN: Okay.

18 DR. TOMPKINS: -- I think. Correct?

19 MR. FORMAN: This is north; this is we- --

20 well, okay.

21 MR. BIELSKIS: Correct.

22 MR. FORMAN: Yes.

23 MR. BIELSKIS: So between the landfill -- here,

24 easier if I point.

25 DR. TOMPKINS: Please.

1 MR. BIELSKIS: So the landfill is here  
2 [indicating]. There were soil samples and groundwater  
3 samples collected in this area.

4 The Navy also performed some recent excavation  
5 work over the last two years that helped determine that  
6 the source of the contamination was right in this area  
7 where I'm pointing [indicating], and it is outside of  
8 the landfill --

9 MR. FORMAN: That's --

10 MR. BIELSKIS: -- the basis of Mr. Forman's  
11 statement.

12 MR. FORMAN: Right.

13 DR. TOMPKINS: Okay.

14 MR. FORMAN: Thank you.

15 DR. TOMPKINS: Then may I see Slide -- Thank  
16 you for clarity on that. May I please see Slide 33, see  
17 the pointer again. Thank you.

18 I have somewhat of concern for the regulators  
19 in dealing with presumptions that your presentation was  
20 presented to us and that all of you run on the same  
21 presumption of the stability of the pollution of the  
22 oil, shall we say -- I don't know the viscosity of it  
23 but that it happens to be thick and that the chance of  
24 migration.

25 I submit to you, when I had the TAG grant some

1 years ago under the Bush administration, of course we --  
2 I sat down with EPA, and they couldn't discuss it with  
3 us in terms of that because global warming was not a  
4 reality. It's -- became the politics of science in a  
5 denial.

6 Now that we've finally grown past that and that  
7 we do deal with the rise of the bay and that the bay  
8 will rise in the future, given that 1 pound -- 1 gallon  
9 of fresh water weighs 6.5 pounds and supposedly will  
10 rise 10 feet -- and I forget what the weight is for salt  
11 water and of the bay -- with the additional pressure of  
12 additional water coming up above the current level,  
13 would that not affect the viscosity of the solution in  
14 the oil?

15 And what are the plans there to deal with  
16 prevention of pollution and contamination of the land?  
17 And because it would become soggy, wet, and et cetera,  
18 and leaching into the bay.

19 DR. MIYA: Great question, Dr. Tompkins. I  
20 appreciate that.

21 Remember how I was saying that --? First of  
22 all, remember how I was saying that -- that we were  
23 initially hoping to have a lot of the -- the covers  
24 along the shoreline be sort of more ecologically  
25 friendly? In this particular location, because of the

1 proximity of the oil to the bay, it's not going to be  
2 that.

3 It's going to be that riprap, that  
4 rocky-looking thing, for the purposes of exactly what  
5 you're talking about, the stability.

6 And in -- during the design process, one of the  
7 things that we've now been mandated to do, actually, is  
8 actually to as a part of the consideration for the  
9 design look into exactly what you're talking about with  
10 respect to sea level rise for that very reason.

11 And what we don't want to have happen is  
12 exactly what you're talking about. We don't want to  
13 have the sea rise go above that riprap wall and spill  
14 out over into where the contamination is because, yeah,  
15 there's a lot of different things that could happen  
16 there. One of them is exactly what you're talking  
17 about: It could be mobilized, and it could cause  
18 problems there.

19 But I think what I want to say is that we are  
20 mandated now, all of our -- us as regulators, to have  
21 that as a part of the consideration for the design to  
22 ensure that this riprap is going to be high enough. And  
23 in general, the remedies implemented along the bay  
24 throughout are rigorous enough to account for the  
25 potential for sea-level rise.

1           And so, just like you said, it's been a  
2     learning process for all of us in terms of, first of  
3     all, maybe not suggesting that it didn't -- it's not  
4     going to happen, but now being open to it and then now  
5     essentially planning for it, the possibility of it  
6     occurring.

7           And so there will be as a part of the design  
8     considerations to ensure that the -- the shoreline  
9     revetment at this location [indicating] and the remedy  
10    as a whole will be rigorous enough to account for that  
11    possibility.

12           DR. TOMPKINS: For the long-term effect,  
13    wouldn't it be cost effective to the taxpayer that it be  
14    removed rather than these half measures? And then you  
15    add up your multiple cost because the maintenance of the  
16    half-life span for the polonium, the radioactive  
17    material, is 1,600 years. So it's multiple cost.

18           Wouldn't it be long-term benefit to remove it  
19    rather than --?

20           DR. MIYA: So -- so what -- so what might  
21    happen, actually -- and we're still in the process of  
22    figuring exactly. There may be -- and we're still --  
23    it's still -- we're still in discussions, really, about  
24    this.

25           But there may be some that's closer to the bay



1 that is removed because of that possibility. There --  
 2 But it may als- -- and -- or it may also be treated  
 3 with -- by -- and removing it --

4 DR. TOMPKINS: Bacteria?

5 DR. MIYA: Yeah, with different methods. But  
 6 it's a combination of all these different things that  
 7 are going to be used at this location. And if in fact  
 8 the calculations that are done suggest that maybe a  
 9 particular portion of that contamination closer to the  
 10 bay is more susceptible or more likely to be migrating  
 11 or leaching, then we might actually have them take it  
 12 away at that point.

13 But yeah, I mean, it's -- right now the way  
 14 that it's written is -- is in a way that will allow us  
 15 to -- still flexible enough to do things like that,  
 16 to --

17 Yeah.

18 MR. COOPER: Can I jump in here?

19 I'd like to -- Dr. Tompkins, I think you're  
 20 right. We -- For -- We're talking about the oily  
 21 waste ponds, right?

22 DR. TOMPKINS: Mmhmm.

23 MR. COOPER: And we don't assume that thick  
 24 molasses waste oil down there is 100 percent stagnant.  
 25 We think that there are components of it that can move

1 very slowly; and that's why, you know, the Navy -- we've  
2 encouraged the Navy -- and the Navy stepped up -- to  
3 take some -- they're going to do some active treatment  
4 to remove the components of that waste oil that can  
5 move.

6 And that's what we really want to go after, and  
7 that's what Ryan was alluding to.

8 We're looking at three different technologies  
9 on how to do that. One, you know, is just simple  
10 digging and get the hot spots out. But we're also  
11 looking at what's called in situ thermal extraction.  
12 We'll heat up that waste oil a little bit and then get  
13 it to move into a -- an extraction well and pump it  
14 out.

15 And we're going to be trying out that  
16 technology. The Navy's hired some contractors. We're  
17 going to be trying out that technology later this year.  
18 That's a very exciting technology. It's pretty  
19 complicated.

20 I've actually got someone from EPA's Office of  
21 Research and Development to help me give oversight and  
22 comments to the Navy's cleanup, and we'll have check-ins  
23 with the -- with the community about how successful this  
24 in situ -- that means just in place -- will warm --  
25 thermal extraction, will warm it up, and then hopefully

1 we'll get it to move into a well where we can pump it  
2 out.

3 Right now we can't pump it out. It's so thick;  
4 it won't come out normally. So . . .

5 DR. TOMPKINS: Okay.

6 DR. MIYA: But also just again emphasizing that  
7 this shoreline revetment is constructed -- will be  
8 constructed in this way, a more rigorous way, because of  
9 this proximity to here, as well as the design for it  
10 will be accounting for potential sea-level rise and  
11 things like that.

12 DR. TOMPKINS: Basically would be solid cement  
13 wall then?

14 DR. MIYA: I mean, it's going to be -- it's  
15 going to be rigorous because of its proximity to the bay  
16 and -- yeah. So, I mean, it's -- it is part of the  
17 consideration.

18 DR. TOMPKINS: Can we go back, please, to  
19 Slide 31, Mr. Forman? Oh, thank -- oops.

20 DR. MIYA: Okay.

21 DR. TOMPKINS: All right.

22 No one else? Okay. I'm on a roll. Hey, I  
23 give three-hour lectures, used to.

24 On this piece here previously in your  
25 presentation that when you put in the wall -- and I

1 thought you were pointing in this area -- or wherever  
2 it's at --

3 MR. FORMAN: The wall will be between the site  
4 and the bay.

5 DR. TOMPKINS: No, no, not that wall.

6 MR. FORMAN: Oh.

7 DR. TOMPKINS: But in previous remediation work  
8 that you did when you put the corrugated steel --

9 MR. COOPER: The sheet-pile wall.

10 DR. TOMPKINS: Sheet -- The steel?

11 MR. FORMAN: Sorry. The sheet-pile wall went  
12 like that [indicating].

13 DR. TOMPKINS: Okay. I remember going back a  
14 ways, and we made comments in the first review;  
15 Dr. Palmer, Dr. Grist, and myself made comments that the  
16 Navy ran into some chlorine containers that they used in  
17 welding, and it was under pressure and that they moved  
18 the wall where they were placing the Sheetrock rather  
19 than remove the containers and left it.

20 We have a strong objection, as we put in our  
21 first letter, to leaving that because you're leaving a  
22 time -- you're leaving a ticking time bomb in that as we  
23 know, everything will rust in water. In time it will  
24 decay. That gas is under pressure. Chlorine is the  
25 basic element of mustard gas.

1                   And that if my great grandchildren are there --  
2           I'm -- will be gone and in the dirt, but they may --

3                   MR. FORMAN:   That happened --

4                   DR. TOMPKINS:   -- inhale it or whomever may be  
5           victim to this gas release because of just plain factors  
6           of nature.   Wouldn't it be wiser and safer to remove  
7           that from the area?

8                   Also, in the documents you presented us with,  
9           Mr. Forman, I didn't see any reference to U.S.  
10          Geological reports in their -- in their involvement and  
11          analysis of this, because I'm concerned about -- and for  
12          your discu- -- for your discussion and for your  
13          consideration, in the previous map that the U.S.  
14          Geological Department put out, all of this was in a red  
15          zone on the shoreline of the base, meaning it's  
16          susceptible to liquefaction.

17                   That's a very valenic equation as we were  
18          talking about on Slide 33.   What would happen, when the  
19          earth shakes, that would then create mobility for not  
20          only for oil, but what's in the landfill as well.

21                   I also have concerns of we talked about in  
22          previous -- and I'll put it in for a comment on going on  
23          record and then also in writing -- that there were no  
24          parallel holes drilled for soil samples -- confirmation  
25          samples back in '96, '94 when the Navy first started

1 doing some drilling before you came on board and that  
2 they did one per acre. There were 23.

3 And then after the 2000 fire, there were no  
4 holes drilled to see what are the chemical changes; and  
5 that given the possibility, there was no one -- I asked  
6 EPA, but I didn't get a response about the creation of  
7 dioxin in the underground fire that occurred for  
8 3 1/2 months, again, before you arrived. What are the  
9 new compounds? What are the risk, the solubility of the  
10 dioxin that may be there?

11 None of these things have been addressed as  
12 you're asking the Navy to go further, hit the bottom. I  
13 think would be prudent -- I'm asking for consideration  
14 that the holes that were drilled back in the '90s be  
15 done for analysis so that you reduce the risk to the  
16 population.

17 DR. MIYA: You're talking about Parcel E-2?

18 DR. TOMPKINS: E-2, exactly, in that -- and  
19 that "E" itself, that the containers, that the chlorine  
20 gas be removed because of corrosion and decay. It may  
21 not happen in a hundred years in our lifetime, but  
22 long-term process it should be considered in terms of  
23 removal and not be a hot spot that can be handled.

24 MR. FORMAN: Okay.

25 DR. TOMPKINS: But I think -- 'cause we asked

1 for ground x-rays to then hunt down these possible where  
2 these places that wasn't addressed, and I'm asking again  
3 in the process now --

4 MR. FORMAN: Dr. Tompkins, it's my --

5 DR. TOMPKINS: -- and remove it.

6 MR. FORMAN: My only objection is we are still  
7 at clarifying questions. So it's not -- that really  
8 sounded more like a comment or request, but not a  
9 question.

10 DR. TOMPKINS: Request, then -- well, the other  
11 part, in your presentation, in the previous -- not this  
12 one but in previous but you alluded to here in your  
13 document on radiation and your radi- -- scans that you  
14 did --

15 MR. FORMAN: Okay.

16 DR. TOMPKINS: -- please clarify for me,  
17 because, as I understand it, that the cover from 2005  
18 was presented to us to smother the fire out, and that's  
19 referred and that's what you scanned. But we are not  
20 going back to the original dirt and what's the  
21 contamination level before the cap. So what you're  
22 scanning is really the work that the Navy did.

23 And you plan to put another foot of dirt on top  
24 of that?

25 MR. FORMAN: Yeah, the -- okay. So,

1 Dr. Tompkin- --

2 DR. TOMPKINS: It's so clean, but that's the  
3 Navy's --

4 MR. FORMAN: Okay.

5 DR. TOMPKINS: -- clean soil they brought in --

6 MR. FORMAN: Yes, sir.

7 DR. TOMPKINS: -- up clean.

8 MR. FORMAN: Yes, sir. But that's --

9 DR. TOMPKINS: And that's why it's baseline.

10 MR. FORMAN: That's really a topic for another  
11 day.

12 MR. ROBINSON: E-2, is it?

13 MR. FORMAN: Yeah.

14 We're talking about the landfill cover. And  
15 we -- much of the work that you were alluding to we have  
16 discussed and we have proposed, but we haven't done it  
17 yet. So it's not -- it's not work that has been done  
18 yet.

19 DR. TOMPKINS: Oh.

20 MR. FORMAN: We still have -- okay. We still  
21 have work to do on the landfill. But that's in  
22 Parcel E-2, and that's a little different than here.

23 Here what we're proposing on these large  
24 expanses for Site 2, for instance, which runs here,  
25 okay, we are going to have to -- we're most likely going



1 to have to do a surface scan. And that instrumentation  
2 in the surface scan will tell us and will therefore  
3 certify the cleanliness of, if you want to call it that,  
4 the top 12 inches.

5 In addition to that, if you put 2 feet of clean  
6 fill on top of 12 inches of certified nonrad soil, as we  
7 did at 7 and 18, then you have 3 feet.

8 DR. TOMPKINS: Okay.

9 MR. FORMAN: Okay.

10 DR. TOMPKINS: But you do understand what  
11 Dr. Sudeep and I were talking about in the previous -- I  
12 had to leave -- when you presented your radiological  
13 scan on E-2 since we're talk -- it's all "E," since you  
14 clarified that for me --

15 MR. FORMAN: Okay.

16 DR. TOMPKINS: -- but this is more  
17 contaminated, that basically we're just examining the  
18 cap and not the underlying --

19 MR. FORMAN: Okay. Well, that's the -- that's  
20 a topic for another day.

21 MR. ROBINSON: That's the E-2.

22 MR. FORMAN: Parcel E-2. And that initial  
23 survey that was done back in the day, there's going to  
24 be another survey that's done. And in fact, a lot's  
25 going to happen on the Parcel E-2 cap and what might

1 have to be removed and put back in place to do a final  
2 rad survey on the surface on that.

3 DR. TOMPKINS: Will that be --?

4 MR. FORMAN: But that, again, is -- that's  
5 Parcel E-2, and that's -- we will talk --

6 DR. TOMPKINS: For consideration --

7 MR. FORMAN: We will talk about that later on  
8 in 2013.

9 DR. TOMPKINS: Okay.

10 MR. FORMAN: In fact, we're going to talk  
11 about --

12 DR. TOMPKINS: For samples --

13 MR. FORMAN: -- in --

14 In a future community meeting here in 2013,  
15 we'll talk about the remedial design for E-2.

16 MR. COOPER: Great.

17 DR. TOMPKINS: Okay.

18 MR. FORMAN: Okay.

19 DR. TOMPKINS: But -- oh. In one of your  
20 points -- and then I'll shut up. My luck just did --  
21 went on.

22 That when you ask for community input and  
23 concern as part of it that for the record for the  
24 regulators -- some of you guys weren't here -- but back  
25 when Mr. Bloom was part of the team that's set up,

1 Prop P, that 86.5 percent of the residents of San  
2 Francisco want to clean up to residential level.

3 And my concern later as well, are we still  
4 keeping that point to the sixth power in terms of the  
5 level of clean of contaminations? Is that still  
6 employed as it also applies to radiation and the  
7 chemicals, or has it been a variance in that?

8 DR. MIYA: There's been -- yeah. So this is  
9 Ryan Miya from the DTSC State of California.

10 There has been cleanup levels that have been  
11 established for specific radionuclides of concern  
12 because based on sort of past uses in each area, there's  
13 different -- different types of radionuclides were  
14 there. And those numbers, they are -- they're still in  
15 that range of -- the risk range of the 10 to the minus  
16 4, 10 to the minus 6.

17 But it -- they have -- they've already been  
18 established and vetted with the State of California and  
19 established and carried forward and then therefore also  
20 used just as they've used elsewhere on the base to  
21 clear -- or I shouldn't say clear.

22 I should just say there's a recommendation that  
23 comes forward at the end of the process with the  
24 rad-impacted locations to state that the State of  
25 California recommends that from the radiological

1 perspective, there's -- the property can be used for  
2 unrestricted purposes.

3 DR. TOMPKINS: Okay.

4 DR. MIYA: And it's those numbers that we carry  
5 forward to the end of the process and ensure that it's  
6 cleaned up. That's the -- and it is consistent with  
7 what you're talking about.

8 DR. TOMPKINS: So the clarity is that it's  
9 equivalent to the 10 to the 6 power --

10 DR. MIYA: Yes, it's in the --

11 DR. TOMPKINS: -- in that --

12 DR. MIYA: -- in risk range.

13 DR. TOMPKINS: -- radiological and chemical --

14 DR. MIYA: It's the sa- --

15 DR. TOMPKINS: -- equivalent?

16 DR. MIYA: Yeah, there's -- and --

17 DR. TOMPKINS: Okay.

18 DR. MIYA: And it's -- and I'll just say also  
19 that for the rad stuff, it's like very close to  
20 background levels that we're cleaning --

21 DR. TOMPKINS: Thank you.

22 DR. MIYA: -- up to. Thank you.

23 DR. TOMPKINS: That one's for the record.

24 MR. ROBINSON: All rightie. Now before that I  
25 want to check with Christine, you want to take a little

1 break? Are your fingers okay?

2 THE COURT REPORTER: How much longer are we  
3 going?

4 MR. ROBINSON: Let's --  
5 Take a five-minute break?

6 MR. FORMAN: Yeah.

7 MR. ROBINSON: Yeah.

8 We'll just take a five-minute break, and then  
9 we'll start and finish it with your chance to give  
10 statements on the Proposed Plan. So we'll be back in  
11 five minutes.

12 *(Whereupon, a recess is taken from*  
13 *8:32 p.m. to 8:38 p.m.)*

14 MR. ROBINSON: Okay, everybody. So let's head  
15 into the homestretch now and take our seats again.

16 MR. FORMAN: Yes, sir.

17 MR. ROBINSON: All right. Now we're going into  
18 our spoken comments portion of the Proposed Plan. This  
19 format will be the same as clarifying questions except  
20 for the fact that the Navy will not speak at this  
21 portion.

22 Please get in line at the microphone. Limit to  
23 yourself for one time -- for one comment at a time.

24 Please begin each comment by stating your name and, if  
25 necessary, spelling it for our court reporter to make

1 | sure we get it proper.

2                   And you will have three minutes to give your  
3       comments. I will give you a two-minute, one-minute, and  
4       30-second warning to let you know when your time is  
5       running down.

6           The Navy will not respond to any comments  
7   tonight, but your comments will be recorded, and your  
8   comments and the Navy's responses will be in the Record  
9   of Decision.

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10         After time is up, please sit down.  And then
11         once everybody has had a chance to make one comment,
12         you'll be allowed to get up for a second round of
13         comments.
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14         So let's get started, please.  State your name
15 for the record, and go ahead and give your comment.
```

| 16 | COMMENT |
|----|---------|
|----|---------|

17 BY SAUL BLOOM:

18                   Yes. My name is Saul Bloom. I'm the executive  
19       director of Arc Ecology, and we are the current  
20       community technical advisor through the EPA Technical  
21       Assistance Grant.

22 I have four comments, the first of which I'll  
23 make right now, which is that we are formally requesting  
24 that the Navy, regulators, extend the public comment  
25 period for the Proposed Plan to March 31.

1 Thank you.

2 COMMENT

3 BY RAYMOND TOMPKINS:

4 Hi. I don't really need to spell my name, do  
5 I --

6 THE COURT REPORTER: No.

7 DR. TOMPKINS: -- after all these years? Okay.  
8 Dr. Tompkins, for the record.

9 My concern on that in terms of the comment is  
10 that, as I've stated in the letter previously when we  
11 reviewed E-2 and to the regulators as well for  
12 consideration in that matter, that I believe the  
13 presumptive remedy is incorrect being utilized here for  
14 the remediation work on this particular site of "E."

15 Given the definition and the supporting  
16 evidence that I looked at and reviewed, I do not -- for  
17 the volume, according to RASO and Dr. Lowmax [sic],  
18 Laurie Lowmax, who gave a report to the RAB in that her  
19 projection of the total volume of soil what was impacted  
20 at the E-2 site that it was 23 acres; in some areas it  
21 goes to 36 feet deep, and the soil volume is 20 percent  
22 of the total volume.

23 I do not see that as municipal waste and that  
24 the remedy is inappropriate being used there. I don't  
25 see radiation coming out of people's sinks.

1           I think also for consideration on this -- on  
2   this issue of presumptive remedy, given the type of  
3   radiation from the radium dials -- and I'm an old baby  
4   boomer, and they used to make kids watches with the glow  
5   stuff on it and that as a child, yes, it crumbled in my  
6   hand. It came off real quick, and that we know the  
7   second product is radon gas. Great radon gas as being a  
8   gas means that it's mobile. The possibility of this,  
9   especially with land use and rise being in the area,  
10   this could migrate.

11           And then the third product is polonium, which  
12   has a life span -- half-life span of 1,600 years being  
13   radioactive. That's a long time for the government to  
14   be dealing with that.

15           Again, I do not feel that this -- and also  
16   under the section that talked about being close to  
17   tides -- thank you -- that given all these variables and  
18   limitations, that we're scoting -- scooting very close  
19   to the edge in terms of what the law and it's up to  
20   interpretation.

21           I think for human safety, a more rigid and  
22   vigorous approach should be used in the analysis and  
23   approach in terms of solving this problem.

24           Thank you.

25           MR. FORMAN: Thank you, Dr. Tompkins.



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FURTHER COMMENT

BY SAUL BLOOM:

Saul Bloom, Arc Ecology, second comment.

In 2009 the Regional Water Control Board entered into an order with -- amendment with the San Francisco Airport in which it established a research program that Arc Ecology is involved in engineering to establish a wetlands on the property in -- on Parcel E midway from the point in between the two zones that the Proposed Plan calls for riprapping or at least doing some additional shore armoring.

We look forward to seeing more detail within the final Proposed Plan and the ROD that indicates how the Navy is contemplating making this area accessible for doing that kind of wetlands restoration activity on that site.

So that is something that we'll be going into in further detail in our formal written comments, but I wanted to raise that issue as an oral comment right now for you to consider.

And that final point on that is that my understanding, according -- based on the settlement of litigation between the City and the Sierra Club and the Audubon Society with regard to the Environmental Impact Report for the site, that is now the preferred

1 alternative use for -- that wetlands is now the  
2 preferred alternative use consistent with the  
3 redevelopment plan for this particular site.

4 So thank you.

5 MR. FORMAN: Thank you, Mr. Bloom.

6 DR. TOMPKINS: Anybody else?

7 COMMENT

8 BY JOHN NJOROGGE:

9 Hi. I'm intending to make some comments about  
10 CEQA and the environmental impact of this project as  
11 well as the impact it has on other people here in the  
12 Bay Area who are churchgoers and people struggling in  
13 this community basically.

14 THE COURT REPORTER: Please speak into the  
15 microphone.

16 MR. NJOROGGE: Sure.

17 THE COURT REPORTER: And restate your name,  
18 please.

19 MR. NJOROGGE: John, last name N-j-o-r-o-g-e.

20 From James, Chapter 5:

21 Look here, you rich men, now is the time  
22 to cry and groan with anguished grief because  
23 of all the terrible troubles ahead of you.

24 Your wealth is even now rotting away, and  
25 your fine clothes are becoming mere moth-eaten

1           rags. The value of your gold and silver is  
2           dropping fast, yet it will stand as evidence  
3           against you, and eat your flesh like fire.  
4           That is what you have stored up for yourselves  
5           to receive on that coming day of judgment.

6           For listen! Hear the cries of the field  
7           workers whom you have cheated of their pay.  
8           Their cries have reached the ears of the Lord  
9           of Hosts.

10          You have spent your years here on earth  
11          having fun, satisfying your every whim, and  
12          now your fat hearts are ready for the  
13          slaughter. You have condemned and killed good  
14          men who had no power to defend themselves  
15          against you.

16          Now as for you, dear brothers who are  
17          waiting for the Lord's return, be patient,  
18          like a farmer who waits until the autumn for  
19          his precious harvest to ripen. Yes, be  
20          patient. And take courage, for the coming of  
21          the Lord is near.

22          Don't grumble about each other,  
23          brothers. You are yourselves above criticism  
24          [sic]. For see! The great Judge is coming.  
25          He is almost here (let Him do whatever

1                   criticizing must be done).

2                   MR. FORMAN: Thank you, sir.

3                                   FURTHER COMMENT

4 BY SAUL BLOOM:

5                   Saul Bloom, Arc Ecology, Comment No. 3.

6                   With regard to liquefaction and community  
7 acceptance with regard to the ultimate remedy of the  
8 site, we would encourage the Navy to -- in its  
9 presentation about the engineering for site  
10 stabilization and that sort of thing to talk about the  
11 impacts of failure in more detail, not just because we  
12 are concerned about necessarily failure, but because we  
13 think that in co- -- in discussing the impacts of  
14 failure with regard to health risk and that sort of  
15 thing will help clarify for the community the relative  
16 risk of failure for these remedies.

17                   People become confused. When people talk about  
18 the site fissuring; when people talk about any of these  
19 institutional controls failing, oftentimes we don't talk  
20 enough about is what is in fact the ramification of such  
21 a failure. And in many cases, what we are finding is  
22 that the ramifications of these failures are far less  
23 than what people are concerned about.

24                   As a result, articulating these assessments  
25 will be much more helpful to the community in terms of

1 understanding why a particular remedy is selected and  
2 how that remedy will be engineered and what -- the  
3 ramifications of that remedy's failure. I think those  
4 are going to be very, very helpful in terms of  
5 translating these decisions back to the community.

6 MR. FORMAN: Thank you, sir.

7 FURTHER COMMENT

8 BY RAYMOND TOMPKINS:

9 I have to concur with Mr. --

10 Oh. Dr. Raymond Tompkins.

11 I have to concur with Mr. Bloom's statement  
12 100 percent.

13 As I was talking to -- and then I was told I  
14 can't discuss that. But in this point, confirmation,  
15 confirmation, confirmation. My criticism was: In the  
16 presenting of this evening, there was a lot of  
17 assumptions without confirmation, in my view.

18 And that in the future studies for those holes,  
19 those -- in 2000 -- no -- 1996, I believe, in '93 when  
20 those bores were done, I would like to see confirmation  
21 for a couple of reasons. Synergistic effect.

22 After the fire, what other harmful products can  
23 be possibility in that how is that brought up in your  
24 plan to address that and to then put the limitation?  
25 Because one of the issues when -- as Mr. Bloom just

1 talked about, when the systems or whatever we create --  
2 we're human beings. There's always a possibility of  
3 failure. Then what are the protections safeguard?

4 And would the Navy pay for damages from this  
5 failure of the site to the community as it affects their  
6 impact in health or property under, for example, a  
7 serious earthquake? I haven't heard or -- in our  
8 discussions or presented publicly how will this hold up  
9 under an earthquake?

10 Since Japan had a 9, the earth is changing.  
11 We've had historically a 8.2. We had the echoing effect  
12 of the Cypress Freeway, although it was a 7 because of  
13 the rever- -- re- -- I'm not a geologist, but the  
14 wavelength being not -- what do they call it? --  
15 increase because of the bouncing to and forth. This  
16 property is susceptible to this under certain  
17 conditions. How is that going to be addressed, and how  
18 are the safeguards going to be placed over there?

19 I haven't seen it or any of the public  
20 presentations. You may have it on record, but we  
21 haven't heard about it, since it's no longer a RAB or  
22 technically to talk about it.

23 Could you please in future discuss that to the  
24 public and the Navy's responsibility and liability of  
25 these. Unfortunately, the times we live in drastic

1 situations, and how would that be respond that would  
2 hold down confusion under serious situation?

3 Thank you.

4 MR. FORMAN: Thank you.

5 FURTHER COMMENT

6 BY SAUL BLOOM:

7 Saul Bloom, Arc Ecology, fourth and final  
8 comment with regard to Proposition P. I would be remiss  
9 if I did not mention Proposition P.

10 Again, my recommendation to the Navy with  
11 regard -- and to the regulators with regard to the  
12 discussion of Proposition P is to acknowledge  
13 Proposition P for what it is, which is the community's  
14 concern about the quality of the cleanup at the site.

15 And in terms of presentation of why specific  
16 remedies and health risks are selected, I would highly  
17 recommend that the discussion take place in light of  
18 Prop P as a reference point getting what the  
19 difficulties are, meeting the criteria of what the  
20 relative benefits would be.

21 That way, again, as with the liquefaction  
22 question, the community would be better able to  
23 understand why a particular remedial decision is  
24 selected versus the sense that most people get, which is  
25 that Prop P is just simply not a topic for discussion

1 among the regulators and the Navy, which I don't believe  
2 is in fact the case.

3 I understand that everybody is trying hard to  
4 figure out how to address the community's selectio- --  
5 cleanup criterion. And I think the best way to do that,  
6 as a friendly suggestion, would be to talk about it  
7 effect -- positively and say: It's a recognized concern  
8 of the community. Here's why we are doing what we are  
9 doing relative to that. And I think that will go a long  
10 way to address people's concerns about the selection of  
11 remedies for the site.

12 Thank you very much.

13 MR. FORMAN: Thank you, sir.

14 MR. ROBINSON: I guess there are no other  
15 questions. So this will conclude our meeting for  
16 tonight. Thank you very much for coming.

17 And we still have until March 15th to put in  
18 your written comments in to the Navy of the Parcel E and  
19 UC-3. Thank you again and good night.

20 *(Off record at 8:52 p.m., 2/28/13.)*

21 ---oOo---

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CERTIFICATE OF REPORTER

I, CHRISTINE M. NICCOLI, Certified  
Shorthand Reporter of the State of California, do hereby  
certify that this 115-page transcript of the foregoing  
meeting was reported by me stenographically to the best  
of my ability at the time and place aforementioned and  
meets the Minimum Transcript Format Standards pursuant  
to California Code of Regulations Title 16, Division 24,  
Article 8, Section 2473, as mandated by the California  
Court Reporters Board..

IN WITNESS WHEREOF, I have hereunto set my hand  
this 26th day of March, 2013.

\_\_\_\_\_  
CHRISTINE M. NICCOLI, C.S.R. NO. 4569

## **Attachment 3. Responsiveness Summary**

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**


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**Spoken Comments by Saul Bloom (Arc Ecology) at the public meeting held on February 28, 2013**


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| Comment No. | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.          | I have four comments, the first of which I'll make right now, which is that we are formally requesting that the Navy, regulators, extend the public comment period for the Proposed Plan to March 31.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | After consulting with the HPNS <sup>1</sup> regulators, the Navy extended the public comment deadline from March 15, 2013, to April 1, 2013.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 2.          | <p>In 2009, the Regional Water Control Board entered into an order with — amendment with the San Francisco Airport in which it established a research program that Arc Ecology is involved in engineering to establish a wetlands on the property in — on Parcel E midway from the point in between the two zones that the Proposed Plan calls for riprapping or at least doing some additional shore armoring.</p> <p>We look forward to seeing more detail within the final Proposed Plan and the ROD that indicates how the Navy is contemplating making this area accessible for doing that kind of wetlands restoration activity on that site.</p> <p>So, that is something that we'll be going into in further detail in our formal written comments, but I wanted to raise that issue as an oral comment right now for you to consider.</p> <p>And that final point on that is that my understanding, according — based on the settlement of litigation between the City and the Sierra Club and the Audubon Society with regard to the Environmental Impact Report for the site, that is now the preferred alternative use for — that wetlands is now the preferred alternative use consistent with the redevelopment plan for this particular site.</p> | <p>During preparation of the FS Report for Parcel E (<a href="#">ERRG, 2012</a>), the Navy previously responded to Arc Ecology comments regarding the compatibility of the CERCLA remedial alternatives with the CCSF's future redevelopment plans (as guided by the 2010 HPNS Redevelopment Plan [<a href="#">SFRA, 2010b</a>]). The previous responses are briefly summarized in the following paragraphs.</p> <p>The CCSF's EIR (<a href="#">SFRA, 2010a</a>) was prepared pursuant to CEQA, and was the subject of litigation between the CCSF and Sierra Club/Audubon Society. The court-approved settlement agreement between the CCSF and Sierra Club/Audubon Society identified design concepts (including constructed wetlands for stormwater management) for portions of Parcel E that were to be implemented by the CCSF's developer (i.e., Lennar Corporation). CEQA does not apply to the Navy's cleanup decisions under CERCLA, and there is no legal requirement for the Navy to conform to CEQA. Nonetheless, the Navy reviewed the CCSF's EIR and determined that the remedial alternatives presented in the FS Report (which formed the basis of the selected remedy in this ROD) are compatible with the future reuses identified in the 2010 HPNS Redevelopment Plan.</p> <p>The Navy evaluated an appropriate range of shoreline protection technologies and process options in Appendix D of the FS Report. This evaluation concluded that the most viable shoreline protection options for the Parcel E shoreline are armoring (rock revetment) and hybrid stabilization using natural shoreline materials with underlying rock armor. Section 4.2.2.3 of the FS Report identifies a conceptual design for implementing these two options along different sections of the Parcel E shoreline. The conceptual designs presented in the FS Report will be further refined in the RD and will not conflict with CCSF's plans to construct stormwater management systems (including constructed wetlands).</p> |

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<sup>1</sup> [Abbreviations and acronyms](#) are defined at the end of this appendix.

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**

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**Spoken Comments by Saul Bloom (Arc Ecology) at the public meeting held on February 28, 2013** *(continued)*

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3. With regard to liquefaction and community acceptance with regard to the ultimate remedy of the site, we would encourage the Navy to — in its presentation about the engineering for site stabilization and that sort of thing to talk about the impacts of failure in more detail, not just because we are concerned about necessarily failure, but because we think that in co— — in discussing the impacts of failure with regard to health risk and that sort of thing will help clarify for the community the relative risk of failure for these remedies.
- People become confused. When people talk about the site fissuring; when people talk about any of these institutional controls failing, often times we don't talk enough about what is in fact the ramification of such a failure. And in many cases, what we are finding is that the ramifications of these failures are far less than what people are concerned about.
- As a result, articulating these assessments will be much more helpful to the community in terms of understanding why a particular remedy is selected and how that remedy will be engineered and what — the ramifications of that remedy's failure. I think those are going to be very, very helpful in terms of translating these decisions back to the community.

The Navy will describe the potential risks associated with liquefaction in the RD and will further evaluate this very important part of the design, including consulting with other technical experts, to make sure that the final cover is built to withstand the appropriate design earthquake and comply with numerous other regulatory requirements.

Specifically, the Navy will perform, as part of the RD, a comprehensive static and seismic slope stability evaluation for the covers at Parcel E to ensure that the proposed design can, consistent with the requirements of Title 22 Cal. Code Regs. § 66264.310(a)(5), accommodate the inertial forces generated by the maximum credible earthquake while maintaining the integrity of the cover system. Also, in accordance with the requirements of Title 22 Cal. Code Regs. § 66264.310(b)(1) and (b)(5), the Navy will maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events throughout the post-closure period (which will extend for as long as necessary to protect human health and the environment).

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**

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**Spoken Comments by Saul Bloom (Arc Ecology) at the public meeting held on February 28, 2013** *(continued)*

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4. I would be remiss if I did not mention Proposition P.
- Again, my recommendation to the Navy with regard — and to the regulators with regard to the discussion of Proposition P is to acknowledge Proposition P for what it is, which is the community's concern about the quality of the cleanup at the site.
- And in terms of presentation of why specific remedies and health risks are selected, I would highly recommend that the discussion take place in light of Prop P as a reference point getting what the difficulties are, meeting the criteria of what the relative benefits would be.
- That way, again, as with the liquefaction question, the community would be better able to understand why a particular remedial decision is selected versus the sense that most people get, which is that Prop P is just simply not a topic for discussion among the regulators and the Navy, which I don't believe is in fact the case.
- I understand that everybody is trying hard to figure out how to address the community's selection — cleanup criterion. And I think the best way to do that, as a friendly suggestion, would be to talk about it effect — positively and say: It's a recognized concern of the community. Here's why we are doing what we are doing relative to that. And I think that will go a long way to address people's concerns about the selection of remedies for the site.
- As described on page 18 of the Proposed Plan, the community acceptance criterion is one of two modifying criteria and has been evaluated based on comments provided in the course of the CERCLA remedy selection process, including those received on the Proposed Plan, and other community input, including Proposition P. Consistent with the NCP [Title 40 CFR § 300.430(e) and (f)], the Navy's evaluation of the community acceptance criterion is documented in this ROD, which includes the subject responsiveness summary. The Navy notes that several engaged residents who live in close proximity to HPNS have agreed with the preferred alternatives published in the Proposed Plan, and their agreement documents community acceptance.
- Proposition P was adopted by the CCSF Board of Supervisors in Resolution 634-01 in August 2001. Although Proposition P does express a recommendation from the Hunters Point Bayview community for cleanup to a level allowing unrestricted use of the property, Proposition P also urges the Navy to clean up the shipyard in a manner that does not rely on future owners to maintain barriers to protect the public from exposure unless other remedies are technically infeasible. The Navy, in its FS Report that was concurred upon by the other Federal Facility Agreement signatories, has determined that the selected remedies are the most feasible and effective.
- The Navy also notes that Proposition P is a local governmental resolution and is not a federal or state statute or promulgated regulation. Therefore, Proposition P is not a CERCLA federal or state ARAR for purposes of CERCLA remedy selection in Parcel E.
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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**


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**Spoken Comments by Raymond Tompkins at the public meeting held on February 28, 2013**


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| Comment No. | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.          | <p>My concern on that in terms of the comment is that, as I've stated in the letter previously when we reviewed E-2 and to the regulators as well for consideration in that matter, that I believe the presumptive remedy is incorrect being utilized here for the remediation work on this particular site of "E."</p> <p>Given the definition and the supporting evidence that I looked at and reviewed, I do not — for the volume, according to RASO and Dr. Lowmax [sic], Laurie Lowmax, who gave a report to the RAB in that her projection of the total volume of soil what was impacted at the E-2 site that it was 23 acres; in some areas it goes to 36 feet deep, and the soil volume is 20 percent of the total volume. I do not see that as municipal waste and that the remedy is inappropriate being used there. I don't see radiation coming out of people's sinks.</p> <p>I think also for consideration on this — on this issue of presumptive remedy, given the type of radiation from the radium dials — and I'm an old baby boomer, and they used to make kids watches with the glow stuff on it and that as a child, yes, it crumbled in my hand. It came off real quick, and that we know the second product is radon gas. Great radon gas as being a gas means that it's mobile. The possibility of this, especially with land use and rise being in the area, this could migrate.</p> <p>And then the third product is polonium, which has a life span — half—life span of 1,600 years being radioactive. That's a long time for the government to be dealing with that.</p> <p>Again, I do not feel that this — and also under the section that talked about being close to tides — thank you — that given all these variables and limitations, that we're scoting — scoting very close to the edge in terms of what the law and it's up to interpretation. I think for human safety, a more rigid and vigorous approach should be used in the analysis and approach in terms of solving this problem.</p> | <p>The Navy wishes to clarify that it has not relied upon the containment presumption in developing or evaluating the remedial alternatives for Parcel E. Further, the Navy wishes to clarify that Parcel E is distinct from the adjoining Parcel E-2. Parcel E is one of six parcels (Parcels A through F) originally designated for environmental restoration. In September 2004, the Navy divided Parcel E into two parcels (Parcels E and E-2) to facilitate closure of the Parcel E-2 Landfill and its adjacent areas. Parcel E-2 was the subject of a separate evaluation process, performed in accordance with CERCLA<sup>2</sup> and the NCP, that culminated with a signed ROD in November 2012. This ROD addresses Parcel E and is unrelated to the Parcel E-2 Landfill referred to in this comment.</p> |

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<sup>2</sup> Abbreviations and acronyms are defined at the end of this appendix.

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**


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**Spoken Comments by Raymond Tompkins at the public meeting held on February 28, 2013**


---

2. I have to concur with Mr. Bloom's statement 100 percent.
- As I was talking to — and then I was told I can't discuss that. But in this point, confirmation, confirmation, confirmation. My criticism was: In the presenting of this evening, there was a lot of assumptions without confirmation, in my view.
- And that in the future studies for those holes, those — in 2000 — no — 1996, I believe, in '93 when those bores were done, I would like to see confirmation for a couple of reasons. Synergistic effect.
- After the fire, what other harmful products can be possibility in that how is that brought up in your plan to address that and to then put the limitation? Because one of the issues when — as Mr. Bloom just talked about, when the systems or whatever we create — we're human beings. There's always a possibility of failure. Then what are the protections safeguard?
- And would the Navy pay for damages from this failure of the site to the community as it affects their impact in health or property under, for example, a serious earthquake? I haven't heard or — in our discussions or presented publicly how will this hold up under an earthquake?
- Since Japan had a 9, the earth is changing. We've had historically a 8.2. We had the echoing effect of the Cypress Freeway, although it was a 7 because of the rever— — re— — I'm not a geologist, but the wavelength being not — what do they call it? — increase because of the bouncing to and forth. This property is susceptible to this under certain conditions. How is that going to be addressed, and how are the safeguards going to be placed over there?
- I haven't seen it or any of the public presentations. You may have it on record, but we haven't heard about it, since it's no longer a RAB or technically to talk about it.
- Could you please in future discuss that to the public and the Navy's responsibility and liability of these. Unfortunately, the times we live in drastic situations, and how would that be respond that would hold down confusion under serious situation?
- 

As stated in the response to comment 3 from Mr. Bloom, the Navy will perform, as part of the RD, a comprehensive static and seismic slope stability evaluation for the covers at Parcel E to ensure that the proposed design can, consistent with the requirements of Title 22 Cal. Code Regs. § 66264.310(a)(5), accommodate the inertial forces generated by the maximum credible earthquake while maintaining the integrity of the cover system. Also, in accordance with the requirements of Title 22 Cal. Code Regs. § 66264.310(b)(1) and (b)(5), the Navy will maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events throughout the post-closure period (which will extend for as long as necessary to protect human health and the environment).

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**


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**Spoken Comments by John Njoroge at the public meeting held on February 28, 2013**


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| Comment No. | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.          | <p>Hi. I'm intending to make some comments about CEQA and the environmental impact of this project as well as the impact it has on other people here in the Bay Area who are churchgoers and people struggling in this community basically.</p> <p>From James, Chapter 5:</p> <p>Look here, you rich men, now is the time to cry and groan with anguished grief because of all the terrible troubles ahead of you.</p> <p>Your wealth is even now rotting away, and your fine clothes are becoming mere moth-eaten rags. The value of your gold and silver is dropping fast, yet it will stand as evidence against you, and eat your flesh like fire. That is what you have stored up for yourselves to receive on that coming day of judgment.</p> <p>For listen! Hear the cries of the field workers whom you have cheated of their pay. Their cries have reached the ears of the Lord of Hosts.</p> <p>You have spent your years here on earth having fun, satisfying your every whim, and now your fat hearts are ready for the slaughter. You have condemned and killed good men who had no power to defend themselves against you.</p> <p>Now as for you, dear brothers who are waiting for the Lord's return, be patient, like a farmer who waits until the autumn for his precious harvest to ripen. Yes, be patient. And take courage, for the coming of the Lord is near.</p> <p>Don't grumble about each other, brothers. You are yourselves above criticism [sic]. For see! The great Judge is coming. He is almost here (let Him do whatever criticizing must be done).</p> | <p>The Navy wishes to clarify that the cleanup decision being made for Parcel E is following a process established by CERCLA<sup>3</sup> and the NCP. CEQA does not apply to the Navy's cleanup decisions under CERCLA, and there is no legal requirement for the Navy to conform to CEQA.</p> <p>The Navy has worked with EPA, DTSC, and the Water Board to perform the environmental cleanup work at HPNS in a manner that achieves the environmental justice goals (consistent with Executive Order 12898) of fully protective cleanup actions, fair and equal treatment, and meaningful involvement for all people in the Bayview-Hunters Point community. Our efforts to satisfy these goals include:</p> <ul style="list-style-type: none"> <li>▪ Substantial regulatory review and oversight of all Navy cleanup activities. The EPA, DTSC, Water Board, CCSF, California Department of Public Health, Bay Area Air Quality Management District, and San Francisco Bay Conservation and Development Commission all have dedicated significant additional staff to HPNS to ensure that the Navy's cleanup work is performed in a way that is protective of the Bayview-Hunters Point community and complies with federal and state laws and regulations.</li> <li>▪ Substantial financial commitment from the Navy to HPNS cleanup. The Navy has spent approximately \$716 million over the past 20 years on the HPNS cleanup program, and these expenditures have made HPNS one of the nation's largest BRAC cleanup programs. The Navy's cleanup efforts to date have successfully removed, treated, or contained a significant volume of contamination that would otherwise pose an unacceptable risk to site workers and future occupants.</li> <li>▪ Meaningful community engagement under the Navy's Updated CIP. The Navy updated their CIP in 2011 (and will update the CIP again in summer 2013) to present the communication and community involvement program activities that were designed to meet the specific needs and desires of the HPNS community (<a href="#">Navy, 2011</a>).</li> </ul> |

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<sup>3</sup> [Abbreviations and acronyms](#) are defined at the end of this appendix.



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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**

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**Spoken Comments by John Njoroge at the public meeting held on February 28, 2013** *(continued)*

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| Comment No.                             | Comment | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.<br><i>(cont.)</i> <i>(see above)</i> |         | <ul style="list-style-type: none"> <li>▪ Employment. The Navy works closely with their existing contractors to emphasize the importance of hiring community members to assist in the cleanup program, and works with interested stakeholders (such as the CCSF) to promote job training programs. These efforts have proven successful based on recent estimates—from 2009 to 2011 over 1,000 community members have been employed under Navy contracts (on either full-time, part-time, or temporary basis) to assist in the cleanup program. In addition, the Navy and their contractors have identified a large network of local businesses to assist in the cleanup program, such as those providing document production services, supplying building materials and consumables (drinking water and ice), renting heavy equipment, and transporting soil and rock. These efforts have proven successful based on recent estimates of over \$11 million worth of goods and services from local businesses.</li> <li>▪ Commitment to protective cleanup actions. Most importantly, the Navy, EPA, and the State of California regulatory agencies are committed to fully protective cleanup actions at Parcel E and throughout HPNS. The selected remedies for Parcel E will remove significant amounts of contaminants and safely contain the remaining material, and will prevent unacceptable exposure to humans (both future site users and the surrounding community) and wildlife.</li> </ul> |

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**

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**Written Comments by Andrea Ibarra-Tacdol received on March 12, 2013 via email**

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| Comment No. | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.          | <p>My name is Andrea Tacdol. I am a mother of two living on Van Dyke Avenue in the Bayview, less than a mile from Parcels E and UC-3 of the Hunters Point Naval Shipyard. One of my biggest concerns is that my family already lives beside an industrial zone where trucks are coming and going on our residential street. Residents of our community and neighborhood are feeling the impacts of the air pollution and excess noise.</p> <p>I believe that the Proposed Plan for clean-up for all parcels must include a requirement that trucks coming and going to the Naval Shipyard do NOT go through residential streets. Not only do the trucks inundate our community with even more diesel pollution that is a major cause of asthma and linked to cancer, but the trucks will also be carrying toxic waste. As you remove and dispose of contaminated soil, remove the oil source at the Former Oily Waste Ponds, remove radiologically contaminated soil, please assure us that the trucks are safely carrying the materials out of our community without chance of spillage and avoiding residential streets.</p> <p>The shipyard must have an agreement with the trucking companies to utilize the SF MTA's advised truck routes. There should be a community hotline to call when we see large trucks passing through our neighborhood and the city should find a way to enforce these rules and address violations quickly. Ultimately, we'd like to see the city move beyond having these truck routes as only advisory.</p> | <p>The Navy and their contractors have established strict protocols for all offsite hauling from HPNS cleanup activities. These protocols have been implemented on numerous past cleanup actions at HPNS and serve to minimize the impact of offsite hauling on the local community. Similar protocols would be implemented for the final cleanup at Parcel E. The procedures for offsite hauling, which are detailed in plans that are subject to regulatory agency review and approval, are summarized below.</p> <p><b>Dust Control:</b> Dust control is a top priority on all HPNS cleanup projects. All trucks are covered (tarped) and their exterior areas (most notably the fenders and tires) are cleaned prior to leaving the cleanup site. While driving on paved roads within HPNS property, all trucks adhere to a speed limit of 15 miles per hour. In addition, water is applied to the onsite roads during hauling operations. These onsite actions serve to minimize dust emissions once the trucks leave HPNS property.</p> <p><b>Additional Controls for Contaminated Waste:</b> All contaminated material is properly characterized prior to offsite disposal, and all offsite disposal is performed in accordance with pertinent federal and state requirements. For example, the U.S. Department of Transportation Hazardous Material Transportation regulations require the proper packaging, labeling, and tracking of hazardous wastes while being transported to a licensed disposal facility.</p> <p><b>Truck Hauling Route:</b> The Navy has a qualification process for all truck drivers to ensure that they are properly licensed, and that they fully understand and will adhere to the HPNS protocols for offsite hauling. This qualification process includes a requirement to follow a prescribed hauling route from the HPNS main gate to either Highway 101 or Interstate 280:</p> <ul style="list-style-type: none"> <li>▪ Trucks exit the HPNS main gate and turn right on Innes Avenue.</li> <li>▪ Trucks bear right at the fenced vacant lot as Innes Avenue becomes Hunters Point Boulevard (which again changes to Evans Avenue at the former Pacific Gas &amp; Electric power plant).</li> <li>▪ Trucks follow Evans Avenue across Third Street to Cesar Chavez.</li> </ul> <p>The qualification process, which would be implemented for the final cleanup at Parcel E, includes obtaining each truck driver's signature acknowledging their understanding and acceptance of all protocols for offsite hauling.</p> |

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**

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**Written Comments by Christopher Mooney received on March 14, 2013 via e-mail**

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                     | <b>Response</b>             |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 1.                 | I write in support of the Navy's proposed plan for cleanup of HPNS Parcels E and UC-3. The February 2013 written proposal provides detailed explanations of cleanup alternatives and adequately considers the cost-to-benefit impacts of each alternative. I agree with the Navy's proposed solutions and hope the cleanup proceeds expeditiously. | Thank you for your comment. |

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**Written Comments by Philip Ragozziano received on March 18, 2013 via mail**

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Response</b>             |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 1.                 | After having read and considered the alternatives, I support the conclusion on page 18 of the pamphlet "Hunters Point Naval Shipyard – Parcels E and UC-3." I have been a resident of the neighborhood outside the shipyard for more than twenty years, have had the opportunity on occasion to tour the shipyard, and thought no clean-up would ever occur. I would rather see the remediation, even if not to the ultimate degree, than nothing done. So please move on with the process right away. Do what's most expedient and will both clean and contain the toxic elements and which can be paid for. Thanks for the opportunity to be heard. Keep me informed with your mailings. | Thank you for your comment. |

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**

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**Written Comments by Jaron Browne (POWER<sup>4</sup>) and Marie Harrison (Greenaction ) received on April 1, 2013 via e-mail**

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| Comment No. | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.          | <p>POWER and Greenaction are submitting the following comments on the Proposed Plan for Parcels E and UC3, with support and consultation from environmental scientist Wilma Subra. There are two core areas of concern where we differ with the Navy's recommendations in the Proposed Plan:</p> <ul style="list-style-type: none"> <li>First, in relation to remediation of residual radiological contamination in the proposed plan, we strongly urge the Navy to use the 3-foot thick soil cover that was proposed in remedy R-3, rather than the 2-foot soil cover.</li> <li>Second, in relation to the former oily waste ponds, we strongly urge the Navy to pursue Alternative O-6, because of how much information is still needed to understand the level of contamination. Alternative O-6 is the most comprehensive remedy for minimizing risk for the community.</li> </ul> | Please refer to the responses to comments 2 and 3 below.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2.          | <p><b>Residual Radiological Contamination</b></p> <p>The preferred alternative R-2 is an appropriate remedy. However, R-3 proposes a 3-foot thick soil cover versus a 2-foot thick soil cover proposed in R-2 and would be more protective. The R-3, 3-foot thick soil cover would provide an added depth of cover material. However, the Navy states the 2-foot thick soil cover is easier to carry out. <b><i>We strongly urge that the Navy adhere to the precautionary principle and apply the 3-foot cover in order to best protect the health of residents.</i></b></p>                                                                                                                                                                                                                                                                                                          | <p>As described on pages 17 and 18 of the Proposed Plan (and illustrated in Table 15), Alternatives R-2 and R-3 are both protective of human health and the environment and are equally effective in the long-term. The Navy reached this conclusion based on an evaluation performed in the Radiological Addendum to the FS Report for Parcel E (<a href="#">ERRG and RSRS, 2012</a>). The Navy's evaluation, which was reviewed and accepted by the EPA, DTSC, and Water Board, includes risk modeling that demonstrates the 2-foot-thick soil cover, combined with institutional controls and long-term inspection and maintenance, would prevent unacceptable exposure to people. The information presented in the Proposed Plan, as supported by the Radiological Addendum to the FS Report, demonstrates that the 3-foot-thick cover is not more effective but would be more difficult to carry out. Accordingly, the Navy has selected Alternative R-2 to address residual radiological contamination at Parcel E because it complies with the two threshold criteria, and provides the best balance of tradeoffs with respect to the five balancing criteria specified in the NCP. The Navy's evaluation of the two modifying criteria did not warrant changes to the preferred alternative for residual radiological contamination at Parcel E.</p> |

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<sup>4</sup> [Abbreviations and acronyms](#) are defined at the end of this appendix.

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**

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**Written Comments by Jaron Browne (POWER) and Marie Harrison (Greenaction) received on April 1, 2013 via e-mail (continued)**

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| Comment No.   | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.<br>(cont.) | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>The State of California, through DTSC and the Water Board, and several engaged residents who live in close proximity to HPNS have agreed with the preferred alternative published in the Proposed Plan. The information presented by members of the community that disagree with the preferred alternative does not justify modification of the preferred alternative based upon the “community acceptance” criteria of the NCP. The preferred alternative will remove significant amounts of radiological contamination, safely contain the remaining contamination, and will prevent unacceptable exposure to humans (both future site users and the surrounding community) and wildlife.</p> <p>The Navy wishes to clarify that the precautionary principle, incorporated as a policy statement in Chapter 1 of the San Francisco Environment Code, is a local governmental policy and is not a federal or state statute or promulgated regulation. Therefore, the precautionary principle is not a CERCLA federal or state ARAR for purposes of the CERCLA remedy selection for Parcel E. In addition, the precautionary principle policy statement, as reflected in Chapter 1 of the San Francisco Environment Code, contains no substantive provisions that would pertain to evaluation and selection of a CERCLA remedial action. The Navy believes that the nine NCP evaluation criteria, which were used to evaluate each remedial alternative for Parcel E, adequately capture the elements described in the CCSF’s policy statement.</p> |
| 3.            | <p><b>Former Oily Waste Ponds</b></p> <p>The Navy’s preferred alternative for the former oily waste ponds consist of O-4. The remedy consists of removal of contaminated oil or in-situ treatment, a soil cover, liner and below ground barrier and active groundwater treatment. This alternative leaves much information to be determined before the actual remedy is selected. Alternative O-5 consists of removal of all contaminated oil above the groundwater. Alternative O-6 consists of the removal of all contaminated oil above and below the groundwater. <b><i>We strongly urge the Navy to pursue Alternative O-6 because it will result in the removal of all the contaminated oil. The contaminated oil in the former oily waste ponds is a principal threat waste in Parcel E.</i></b></p> | <p>As described on page 18 of the Proposed Plan, the Navy’s evaluation identified major differences between Alternative O-6 and Alternatives O-2, O-3, and O-4 relative to short-term effectiveness, implementability, and cost. In comparison with Alternatives O-2, O-3, and O-4, Alternative O-6 presents more short-term risks (for example, increased risk of accidents for site workers), would be more difficult to carry out, and would cost more. The ratings for Alternative O-6 were based on several factors, the most significant being the deep excavation (potentially up to 35 feet) required to completely remove the contaminated oil. Alternatives O-2, O-3, and O-4 present fewer short-term risks, would be easier to carry out, and would cost significantly less in comparison with Alternative O-6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**


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**Written Comments by Jaron Browne (POWER) and Marie Harrison (Greenaction) received on April 1, 2013 via e-mail (continued)**


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| Comment No.               | Comment | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.<br>(cont.) (see above) |         | <p>Alternative O-2 would be the easiest and least expensive because it involves only containment, while Alternatives O-3 and O-4 balance ease of implementation and cost because they would involve removing or treating the contaminated oil without major excavations.</p> <p>Accordingly, the Navy has selected Alternative O-4 to address the contaminated oil source at Parcel E because it complies with the two threshold criteria and provides the best balance of tradeoffs with respect to the five balancing criteria specified in the NCP. The Navy's evaluation of the two modifying criteria did not warrant changes to the preferred alternative for residual radiological contamination at Parcel E. The State of California, through DTSC and the Water Board, and several engaged residents who live in close proximity to HPNS have agreed with the preferred alternative published in the Proposed Plan. The information presented by members of the community that disagree with the preferred alternative does not justify modification of the preferred alternative based upon the "community acceptance" criteria of the NCP. The preferred alternative will either remove or treat the contaminated oil source and will safely contain the residual contamination in a manner that prevents unacceptable exposure to humans (both future site users and the surrounding community) and wildlife.</p> <p>Although the complex site conditions at the Former Oily Waste Ponds result in some uncertainty regarding the effectiveness and implementability of certain remediation technologies, the Navy, with the support of EPA, DTSC, and the Water Board, believes that there is adequate information to select a remedy for the contaminated oil source. Further, the Navy believes that Alternative O-4 incorporates a broad range of removal and treatment technologies that could be used in combination to cost-effectively achieve the RAOs. As described on page 26 of the Proposed Plan, the Navy will perform additional studies to select the best combination of technologies to remove or treat the contaminated oil source at the Former Oily Waste Ponds. The Navy has begun developing the approach for these additional studies in consultation with EPA, DTSC, and the Water Board. A field study is planned for later in 2013 and is expected to help refine the cleanup approach at the Former Oily Waste Ponds in support of the RD.</p> |

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**Proposed Plan for Parcel E, Hunters Point Naval Shipyard (HPNS), San Francisco, California**

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**Written Comments by Jaron Browne (POWER) and Marie Harrison (Greenaction) received on April 1, 2013 via e-mail (continued)**

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Response</b>                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| 4.                 | <p>In review of the soil and shoreline sediment and groundwater contamination, we are aligned with the preferred alternatives recommended by the Navy.</p> <p><b>Soil and Shoreline Sediment</b></p> <p>Alternative S-4 is the most robust and protective of the alternatives proposed for contaminants in soil and shoreline sediments. Alternative S-4 is the only alternative that will result in excavation and off site disposal of contaminated soil from Tier 2 and Total Petroleum Hydrocarbon locations. Tier 2 locations contain chemicals at concentrations greater than five times the preliminary remedial goal. Total petroleum hydrocarbons locations exceed the preliminary remedial goal. Alternative S-4 is the only alternative that will address VOC contamination associated with the building 406 TCE plume using soil vapor extraction.</p> | Thank you for your comment.                              |
| 5.                 | <p><b>Groundwater Contamination</b></p> <p>Alternative GW-3 and GW-4 are the most protective alternatives proposed for groundwater contamination. The two alternatives consist of active groundwater treatment for VOC plumes under parcels E and UC-3. Alternative GW-3 consists of either biological nutrients or zero valent iron treatment while alternative GW-4 consists of air sparging for the building 406 TCE plume. The Navy selected GW-3 as the preferred alternative remedy. That alternative, as well as GW-4, will treat the groundwater contaminants appropriately.</p>                                                                                                                                                                                                                                                                           | Thank you for your comment.                              |
| 6.                 | <p>We urge the Navy to reconsider the preferred plans for the residual radiological contamination and select a 3-foot soil cover, and select alternative O-6 the former oily waste ponds based on the need to minimize risk and provide the highest level of protection of the health of residents in the community.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Please refer to the responses to comments 2 and 3 above. |

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**ABBREVIATIONS AND ACRONYMS**

|                 |                                                                       |
|-----------------|-----------------------------------------------------------------------|
| ARAR            | applicable or relevant and appropriate requirement                    |
| BRAC            | Base Realignment and Closure                                          |
| Cal. Code Regs. | California Code of Regulations                                        |
| CCSF            | City and County of San Francisco                                      |
| CERCLA          | Comprehensive Environmental Response, Compensation, and Liability Act |
| CEQA            | California Environmental Quality Act                                  |
| CFR             | Code of Federal Regulations                                           |
| CIP             | Community Involvement Plan                                            |
| DTSC            | Department of Toxic Substances Control                                |
| EPA             | U.S. Environmental Protection Agency                                  |
| ERRG            | Engineering/Remediation Resources Group, Inc.                         |
| EIR             | Environmental Impact Report                                           |
| FS              | Feasibility Study                                                     |
| Greenaction     | Greenaction for Health and Environmental Justice                      |
| HPNS            | Hunters Point Naval Shipyard                                          |
| Navy            | Department of the Navy                                                |
| NCP             | National Oil and Hazardous Substances Pollution Contingency Plan      |
| POWER           | People Organized to Win Employment Rights                             |
| RAB             | Restoration Advisory Board                                            |
| RAOs            | remedial action objectives                                            |
| RASO            | Radiological Affairs Support Office                                   |
| RD              | Remedial Design                                                       |
| ROD             | Record of Decision                                                    |
| RSRS            | Radiological Survey and Remedial Services, LLC                        |
| SF MTA          | San Francisco Municipal Transportation Agency                         |
| SFRA            | San Francisco Redevelopment Agency                                    |
| Water Board     | San Francisco Bay Regional Water Quality Control Board                |
| §               | Section                                                               |



**REFERENCES**

Department of the Navy (Navy), 2011. "Final Community Involvement Plan. Hunters Point Shipyard, San Francisco, California." May.

Engineering/Remediation Resources Group, Inc., 2012. "Final Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California." August.

Engineering/Remediation Resources Group, Inc., and Radiological Survey and Remedial Services, LLC, 2012. "Final Radiological Addendum to the Feasibility Study Report for Parcel E, Hunters Point Shipyard, San Francisco, California." August.

San Francisco Redevelopment Agency (SFRA), 2010a. "Final Environmental Impact Report, Candlestick Point-Hunters Point Phase II." Volumes I through X. May 13.

SFRA, 2010b. "Hunters Point Shipyard Redevelopment Plan." August 3 (amendment to July 14, 1997, redevelopment plan).

## **Attachment 4.   Applicable or Relevant and Appropriate Requirements**

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**Attachment 4. Federal Chemical-Specific ARARs <sup>a</sup>**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                           | Prerequisite        | Citation <sup>b</sup>              | ARAR Determination       | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------|---------------------|------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater</b>                                                                                    |                     |                                    |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Safe Drinking Water Act (42 USC, ch. 6A, § 300[f] through 300[j]-26)<sup>c</sup></b>               |                     |                                    |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| National primary drinking water standards are health-based standards for public water systems (MCLs). | Public water system | 40 CFR § 141.61(a) and § 141.62(b) | Relevant and appropriate | The Navy considers the B-aquifer a Class II aquifer under federal criteria and a potential source of drinking water based on an evaluation of site-specific factors. The Navy has identified MCLs for three COCs (PCE, TCE, and arsenic) as chemical-specific ARARs for the B-aquifer under the following scenarios: (1) containment of in-place waste at Parcel E IR-02 and IR-03, for which federal MCLs are ARARs for groundwater in the B-aquifer downgradient of the POC; and (2) clean closure of contaminated groundwater plumes outside of Parcel E IR-02 and IR-03, for which federal MCLs are ARARs for groundwater in the B-aquifer throughout the contaminated plumes. The Navy and the Water Board have determined that the A-aquifer is not a potential source of drinking water; therefore, drinking water standards (MCLs) are not ARARs for the A-aquifer. |
| MCLGs pertain to known or anticipated adverse health effects (also known as recommended MCLs).        | Public water system | 40 CFR § 141.51(b)                 | Relevant and appropriate | The Navy considers the B-aquifer a Class II aquifer under federal criteria and a potential source of drinking water based on an evaluation of site-specific factors. The Navy has identified the non-zero MCLG for thallium as a chemical-specific ARAR for the B-aquifer under the following scenarios: (1) containment of in-place waste at Parcel E IR-02 and IR-03, for which federal MCLGs are ARARs for groundwater in the B-aquifer downgradient of the POC; and (2) clean closure of contaminated groundwater plumes outside of Parcel E IR-02 and IR-03, for which federal MCLGs are ARARs for groundwater in the B-aquifer throughout the contaminated plumes. The Navy and the Water Board have determined that the A-aquifer is not a potential source of drinking water; therefore, drinking water standards (MCLGs) are not ARARs for the A-aquifer.          |

**Attachment 4. Federal Chemical-Specific ARARs <sup>a</sup> (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Prerequisite                                                                                                                                                                                                                                                         | Citation <sup>b</sup>                                             | ARAR Determination       | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <b>Groundwater (continued)</b>                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                      |                                                                   |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Resource Conservation and Recovery Act (42 USC, ch. 82, §§ 6901 through 6991[i])<sup>c</sup></b>                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                      |                                                                   |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Groundwater protection standards. Owners and operators of RCRA treatment, storage, or disposal facilities must comply with conditions in these sections that are designed to ensure that hazardous chemicals entering groundwater from a regulated unit do not exceed concentration limits for chemicals of concern set forth under Cal. Code Regs. tit. 22, § 66264.94 in the uppermost aquifer underlying the waste management area of concern at the POC. | A regulated unit that receives or has received hazardous waste before July 26, 1982, or regulated units that ceased receiving hazardous waste prior to July 26, 1982, where chemicals in or derived from waste may pose a threat to human health or the environment. | Cal. Code Regs, tit. 22, § 66264.94 (a)(1), (a)(3), (c), (d), (e) | Relevant and appropriate | There is no RCRA-regulated unit at Parcel E; therefore, these standards are not applicable. These standards are relevant and appropriate for the A-aquifer for clean closure of contaminated groundwater plumes outside of Parcel E IR-02 and IR-03, for which concentration limits based on unacceptable risk from the vapor intrusion pathway, pursuant to Cal. Code Regs. tit. 22, §§ 66264.94, are ARARs for groundwater in the A-aquifer throughout the contaminated plumes. Actions and decisions to address the indoor inhalation of vapors will be based on soil gas data and the soil gas action levels. Soil gas action levels are calculated based on a cumulative excess cancer risk level of 10 <sup>-6</sup> using the accepted methodology for risk assessments at HPNS. Preliminary soil gas action levels have been developed for HPNS but will be refined using data from future soil gas surveys following active treatment (to be performed at contaminated groundwater plumes outside of Parcel E IR-02 and IR-03). |
| <b>Surface Water</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                      |                                                                   |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Clean Water Act of 1977, as Amended (33 USC, ch. 26, §§ 1313–1314)<sup>c</sup></b>                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                      |                                                                   |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Surface water quality standards                                                                                                                                                                                                                                                                                                                                                                                                                              | Discharges to waters of the United States                                                                                                                                                                                                                            | 40 CFR § 131.38                                                   | Applicable               | These standards, known as the CTR, are applicable surface water ARARs. The Navy has identified the CTR as ARARs for HPNS Parcel E because groundwater discharges to San Francisco Bay. The Navy will meet these ARARs for chemicals that do not have a promulgated standard in Table 3-3 of the Basin Plan at the interface of the A-aquifer and the bay. The Navy has identified MCLs as ARARs for the B-aquifer, which will be protective of the discharge of B-aquifer groundwater to the bay. Therefore, these are not ARARs for the interface of the B-aquifer and the bay.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**Attachment 4. Federal Chemical-Specific ARARs <sup>a</sup> (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Prerequisite                                                                                                | Citation <sup>b</sup>                                                                         | ARAR Determination                      | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Soil and Sediment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                             |                                                                                               |                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Resource Conservation and Recovery Act (42 USC, ch. 82, §§ 6901 through 6991[i])<sup>c</sup></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                             |                                                                                               |                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| This requirement defines RCRA hazardous waste. Solid wastes are characterized as toxic based on the TCLP results if the wastes exceed the TCLP maximum concentrations.                                                                                                                                                                                                                                                                                                                                                                                   | Waste                                                                                                       | Cal. Code Regs, tit. 22, §§ 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100 | Applicable                              | These regulations are ARARs for all waste generated by the Navy in implementing Alternatives S-4, GW-3, O-4, and R-2. The Navy will determine if the waste is RCRA hazardous at the time it is generated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Toxic Substances Control Act (15 USC, ch. 53, §§ 2601–2692)<sup>c</sup></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                             |                                                                                               |                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Regulates storage and disposal of PCB remediation waste. There are three options: (a) self-implementing onsite cleanup and disposal; (b) performance-based disposal using existing approved disposal technologies; and (c) risk-based disposal.                                                                                                                                                                                                                                                                                                          | Soils, debris, sludge, or dredged materials contaminated with PCBs at concentrations greater than 50 mg/kg. | 40 CFR § 761.61(c)                                                                            | Applicable and relevant and appropriate | The risk-based disposal option at § 761.61(c) is an applicable requirement for soil containing PCB concentrations equal to or greater than 50 mg/kg. The risk-based disposal option is a relevant and appropriate requirement for soil containing PCB concentrations less than 50 mg/kg.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Uranium Mill Tailings Radiation Control Act (42 USC, ch. 88, § 192.02, 192.12(a,b), and 192.42)<sup>c</sup></b>                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                             |                                                                                               |                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Standards for cleanup of land and buildings contaminated with radium-226, radium-228, and thorium from inactive uranium processing sites.<br>As a result of residual radioactive materials from any designated processing site:<br>(a) The concentration of radium-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than:<br>(1) 5 pCi/g, averaged over the first 15 cm of soil below the surface, and<br>(2) 15 pCi/g, averaged over 15-cm-thick layers of soil more than 15 cm below the surface. | UMTRCA sites                                                                                                | 40 CFR §§ 192.12(a) and 192.32(b)(2)                                                          | Relevant and appropriate                | Not applicable because Parcel E is not an UMTRCA site, but is relevant and appropriate for sites with soil contaminated with radioactive waste.<br>The surface and subsurface concentration of 5 pCi/g is relevant and appropriate for all radiologically impacted areas at Parcel E, except for IR-02 and IR-03. These areas, following remediation of ROCs exceeding the RGs (specifically, radium-226 exceeding 1 pCi/g above background), will not require land use restrictions regarding exposure to radioactivity. The RG for radium-226 is based on the CERCLA risk criterion, which is consistent with an agreement with EPA (see Table 8 of this ROD), rather than the standards established by UMTRCA.<br>Not an ARAR for radiologically impacted areas (IR-02 and IR-03) that will be transferred with engineering and institutional controls for radioactive chemicals. |

**Attachment 4. Federal Chemical-Specific ARARs <sup>a</sup> (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                   | Prerequisite               | Citation <sup>b</sup>                 | ARAR Determination       | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Soil and Sediment (continued)</b>                                                                                                                                                                                                                                                                                                                                                                                          |                            |                                       |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Uranium Mill Tailings Radiation Control Act (42 USC, ch. 88, § 192.02, 192.12(a,b), and 192.42)<sup>c</sup> (continued)</b>                                                                                                                                                                                                                                                                                                |                            |                                       |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| In any occupied or habitable building, the objective of the remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL. In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL. Provisions applicable to radon-222 shall also apply to radon-220. | UMTRCA sites               | 40 CFR § 192.12(b)(1) and § 192.41(b) | Relevant and appropriate | Not applicable because Parcel E is not an UMTRCA site. Relevant and appropriate because the alternatives will result in excavation of material with radiological contamination that may produce this level of dose.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Concentration limits for cleanup of gamma radiation in buildings at inactive uranium processing sites designated for remedial action.<br><br>In any occupied or habitable building, the level of gamma radiation shall not exceed the background level by more than 20 microroentgens per hour.                                                                                                                               | UMTRCA sites               | 40 CFR § 192.12(b)(2)                 | Relevant and appropriate | Not applicable because Parcel E is not an UMTRCA site. Relevant and appropriate because the alternatives will result in excavation of material with radiological contamination that may produce this level of dose.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Radiological Criteria for License Termination</b>                                                                                                                                                                                                                                                                                                                                                                          |                            |                                       |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| A site will be considered acceptable for unrestricted use if residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem/yr, including that from groundwater sources of drinking water, and that the residual radioactivity has been reduced to ALARA.                                                                 | Existing NRC-licensed site | 10 CFR § 20.1402                      | Relevant and appropriate | Not applicable because Parcel E is not an NRC-licensed site. This ARAR is relevant and appropriate for all radiologically impacted areas at Parcel E, except for IR-02 and IR-03. These areas, following remediation of ROCs exceeding the RGs (see Table 8 of this ROD), will not require land use restrictions regarding exposure to radioactivity. EPA does not believe this NRC regulation is protective of human health and the environment, and believes the RGs are more protective.<br><br>Not an ARAR for radiologically impacted areas (IR-02 and IR-03) that will be transferred with engineering and institutional controls for radioactive chemicals. |

**Attachment 4. Federal Chemical-Specific ARARs <sup>a</sup> (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                                                                                                                                                                                                                                                                                                                   | Prerequisite                                                                                                       | Citation <sup>b</sup>            | ARAR Determination       | Comments                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Soil and Sediment (continued)</b>                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                    |                                  |                          |                                                                                                                                                                                                                                                                                  |
| <b>Radiological Criteria for License Termination (continued)</b>                                                                                                                                                                                                                                                                                                                              |                                                                                                                    |                                  |                          |                                                                                                                                                                                                                                                                                  |
| Requires that the TEDE to individual members of public not exceed 0.1 rem from licensed operation, construction, operation, and decommissioning of commercial reactors and fuel cycle facilities; possession, use, processing, exporting, and certain aspects of transporting nuclear materials and waste; and siting, design, construction, operations, and closure of waste disposal sites. | Existing NRC-licensed site                                                                                         | 10 CFR § 20.1301                 | Relevant and appropriate | Not applicable because Parcel E is not an NRC-licensed site. Relevant and appropriate because remedial alternative R-2 leaves potential radiological contamination at IR-02 and IR-03.                                                                                           |
| Performance objectives for the land disposal of LLRW. Concentrations of radioactive material that may be released to the general environment must not result in an annual dose exceeding 25 mrem to the body or any organ of a member of the general public.                                                                                                                                  | Existing NRC-licensed LLRW disposal site                                                                           | 10 CFR § 61.41                   | Relevant and appropriate | Not applicable because Parcel E is not an NRC-licensed site. Relevant and appropriate for radiologically impacted areas (IR-02 and IR-03) that will be transferred with engineering and institutional controls for radioactive chemicals.                                        |
| <b>Air</b>                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                    |                                  |                          |                                                                                                                                                                                                                                                                                  |
| <b>NESHAPs under CAA that Apply to Radionuclides</b>                                                                                                                                                                                                                                                                                                                                          |                                                                                                                    |                                  |                          |                                                                                                                                                                                                                                                                                  |
| Emissions of radionuclides to ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr.                                                                                                                                                                                     | Facility owned or operated by the DOE that emits any radionuclide other than radon-222 and radon-220 into the air. | 40 CFR pt. 61, subpt. H, § 61.92 | Relevant and appropriate | Not applicable because Parcel E is not a DOE site, but may be relevant and appropriate if there is the potential for airborne emissions of radionuclides other than radon. Only an ARAR until cleanup action is completed. Not an ARAR for residual contamination after cleanup. |

**Attachment 4. Federal Chemical-Specific ARARs <sup>a</sup> (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Prerequisite                                                                                       | Citation <sup>b</sup>            | ARAR Determination | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <i>Air (continued)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                    |                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>NESHAPs under CAA that Apply to Radionuclides (continued)</b>                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                    |                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Emissions of radionuclides, including iodine, to ambient air from a facility regulated under this subpart shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr. Emissions of iodine to ambient air from a facility regulated under this subpart shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 3 mrem/yr. | Facilities owned or operated by any federal agency other than the DOE and not licensed by the NRC. | 40 CFR pt. 61 subpt. I, § 61.102 | Applicable         | The requirements are applicable because fugitive dust may be generated during implementation of the remedial action at Parcel E. Exposure to the public from remedial action operations at Parcel E is not likely to exceed 10 mrem/y because of the following reasons:<br><ol style="list-style-type: none"><li>1. the concentrations of any radionuclide in dust are relatively low as previously measured in air samples, and</li><li>2. the concentration of any radionuclide in dust will be reduced by use of engineering controls such as wetting of soil.</li></ol> |

## Notes:

a = Many chemical-specific ARARs also contain action-specific requirements; these ARARs are not repeated in the action-specific ARAR tables.

b = Only the substantive provisions of the requirements cited in this table are ARARs.

c = Statutes and policies and their citations are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only pertinent substantive requirements of the specific citations are considered ARARs.

ALARA = as low as reasonable achievable

ARARs = applicable or relevant and appropriate requirements

CAA = Clean Air Act

Cal. Code Regs. = California Code of Regulations

CFR = Code of Federal Regulations

ch. = Chapter

cm = centimeter

COCs = chemicals of concern

CTR = California Toxics Rule

DOE = U.S. Department of Energy

EPA = U.S. Environmental Protection Agency

HPNS = Hunters Point Naval Shipyard

IR = Installation Restoration

LLRW = low-level radioactive waste

MCLs = maximum contaminant levels

MCLGs = maximum contaminant level goals

mg/kg = milligrams per kilogram

mrem = millirem

mrem/y = millirems per year

Navy = Department of the Navy

NESHAPs = National Emissions Standards for Hazardous Air Pollutants

NRC = U.S. Nuclear Regulatory Commission

PCB = polychlorinated biphenyls

PCE = tetrachloroethene

pCi/g = picocuries per gram

POC = point of compliance

pt. = part

RCRA = Resource Conservation and Recovery Act

RGs = remediation goals

ROCs = radionuclides of concern

subpt. = subpart

TCE = trichloroethene

TCLP = toxicity characteristic leaching procedure

TEDE = total effective dose equivalent

tit. = title

UMTRCA = Uranium Mill Tailings Radiation Control Act

USC = United States Code

Water Board = San Francisco Regional Water Quality Control Board

WL = working level

§ = Section



**Attachment 4. State Chemical-Specific ARARs<sup>a</sup>**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                        | Prerequisite        | Citation <sup>b</sup>                                                                                                                                                             | ARAR Determination | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater</b>                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                                                                                                                                                                                   |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>State and Regional Water Quality Control Boards <sup>c</sup></b>                                                                                                                                                                                                                                                                                                                                                                |                     |                                                                                                                                                                                   |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Authorizes SWRCB and Water Board to establish, in water quality control plans, beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality.                                                                                                                                                                                                                                        | Waters of the state | California Water Code, div. 7, §§ 13241, 13243, 13263(a), 13269, and 13360                                                                                                        | Applicable         | The Navy accepts the substantive provisions of these sections of the California Water Code as enabling legislation, as implemented through the beneficial uses, WQOs, waste discharge requirement, and promulgated policies of the San Francisco Basin Plan as ARARs.                                                                                                                                                                                                                                |
| Describes the water basins in the San Francisco Region, establishes beneficial uses of groundwater and surface water, and establishes WQOs, including narrative and numerical standards.                                                                                                                                                                                                                                           | Waters of the state | Comprehensive Water Quality Control Plan for the San Francisco Region (Basin Plan) Chapters 2 and 3 (California Water Code § 13240), except the MUN designation for the A-aquifer | Applicable         | The substantive groundwater provisions of Chapters 2 and 3 of the Basin Plan, except the MUN designation, are ARARs. According to the Basin Plan, which incorporates SWRCB Resolution 88-63, A-aquifer groundwater at Parcel E is not a potential drinking water source. The only beneficial use of A-aquifer groundwater is freshwater replenishment of San Francisco Bay. B-aquifer groundwater has a moderate potential for use as a drinking water source.                                       |
| Designates all groundwater and surface waters of the state as drinking water, except where total dissolved solids are greater than 3,000 ppm, the well yield is less than 200 gpd from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonably be treated for domestic use using either best management practices or best economically achievable treatment practices. | Waters of the state | SWRCB Resolution 88-63                                                                                                                                                            | Applicable         | The Navy has evaluated the groundwater characteristics in the A-aquifer and B-aquifer at Parcel E against the criteria listed in SWRCB Resolution 88-63. The Navy has determined that groundwater in the A-aquifer is not a potential source of drinking water and groundwater in the B-aquifer has a moderate potential for use as a drinking water source. The Water Board has concurred with the Navy's determination that groundwater in the A-aquifer is not a potential drinking water source. |

**Attachment 4. State Chemical-Specific ARARs<sup>a</sup> (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Prerequisite                     | Citation <sup>b</sup>                                                                                  | ARAR Determination | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <b>Groundwater</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                  |                                                                                                        |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>State and Regional Water Quality Control Boards <sup>c</sup></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                  |                                                                                                        |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Establishes the policy that high quality waters of the state “shall be maintained to the maximum extent possible” consistent with the “maximum benefit to the people of the State.” It provides that whenever the existing quality of water is better than that required by applicable water quality policies, such existing high quality water will be maintained until it has been demonstrated to the state that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies. It also states that any activity that produces or may produce a waste or increased volume or concentration of waste and that discharges or proposes to discharge to existing high-quality waters will be required to meet waste discharge requirements that will result in the best practicable treatment or control of the discharge. | High quality waters of the state | Statement of Policy With Respect to Maintaining High Quality of Waters in California, SWRCB Res. 68-16 | Not an ARAR        | <p>SWRCB Res. 68-16 is not a chemical-specific ARAR because it is not more stringent than the federal Cal. Code Regs. tit. 22 groundwater protection standard [Cal. Code Regs. tit. 22, § 66264.94(a)(1) and (3),(c), (d), and (e)]. SWRCB Res. 68-16 is also not an action-specific ARAR because the selected remedy does not include discharge of treated groundwater to surface water. The Navy has determined that further migration of contaminants through groundwater is not a discharge governed by the language in Res. 68-16. More specifically, the language of SWRCB Res. 68-16 indicates that it is prospective in intent, applying to new discharges in order to maintain existing high-quality waters. It is not intended to apply to restoration of waters that are already degraded.</p> <p>The state does not agree with the Navy's determination that SWRCB Res. 92-49 and 68-16 are not ARARs for this response action. SWRCB has interpreted the term “discharges” in the California Water Code to include the movement of waste from soils to groundwater and from contaminated to uncontaminated water (SWRCB 1994). However, the state agrees that the proposed action would comply with SWRCB Res. 92-49 and 68-16. The state does not intend to dispute the ROD, but reserves its rights if implementation of the provisions at Cal. Code Regs. tit. 22 is not as stringent as state implementation of the provisions at Cal. Code Regs. tit. 23. Because Cal. Code Regs. tit. 22 regulation is part of the state's authorized hazardous waste control program, it is also the state's position that Cal. Code Regs. tit. 22, § 66264.94 is a state ARAR and not a federal ARAR (<i>United States v. State of Colorado</i>, 990 F.2d 1565 [1993]).</p> |

**Attachment 4. State Chemical-Specific ARARs<sup>a</sup> (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Prerequisite                                              | Citation <sup>b</sup>                                                                                                                   | ARAR Determination | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <b>Groundwater</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                           |                                                                                                                                         |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>State and Regional Water Quality Control Boards <sup>c</sup></b>                                                                                                                                                                                                                                                                                                                                                                                               |                                                           |                                                                                                                                         |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Describes requirements for Water Board oversight of investigation and cleanup and abatement activities resulting from discharges of hazardous substances. Water Board may decide on cleanup and abatement goals and objectives for the protection of water quality and beneficial uses of water within each region. Establishes criteria for "containment zones" where cleanup to established water quality goals is not economically or technically practicable. | Discharge of hazardous substance into waters of the state | Policies and procedures for investigation and cleanup and abatement of discharges under California Water Code § 13304, SWRCB Res. 92-49 | Not an ARAR        | SWRCB Res. 92-49 is not an ARAR because it is not more stringent than the federal Cal. Code Regs. tit. 22 monitoring requirements [Cal. Code Regs. tit. 22, § 66264.94(a)(1) and (3),(c), (d), and (e)].<br><br>The state does not agree with the Navy's determination that SWRCB Res. 92-49 and 68-16 are not ARARs for this response action. SWRCB has interpreted the term "discharges" in the California Water Code to include the movement of waste from soils to groundwater and from contaminated to uncontaminated water (SWRCB, 1994). However, the state agrees that the proposed action would comply with SWRCB Res. 92-49 and 68-16. The state does not intend to dispute the ROD, but reserves its rights if implementation of the provisions at Cal. Code Regs. tit. 22 is not as stringent as state implementation of the provisions at Cal. Code Regs. tit. 23. Because Cal. Code Regs. tit. 22 regulation is part of the state's authorized hazardous waste control program, it is also the state's position that Cal. Code Regs. tit. 22, § 66264.94 is a state ARAR and not a federal ARAR ( <i>United States v. State of Colorado</i> , 990 F.2d 1565 [1993]). |

**Attachment 4. State Chemical-Specific ARARs<sup>a</sup> (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                                               | Prerequisite                                                                | Citation <sup>b</sup>            | ARAR Determination       | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater</b>                                                                                                        |                                                                             |                                  |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Department of Toxic Substances Control <sup>c</sup> / State and Regional Water Quality Control Boards <sup>c</sup></b> |                                                                             |                                  |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| State MCL list.                                                                                                           | Source of drinking water                                                    | Cal. Code Regs. tit. 22, § 64444 | Relevant and appropriate | The Navy considers the B-aquifer a Class II aquifer under federal criteria and a potential source of drinking water based on an evaluation of site-specific factors. The Navy has identified State primary MCLs for select COCs (1,1-DCE, 1,2-DCE, 1,4-dichlorobenzene, and vinyl chloride) as chemical-specific ARARs for the B-aquifer because they are more stringent than the corresponding federal MCL. State primary MCLs are state ARARs for the following scenarios:<br>(1) containment of in-place waste at Parcel E IR-02 and IR-03, for which State primary MCLs are ARARs for groundwater in the B-aquifer downgradient of the POC; and (2) clean closure of contaminated groundwater plumes outside of Parcel E IR-02 and IR-03, for which State primary MCLs are ARARs for groundwater in the B-aquifer throughout the contaminated plumes. The Navy and the Water Board have determined that the A-aquifer is not a potential source of drinking water; therefore, drinking water standards (MCLs) are not ARARs for the A-aquifer. |
| <b>Surface Water</b>                                                                                                      |                                                                             |                                  |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>State Water Resources Control Board <sup>c</sup></b>                                                                   |                                                                             |                                  |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Surface water quality standards.                                                                                          | Marine water with salinities equal to or greater than 10 parts per thousand | Basin Plan Table 3-3             | Applicable               | These standards are applicable to San Francisco Bay. The Navy has identified Table 3-3 as ARARs for Parcel E because groundwater discharges to the bay. The Navy will meet these ARARs in the Bay, at a point past the interface of the A-aquifer (or surface water bodies) and the bay. The Navy has identified MCLs as ARARs for the B-aquifer, which will be protective of any discharge of B-aquifer groundwater to the permeable zones underlying the bay. Therefore, these are not ARARs for the interface of the B-aquifer and the permeable zones underlying the bay.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**Attachment 4. State Chemical-Specific ARARs<sup>a</sup> (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Requirement                                                                                                                                                  | Prerequisite                                 | Citation <sup>b</sup>                                                                                                   | ARAR Determination | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Soil, Sediment, and Groundwater</b>                                                                                                                       |                                              |                                                                                                                         |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Department of Toxic Substances Control <sup>c</sup> / State Water Resources Control Board <sup>c</sup> / California Integrated Waste Management Board</b> |                                              |                                                                                                                         |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Definition of non-RCRA hazardous waste.                                                                                                                      | Waste                                        | Cal. Code Regs, tit. 22, §§ 66261.22(a)(3) and (a)(4), 66261.24(a)(2)-(a)(8), 66261.101, 66261.3(a)(2)(C) and (a)(2)(F) | Applicable         | These requirements are ARARs for all waste the Navy generates in implementing Alternatives S-4, GW-3, O-4, and R-2. The Navy will determine if the waste meets the definition of non-RCRA hazardous waste when it is generated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Definition of designated waste and nonhazardous waste.                                                                                                       | Waste                                        | Cal. Code Regs, tit. 27, §§ 20210 and 20220                                                                             | Applicable         | These requirements are ARARs for all waste the Navy generates in implementing Alternatives S-4, GW-3, O-4, and R-2. The Navy will determine if the waste meets the definition of non-RCRA hazardous waste when it is generated                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| This requirement controls release of methane.                                                                                                                | Release of methane from waste disposal sites | Cal. Code Regs, tit. 27, § 20921(a)                                                                                     | Applicable         | Provides that methane must not exceed 1.25 percent by volume in air within onsite structures, and concentrations of methane migrating from waste disposal sites at Parcel E (at IR-02, IR-03, and IR-12) must not exceed 5 percent by volume in air at the property boundary (or an alternative boundary) in accordance with Cal. Code Regs, tit. 27, § 20925.<br><br>The potential presence of subsurface methane, which was previously reported in isolated areas within IR-03 and IR-12, will be further evaluated in conjunction with the RD to determine if control measures (such as passive vents) are required to protect human health in accordance with Cal. Code Regs, tit. 27, § 20921(a). |

#### Attachment 4. State Chemical-Specific ARARs<sup>a</sup> (*continued*)

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

Notes:

a = The chemical-specific ARARs also contain action-specific requirements; these ARARs are not repeated in the action-specific ARAR tables.

b = Only the substantive provisions of the requirements cited in this table are ARARs.

c = Statutes and policies and their citations are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only pertinent substantive requirements of the specific citations are considered ARARs.

ARAR = applicable or relevant and appropriate requirement

Cal. Code Regs = California Code of Regulations

COCs = chemicals of concern

DCE = dichloroethene

div. = Division

gpd = gallons per day

IR = Installation Restoration

MCL = maximum contaminant level

MUN = municipal and domestic supply

Navy = Department of the Navy

POC = point of compliance

ppm = parts per million

RCRA = Resource Conservation and Recovery Act

RD = remedial design

Res. = Resolution

ROD = Record of Decision

SWRCB = State Water Resources Control Board

tit. = title

Water Board = Regional Water Quality Control Board

WQOs = water quality objectives

§ = Section

Reference: SWRCB, 1994. "Application of State Water Board Resolution No. 68-16 to Cleanup of Contaminated Groundwater." February.

**Attachment 4. Federal Location-Specific ARARs**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Location                                                                                          | Requirement                                                                                                                                                              | Prerequisite                                                                               | Citation <sup>a</sup>                                       | ARAR Determination       | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>National Historic Preservation Act of 1966, as Amended (16 USC § 1470-470x-6) <sup>b</sup></b> |                                                                                                                                                                          |                                                                                            |                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Historic project owned or controlled by federal agency                                            | Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places. | Property included in or eligible for the National Register of Historic Places              | 16 USC § 470-470x-6<br>36 CFR Part 800<br>40 CFR § 6.301(b) | Not an ARAR              | Not an ARAR because the Parcel E response action will not impact property listed on or eligible for listing on the National Register of Historic Places. A sensitive archaeological area (potential shellmound site) has been identified in Parcel UC-3 (along Crisp Road). The substantive provisions of this regulation was identified as a potential ARAR in the FS Report because the sensitive archaeological area in Crisp Road was formerly part of Parcel E. |
| <b>Migratory Bird Treaty Act of 1972 (16 USC §§ 703 through 712) <sup>b</sup></b>                 |                                                                                                                                                                          |                                                                                            |                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Migratory bird area                                                                               | Protects almost all species of native migratory birds in the United States from unregulated "take," which can include poisoning at hazardous waste sites.                | Presence of migratory birds                                                                | 16 USC § 703                                                | Relevant and appropriate | This section is relevant and appropriate because migratory birds have been observed at Parcel E.                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Coastal Zone Management Act (16 USC §§ 1451 through 1464) <sup>b</sup></b>                     |                                                                                                                                                                          |                                                                                            |                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Within coastal zone                                                                               | Conduct activities in a manner consistent with approved state management programs to the maximum extent practicable.                                                     | Activities affecting the coastal zone, including lands there under and adjacent shore land | 16 USC § 1456(c)<br>15 CFR § 930.30                         | Relevant and appropriate | Remedial alternatives will comply with the CZMA and San Francisco Bay Plan to the maximum extent practicable.                                                                                                                                                                                                                                                                                                                                                        |
| <b>Clean Water Act of 1977, as Amended, § 404 (33 USC § 1344) <sup>b</sup></b>                    |                                                                                                                                                                          |                                                                                            |                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Jurisdictional waters of the United States                                                        | Action to prohibit discharge of dredged or fill material into wetland without permit.                                                                                    | Jurisdictional waters as defined by Clean Water Act                                        | 33 USC § 1344                                               | Applicable               | Substantive provisions are applicable because discharge of dredged or fill material is planned as part of the response action.                                                                                                                                                                                                                                                                                                                                       |

#### **Attachment 4. Federal Location-Specific ARARs (*continued*)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

Notes:

a = Only the substantive provisions of the requirements cited in this table are ARARs.

b = Statutes and policies and their citations are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statute or policy as an ARAR; specific ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered ARARs.

ARAR = applicable or relevant and appropriate requirement

CFR = Code of Federal Regulations

CZMA = Coastal Zone Management Act

FS = Feasibility Study

USC = United States Code

§ = Section



**Attachment 4.****State Location-Specific ARARs**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Location                                                                                         | Requirement                                                                                                                                                                                                                                                                                                                                                                                                               | Prerequisite                                                                       | Citation <sup>a</sup>                                       | ARAR<br>Determination    | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>McAteer-Petris Act (California Government Code §§ 66600 through 66661) <sup>b</sup></b>       |                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                    |                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Within the San Francisco Bay coastal zone                                                        | Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the San Francisco Bay.                                                                                                                                                                                          | Activities affecting the San Francisco Bay and 100 feet landward of the shoreline. | Bay Plan at Cal. Code Regs, tit. 14, §§ 10110 through 11990 | Relevant and appropriate | The Bay Plan, developed under the authority of the McAteer-Petris Act, is an approved state coastal zone management program. Any remedial actions take by the Navy that will affect San Francisco Bay or that will occur within 100 feet landward of the shoreline will be consistent with the enforceable policies of the Bay Plan to the maximum extent practicable. See action-specific ARARs table for analysis of the substantive provisions of the Bay Plan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>California Department of Fish and Wildlife (California Fish &amp; Game Code) <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                    |                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Fully protected birds                                                                            | Fully protected birds or parts thereof may not be taken or possessed at any time. The following are fully protected birds: American Peregrine Falcon, California Brown Pelican, California Black Rail, California Clapper Rail, California Condor, California Least Tern, Golden Eagle, Greater Sandhill Crane, Light-footed Clapper Rail, Southern Bald Eagle, Trumpeter Swan, White-tailed Kite, and Yuma Clapper Rail. | A fully protected species must be potentially affected.                            | California Fish & Game Code § 3511                          | Relevant and appropriate | <p>California Fish &amp; Game Code § 3511 is not applicable because the United States of America has not waived sovereign immunity in the FESA for this State of California requirement. The American peregrine falcon is present at the site and the White-tailed Kite is potentially present at the site, and these species are protected under California Fish &amp; Game Code § 3511. The substantive provisions of California Fish &amp; Game Code § 3511 meet the pertinent NCP criteria under 40 CFR § 300.400(g)(2)(viii) and are "relevant and appropriate" because the American peregrine falcon is present at the site and the White-tailed Kite is potentially present at the site, and protection of these vulnerable resources allows them to be "used" in the sense that they continue to provide their unique value to the State of California.</p> <p>The Navy accepts California Fish &amp; Game Code § 3511 as a state ARAR subject to the following conditions. The State of California, through CDFW-OSPR, concurs that this statute addresses prohibited conduct but does not provide for or prescribe affirmative measures to avoid a "taking."</p> |

**Attachment 4.****State Location-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Location                                                                                               | Requirement                                                                                                                     | Prerequisite                                                                                                                               | Citation <sup>a</sup>                               | ARAR<br>Determination    | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>California Department of Fish and Wildlife (Cal. Fish &amp; Game Code) <sup>b</sup> (continued)</b> |                                                                                                                                 |                                                                                                                                            |                                                     |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Fully protected birds                                                                                  | (see above)                                                                                                                     | (see above)                                                                                                                                | (see above)                                         | (see above)              | Notwithstanding the absence of specific affirmative measures in the statute, the Navy will implement reasonable measures to ensure adequate protection of ecological receptors during response action construction following issuance of a CERCLA decision document pursuant to the Navy's obligations under CERCLA to select removal or remedial actions that are protective of human health and the environment (see Section 121[b][1] of CERCLA). The Navy will coordinate with the State, through CDFW-OSPR, prior to implementation of such reasonable measures. The Navy understands that the State of California reserves the right to conduct periodic site visits during removal or remedial activities to confirm implementation of avoidance measures. |
| Waters of the State                                                                                    | Prohibits the passage of enumerated substances or materials into waters of the state deleterious to fish, plant life, or birds. | Not authorized under California Water Code § 13263 or a waiver issued pursuant to subdivision (a) of § 13269 of the California Water Code. | California Fish & Game Code § 5650(a), (b), and (c) | Relevant and appropriate | California Fish & Game Code § 5650 is not applicable because the United States of America has not waived sovereign immunity for this State of California requirement. While no direct deposition of material is expected to enter into or affect waters of the states, the substantive portions of this standard will be complied with as an ARAR. Response actions along the Parcel E shoreline will be conducted in such a way as to ensure that materials dug up will not be released into the water column.                                                                                                                                                                                                                                                   |

## Attachment 4.

### State Location-Specific ARARs (*continued*)

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

#### Notes:

a = Only the substantive provisions of the requirements cited in this table are ARARs.

b = Statutes and policies and their citations are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statute or policy as an ARAR; specific ARARs follow each general heading; only substantive requirements of the specific citations are considered ARARs.

ARAR = applicable or relevant and appropriate requirement

Bay Plan = San Francisco Bay Plan

Cal. Code Regs. = California Code of Regulations

CDFW = California Department of Fish and Wildlife

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

CFR = Code of Federal Regulations

FESA = Federal Endangered Species Act

Navy = Department of the Navy

NCP = National Oil and Hazardous Substances Pollution Contingency Plan

OSPR = Office of Spill Prevention and Response

tit. = Title

§ = Section

**Attachment 4. Federal Action-Specific ARARs**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                             | Requirement                                                                                                                                                                                                                | Prerequisite     | Citation <sup>a</sup>                              | ARAR Determination                                      | Comments                                                                                   |
|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>Containment</b>                                                                                 |                                                                                                                                                                                                                            |                  |                                                    |                                                         |                                                                                            |
| <b>Resource Conservation and Recovery Act (Title 42 USC, ch. 82, §§ 6901-6991[i]) <sup>b</sup></b> |                                                                                                                                                                                                                            |                  |                                                    |                                                         |                                                                                            |
| Compaction                                                                                         | If waste is to remain in a unit, the unit shall be compacted before any portion of the final cover is installed.                                                                                                           | Landfill closure | Cal. Code Regs. tit. 22, § 66264.228(e)(1)         | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Post-closure water entry                                                                           | The final cover will be designed to prevent the downward entry of water into the closed landfill throughout a period of at least 100 years.                                                                                | Landfill closure | Cal. Code Regs. tit. 22, § 66264.310(a)(1)         | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Cover seismic requirements                                                                         | The final cover shall accommodate lateral and vertical shear forces generated by the maximum credible earthquake so that the integrity of the cover is maintained.                                                         | Landfill closure | Cal. Code Regs. tit. 22, § 66264.310(a)(5)         | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for covers throughout Parcel E.                                   |
| Post-closure care                                                                                  | Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events throughout the post-closure period. | Landfill closure | Cal. Code Regs. tit. 22, § 66264.310(b)(1) and (4) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for covers throughout Parcel E.                                   |
| Benchmark maintenance                                                                              | Protect and maintain surveyed benchmarks throughout the post-closure period.                                                                                                                                               | Landfill closure | Cal. Code Regs. tit. 22, § 66264.310(b)(5)         | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for covers throughout Parcel E.                                   |

**Attachment 4. Federal Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                             | Requirement                                                                                                                                                                                                           | Prerequisite                | Citation <sup>a</sup>                                                               | ARAR Determination                     | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Shoreline Construction</b>                                                      |                                                                                                                                                                                                                       |                             |                                                                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Clean Water Act, as Amended, Section 404 (Title 33 USC § 1344) <sup>b</sup></b> |                                                                                                                                                                                                                       |                             |                                                                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Perform construction in shoreline zone                                             | These sections describe specific restrictions on the discharge of dredged or fill material into waters of the United States, and require that appropriate and practicable steps be taken to minimize adverse impacts. | Waters of the United States | 40 CFR §§ 230.10; 230.70 through 230.77                                             | Applicable (for Alternative S-4)       | Compliance with 40 CFR § 230.10 is evaluated using factual determinations, per 40 CFR § 230.11, for the proposed action. Potential actions to minimize adverse impacts are identified at 40 CFR §§ 230.70 through 230.77. The shoreline construction planned for Alternative S-4 will comply with the specified discharge restrictions and will incorporate appropriate steps to minimize adverse impacts to waters of the United States. Appendix D of the FS Report evaluates the proposed shoreline construction relative to these requirements. |
| Perform construction in shoreline zone                                             | These sections identify specific information to be included in factual determinations for proposed actions involving discharge of dredged or fill material into waters of the United States.                          | Waters of the United States | 40 CFR §§ 230.11; 230.20 through 230.25; 230.31; 230.32; 230.41; 230.42; and 230.53 | Applicable (for Alternative S-4)       | Appendix D of the FS Report provides a factual determination for the shoreline construction planned for Alternative S-4.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Perform construction in shoreline zone                                             | This section identifies general requirements for compensatory mitigation to offset losses from unavoidable impacts to waters of the United States.                                                                    | Waters of the United States | 40 CFR § 230.93                                                                     | Applicable (for Alternative S-4)       | Alternative S-4 includes shoreline construction that would result in the discharge of fill material into a wetland, the loss of which would be mitigated by the Navy (on site at adjacent Parcel E-2) in accordance with the substantive provisions of 40 CFR § 230.93.                                                                                                                                                                                                                                                                             |
| Perform construction in shoreline zone                                             | This section identifies the required content for mitigation plans.                                                                                                                                                    | Waters of the United States | 40 CFR § 230.94(c)                                                                  | To Be Considered (for Alternative S-4) | Requirements are procedural and not substantive; however, these requirements will be used as TBCs in developing site-specific mitigation plans for adjacent Parcel E-2.                                                                                                                                                                                                                                                                                                                                                                             |

**Attachment 4. Federal Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                             | Requirement                                                                                                                                                      | Prerequisite                | Citation <sup>a</sup>       | ARAR Determination               | Comments                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Shoreline Construction (continued)</b>                                          |                                                                                                                                                                  |                             |                             |                                  |                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Clean Water Act, as Amended, Section 404 (Title 33 USC § 1344) <sup>b</sup></b> |                                                                                                                                                                  |                             |                             |                                  |                                                                                                                                                                                                                                                                                                                                                                                               |
| Perform construction in shoreline zone                                             | These sections identify ecological performance standards and monitoring requirements for mitigation projects.                                                    | Waters of the United States | 40 CFR §§ 230.95 and 230.96 | Applicable (for Alternative S-4) | Ecological performance standards and monitoring requirements will be incorporated, as appropriate, into site-specific mitigation plans for adjacent Parcel E-2.                                                                                                                                                                                                                               |
| Perform construction in shoreline zone                                             | This section identifies the long-term management methods for compensatory mitigation projects.                                                                   | Waters of the United States | 40 CFR § 230.97             | Applicable (for Alternative S-4) | Long-term management methods will be incorporated, as appropriate, into site-specific mitigation plans for adjacent Parcel E-2.                                                                                                                                                                                                                                                               |
| Perform construction in shoreline zone                                             | This section identifies general policies for evaluating permit applications for proposed discharge of dredged or fill material into waters of the United States. | Waters of the United States | 33 CFR § 320.4              | Applicable (for Alternative S-4) | The planned shoreline construction is to be performed on site pursuant to CERCLA and, as such, the Navy is not required to obtain a permit to discharge the fill; however, the Navy will comply with the substantive provisions of general policies for evaluating permit applications. Appendix D of the FS Report evaluates the proposed shoreline construction relative to these policies. |
| Perform construction in shoreline zone                                             | These sections identify terms and conditions for the nationwide permit program, which authorizes discharges having minimal impacts.                              | Waters of the United States | 33 CFR § 330.1(e)(3)        | Applicable (for Alternative S-4) | The planned shoreline construction is to be performed on site pursuant to CERCLA and, as such, the Navy is not required to obtain a permit to discharge the fill; however, the Navy will comply with the substantive terms and conditions of Nationwide Permit 38.                                                                                                                            |

**Attachment 4. Federal Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                             | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                    | Prerequisite                                                                                                                                                                        | Citation <sup>a</sup>                                  | ARAR Determination                                                | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Stormwater Discharge</b>                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                     |                                                        |                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Clean Water Act, as Amended (Title 33 USC, ch. 26, §§ 1251–1387) <sup>b</sup></b>               |                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                     |                                                        |                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Excavation and grading activities                                                                  | Construction that disturbs at least 1 acre must use best management practices to control stormwater discharges.                                                                                                                                                                                                                                                                                                                                | Construction activities at least 1 acre in size.                                                                                                                                    | Clean Water Act § 402<br>40 CFR § 122.44(k)(2) and (4) | Applicable<br>(for Alternative S-4 and O-4)                       | Implementation of Alternatives S-4 and O-4 will disturb more than 1 acre. The Navy will implement the substantive provisions of state general stormwater discharge permit, Orders 09-09-DWQ and 10-14-DWQ (adopted pursuant to Clean Water Act § 402), to comply with the federal Clean Water Act ARARs and water quality state ARARs for discharge to surface water. The federal and state ARARs require implementing best management practices and meeting the substantive numeric effluent limit and action level requirements. Although procedural requirements do not qualify as CERCLA ARARs, the Navy shall voluntarily prepare a CERCLA storm water plan as a component of CERCLA remedial design to address the substantive provisions.                                                                                                            |
| <b>Groundwater Monitoring</b>                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                     |                                                        |                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Resource Conservation and Recovery Act (Title 42 USC, ch. 82, §§ 6901-6991[i]) <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                     |                                                        |                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Monitor groundwater                                                                                | The RCRA monitoring regulations apply during the post-closure care period and during any compliance period unless: (1) the regulated unit has been in compliance with the water quality protection standard for a period of 3 consecutive years; and (2) all waste, waste residues, contaminated containment system components, contaminated subsoils, and all other contaminated geologic materials are removed or decontaminated at closure. | Surface impoundment, waste pile, land treatment unit, or landfill for which constituents in or derived from waste in the unit may pose a threat to human health or the environment. | Cal. Code Regs. tit. 22, § 66264.90(c)                 | Relevant and appropriate<br>(for Alternatives GW-3, O-4, and R-2) | These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the groundwater monitoring component of Alternatives GW-3, O-4, and R-2 (as they pertain to waste left in place at IR-02 and IR-03). The groundwater monitoring period for Alternatives GW-3 and O-4 will extend, consistent with Cal. Code Regs. tit. 27, § 20950(a), as long as the wastes pose a threat to water quality. The groundwater monitoring period for Alternative R-2 may be terminated after 3 consecutive years of monitoring if the results demonstrate, consistent with the findings of previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health. |

**Attachment 4. Federal Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                             | Requirement                                                                                                                                                                                                                                                                                                        | Prerequisite                         | Citation <sup>a</sup>                                                       | ARAR Determination                                             | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater Monitoring (continued)</b>                                                          |                                                                                                                                                                                                                                                                                                                    |                                      |                                                                             |                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Resource Conservation and Recovery Act (Title 42 USC, ch. 82, §§ 6901-6991[i]) <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                    |                                      |                                                                             |                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Monitor groundwater                                                                                | Chemicals of concern are the waste constituents, reaction products, and hazardous constituents that are reasonably expected to be in or derived from the waste contained in the regulated unit.                                                                                                                    | RCRA hazardous waste management unit | Cal. Code Regs. tit. 22, § 66264.93                                         | Relevant and appropriate (for Alternatives GW-3, O-4, and R-2) | These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of Alternatives GW-3, O-4, and R-2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Monitor groundwater                                                                                | The POC is a vertical surface, located at the hydraulically downgradient limit of the waste management area that extends through the uppermost aquifer underlying the regulated unit.                                                                                                                              | RCRA hazardous waste management unit | Cal. Code Regs. tit. 22, § 66264.95                                         | Relevant and appropriate (for Alternatives GW-3, O-4, and R-2) | The POC provisions at Cal. Code Regs. tit. 22, § 66264.95 are relevant and appropriate ARARs for the scenario involving containment of in-place waste at Parcel E IR-02 and IR-03. Waste has been identified throughout IR-02 and IR-03, and this waste is the primary source of contamination to groundwater (see Sections 4.3.9, 4.3.10, and 4.3.11 of the Revised RI Report). Based on these findings, IR-02 and IR-03 are considered a contiguous waste management unit. The Navy believes that, for plumes located within IR-02 and IR-03, contamination upgradient of the POC would be adequately contained by the remedial action to ensure compliance with the RAOs and adequately protect human health and the environment. |
| Monitor groundwater                                                                                | Owner or operator of shall establish a groundwater monitoring system for each regulated unit and include a sufficient number of monitoring points installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the POC. | RCRA hazardous waste management unit | Cal. Code Regs. tit. 22, § 66264.97(b)(1)(A), (b)(1)(D)(1) and (b)(1)(D)(2) | Relevant and appropriate (for Alternatives GW-3, O-4, and R-2) | These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of Alternatives GW-3, O-4, and R-2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |



**Attachment 4. Federal Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                             | Requirement                                                           | Prerequisite                         | Citation <sup>a</sup>                                                                                                         | ARAR Determination                                             | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater Monitoring (continued)</b>                                                          |                                                                       |                                      |                                                                                                                               |                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Resource Conservation and Recovery Act (Title 42 USC, ch. 82, §§ 6901-6991[i]) <sup>b</sup></b> |                                                                       |                                      |                                                                                                                               |                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Monitor groundwater                                                                                | Requirements for monitoring well construction and sampling intervals. | RCRA hazardous waste management unit | Cal. Code Regs. tit. 22, § 66264.97(b)(4), (5), (6), and (7)                                                                  | Relevant and appropriate (for Alternatives GW-3, O-4, and R-2) | These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of Alternatives GW-3, O-4, and R-2.                                                                                                                                                                                                                                                                                                                                                              |
| Monitor groundwater                                                                                | Requirements for collecting samples.                                  | RCRA hazardous waste management unit | Cal. Code Regs. tit. 22, § 66264.97(e)(6), (e)(12)(A), (e)(12)(B), (e)(13), and (e)(15)                                       | Relevant and appropriate (for Alternatives GW-3, O-4, and R-2) | These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of Alternatives GW-3, O-4, and R-2.                                                                                                                                                                                                                                                                                                                                                              |
| Monitor groundwater                                                                                | Requirements for a detection monitoring program.                      | RCRA hazardous waste management unit | Cal. Code Regs. tit. 22, § 66264.98(e)(1-5), (i), (j), (k)(1-3), (4)(A) and (D), (5), (7)(C) and (D), (n)(1), (2)(B), and (C) | Relevant and appropriate (for Alternative R-2)                 | These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of Alternative R-2, which will require continued groundwater monitoring to demonstrate, consistent with the findings of previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health. No other response action is required for radionuclides in groundwater. |

**Attachment 4. Federal Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                             | Requirement                                                                                                                                                                                                                                                                                                                          | Prerequisite                          | Citation <sup>a</sup>                              | ARAR Determination                                       | Comments                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|----------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater Monitoring / Excavation and Offsite Disposal / In-Situ Treatment</b>                |                                                                                                                                                                                                                                                                                                                                      |                                       |                                                    |                                                          |                                                                                                                                                                                                                                                                                            |
| <b>Resource Conservation and Recovery Act (Title 42 USC, ch. 82, §§ 6901-6991[i]) <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                      |                                       |                                                    |                                                          |                                                                                                                                                                                                                                                                                            |
| Monitor groundwater                                                                                | In conjunction with corrective action measures, the owner or operator shall establish and implement a water quality monitoring program to demonstrate the effectiveness of the corrective action program. The program shall be effective in determining compliance and in determining the success of the corrective action measures. | RCRA hazardous waste management unit. | Cal. Code Regs. tit. 22, § 66264.100(d)            | Relevant and appropriate (for Alternatives GW-3 and O-4) | These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of Alternatives GW-3 and O-4 (which both involve response actions for non-radioactive chemicals in groundwater). |
| Onsite generation of waste                                                                         | Person who generates waste shall determine if the waste is a RCRA hazardous waste.                                                                                                                                                                                                                                                   | Generator of waste.                   | Cal. Code Regs. tit. 22, §§ 66262.10 (a), 66262.11 | Applicable (for Alternatives S-4, GW-3, O-4, and R-2)    | These regulations are applicable to any operation that generates waste. Alternatives S-4, GW-3, O-4, and R-2 will generate waste to be disposed of off site. The Navy will decide whether the waste is RCRA hazardous waste when it is generated.                                          |
| Onsite generation of waste                                                                         | Requirements for analyzing waste for determining whether waste is hazardous.                                                                                                                                                                                                                                                         | Generator of waste.                   | Cal. Code Regs. tit. 22, § 66264.13 (a) and (b)    | Applicable (for Alternatives S-4, GW-3, O-4, and R-2)    | These regulations are applicable to any operation that generates waste. Alternatives S-4, GW-3, O-4, and R-2 will generate waste to be disposed of off site. The Navy will decide whether the waste is RCRA hazardous waste when it is generated.                                          |

**Attachment 4. Federal Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                                  | Requirement                                                                                                                                                                          | Prerequisite                                                  | Citation <sup>a</sup>                                        | ARAR Determination                                                  | Comments                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Excavation and Disposal / Soil Vapor Extraction</b>                                                  |                                                                                                                                                                                      |                                                               |                                                              |                                                                     |                                                                                                                                                                                                                                                                         |
| <b>Clean Air Act (Title 42 USC, § 7401 et seq.) <sup>b</sup></b>                                        |                                                                                                                                                                                      |                                                               |                                                              |                                                                     |                                                                                                                                                                                                                                                                         |
| Excavation                                                                                              | Sets forth opacity limitations.                                                                                                                                                      | Excavation.                                                   | BAAQMD Regulation 6, Rule 302                                | Applicable (for Alternatives S-4, GW-3 and O-4)                     | Applicable for excavation activities, including construction of shoreline revetment and groundwater containment barriers.                                                                                                                                               |
| Operate an SVE system                                                                                   | New emission sources must use best available control technology.                                                                                                                     | New emission source                                           | BAAQMD Regulation 2-1-301                                    | Applicable (for Alternatives S-4 and O-4)                           | The Navy would treat the off-gas resulting from the SVE system (or dual-phase extraction system) with a granular activated carbon unit.                                                                                                                                 |
| Operate an SVE system                                                                                   | Requirements for SVE systems.                                                                                                                                                        | SVE system                                                    | BAAQMD Regulation 8-47                                       | Applicable (for Alternatives S-4 and O-4)                           | These requirements are applicable to the SVE system under Alternative S-4 and dual-phase extraction system under Alternative O-4.                                                                                                                                       |
| <b>Groundwater Containment or Extraction / Excavation and Offsite Disposal / Shoreline Construction</b> |                                                                                                                                                                                      |                                                               |                                                              |                                                                     |                                                                                                                                                                                                                                                                         |
| <b>Resource Conservation and Recovery Act (Title 42 USC, ch. 82, §§ 6901-6991[i]) <sup>b</sup></b>      |                                                                                                                                                                                      |                                                               |                                                              |                                                                     |                                                                                                                                                                                                                                                                         |
| Stockpiling soil for offsite disposal                                                                   | Allows generators to accumulate solid remediation waste in an EPA-designated pile for storage only up to 2 years during remedial operations without triggering LDRs.                 | RCRA hazardous waste temporarily stored in piles.             | 40 CFR § 264.554(a), (d), (g), (h), (i), (j), and (k)        | Relevant and appropriate (for Alternatives S-4, GW-3, O-4, and R-2) | The Navy will temporarily stockpile soil in staging piles for offsite disposal. The Navy does not anticipate that all soil will be RCRA hazardous waste; however, the Navy has determined that these requirements are relevant and appropriate for all stockpiled soil. |
| Temporary units                                                                                         | Alternative requirements that are protective of human health or the environment may replace design, operating, or closure standards for temporary tanks and container storage areas. | Temporary units may be used and are not subject to RCRA LDRs. | Cal. Code Regs. tit. 22, §§ 66264.553 (b), (d), (e), and (f) | Applicable (for Alternatives S-4, GW-3, O-4, and R-2)               | The substantive portions are applicable for temporary onsite storage of liquid generated during excavation of saturated soil or sediments and prior to offsite disposal.                                                                                                |

**Attachment 4. Federal Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                  | Requirement                                                                                                                                                                                                     | Prerequisite                                                                                                                                                                                                                                                                                                                           | Citation <sup>a</sup>                                                                   | ARAR Determination                                       | Comments                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater Containment or Extraction</b>                            |                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                        |                                                                                         |                                                          |                                                                                                                                                                                                                                                                            |
| <b>Clean Water Act (General Pretreatment Regulations) <sup>b</sup></b>  |                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                        |                                                                                         |                                                          |                                                                                                                                                                                                                                                                            |
| Discharge of treated groundwater to publicly owned treatment works      | Identifies prohibited discharges, categorical standards, and monitoring requirements.                                                                                                                           | Pollutants from nondomestic sources that are discharged indirectly into publicly owned treatment works.                                                                                                                                                                                                                                | 40 CFR Part 403                                                                         | Relevant and appropriate (for Alternatives GW-3 and O-4) | If onsite groundwater extracted or treated under Alternatives GW-3 or O-4 is discharged to a publicly owned sanitary sewer system, the substantive provisions of the pretreatment standards are relevant and appropriate federal ARARs.                                    |
| <b>In-Situ Treatment</b>                                                |                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                        |                                                                                         |                                                          |                                                                                                                                                                                                                                                                            |
| <b>Safe Drinking Water Act (42 USC § 300[f]-300[j]-26) <sup>b</sup></b> |                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                        |                                                                                         |                                                          |                                                                                                                                                                                                                                                                            |
| Inject biological amendment or zero-valent iron into groundwater.       | The underground injection control program prohibits injection that allows movement of contaminants into underground sources of drinking water that may result in violations of MCLs or adversely affect health. | An approved UIC program is required in states listed under SDWA Section 1422. Class I wells and Class IV wells are the relevant classifications for CERCLA sites. Class I wells are used to inject hazardous waste beneath the lowermost formation that contains an underground source of drinking water within 0.25 mile of the well. | 40 CFR § 144.12(a) excluding the reporting requirements in § 144.12(b) and 144.12(c)(1) | Applicable (for Alternatives GW-3 and O-4)               | This requirement is applicable to the Navy's injection of biological amendment or zero-valent iron into the groundwater. The Navy will use the basic information requirements contained in 40 CFR §144.83 as TBCs for complying with the requirement in 40 CFR §144.12(a). |

**Attachment 4. Federal Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                             | Requirement                                                                                                                                                                                                                                                  | Prerequisite                          | Citation <sup>a</sup>                      | ARAR Determination                                                  | Comments                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Leachate/Groundwater Collection and Control</b>                                                 |                                                                                                                                                                                                                                                              |                                       |                                            |                                                                     |                                                                                                                                                                                                                                                                                |
| <b>Resource Conservation and Recovery Act (Title 42 USC, ch. 82, §§ 6901-6991[i]) <sup>b</sup></b> |                                                                                                                                                                                                                                                              |                                       |                                            |                                                                     |                                                                                                                                                                                                                                                                                |
| Source containment                                                                                 | Continue to operate leachate collection and removal system until leachate is no longer detected (this regulation does not require the installation of a leachate collection system)                                                                          | RCRA hazardous waste management unit. | Cal. Code Regs. tit. 22, § 66264.310(b)(2) | Relevant and appropriate (for Alternatives S-4 and O-4)             | Relevant and appropriate for post-closure leachate/groundwater control at IR-02 Northwest/Central and IR-03 (if required based on groundwater monitoring results).                                                                                                             |
| <b>Radionuclides</b>                                                                               |                                                                                                                                                                                                                                                              |                                       |                                            |                                                                     |                                                                                                                                                                                                                                                                                |
| Radioactive material and waste storage and control                                                 | The licensee shall secure from unauthorized removal or access licensed materials that are stored in controlled or unrestricted areas.                                                                                                                        | Existing NRC-licensed site            | 10 CFR § 20.1801                           | Relevant and appropriate (for Alternatives S-4, GW-3, O-4, and R-2) | Not applicable because Parcel E is not an existing NRC-licensed site. The substantive provisions of this requirement are relevant and appropriate for staging excavated soil containing ROCs activities exceeding the RGs (see Table 8 of this ROD) prior to offsite disposal. |
|                                                                                                    | The licensee shall control and maintain constant surveillance of licensed material that is in a controlled or unrestricted area and that is not in storage.                                                                                                  | Existing NRC-licensed site            | 10 CFR § 20.1802                           | Relevant and appropriate (for Alternatives S-4, GW-3, O-4, and R-2) | Not applicable because Parcel E is not an existing NRC-licensed site. The substantive provisions of this requirement are relevant and appropriate for staging excavated soil containing ROCs activities exceeding the RGs (see Table 8 of this ROD) prior to offsite disposal. |
| Radioactive waste disposal                                                                         | Performance objectives for the land disposal of LLRW. Concentrations of radioactive material that may be released to the general environment must not result in an annual dose exceeding 25 mrem to the body or any organ of a member of the general public. | NRC-licensed LLRW disposal site       | 10 CFR § 61.41                             | Relevant and appropriate (for Alternatives S-4, GW-3, O-4, and R-2) | Not applicable because Parcel E is not an NRC-licensed disposal site. Relevant and appropriate for sites with radionuclides.                                                                                                                                                   |

#### **Attachment 4. Federal Action-Specific ARARs (*continued*)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

Notes:

a = Only the substantive provisions of the requirements cited in this table are ARARs.

b = Statutes and policies and their citations are provided as headings to identify general categories of ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only substantive requirements of specific citations are considered ARARs.

ARAR = applicable or relevant and appropriate requirement

BAAQMD = Bay Area Air Quality Management District

Cal. Code Regs. = California Code of Regulations

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

CFR = Code of Federal Regulations

ch. = Chapter

EPA = U.S. Environmental Protection Agency

FS = feasibility study

IR = Installation Restoration

LDRs = land disposal restrictions

LLRW = low-level radioactive waste

MCLs = maximum contaminant levels

mrem = millirem

Navy = Department of the Navy

NRC = Nuclear Regulatory Commission

POC = point of compliance

RAOs = remedial action objectives

RCRA = Resource Conservation and Recovery Act

RGs = remediation goals

RI = Remedial Investigation

ROCs = radionuclides of concern

SVE = soil vapor extraction

SWDA = Safe Drinking Water Act

TBC = to be considered

tit. = Title

UIC = underground injection control

USC = United States Code

§ = Section

**Attachment 4.****State Action-Specific ARARs**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                                              | Requirement                                                                                                                                                                                                                                                                                                                                                                                           | Prerequisite                                                                                                                                                                     | Citation <sup>a</sup>                        | ARAR Determination                                      | Comments                                                                                   |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>Containment</b>                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                  |                                              |                                                         |                                                                                            |
| <b>State Water Resources Control Board / California Department of Resources Recycling and Recovery <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                  |                                              |                                                         |                                                                                            |
| Capping permeability                                                                                                | Hydraulic conductivities will be evaluated primarily through laboratory methods and will be confirmed by appropriate field testing. Earthen materials used in containment structures will consist of a clay mixture and other suitable fine-grained soils that have specific characteristics and that, in combination, can be compacted to attain the required hydraulic conductivity when installed. | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 20320 (c) and (d) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Erosion control                                                                                                     | Diversion and drainage facilities will be designed, constructed, and maintained to accommodate the anticipated volume of precipitation and peak flows.                                                                                                                                                                                                                                                | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, §§ 20365(c) and (d) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Erosion control                                                                                                     | Erosion and related damage of the final cover due to drainage must be prevented throughout the post-closure maintenance period.                                                                                                                                                                                                                                                                       | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21090(c)(4)       | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for covers throughout Parcel E.                                   |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                                              | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Prerequisite                                                                                                                                                                     | Citation <sup>a</sup>                              | ARAR Determination                                      | Comments                                                                                   |
|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>Containment (continued)</b>                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                  |                                                    |                                                         |                                                                                            |
| <b>State Water Resources Control Board / California Department of Resources Recycling and Recovery <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                  |                                                    |                                                         |                                                                                            |
| Post-closure care                                                                                                   | <p>§ 20950(a): The post-closure maintenance period shall extend as long as the wastes pose a threat to water quality.</p> <p>§ 21180(a): The landfill shall be maintained and monitored for a period of not less than 30 years after closure of the entire solid waste landfill.</p>                                                                                                                                                                           | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 20950(a) and § 21180(a) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Survey monuments                                                                                                    | Closed units shall be provided with at least two permanent monuments installed by a licensed land surveyor or a registered civil engineer, from which the location and elevation of containment structures can be determined throughout the post-closure maintenance period.                                                                                                                                                                                   | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 20950(d)                | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for covers throughout Parcel E.                                   |
| Aerial photograph survey                                                                                            | For a closed landfill, when all closure activities are complete for the unit, the discharger shall conduct an aerial photographic survey. The data obtained shall be used to produce a topographic map of the site at a scale and contour interval sufficient to depict the as-closed topography of each portion of the unit. The map produced pursuant to this paragraph shall act as a baseline against which to measure the total settlement, through time. | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21090(e)(1) and (3)     | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for covers throughout Parcel E.                                   |



**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                                              | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Prerequisite                                                                                                                                                                     | Citation <sup>a</sup>                  | ARAR Determination                                      | Comments                                                                                   |
|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>Containment (continued)</b>                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                  |                                        |                                                         |                                                                                            |
| <b>State Water Resources Control Board / California Department of Resources Recycling and Recovery <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                  |                                        |                                                         |                                                                                            |
| Foundation layer                                                                                                    | Closed landfills shall be provided with not less than 2 feet of appropriate materials as a foundation layer for the final cover. The foundation layer shall be compacted to the maximum density obtainable at optimum moisture content using methods that are in accordance with accepted civil engineering practice. A lesser thickness may be allowed for units if the differential settlement of waste and ultimate land use will not affect the structural integrity of the final cover. | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21090(a)(1) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Final grading                                                                                                       | The final cover of closed landfills will be designed, graded, and maintained to prevent ponding and to prevent site erosion caused by high runoff velocities. Slopes should be at least 3 percent.                                                                                                                                                                                                                                                                                           | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21090(b)(1) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Erosion-resistant layer                                                                                             | The low hydraulic conductivity layer of § 21090(a)(2) shall be directly overlain by an erosion-resistant layer. Closed landfills shall be provided with an uppermost cover layer consisting of either a vegetative layer consisting of not less than 1 foot of soil capable of sustaining native or other suitable plant growth or a mechanically erosion-resistant layer.                                                                                                                   | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21090(a)(3) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                                              | Requirement                                                                                                                                                                     | Prerequisite                                                                                                                                                                     | Citation <sup>a</sup>                        | ARAR Determination                                      | Comments                                                                                   |
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| <b>Containment (continued)</b>                                                                                      |                                                                                                                                                                                 |                                                                                                                                                                                  |                                              |                                                         |                                                                                            |
| <b>State Water Resources Control Board / California Department of Resources Recycling and Recovery <sup>b</sup></b> |                                                                                                                                                                                 |                                                                                                                                                                                  |                                              |                                                         |                                                                                            |
| Emergency response                                                                                                  | Potential emergency conditions that may exceed the design of the site and could endanger the public health or the environment must be anticipated.                              | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21130             | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Site security                                                                                                       | Requires that all points of access be restricted except at permitted entry points and that the monitoring, control, and recovery systems be protected from unauthorized access. | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21135 (f) and (g) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Structure removal                                                                                                   | Requires that the operator dismantle and remove site structures at the time of closure to protect public health and safety in accordance with the closure plan.                 | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21137             | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Final cover                                                                                                         | Contains general standards for the design of the final cover.                                                                                                                   | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, §21140(a) and (b)   | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for covers throughout Parcel E.                                   |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                                              | Requirement                                                                                                                                                                                                                                                                                                                          | Prerequisite                                                                                                                                                                     | Citation <sup>a</sup>               | ARAR Determination                                      | Comments                                                                                   |
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| <b>Containment (continued)</b>                                                                                      |                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                  |                                     |                                                         |                                                                                            |
| <b>State Water Resources Control Board / California Department of Resources Recycling and Recovery <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                  |                                     |                                                         |                                                                                            |
| Final grading                                                                                                       | Contains general standards for landfill grading.                                                                                                                                                                                                                                                                                     | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21142(a) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for low-permeability covers at IR-02 Northwest/Central and IR-03. |
| Slope stability                                                                                                     | Contains general standards for slope stability.                                                                                                                                                                                                                                                                                      | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21145(a) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for covers throughout Parcel E.                                   |
| Erosion control                                                                                                     | The drainage and erosion control system will be designed and maintained to (1) ensure integrity of post-closure land uses, roads, and structures; (2) prevent public contact with waste and leachate; (3) ensure the integrity of gas monitoring and control systems; (4) prevent safety hazards; and (5) prevent exposure of waste. | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21150(a) | Relevant and appropriate (for Alternatives S-4 and O-4) | Relevant and appropriate for covers throughout Parcel E.                                   |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                                              | Requirement                                                                                                                                                                                                   | Prerequisite                                                                                                                                                                     | Citation <sup>a</sup>               | ARAR Determination                                    | Comments                                                                                                                                                                                |
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| <b>Containment (continued)</b>                                                                                      |                                                                                                                                                                                                               |                                                                                                                                                                                  |                                     |                                                       |                                                                                                                                                                                         |
| <b>State Water Resources Control Board / California Department of Resources Recycling and Recovery <sup>b</sup></b> |                                                                                                                                                                                                               |                                                                                                                                                                                  |                                     |                                                       |                                                                                                                                                                                         |
| Final closure plan                                                                                                  | Sets forth requirements for final closure plan contents.                                                                                                                                                      | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21800(c) | To be considered (for Alternatives S-4 and O-4)       | Requirements are procedural and not substantive; however, these requirements will be used as TBCs in developing the final closure plan for IR-02 Northwest/Central and IR-03.           |
| Final closure plan                                                                                                  | Provides the content requirements for post-closure maintenance plans for solid waste disposal sites.                                                                                                          | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, § 21830    | To be considered (for Alternatives S-4 and O-4)       | Requirements are procedural and not substantive; however, these requirements will be used as TBCs in developing the postclosure maintenance plan for IR-02 Northwest/Central and IR-03. |
| <b>Construction and Grading</b>                                                                                     |                                                                                                                                                                                                               |                                                                                                                                                                                  |                                     |                                                       |                                                                                                                                                                                         |
| <b>California Air Resources Board <sup>b</sup></b>                                                                  |                                                                                                                                                                                                               |                                                                                                                                                                                  |                                     |                                                       |                                                                                                                                                                                         |
| Construction or grading in soil containing asbestos, serpentinite, or ultramafic rock                               | This regulation sets forth requirements for road construction and maintenance, and for construction and grading operations in soil containing naturally occurring asbestos, serpentinite, or ultramafic rock. | Soil containing naturally occurring asbestos, serpentine, or ultramafic rock.                                                                                                    | Cal. Code Regs. tit. 17, § 93105    | Applicable (for Alternatives S-4, GW-3, O-4, and R-2) | This regulation is applicable for construction and grading activities if they will occur in areas containing asbestos, serpentinite, or ultramafic rock.                                |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                  | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Prerequisite                                                                            | Citation <sup>a</sup>              | ARAR Determination                                      | Comments                                                                    |
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| <b>Construction and Grading (continued)</b>             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                         |                                    |                                                         |                                                                             |
| <b>State Water Resources Control Board <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                         |                                    |                                                         |                                                                             |
| Remediation activities                                  | Actions taken by or at the direction of public agencies to clean up or abate conditions of pollution or nuisance resulting from unintentional or unauthorized releases of waste or pollutants to the environment are exempt from the Cal. Code Regs. tit. 27 requirements identified in Cal. Code Regs. tit 27, div. 2, subdiv. 1, provided that wastes, pollutants, or contaminated materials removed from the immediate place of release shall be discharged according to the SWRCB-promulgated sections of div. 2, subdiv. 1, ch. 3, subch. 2 and further provided that remedial actions intended to contain such wastes at the place of release shall implement applicable SWRCB-promulgated provisions of div. 2 to the extent feasible. | Action taken by or at the direction of a public agency to cleanup release of pollutant. | Cal. Code Regs, tit. 27 § 20090(d) | Relevant and appropriate (for Alternatives S-4 and O-4) | The substantive provisions of this regulation are relevant and appropriate. |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                     | Requirement                                                                                                                                                                                                                                                                                                                                                                | Prerequisite                                                                                                                                                                 | Citation <sup>a</sup>                                                                                                  | ARAR Determination                                    | Comments                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater Monitoring / Excavation and Offsite Disposal</b>                            |                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                              |                                                                                                                        |                                                       |                                                                                                                                                                                                                                                                              |
| <b>State Water Resources Control Board <sup>b</sup></b>                                    |                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                              |                                                                                                                        |                                                       |                                                                                                                                                                                                                                                                              |
| Generating IDW                                                                             | Sampling and analysis of discharges shall be used for accurate characterization of wastes.                                                                                                                                                                                                                                                                                 | Waste.                                                                                                                                                                       | Cal. Code Regs. tit. 27, §20200(c)                                                                                     | Applicable (for Alternatives S-4, GW-3, O-4, and R-2) | This regulation is applicable to excavation of soil and generation of IDW. The Navy will characterize soil or any IDW when it is generated.                                                                                                                                  |
| Offsite disposal of soil and IDW                                                           | Requires that designated waste as defined at California Water Code §13173 be discharged to Class I or Class II waste management units.                                                                                                                                                                                                                                     | Discharge of designated waste after July 18, 1997 (nonhazardous waste that could cause degradation of surface or ground waters) to land for treatment, storage, or disposal. | Cal. Code Regs. tit. 27, §20210                                                                                        | Applicable (for Alternatives S-4, GW-3, O-4, and R-2) | This regulation is applicable to excavation of soil and generation of IDW. The Navy will characterize soil or any IDW when it is generated.                                                                                                                                  |
| Offsite disposal of soil and IDW                                                           | Requires that nonhazardous solid waste as defined at Cal. Code Regs. tit. 27, §20220(a) be discharged to a classified waste management unit.                                                                                                                                                                                                                               | Discharge of nonhazardous solid waste after July 18, 1997, to land for treatment, storage, or disposal.                                                                      | Cal. Code Regs. tit. 27, § 20220(b), (c), and (d)                                                                      | Applicable (for Alternatives S-4, GW-3, O-4, and R-2) | This regulation is applicable to excavation of soil and generation of IDW. The Navy will characterize soil or any IDW when it is generated.                                                                                                                                  |
| <b>Shoreline Construction</b>                                                              |                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                              |                                                                                                                        |                                                       |                                                                                                                                                                                                                                                                              |
| <b>McAteer-Petris Act (California Government Code §§ 66600 through 66661) <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                              |                                                                                                                        |                                                       |                                                                                                                                                                                                                                                                              |
| Tidal marshes and tidal flats in the San Francisco Bay coastal zone                        | Tidal marshes and tidal flats should be conserved to the fullest possible extent. Projects harming tidal marshes and tidal flats should be allowed only for purposes providing substantial public benefits and only if there is no feasible alternative. Restoration projects should include a monitoring program with biological and physical goals and success criteria. | Activities affecting the San Francisco Bay.                                                                                                                                  | Part III of Bay Plan (Findings and Policies Concerning Tidal Marshes and Tidal Flats around the Bay, Policies 1 and 5) | Relevant and appropriate (for Alternative S-4)        | The planned shoreline protection for Parcel E would destroy onsite tidal marshes, the loss of which would be mitigated by the Navy (on site at adjacent Parcel E-2). Appendix D of the FS Report evaluates the proposed shoreline protection relative to these requirements. |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                     | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Prerequisite                                | Citation <sup>a</sup>                                                                                            | ARAR Determination                             | Comments                                                                                                                                                                                                                                                                                                                                                                                                        |
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| <b>Shoreline Construction (continued)</b>                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                             |                                                                                                                  |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>McAteer-Petris Act (California Government Code §§ 66600 through 66661) <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                             |                                                                                                                  |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Fills in the San Francisco Bay coastal zone                                                | To prevent damage by flooding, shoreline structures should be designed to consider future rise in sea level and subsidence for the expected life of the project.                                                                                                                                                                                                                                                                                             | Activities affecting the San Francisco Bay. | Part IV of Bay Plan (Findings and Policies Concerning Safety of Fills in the Bay, Policies 4 and 5)              | Relevant and appropriate (for Alternative S-4) | Shoreline protection features will be installed to prevent erosion and protect the integrity of the remedial action. Appendix D of the FS Report evaluates the planned shoreline protection relative to these requirements.                                                                                                                                                                                     |
| Shoreline protection in the San Francisco Bay coastal zone                                 | Riprap revetments should be constructed of properly sized and placed material. Protective projects should be maintained to ensure that the shoreline will be protected from tidal erosion. Protective projects should include nonstructural methods such as marsh vegetation where feasible.                                                                                                                                                                 | Activities affecting the San Francisco Bay. | Part IV of Bay Plan (Findings and Policies Concerning Shoreline Protection around the Bay, Policies 2, 3, and 4) | Relevant and appropriate (for Alternative S-4) | Shoreline protection features will be installed to prevent erosion and protect the integrity of the remedial action. Appendix D of the FS Report evaluates the planned shoreline protection relative to these requirements.                                                                                                                                                                                     |
| Fills in the San Francisco Bay coastal zone                                                | Fills in accord with the Bay Plan should be the minimum necessary to achieve its purpose and meet one of the following criteria outlined in Bay Plan policies: (a) filling supports bay-related purposes (e.g., ports, water-related recreation, etc.); (b) filling is needed for infrastructure for which there is no other alternative (e.g., airports, roads, etc.); or (c) filling is minor and needed to improve shoreline appearance or public access. | Activities affecting the San Francisco Bay. | Part IV of Bay Plan (Findings and Policies Concerning Fills in Accord with the Bay Plan, Policy 1)               | Relevant and appropriate (for Alternative S-4) | The planned shoreline protection involve varying degrees of excavation of contaminated sediment in order to protect human health and the environment that require minor filling of onsite tidal marshes, the loss of which would be mitigated by the Navy (on site at adjacent Parcel E-2), and the bay. Appendix D of the FS Report evaluates the planned shoreline protection relative to these requirements. |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                     | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Prerequisite                                | Citation <sup>a</sup>                                                                             | ARAR Determination                             | Comments                                                                                                                                                                                                                                                                    |
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| <b>Shoreline Construction (continued)</b>                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                             |                                                                                                   |                                                |                                                                                                                                                                                                                                                                             |
| <b>McAteer-Petris Act (California Government Code §§ 66600 through 66661) <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                             |                                                                                                   |                                                |                                                                                                                                                                                                                                                                             |
| Fills in the San Francisco Bay coastal zone                                                | Minor fill to improve shoreline appearance is permissible if (1) the fill is necessary because the present appearance adversely affects the enjoyment of the bay and its shoreline; (2) it is either physically impractical or economically infeasible to improve the appearance without filling; (3) the amount of filling is the minimum necessary to improve shoreline appearance; (4) the proposed project would improve the shoreline appearance; and (5) the fill would not adversely affect enjoyment of the bay and its shoreline, and the fill will not have any adverse effect on present or future use designated in the Bay Plan. | Activities affecting the San Francisco Bay. | Cal. Code Regs. tit. 14, § 10700                                                                  | Relevant and appropriate (for Alternative S-4) | Alternative S-4 requires minor filling of onsite tidal marshes, the loss of which would be mitigated by the Navy (on site at adjacent Parcel E-2), and the bay. Appendix D of the FS Report evaluates the planned shoreline protection relative to these requirements.      |
| Fills in the San Francisco Bay coastal zone                                                | Measures to compensate for unavoidable adverse impacts to natural resources of the bay should be required. Mitigation projects should be sited as close to the impact site as practicable. The amount and type of mitigation should be based on an analysis of the probability of success of the mitigation project, the expected delay between the impact and the functioning mitigation site, and the type and quality of ecological functions of the mitigation site compared with the impacted site.                                                                                                                                      | Activities affecting the San Francisco Bay. | Part IV of Bay Plan (Findings and Policies Concerning Mitigation, Policies 1, 2, and 4 through 7) | Relevant and appropriate (for Alternative S-4) | Alternative S-4 includes shoreline construction that would result in the discharge of fill material into a wetland, the loss of which would be mitigated by the Navy (on site at adjacent Parcel E-2) in accordance with the substantive provisions of Part IV of Bay Plan. |



**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                    | Requirement                                                                                    | Prerequisite                                                             | Citation <sup>a</sup>        | ARAR Determination                                                  | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Institutional Controls</b>             |                                                                                                |                                                                          |                              |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>California Civil Code <sup>b</sup></b> |                                                                                                |                                                                          |                              |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Land use controls                         | Provides conditions under which land use restrictions will apply to successive owners of land. | Transfer of property from the federal government to a nonfederal agency. | California Civil Code § 1471 | Relevant and appropriate (for Alternatives S-4, GW-3, O-4, and R-2) | Generally, California Civil Code § 1471 allows an owner of land to make a covenant to restrict the use of land for the benefit of a covenantee. The covenant runs with the land to bind successive owners, and the restrictions must be reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the land of hazardous materials, as defined in California Health & Safety Code § 25260. Substantive provisions are the following general narrative standard: "Each act that the owner or grantee will do or refrain from doing relates to the use of land and each act is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the land of hazardous materials, as defined in Section 25260 of the California Health & Safety Code." This narrative standard would be implemented through incorporation of restrictive covenants in the deed and Environmental Restriction and Covenant Agreement at the time of transfer. |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                | Requirement                                                                                                                               | Prerequisite                                                             | Citation <sup>a</sup>                                 | ARAR Determination                                                  | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Institutional Controls (continued)</b>             |                                                                                                                                           |                                                                          |                                                       |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>California Health and Safety Code <sup>b</sup></b> |                                                                                                                                           |                                                                          |                                                       |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Land use controls                                     | Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.             | Transfer of property from the federal government to a nonfederal agency. | California Health and Safety Code § 25202.5           | Relevant and appropriate (for Alternatives S-4, GW-3, O-4, and R-2) | The substantive provisions of California Health & Safety Code § 25202.5 are the general narrative standards to restrict "present and future uses of all or part of the land on which the...facility...is located..."                                                                                                                                                                                                                                                                           |
| Land use controls                                     | Provides processes and criteria for obtaining written variances from a land use restriction and for removal of the land use restrictions. | Transfer of property from the federal government to a nonfederal agency. | California Health & Safety Code §§ 25223(c) and 25224 | Relevant and appropriate (for Alternatives S-4, GW-3, O-4, and R-2) | California Health & Safety Code § 25223(c) sets forth "relevant and appropriate" substantive criteria for granting variances based upon specified environmental and health criteria." California Health & Safety Code § 25224 sets forth the following "relevant and appropriate" substantive criteria for the removal of a land use restriction on the grounds that "...the waste no longer creates a significant existing or potential hazard to present or future public health or safety." |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                | Requirement                                                                                                | Prerequisite                                                         | Citation <sup>a</sup>                                         | ARAR Determination                                                  | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Institutional Controls (continued)</b>             |                                                                                                            |                                                                      |                                                               |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>California Health and Safety Code <sup>b</sup></b> |                                                                                                            |                                                                      |                                                               |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Land use controls                                     | Provides a streamlined process to be used to enter into an agreement to restrict specific use of property. | Transfer of property from federal government to a nonfederal agency. | California Health & Safety Code §§ 25221 and 25355.5(a)(1)(C) | Relevant and appropriate (for Alternatives S-4, GW-3, O-4, and R-2) | <p>Generally, California Health &amp; Safety Code §§ 25221 and 25355.5(a)(1)(C) provide the authority for DTSC to enter into voluntary agreements with land owners to restrict the use of property. The agreements run with the land restricting present and future uses of the land.</p> <p>The substantive requirements of the following California Health &amp; Safety Code § 25221 provisions are "relevant and appropriate": (1) the general narrative standard: "restricting specified uses of the property..." and (2) "...the agreement is irrevocable, and shall be recorded by the owner, ...as a hazardous waste easement, covenant, restriction, or servitude, or any combination of those servitudes, as appropriate, upon the present and future uses of the land."</p> <p>The substantive requirements of the following California Health &amp; Safety Code § 25355.5(a)(1)(C) provisions are "relevant and appropriate": "...execution and recording of a written instrument that imposes an easement, covenant, restriction, or servitude, or combination thereof, as appropriate, upon the present and future uses of the site."</p> |

**Attachment 4.****State Action-Specific ARARs (continued)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

| Action                                                                                                              | Requirement                                                                                                                                                                                                                                                                                                                                                                                     | Prerequisite                                                                                                                                                                     | Citation <sup>a</sup>                        | ARAR Determination                                                  | Comments                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Institutional Controls (continued)</b>                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                  |                                              |                                                                     |                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Department of Toxic Substances Control <sup>b</sup></b>                                                          |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                  |                                              |                                                                     |                                                                                                                                                                                                                                                                                                                                                                          |
| Land use covenants                                                                                                  | A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. | Transfer of property from federal government to a nonfederal agency.                                                                                                             | Cal. Code Regs. tit. 22, § 67391.1           | Relevant and appropriate (for Alternatives S-4, GW-3, O-4, and R-2) | The Navy is evaluating ICs for soil and groundwater. These requirements are ARARs for those ICs. EPA agrees that the substantive portions of the regulations referenced are ARARs. EPA specifically considers sections (a), (d), and (e) of Cal. Code Regs. tit. 22 § 67391.1, to be ARARs for this ROD. DTSC's position is that all of the state regulation is an ARAR. |
| <b>Leachate Collection and Control</b>                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                  |                                              |                                                                     |                                                                                                                                                                                                                                                                                                                                                                          |
| <b>State Water Resources Control Board / California Department of Resources Recycling and Recovery <sup>b</sup></b> |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                  |                                              |                                                                     |                                                                                                                                                                                                                                                                                                                                                                          |
| Leachate control                                                                                                    | During the post-closure maintenance period, the owner and operator will ensure that leachate collection and control are performed in a manner that prevents public contact and controls vectors, nuisance, and odors. (This section does not require installation of a new leachate collection system.)                                                                                         | Cal. Code Regs. tit. 27, requirements are only applicable for waste discharged after July 18, 1997 (the effective date of the consolidated regulations), unless otherwise noted. | Cal. Code Regs. tit. 27, §§ 21160(a) and (c) | Relevant and appropriate (for Alternatives S-4 and O-4)             | Relevant and appropriate for leachate control (if required based on monitoring results) at IR-02 Northwest/Central and IR-03.                                                                                                                                                                                                                                            |

#### **Attachment 4.**

#### **State Action-Specific ARARs (*continued*)**

Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California

Notes:

a = Only the substantive provisions of the requirements cited in this table are ARARs.

b = Statutes and policies and their citations are provided as headings to identify general categories of ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only substantive requirements of specific citations are considered ARARs.

ARAR = applicable or relevant and appropriate requirement

Bay Plan = San Francisco Bay Plan

Cal. Code Regs. = California Code of Regulations

ch. = Chapter

div. = Division

DTSC = Department of Toxic Substances Control

EPA = U.S. Environmental Protection Agency

FS = Feasibility Study

ICs = institutional controls

IDW = investigation-derived waste

IR = Installation Restoration

Navy = Department of the Navy

ROD = Record of Decision

subch. = Subchapter

subdiv. = Subdivision

SWRCB = State Water Resources Control Board

TBC = to be considered

tit. = Title

§ = Section

## **Attachment 5. Responses to Comments on Draft Record of Decision**

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013**


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| <b>Comment No.</b>       | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>General Comments</i>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1.                       | The Draft Record of Decision for Parcel E (the ROD) does not include a figure identifying all of the Installation Restoration (IR) sites within Parcel E. Figure 2 displays the IR site boundaries, but labels are only included for IR-02 and IR-03. Please either revise Figure 2 to display IR site labels for all IR sites within Parcel E or provide an additional figure to display the IR sites within Parcel E.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Figure 2 was revised to identify and label all IR sites within Parcel E. A new Figure 3 was created to identify other historical shipyard operations that were previously shown on Figure 2, including NRDL buildings and Triple A sites.                                                                                                                                                                                                                                                    |
| 2.                       | The ROD indicates that Tier 1 (locations that contain chemicals in soil at concentrations greater than 10 times the remediation goals) and Tier 2 (locations that contain chemicals in soil at concentrations greater than 5 times the remediation goals) soils will be excavated and disposed of off-site; however, soil with concentrations greater than the remediation goals but less than 5 times the remediation goals will be left in place at Parcel E, but these locations have not been identified on a figure. Figure 9 displays Tier 1 and Tier 2 locations, but does not show remaining locations where concentrations in soil are greater than the remediation goals but less than 5 times the remediation goals. Please revise Figure 9 to display locations where concentrations in soil are greater than the remediation goals but less than 5 times the remediation goals or provide an additional figure to display this information. | The subject figure (now referred to as Figure 10) was revised to include locations where chemical concentrations in soil exceeded the RGs but were not identified as Tier 1 or Tier 2 locations (because concentrations were less than five times the RGs).                                                                                                                                                                                                                                  |
| <i>Specific Comments</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1.                       | Page 1-1, 2nd paragraph. The term "facilitate closure" is used twice in this paragraph and its use does appear appropriate. Please consider editing this paragraph and decide if "facilitate closure" is appropriate in this context.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | The phrase "facilitate closure" was used twice in the subject paragraph to explain two separate changes made to the original Parcel E boundary. The first boundary change was made to separate IR-01/21 into Parcel E-2 to facilitate closure of the former landfill and its surrounding areas. The second boundary change was made to separate Crisp Road into Parcel UC-3 to facilitate closure of this future utility corridor. The document was not revised in response to this comment. |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013** *(continued)*


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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1.<br>(cont.)                        | <i>(Follow-on comment received on October 28, 2013)</i><br>Response to EPA Specific Comment (SC) 1. The Navy's response does not capture the point EPA was trying to make. Our comment tried to express concern was that the term "closure" most commonly refers to formal closure under RCRA, which is not being conducted at either Parcel E-2 or Parcel E. We believe that the Navy intended to refer to "CERCLA administrative" closure which should be added in front of each time the term "closure" is used in this section. | The subject text was revised to consistently use the phrase "CERCLA administrative closure," as suggested.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2.                                   | Page 1-1, 3rd paragraph. The first sentence of this paragraph states: "Parcel E has been divided into two areas to support its planned reuse. (underlines added). EPA suggests re-writing this sentence to simply say, "Parcel E consists of two planned landuse zones.". The word "divided" was used in the previous paragraph to mean the creation of new parcels.                                                                                                                                                                | The sentence was revised to read " <del>Parcel E has been divided into two areas to support its planned reuse</del> <u>includes two future land use districts: the Shipyard South Multi-Use District and Shipyard Shoreline Open Space.</u> "                                                                                                                                                                                                                                                                                                                                                               |
| 3.                                   | Page 1-4, Top Paragraph. The last sentence should read.."scheduled to be completed in 2015".                                                                                                                                                                                                                                                                                                                                                                                                                                        | The sentence was revised as suggested.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 4.                                   | Page 1-4, Second Paragraph. There are minor differences between the Selected Remedy in Section 1.1, and the Selected Remedy presented in Section 2.9. EPA considers Section 2.9 to be the more complete and effective description of the selected remedy for Parcel E.                                                                                                                                                                                                                                                              | Section 1.1 was revised to ensure consistency with Section 2.9.2. Specifically, Section 1.1 was revised to discuss (1) the removal and disposal of contaminated sediment along the shoreline (prior to installation of the shoreline protection materials) and (2) the groundwater monitoring for radionuclides at IR-02 and IR-03. Please note that Section 1.1 briefly summarizes the selected remedy in a series of text bullets (covering about 2 pages), whereas Section 2.9.2 provides a comprehensive narrative description of the selected remedy in multiple paragraphs (covering about 10 pages). |
| 5.                                   | Figure 2. (a) In the Legend, the light green color is difficult to see due to smaller box size.                                                                                                                                                                                                                                                                                                                                                                                                                                     | (a) As described in the response to general comment 1, Figure 2 was revised to identify and label all IR sites within Parcel E. Accordingly, this figure no longer uses green shading to distinguish IR-02 from the other IR sites.                                                                                                                                                                                                                                                                                                                                                                         |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**

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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                               | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 5.<br>(cont.)                        | Figure 2 (continued). (b) Why are "Triple A Sites" relevant since exact operations and COCs used by Triple A are not identified? Keeping this information in the figure is fine, just curious if there is more meaning in the context of this ROD to showing these sites on this figure.                                                                                                     | (b) Triple A, a private ship repair company, occupied some sites at HPNS and allegedly disposed of hazardous wastes, including possibly discharging waste oil within Parcel E using below-ground fuel and steam lines (which will be closed under the selected remedy). Section 2.1 of the ROD includes a brief description about shipyard operations, including Triple A activities, that led to the contamination requiring cleanup; as a result, the Triple A site boundaries are shown on Figure 3 (formerly Figure 2).                                                                                                                                                                                                                                     |
| 6.                                   | Figure 3. IR Site boundaries in Figure 2 and Figure 3 do not appear to match. Are the bolding of buildings numbers in each figure of any significance?                                                                                                                                                                                                                                       | As described in the response to general comment 1, Figure 2 was revised to identify and label all IR sites within Parcel E, and a new Figure 3 was created to identify other historical shipyard operations that were previously shown on Figure 2. The radiological impacted sites shown on Figure 4 (formerly Figure 3) include only two IR site boundaries (IR-02 and IR-03), and those boundaries match the information provided on Figure 2. The bold building numbers correspond to the existing buildings at Parcel E (which are shown with a dark outline), whereas the lighter building numbers correspond to demolished buildings (which are shown with a lighter dashed outline). This information was added to the legend for both Figures 3 and 4. |
| 7.                                   | Page 2-4, top paragraph. This paragraph which presents a summary of land uses in Parcel E should end with a sentence stating that a more complete description of current and future land use is presented in Section 2.4.                                                                                                                                                                    | The following sentence was added at the end of the paragraph as suggested: <i>"Section 2.4 further describes the current and future land use of Parcel E."</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 8.                                   | Figure 4. Consider editing Figure 4 so it is clear that the buildings (shaded grey in the figure) areas do not have a different land use or reuse expectation. The reader should not be lead to believe that buildings in the future will have the same footprint as current buildings. Perhaps remove current buildings from Figure 4 since they were already presented in Figures 2 and 3. | The subject figure (now referred to as Figure 5) was revised to remove the existing features (both buildings and road edges).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 9.                                   | Footnote 8. Ending this footnote with the term ".and metals" is awkward since 3 metals are already specifically identified previously in this footnote. EPA recommends listing all ubiquitous metals by name that are common in HPNS non-engineered fill and known to have relatively high concentrations.                                                                                   | The footnote was revised as follows: <i>"The nonengineered fill materials that were derived from serpentinite bedrock contain minerals with relatively high concentrations of <u>certain metals</u>, including <u>arsenic</u>, <u>iron</u>, <u>manganese</u>, <u>mercury</u>, <u>nickel</u>, and <u>vanadium</u>-<del>metals</del>."</i>                                                                                                                                                                                                                                                                                                                                                                                                                        |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**


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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 9.<br>(cont.)                        | (see above)                                                                                                                                                                                                                                                                                                                                                                                                             | The revised text includes all metals identified as COCs in the HHRA for which the risk-based concentration (for the residential exposure scenario) is less than the HPAL. The comparison of HPALs to risk-based concentrations (for the residential exposure scenario) provides a basis for identifying metals that occur naturally at relatively high concentrations.                                                                                                                                                                                                      |
| 10.                                  | Figure 5. The colors designating "Extent of Intertidal Shoreline" and "Sanitary Sewer Line" are similar and different to differentiate. Consider making choosing a different color difference for one that can be easily identified.                                                                                                                                                                                    | The subject figure (now referred to as Figure 6) was revised to show the sanitary sewer lines in orange instead of purple.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 11.                                  | Table 1. The 1993 Phase II Rad Investigation, 1998-99 Phase IV Rad Investigation, and 2001 Rad investigation of Parcel E Shoreline all indicate that removal actions were "recommended". However, at some place in the table, it may be appropriate to clarify if any or all of these removal recommendations were actually carried out.                                                                                | The subject rows within Table 1 were revised to refer to the removal actions that addressed contamination identified during these investigations. These radiological removal actions are already described elsewhere in Table 1.                                                                                                                                                                                                                                                                                                                                            |
| 12.                                  | Page 2-14, Section 2.3.4. The two bullets on this page are not introduced.                                                                                                                                                                                                                                                                                                                                              | The last sentence of the paragraph will be revised to read; <i>"For evaluation purposes in the radiological addendum to the FS Report, the activity level for each ROC was compared against the corresponding release criterion to provide the following a general assessment of the distribution of ROCs in surface soil at Parcel E. The assessment results, as identified in the radiological addendum to the FS Report, are as follows:"</i>                                                                                                                            |
| 13.                                  | Page 2-23. Section 2.6. What does the term "open discharge" mean?                                                                                                                                                                                                                                                                                                                                                       | The term "open discharge" was meant to refer to the lack of any exposed and uncontrolled release of NAPL from IR-03 to San Francisco Bay. However, the subject text was deleted and replaced with text suggested by the Water Board (please see response to Water Board comment 5).                                                                                                                                                                                                                                                                                         |
| 14.                                  | Page 2-23, bottom paragraph. The last couple sentences in this paragraph state that soil gas action levels will be refined in the future using "accepted methodology" for risk assessments at HPNS. This needs further clarification by, at a minimum, explaining more about the process to be followed and stating that applicable and effective State and EPA vapor intrusion guidance will be followed at that time. | The subject text was revised as follows: <i>"These soil gas action levels will be used for an initial risk-based screening of refined using data collected during from a future soil gas survey (such as the survey following active treatment (to be performed at Building 406 and VOC groundwater plumes following active treatment). After the initial risk-based screening, areas with unacceptable risk will be further evaluated using location-specific data (i.e., physical characteristics of the soil) to assess potential exposures consistent with the most</i> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 14.<br>(cont.)                       | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <u>current State of California and EPA vapor intrusion guidance. In addition, risks and hazards at these areas will be further characterized using the accepted methodology for risk assessments at HPNS. Section 2.9.2.1 provides additional information on the future soil gas survey and potential actions that may be prompted based on the results of the risk and hazard evaluation. <del>Future soil gas action levels would account for vapors from both soil and groundwater, and would be calculated based on a cumulative excess cancer risk level of 10<sup>-6</sup> using the accepted methodology for risk assessments at HPNS.</del></u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 15.                                  | <p>Table 4.</p> <p>(a) Since risk management is presented previously in a Tier 1, Tier 2, and TPH Location (per Figure 9), should RGs in Table 4 be presented as Tier 1 (RES, REC), Tier 2 (RES, REC), and TPH?</p> <p>(b) The remediation goals (RG) for the Recreational Exposure Scenario and Construction Worker Exposure Scenario for mercury of 210 milligrams per kilogram (mg/kg) and 93 mg/kg should not be applied in IR-02 and IR-03 (reuse areas EOS-1 through EOS-4), because these areas are adjacent to the shoreline. Based on problems with mercury in groundwater at IR-26 in Parcel B, it is necessary to remediate mercury contaminated soil to the residential standard (2.28 mg/kg), except in areas protected by the underground barrier, to ensure that mercury is not discharged to San Francisco Bay above the California Toxics Rule (CTR) criterion. This RG for mercury (2.28 mg/kg) is already proposed for shoreline sediment in Table 5, so it should also be proposed for IR-02 and IR-03. Please ensure that the residential RG (or shoreline RG) for mercury is applied to IR-02 and IR-03 (reuse areas EOS-1 through EOS-4) except in areas where an underground barrier will be installed to control groundwater migration.</p> | <p>(a) A new table (referred to as Table 4) was integrated into Section 2.5.3 to identify the action levels that will be used, along with the petroleum source criterion, to identify areas requiring excavation and offsite disposal. The tables presenting the RGs (which are introduced in Section 2.7) were renumbered as Tables 5 through 8.</p> <p>(b) Based on the Navy's evaluation of mercury in groundwater at Parcel E, IR-03 is the only area where mercury may be present in groundwater at concentrations that may pose an unacceptable risk to aquatic wildlife in San Francisco Bay. Two wells at IR-03 may contain elevated mercury concentrations, but are located in an area that will be contained with a protective liner and below-ground barrier (following the removal or treatment of the NAPL source within this area) and monitored to ensure that unacceptable mercury concentrations are not discharged to San Francisco Bay. The Navy's evaluation determined that, with the exception of IR-03, mercury is not present in Parcel E groundwater at concentrations that pose an unacceptable risk to aquatic wildlife in San Francisco Bay. These determinations are based on the groundwater SLERA detailed in Appendix A (specifically, Section A3.1.5 and Figure A3-5) of the Final FS Report (ERRG, 2012). Additional information on the Navy's evaluation of potential risks at Parcel E (and the related development of RGs for soil, shoreline sediment, and groundwater) is presented on the following page.</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013** *(continued)*


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| <b>Comment No.</b>                   | <b>Comment</b> | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Specific Comments (continued)</i> |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 15.<br>(cont.)                       | (see above)    | <ul style="list-style-type: none"> <li>Consistent with the technical approach followed during the CERCLA process at all HPNS parcels, RGs are developed for those chemicals that pose a demonstrated risk to either humans or wildlife (i.e., either COCs or COECs). COCs and COECs are determined by risk assessments that follow an evaluation process that all HPNS regulatory agencies have agreed to and approved. The results of the risk assessments for Parcel E were presented in the Revised RI Report (Barajas &amp; Associates, 2008), except for a SLERA for groundwater that was presented in the FS Report (ERRG, 2012). All HPNS regulatory agencies reviewed and finalized the Revised RI Report and FS Report in accordance with the FFA.</li> <li>The FS Report (ERRG, 2012) included a SLERA that evaluated the potential presence of mercury in groundwater at concentrations that could result in unacceptable discharge to San Francisco Bay (exceeding surface water quality criteria). The SLERA initially evaluated the presence of mercury in A-aquifer groundwater relative to a criterion of 0.6 µg/L, which is the HGAL. The SLERA identified seven A-aquifer wells, located between 75 and 1,000 feet from San Francisco Bay, from which at least one groundwater sample had mercury concentrations exceeding the HGAL; however, mercury was not reported at these wells during subsequent sampling events at concentrations exceeding the HGAL (all wells were sampled at least four times following the initial exceedance; see Figure A3-5 from the Final FS Report). Based on the low frequency of detection, the SLERA concluded that mercury was not a COEC for the following wells: IR02MW141A, IR02MW209A, IR02MWB-2, IR02MWB-3, IR03MW342A, IR08MW37A, and IR14MW09A.</li> <li>The SLERA identified three additional A-aquifer wells with samples that had mercury concentrations exceeding the HGAL, thus warranting further evaluation. Two of the wells (IR03MW226A and IR03MWO-1, both located less than 150 feet from San Francisco Bay) each contained</li> </ul> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013** *(continued)*


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| <b>Comment No.</b>                   | <b>Comment</b> | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <i>Specific Comments (continued)</i> |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 15.<br>(cont.)                       | (see above)    | <p>a single reported mercury concentration (in July 1992) that exceeded the HGAL (which was equivalent to the calculated trigger level given the close proximity of the wells to the bay). Mercury was not reported in samples collected from these wells in a follow-up sampling event in August 1992, and was also not reported in the recent sampling event for the ongoing pilot study to evaluate potential removal and treatment technologies for NAPL (this sampling event was performed after the FS Report was finalized, thus the results were not included in the SLERA). No samples were collected from the wells between 1992 and the ongoing pilot study because NAPL was present in the wells. Mercury was retained as a COPEC for wells IR03MW226A and IR03MWO-1 because the number of groundwater samples collected was insufficient to determine whether the reported mercury concentrations in July 1992 were anomalous. The third well that required further evaluation (IR05MW85A, located more than 1,300 feet from San Francisco Bay) contained numerous reported mercury concentrations that exceeded the HGAL; however, the reported mercury concentrations did not exceed the calculated trigger level (26.4 µg/L). Accordingly, mercury was not retained as a COPEC at well IR05MW85A.</p> <ul style="list-style-type: none"> <li>• Wells IR03MW226A and IR03MWO-1 are both located within the area to be contained with a protective liner and below-ground barrier (following the removal or treatment of the NAPL source within this area). As described in Section 2.9.2.3 of the ROD, groundwater quality in this area will be monitored in comparison to trigger levels to ensure the protection of aquatic wildlife in San Francisco Bay.</li> <li>• The Revised RI Report included a SLERA that evaluated the potential risk to benthic invertebrates, birds, and mammals from exposure to chemicals in shoreline sediment. This SLERA, which was distinct from the SLERA for groundwater, determined that mercury was a COEC for benthic invertebrates that inhabit the intertidal shoreline zone. Accordingly, the ROD identifies an RG for mercury in shoreline sediment</li> </ul> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013** *(continued)*


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| <b>Comment No.</b>                   | <b>Comment</b> | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <i>Specific Comments (continued)</i> |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 15.<br>(cont.)                       | (see above)    | <p>at IR-02 and IR-03 (2.28 mg/kg, which is equivalent to the HPAL). As described in Section 2.9.2.1 of the ROD, the potential risk to wildlife in the shoreline zone will be addressed by excavating contaminated sediment (to a depth of at least 2.5 feet) and backfilling with natural materials (such as sand) and large rocks.</p> <ul style="list-style-type: none"> <li>The Revised RI Report included an HHRA that evaluated the potential risk to humans from exposure to chemicals in soil. The HHRA concluded that mercury was a COC for the residential, recreational, and construction worker exposure scenarios. Accordingly, the ROD identifies RGs for mercury in soil based on the appropriate exposure scenarios, which for Redevelopment Blocks EOS-1 through EOS-4 are recreational user (93 mg/kg) and construction worker exposure (210 mg/kg). The RG for the residential exposure scenario (2.28 mg/kg, which is equivalent to the HPAL) applies to the areas planned for mixed use (Redevelopment Blocks MU-1, MU-2, and MU-3). As described in Section 2.9.2.1 of the ROD, the potential risk to humans will be addressed by excavating areas containing COCs in soil at concentrations greater than five times the RGs, and installing a durable cover to cut off potential exposure to residual contamination that remains in soil after excavation.</li> </ul> <p>Based on the information summarized on the previous pages, the Navy does not agree with EPA's request to change the RG for mercury in soil. The Navy acknowledges EPA's input on this matter, which was further explained in an additional comment received on October 28, 2013, but the Navy does not agree with EPA's assertion that conditions at IR-26 warrant development of an alternative RG for mercury for Parcel E Redevelopment Blocks EOS-1 through EOS-4. Please refer to the response to EPA's follow-on comment for further information (see page 9).</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 15.<br>(cont.)                       | <p>(Follow-on comment received on October 28, 2013)</p> <p>Response to EPA SC 15: The response partially addresses the comment. Part (b) of the comment requested that the residential remedial goal (RG) or shoreline RG for mercury be applied to sites IR-02 and IR-03, except in areas where an underground barrier will be installed to control groundwater migration. The Navy response indicates that the proposed RGs for mercury in soil should not be changed due to limited detections of mercury in groundwater. Additional information is needed to support the position that the Navy's proposed RG for mercury in soil is protective of receptors at the shoreline and San Francisco Bay. At this point, it appears that the Navy is relying on a limited number of data points from wells in the vicinity of the shoreline in which mercury was detected in 1992. However because the tidal stage of each sample is unknown (i.e., mercury may only be detected during the outgoing tide) this data may not support the current Navy position. Please revise the Parcel E ROD to include detailed information to justify use of 5 times Tier 2 Recreational soil RGs for mercury in areas along the Parcel E shoreline. If such justification cannot be provided, then a more stringent soil RG for mercury should be considered by the Navy.</p> | <p>The response to EPA specific comment 15 was revised to more thoroughly explain the basis of the Navy's prior evaluation of COPECs in groundwater at Parcel E (and the related evaluation of COCs and COECs in soil and shoreline sediment). In summary, the Navy does not agree with the statement in EPA's original comment that mercury in groundwater at IR-26 (at HPNS Parcel B) warrants consideration of an alternative soil RG for mercury at Parcel E. The Navy believes that its evaluation of groundwater data at Parcel E is adequate and consistent with the technical approach used at other HPNS parcels to ensure protection of aquatic wildlife in San Francisco Bay. Further, the Navy wishes to clarify that the site conditions at IR-26 (at HPNS Parcel B) were different from those encountered at Parcel E. Specifically, the Navy's evaluation of groundwater data at IR-26, which followed the same methodology as that used at Parcel E, identified consistent detections of mercury in groundwater at concentrations exceeding the corresponding trigger level (which was equivalent to the HGAL). As explained in the response to EPA specific comment 15, mercury was not detected consistently in Parcel E groundwater at concentrations exceeding the corresponding trigger levels (see Appendix A of the Final FS Report for further information).</p> <p>The Navy acknowledges EPA's statement regarding the potential effect that tidal mixing may have on groundwater concentrations at locations very close to the shoreline. However, the Navy wishes to clarify that the previous findings at IR-26 were based on several monitoring wells that were installed within approximately 70 feet of the bay and are likely subject to tidal mixing. In contrast, nearly all of the Parcel E wells in question, where elevated mercury concentrations were reported during a single prior sampling event, are located at least 70 feet from the bay, and would be less likely to be subject to tidal mixing (consistent with a tidal mixing study at Parcel E [Tetra Tech EM Inc., 2004]).</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**


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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                             | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 15.<br>(cont.)                       | (see above)                                                                                                                                                                                                                                                                                                | Well IR02MWB-3 is the only well in question (with an elevated mercury concentration from a single prior sampling event) that is located closer than 70 feet from the bay; however, well IR02MWB-3 is located within the area to be contained with a protective liner and below-ground barrier (because of the presence of other chemicals in groundwater that pose a potential risk to aquatic wildlife in the bay). The Navy believes that the additional information presented in this response, and the revised response to EPA specific comment 15 is adequate to address EPA's concern. As described in the revised response to EPA specific comment 15, the Revised RI Report and FS Report include more detailed information on the potential risk attributed to mercury concentrations in soil, shoreline sediment, and groundwater at Parcel E. Pertinent information from these documents, which were finalized in accordance with the FFA, is presented in Attachment 2 of the ROD. Accordingly, the ROD was not revised to include more detailed information on the development of the RG for mercury. |
| 16.                                  | Page 2-25, Section 2.7, second to last paragraph.<br>(a) Please explain why Title 22 regulations (as opposed to EPA Pro-UCL methodology) are most applicable to make determinations of statistical significance of radiological groundwater data and duration of groundwater monitoring for radionuclides. | (a) The pertinent Title 22 regulation for groundwater detection monitoring programs [specifically, Title 22 Cal. Code Regs. § 66264.97(e)(8)] identifies a range of potentially acceptable statistical methods that can be used to evaluate the statistical significance of a release from a regulated unit (in this case, the waste to be contained in place at IR-02 and IR-03). There are two guidance documents that provide more specific information on developing a detection monitoring program (ASTM Standard D6312 and EPA guidance titled "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance," March 2009, EPA 530/R-09-007). The RD will use these guidance documents to develop the groundwater detection monitoring program for radionuclides at IR-02 and IR-03.                                                                                                                                                                                                                                                                                              |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 16.<br>(cont.)                       | <p>(b) EPA currently understands that the Navy is selecting "Monitoring" as the final remedial action for radionuclides in groundwater under IR-02/03. In general, the ROD (in Section 2.9.2 in particular) needs to clarify the selection of this remedial action for radionuclides in groundwater. In addition, according to the ARARs Table in the ROD:</p> <p>"These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of Alternative R-2, which will require continued groundwater monitoring to demonstrate, consistent with the findings of previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health. No other response action is required for radionuclides in groundwater."</p> <p>Without a determination of specific groundwater RGs for radionuclides, how does the Navy interpret the phrase "at concentrations exceeding risk-based levels"? What standards or remedial goals will the Navy use to screen its future radionuclide groundwater data for compliance with RAOs required by this ROD?</p> | <p>(b) Section 2.9.2.4 of the Draft ROD (specifically, the bottom of the first paragraph on page 2-47) discusses the required groundwater monitoring for radionuclides at IR-02 and IR-03. The groundwater detection monitoring program for radionuclides only applies to IR-02 and IR-03 because this is the only area where potential radiological contamination will be contained in place. Radiological contamination in soil at other Parcel E areas will be removed and disposed of off site. In addition, Section 2.7 describes the basis of the groundwater detection monitoring program for radionuclides as follows: <i>"The RAO for radiologically impacted media does not pertain to groundwater because, as described in Section 2.3.4, previous investigations have not identified radionuclides in groundwater at activity levels that warrant remedial action. However, the selected remedy <u>at IR-02 and IR-03</u> includes future monitoring to demonstrate, consistent with the findings of previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health and the environment."</i></p> <p>Regarding the lack of RGs for radionuclides in groundwater, the Navy wishes to clarify that the objective of a groundwater detection monitoring program is to evaluate the statistical significance of a release from a regulated unit. Accordingly, it is not necessary to specify numeric criteria in support of a detection monitoring program. Further, the specification of numeric criteria for radionuclides in groundwater is constrained by the fact that no such criteria exist for the pathway of concern (discharge of groundwater to aquatic wildlife in San Francisco Bay) and that surrogate criteria (drinking water MCLs) do not correlate to a complete exposure pathway (because the potentially impacted shallow groundwater is not a potential source of drinking water). Accordingly, the ROD does not specify RGs for radionuclides in groundwater. The RD will develop specific decision criteria for the groundwater detection monitoring program for radionuclides, as described previously (in the response to the first part of this comment).</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 16.<br>(cont.)                       | <p>(Follow-on comment received on October 28, 2013)</p> <p>Response to EPA SC 16: The response partially addresses the comment. Part (b) of the response states that the objective of a groundwater detection monitoring program is to evaluate the statistical significance of a release to groundwater from a regulated unit. That response raises two concerns: 1) how will background concentrations for radiological contaminants be established, and 2) how will RGs be developed to protect the human and environmental receptors in San Francisco Bay (the Bay) from radionuclide-contaminated groundwater discharges into the Bay if radionuclides are detected in groundwater? Please revise the Parcel E ROD to explain how risk-based RGs for radionuclides in groundwater would be developed if radionuclides are detected in groundwater. In addition, the Attachment 4 of the ROD cites federal action-specific RCRA requirements applicable to RCRA detection monitoring program for hazardous waste facilities as relevant and appropriate to the monitoring component of Alternative R-2.</p> <p>Alternative R-2 requires continued groundwater monitoring to demonstrate, consistent with the findings of previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health and the environment. EPA believes that the applicable guidance document to for this detection monitoring program is “STATISTICAL ANALYSIS OF GROUNDWATER MONITORING DATA AT RCRA FACILITIES UNIFIED GUIDANCE MARCH 2009; EPA 530/R-09-007”.</p> | <p>The Navy wishes to clarify the following points regarding the two additional concerns raised by EPA:</p> <ol style="list-style-type: none"> <li>1. Consistent with the 2009 EPA guidance document cited in this comment, the statistical evaluation approach does not involve establishing fixed background concentrations (that would be used as threshold comparison criteria). The guidance provides that the statistical significance of radionuclides in groundwater at IR-02 and IR-03 will be evaluated by comparing two groups of data (e.g., multiple background wells versus one downgradient well) using established statistical tests. The statistical evaluation will be performed regularly as part of the detection monitoring program.</li> <li>2. The Navy may develop risk-based groundwater RGs if radionuclides are detected at statistically significant concentrations in the future and evaluate whether or not additional remedial action is required in order to protect human and environmental receptors in San Francisco Bay. Accordingly, the ROD was not revised to describe a method for developing risk-based criteria for radionuclides in groundwater.</li> </ol> <p>The Navy agrees that the 2009 guidance document, as cited by EPA, describes the methods for establishing a detection monitoring program. The response to “part a” of EPA specific comment 16 was revised to cite this guidance document. The ROD was not revised to describe statistical methodology to be used in the detection monitoring program because the methodology is relatively complex and exceeds the level of detail that is typically included in a streamlined ROD. As described in “part a” of the response to EPA specific comment 16, the RD will use pertinent guidance documents to develop the groundwater detection monitoring program for radionuclides at IR-02 and IR-03. For informational purposes only, the following paragraphs further describe the detection monitoring program for radionuclides in groundwater at IR-02 and IR-03.</p> <p>The 2009 EPA guidance document, as well as the pertinent Title 22 regulations, distinguishes between a detection monitoring program and a</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013** *(continued)*


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| Comment No.                          | Comment | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <i>Specific Comments (continued)</i> |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 16. (see above)<br>(cont.)           |         | <p>compliance/assessment monitoring program. A detection monitoring program is appropriate when no or minimal releases of hazardous constituents have been identified, and it involves a statistical evaluation to identify significant changes in the groundwater when compared to background or established baseline levels. A compliance/assessment monitoring program is required when there is statistically significant evidence of a release of hazardous constituents, and it typically involves comparing groundwater data with numeric health-based standards. For radionuclides in groundwater at Parcel E, a detection monitoring program is proposed because no release has occurred that affects human health or the environment; a compliance/assessment monitoring program would be implemented if radionuclides were found in groundwater at activity levels that are statistically significant. While the Navy maintains that the RD is the most appropriate document in which to describe and detail the statistical methodology that will be used in the detection monitoring program, it offers the following information to describe one potential approach for developing a detection monitoring program (consistent with the procedures identified in the 2009 EPA guidance document):</p> <ul style="list-style-type: none"> <li>• The goal of the detection monitoring program would be to determine whether or not concentrations of chemicals in groundwater are within the statistically established PLs for that chemical (i.e., determining whether there is evidence of groundwater contamination after the remedy is in place).</li> <li>• Groundwater samples would be collected from two groups of wells: (1) wells located in a general downgradient direction from the waste limits, which would represent POC wells, and (2) wells located upgradient of the waste limits, which would represent background wells.</li> <li>• Data for each chemical from each well would be compared with statistically derived threshold values (i.e., PLs) using valid statistical methods.</li> <li>• The decision rules for the detection monitoring program would follow the three sequential steps described on the following page.</li> </ul> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013** *(continued)*


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| <b>Comment No.</b>                   | <b>Comment</b> | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <i>Specific Comments (continued)</i> |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 16.<br>(cont.)                       | (see above)    | <ul style="list-style-type: none"> <li>Data for each chemical from each well would be compared with statistically derived threshold values (i.e., PLs) using valid statistical methods.               <ol style="list-style-type: none"> <li><i>Statistical analysis using inter-well PLs.</i> POC monitoring well data would be compared with statistically derived inter-well PLs. The inter-well PL represents the maximum concentration that will be contained in the next series of measurements with a certain level of confidence from a sample of background measurements, in this case upgradient versus downgradient wells. If any chemical concentration in a POC well is greater than its specific inter-well PL, then an intra-well statistical analysis would be conducted.</li> <li><i>Statistical analysis using intra-well PLs.</i> If the POC monitoring well data exceed the inter-well PLs, then the data would be compared with statistically derived intra-well PLs. The intra-well PL represents the maximum concentration that will be contained in the next series of measurements with a certain level of confidence for a particular well. If any chemical concentration in a POC well is greater than its specific intra-well PL, then that well would be resampled before a statistically significant result is declared.</li> <li><i>Confirmation sampling and comparison with intra-well PLs.</i> The results of the confirmation sample would be compared with statistically derived intra-well PLs to determine if a statistically significant increase in concentration is declared.</li> </ol> <p>The specific statistical methods and decision rules would be established in either the RD or RAWP. The RD or RAWP would identify appropriate actions if a statistically significant increase in concentration is declared. As described previously, one potential action would involve developing a compliance/assessment monitoring program and comparing the groundwater data with numeric health-based standards. Accordingly, risk-based criteria for radionuclides in groundwater would only be established if a statistically significant increase in concentration is declared.</p> </li> </ul> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 17.                                  | <p>Section 2.9.2.1, last paragraph on this section. The description of the selected remedial action in the shoreline areas describes the installation of shoreline protection consisting of natural materials (such as sand) and large rocks to eliminate the exposure pathways to remaining contaminants in shoreline sediment (and to integrate with the durable covers at onshore areas). EPA supports this remedy. However, although shoreline sediment RGs are identified in Table 5, the selected remedial action does not include any reference to the excavation of shoreline sediments that would be needed to install the shoreline protection. The ROD does not include a description of contaminant distribution in the sediments as the basis for the decision to excavate 2.5 feet of sediment (e.g. estimated depth of shoreline sediments to be excavated and removed for the installation of the shoreline protection).</p> | <p>Section 2.9.2.1 in the Draft ROD includes a brief sentence describing the excavation and disposal of shoreline sediment (specifically, page 2-44, fourth paragraph, fourth sentence). However, the subject paragraph was revised to more clearly describe this action by beginning with the following text: <u>“In addition, contaminated sediment along the Parcel E shoreline would be excavated to a depth of at least 2.5 feet (which aligns with the exposure depth for aquatic wildlife that may inhabit the shoreline) and disposed of at an approved offsite landfill. The shoreline excavations would be backfilled with natural materials (such as sand) and large rocks to prevent exposure to remaining contaminants in shoreline sediment (and to integrate with the durable covers at onshore areas).”</u> The revised statement in Section 2.9.2.1 will also include an electronic reference to information originally presented in the SLERA for the Parcels E/E-2 shoreline.</p>                                                                                                                                                                                                                    |
| 18.                                  | <p>Section 2.9.2.2, Page 2-45, bottom paragraph. Regarding Alternative GW-3, the draft ROD states that monitoring will continue until chemical concentrations meeting remediation goals. Has the Navy identified remedial goals for all groundwater COCs? Is a remedial goal needed for PCBs in groundwater? Why isn't the requirement for groundwater monitoring for radionuclides included in the description of Alternative GW-3?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>Consistent with the information presented in the Final FS Report (ERRG, 2012), the ROD establishes RGs for groundwater COCs identified in the HHRA for potentially complete exposure pathways for groundwater (i.e., construction worker exposure to A-aquifer groundwater and domestic use exposure to B-aquifer groundwater). The ROD also establishes RGs for total TPH in groundwater to ensure consistency with the distance-based criteria that were established as part of the HPNS petroleum program (the total TPH criteria address the attenuation of total TPH as A-aquifer groundwater flows to San Francisco Bay). RGs were not established for COPECs identified in the groundwater SLERA (e.g., PCBs and metals) because (1) the pertinent regulatory criteria are based on standards for aquatic wildlife in San Francisco Bay that do not apply to A-aquifer groundwater, and (2) the trigger levels developed in the SLERA (which adjust the surface water quality criteria to conservatively estimate the attenuation that occurs as groundwater flows from an inland location to San Francisco Bay) will serve as preliminary groundwater monitoring criteria that may be refined in the RD.</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013** *(continued)*

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| <b>Comment No.</b>                   | <b>Comment</b> | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <i>Specific Comments (continued)</i> |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 18.<br>(cont.)                       | (see above)    | <p>Section 2.9.2.2 (as well as Section 2.9.2.3) was revised to more accurately describe the monitoring approach for groundwater plumes located near San Francisco Bay as follows: <u>“Groundwater quality (as well as flow direction) <del>would</del> will be monitored at all plumes, including those the plumes behind the below-ground barrier to ensure that contamination is not discharged into San Francisco Bay at concentrations greater than the corresponding surface water quality criteria for aquatic wildlife (to comply with the groundwater RAO specified in Section 2.7). Plume-specific trigger levels will be used as groundwater monitoring criteria to evaluate the potential risk to aquatic wildlife in San Francisco Bay, but the RD may develop alternative monitoring criteria (using refined fate and transport modeling) to more rigorously assess the groundwater-to-surface water transport mechanism.”</u> The ROD includes electronic reference information (that is linked to the term “trigger levels” in Section 2.9.2.2) that describes the derivation of the trigger levels, as originally presented in the groundwater SLERA (Appendix A to the Final FS Report).</p> <p>In addition, Section 2.7 was revised to explain why RGs were not established for chemicals found in A-aquifer groundwater at concentrations that may pose a risk to aquatic wildlife: <u>“Remediation goals were not developed for COECs in groundwater because, except for total TPH, the water quality criteria referenced in the groundwater and NAPL RAOs are based on standards for aquatic wildlife in San Francisco Bay, apply to surface water at the interface of A-aquifer groundwater, and do not apply to in-situ A-aquifer groundwater at Parcel E. Plume-specific trigger levels will be used as groundwater monitoring criteria to evaluate the potential risk to aquatic wildlife in San Francisco Bay, but the RD may develop alternative monitoring criteria (using refined fate and transport modeling) to more rigorously assess the groundwater-to-surface water transport mechanism.”</u></p> <p>Groundwater monitoring for radionuclides is not discussed in Section 2.9.2.2 but is described in Section 2.9.2.4. This element of the groundwater monitoring program was discussed separately because:</p> <ul style="list-style-type: none"> <li>Section 2.9.2.2 describes the selected remedy for nonradioactive chemicals in groundwater, which was identified based on an evaluation presented in the Final FS Report (ERRG, 2012). In contrast, Section 2.9.2.4 describes</li> </ul> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**


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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 18.<br>(cont.)                       | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>the selected remedy for radiologically impacted media, which was identified based on an evaluation presented in the Radiological Addendum to the Final FS Report (ERRG and RSRS, 2012).</p> <ul style="list-style-type: none"> <li>Groundwater monitoring for nonradioactive chemicals and radionuclides have different technical bases. Specifically, groundwater monitoring data for nonradioactive chemicals indicate an unacceptable risk to human health and the environment that is being addressed by treatment, containment, monitoring, and institutional controls. In contrast, groundwater monitoring data for radionuclides do not indicate an unacceptable risk to human health or the environment, and the only required action is continued monitoring to demonstrate, consistent with the findings of previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health.</li> </ul>                                                                                                                                                                                                                                                                                                                                  |
| 18.<br>(cont.)                       | <p>(Follow-on comment received on October 28, 2013)</p> <p>Response to EPA SC 18: The response partially addresses the comment. The response does not address the question of whether or not an RG is needed for polychlorinated biphenyls (PCBs) in groundwater. Since there is a PCB plume in Parcel E near the shoreline and one of the Remedial Action Objectives is to prevent migration and discharge of groundwater contaminated with Aroclor-1254 and Aroclor-1260 into the Bay, it appears that RGs (or plume trigger concentrations) for PCBs in groundwater are needed. Please revise the Parcel E ROD to include RGs for PCBs in groundwater or to explain why RGs for PCBs are not required and how a trigger level protective of aquatic life in sediments and the Bay will be developed.</p> | <p>The response to EPA specific comment 18 was revised to more clearly explain that the ROD establishes RGs for (1) groundwater COCs identified in the HHRA for potentially complete exposure pathways for groundwater (i.e., construction worker exposure to A-aquifer groundwater and domestic use exposure to B-aquifer groundwater), and (2) total TPH in groundwater to ensure consistency with the distance-based criteria that were established as part of the HPNS petroleum program (the total TPH criteria address the attenuation of total TPH as A-aquifer groundwater flows to San Francisco Bay). The groundwater SLERA identified PCBs as a COPEC that may pose a risk to aquatic wildlife in San Francisco Bay; however, as explained in the initial response to EPA specific comment 18, RGs were not established for COPECs identified in the groundwater SLERA because (1) the pertinent regulatory criteria are based on standards for aquatic wildlife in San Francisco Bay that do not apply to A-aquifer groundwater, and (2) the trigger levels developed in the SLERA (which adjust the surface water quality criteria to conservatively estimate the attenuation that occurs as groundwater flows from an inland location to San Francisco Bay) will serve as preliminary groundwater monitoring criteria that may be refined in the RD.</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013** *(continued)*

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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 18.<br>(cont.)                       | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                | The ROD includes electronic reference information (that is linked to the term “trigger levels” in Section 2.9.2.2) that describes the derivation of the trigger levels, as originally presented in the groundwater SLERA (Appendix A to the Final FS Report).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 19.                                  | Section 2.9.2.3, Page 2-46, second para. In the third sentence please consider changing "destroyed" with "broken down into less toxic compounds".                                                                                                                                                                                                                                                                                                                          | The sentence was revised as suggested.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 20.                                  | Figure 12, Page 2-48. (a) Consider shading the interior of the buildings in green zone (instead of grey) so it is clear that the restrictions cover the interior of the current buildings and that same space in the future after any building demolition is completed. (b) Please consider changing the language in the legend on the map to match what was written in the text (i.e., 'Areas requiring Institutional Controls.' rather than "Restrictions related to.")? | (a) The subject figure (now referred to as Figure 13) was revised to shade the building outlines in the appropriate color (corresponding to the type of ICs that will apply to this area. In addition, Figure 13 was revised to remove the existing road edges.<br>(b) The legend in the subject figure (now referred to as Figure 13) was revised as suggested.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 21.                                  | Page 2-50. Under General Activity Restriction, please change "Parcel E RMP" with "Shipyard-wide RMP" or just "RMP".                                                                                                                                                                                                                                                                                                                                                        | The phrase “Parcel E RMP” was changed to “RMP” as suggested.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 22.                                  | Page 2-51, 3rd para. Should the first sentence be edited as follows: "If an enclosed structure is proposed within IR-02 or IR-03, the FFA signatories and CDPH..etc".                                                                                                                                                                                                                                                                                                      | The subject sentence was intended to describe the potential modification of the VOC ARIC anywhere in Parcel E, which will be subject to approval by the FFA signatories but, because it does not include restrictions related to radionuclides, will not require approval by CDPH. Accordingly, the subject paragraph was revised to read: <i>“If IR-02 or IR-03 are involved, the FFA signatories and CDPH may modify the ARIC as soil contamination areas and groundwater contaminant plumes that are producing unacceptable vapor inhalation risks are reduced over time or in response to further soil, vapor, and groundwater sampling and analysis for VOCs that establishes that areas now included in the ARIC do not pose unacceptable potential exposure risk to VOC vapors.”</i> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**


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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 23.                                  | Section 2.9.4, Statutory Determinations, Page 2-55: According to the last bullet point of Section 2.9.4, "five-year reviews for Parcel E will follow the ongoing schedule of five-year reviews established for other remedies in place at HPNS [Hunters Point Naval Shipyard];" however, the text does not indicate when the next five-year review is scheduled for HPNS. Please revise Section 2.9.4 to specify when the next five-year review will be completed. | The subject bullet was revised to read: <i>"Five-year reviews for Parcel E will follow the ongoing schedule of five-year reviews established for other remedies in place at HPNS (the next five-year review for HPNS will be completed in 2018)."</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 24.                                  | Attachment 4, ARARs Tables.<br>(a) ARARs Table has no reference to CDPH regulations. How is Parcel E different from E-2 which did cite CDPH regulations?<br>(b) ARARs table needs to clarify relationship between UMTRCA standards and HPS cleanup criteria. Current language suggests that 5 pico curies is the cleanup level.                                                                                                                                    | (a) The Navy wishes to clarify that the Parcel E-2 ROD did not identify CDPH regulations as ARARs, consistent with the Navy and EPA's joint evaluation provided in the Radiological Addendum to the RI/FS Report for Parcel E-2 (ERRG and RSRS, 2011). Similarly, the Navy determined that CDPH regulations are not ARARs for the remedial actions at Parcel E, first in the Radiological Addendum to the FS Report (ERRG and RSRS, 2012) and now in the ROD. Please refer to the response to CDPH comment 2 for more information regarding the evaluation of CDPH regulations (specifically Title 17 Cal. Code Regs. § 30256). The document was not revised in response to this comment.<br><br>(b) The notes in the ARARs table describe the Navy's intent to remediate ROCs that exceed the RGs identified in Table 7, consistent with the RAO identified in Section 2.7 of the Draft ROD. The specific citation referenced in this comment pertains to the radium-226 criteria at 40 CFR §§ 192.12(a) and 192.32(b)(2). The note for this ARAR was revised to clarify that the RG for radium-226 is 1 pCi/g above background. Other radiological-related ARARs in Attachment 4 identify a range of other pertinent requirements, some of which include dose-based limits, which will also inform the remediation process. The Navy understands that EPA prefers to focus the discussion on residual radiological risk and minimize reference to radiological dose criteria; however, the Navy believes that the main text of the ROD adequately describes its intent to remediate ROCs that exceed the RGs identified in Table 7, and the inclusion of various radiological-related ARARs provide additional regulatory criteria that will further inform the remediation process. |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated July 24, 2013 (continued)**


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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                            | <b>Response</b>                                                                                                                                                                                                                                                                |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                |
| 24.<br>(cont.)                       | Attachment 4, ARARs Tables. (continued)                                                                                                                                                                                                                                                                                                                                                                   | Further, the Navy wishes to clarify that it is an accepted practice to identify chemical-specific ARARs that may be less stringent than risk-based RGs, when those additional ARARs inform the remediation process.                                                            |
|                                      | (c) References to DTSC authorizing statutes for LUCs should be eliminated.                                                                                                                                                                                                                                                                                                                                | (c) The requested deletion was not made because it would be inconsistent with language that was previously negotiated with DTSC and incorporated into RODs for other HPNS parcels.                                                                                             |
|                                      | (Follow-on comment received on October 28, 2013)<br>Response to EPA SC 24. EPA agrees with the Navy's response to EPA comment concerning the Uranium Mill Tailings Radiation Control Act (UMTRCA). However, we recommend that the Notes Column be supplemented with the following sentence: "The RG for radium-226 is based on the CERCLA risk criteria rather than the standards established by UMTRCA". | The subject note in the chemical-specific ARARs table was revised as follows: <u>"The RG for radium-226 is based on the CERCLA risk criterion, which is consistent with an agreement with EPA (see Table 8 of this ROD), rather than the standards established by UMTRCA."</u> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Additional Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated October 28, 2013 (continued)**


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| Comment No.                                        | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <i>Supplemental Comments on Record of Decision</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1.                                                 | <p>Upon reading the preview Final version of the ROD, EPA believes that the ROD requires additional editing to clarify the remedial goals for (RGs) for soil. EPA understands that only the Tier 2 goals will be the effective soil RGs throughout Parcel E. EPA further understands that Tier 2 goals comprise of 5 times residential RGs in the Mixed Used Zone and 5 times recreational RGs in the Open Space Zone. These Tier 2 goals will be applied to both identify the preliminary extent of soil contamination in remedial design documentation and these same RGs will be used to compare with Navy confirmation soil samples during the remedial action phase. Please edit the ROD so the final, effective soil RGs are clear and EPA recommends that Tier 1 goals be removed from Table 4.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>Sections 2.5.3 and 2.9.2.2 of the ROD were revised to clarify that the soil areas with COC concentrations exceeding “soil action levels” (corresponding to five times the RG for each COC) will be excavated and disposed of off site. Table 4 was also revised to remove the “Tier 1 action levels” and to clearly define the new term “soil action levels” (that were previously referred to as the “Tier 2 action levels”). The Navy decided to not refer to these soil action levels as “remediation goals” because such an edit would conflict with the soil RAOs described in Section 2.7, and would be inconsistent with the terminology used in the CERCLA documentation prepared to date for Parcel E (e.g., FS Report and Proposed Plan).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2.                                                 | <p>Upon reading Navy responses to DTSC and City comments requesting clarification on the scope of soil gas surveys (see Draft-Final ROD, Section 2.9.2.1, BOTTOM OF PAGE 2-49), EPA would like to add this supplemental comment. Because soil gas surveys were not conducted in a comprehensive fashion during the Parcel E remedial investigation, EPA recommends that an appropriate parcel-wide soil gas survey be conducted by the Navy at the end of the soil, SVE, and groundwater remedial actions but prior to Navy preparation of the remedial action completion report for Parcel E. The following presents some suggested text for Section 2.9.2.1 of the ROD:</p> <p><i>“Additionally, soil gas surveys will be conducted, following a planning process performed in consultation with the regulatory agencies, in Parcel E as follows:</i></p> <ul style="list-style-type: none"> <li><i>investigate soil gas in all areas planned for mixed use. Currently the mixed use area is designated as a VOC ARIC because there are concerns about potential residual soil gas and associated risks. The soil gas survey will be conducted to verify whether soil vapors exist in the mixed used area at concentrations that may pose an unacceptable risk via vapor intrusion;</i></li> </ul> | <p>Section 2.9.2.1 was revised to incorporate portions of EPA’s suggested text regarding the future soil gas survey at Parcel E. Please refer to the revised responses to DTSC comment 5 and SFDPH specific comment 22 for the proposed text revisions. The Navy wishes to clarify that some of EPA’s suggested text would be inconsistent with the successful process by which soil gas surveys were developed for HPNS Parcels B, D-1, and G. Specifically, EPA’s recommendation that the Navy “<i>investigate soil gas in all areas planned for mixed use</i>” does not reflect the comprehensive process of evaluating the available soil, soil gas, and groundwater data (within areas planned for mixed use) to identify areas of concern that require soil gas sampling. During development of the soil gas surveys at HPNS Parcels B, D-1, and G, the Navy’s data analysis determined that there were areas where no potential soil gas concerns existed (and thus did not require soil gas sampling). The Navy anticipates that the data analysis at Parcel E may yield similar findings and wishes to avoid using prescriptive wording in the ROD (specifically the phrase “<i>investigate soil gas in all areas planned for mixed use</i>”) that could unnecessarily expand the scope of the soil gas survey. The Navy believes that the revised text regarding the future soil gas survey at Parcel E, which is consistent with information provided in the ROD for Parcel C, is adequately descriptive and that further discussion of the future soil gas survey should be</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Additional Comments by U.S. Environmental Protection Agency Remedial Project Manager (Craig Cooper), dated October 28, 2013** *(continued)*

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| <b>Comment No.</b>                                             | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Response</b>                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Supplemental Comments on Record of Decision (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                             |
| 2.<br>(cont.)                                                  | <ul style="list-style-type: none"> <li>• <i>identify COCs for which risk-based numeric action levels for VOCs in soil gas would be established (based on a cumulative excess cancer risk of 1 in a million); and</i></li> <li>• <i>re-evaluate and map the extent to which areas with potential unacceptable risk via vapor intrusion require control (as described in Section 2.9.2.5, areas with unacceptable vapor intrusion risk will be subject to institutional controls, and the potential risk will be reduced by engineering controls or other design alternatives that meet the specifications set forth in the ROD, RD reports, and LUC RD report)."</i></li> </ul> | deferred to the RD (or appropriate planning documents for the soil gas survey). Please refer to the response to SFDPH specific comment 22 for information regarding the Navy's planned approach for the soil gas survey at Parcel E, which will be consistent with the approach used at other HPNS parcels. |
| 3.                                                             | During the remedial design for Parcel E, the Navy must undertake a detailed analysis of the water quality (i.e. groundwater and surface water/SF Bay) impacts of the underground barrier that will be installed to control groundwater migration especially if the underground barrier from Parcel E-2 and Parcel E will be assembled into a single unified barrier.                                                                                                                                                                                                                                                                                                           | The Navy acknowledges this comment and will work with the regulatory agencies to incorporate the requested analysis into the RD.                                                                                                                                                                            |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Toxic Substances Control Remedial Project Manager (Ryan Miya), dated May August 9, 2013**


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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                 | Section 2.3.4 – Radionuclides in Soil, Shoreline Sediment, and Groundwater. Second bullet item. The text indicates that the radium-226 (226Ra) surface soil release criterion is 1.82 picocuries per gram (pCi/g). However, the remediation goals for radionuclides presented in Table 7 identifies the remediation goal for surface soil as 1.0 pCi/g above background, with the <sup>226</sup> Ra background level for surface soil as 0.633 pCi/g. Please correct and/or explain the apparent numeric discrepancies in the text. | The subject bullet was corrected to read: “ <i>The extent of <sup>226</sup>Ra in surface soil exceeding the release criterion (<del>1.82–1.0</del> pCi/g <u>above the background activity level</u>) was widespread.</i> ” The noted discrepancy arose because the subject text describes the evaluation results presented in the Radiological Addendum to the FS Report (ERRG and RSRS, 2012), which considered background activity levels developed in support of the Phase V Radiological Investigation. The background activity level for radium-226 during the Phase V Radiological Investigation was 0.82 pCi/g, resulting in an evaluation criterion of 1.82 pCi/g. The background activity level for radium-226 in surface soil was subsequently revised (to 0.633 pCi/g) during implementation of the basewide radiological removal action, and this information is reflected in Table 8 (formerly Table 7). |
| 2.                 | Section 2.3.2 – Nonradioactive Chemicals in Groundwater. Please consider adding a paragraph / section summarizing the information available regarding nonradioactive chemicals in soil gas given the volatilization potential that exists for groundwater VOC plumes in IR-12, IR-04, and Building 406.                                                                                                                                                                                                                             | Section 2.3.2 was revised to include the following text: “ <i><u>Following identification of the VOC plumes (Figure 8) in the RI, the Navy performed additional studies (from 2009 to 2012) at these areas to better understand the extent of contamination and to evaluate potential cleanup technologies. The additional studies identified VOCs in soil gas at concentrations that exceed risk-based screening levels. The VOCs reported in soil gas emanate from either contaminated soil or groundwater in the areas.</u></i> ” The new text will include an electronic reference to pertinent information describing the studies (i.e., text from the FS Report [ERRG, 2012] and figures from the treatability study reports [Shaw, 2011 and 2013]).                                                                                                                                                            |
| 3.                 | Section 2.5 – Summary of Site Risks. First paragraph. Since one of the listed primary contaminant transport mechanisms is volatilization from soil or groundwater to the atmosphere, please add soil gas to the list of contaminated media                                                                                                                                                                                                                                                                                          | Soil gas was added to the list of contaminated media as suggested. In addition, the second sentence in the subject paragraph was revised to clarify, consistent with the revised text in Section 2.3.2, that soil gas contamination emanates from either soil or groundwater contamination.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by California Department of Toxic Substances Control Remedial Project Manager (Ryan Miya), dated August 9, 2013 (continued)**

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.                 | Section 2.7 – Remedial Action Objectives. Soil, Soil Gas, and Shoreline Sediment RAOs subsection. Last paragraph. The text states that “active treatment of soil gas would be performed at Building 406 until soil gas action levels are achieved” but does not mention how this will be achieved (soil vapor extraction) or specify what the soil gas action levels are. Please expand this section to provide general details as to how this will be achieved as well as consider adding a table to the ROD specifying the soil gas action levels to which this text is referring (new Table 8?) | <p>The subject text in Section 2.7 generally describes the actions proposed to address the soil, soil gas, and shoreline sediment RAOs, and was not intended to replace the more detailed discussion of the selected remedy in Section 2.9.2. Accordingly, Section 2.7 was not revised as suggested. However, the last paragraph describing the soil, soil gas, and shoreline sediment RAOs (within Section 2.7) was revised to provide a forward reference to Section 2.9.2: <u>“Section 2.9.2 provides further information on the actions required to satisfy the RAOs for soil, soil gas, and shoreline sediment.”</u></p> <p>In addition, as described in the response to EPA specific comment 14, Section 2.7 was revised to more specifically discuss the application of soil gas action levels as follows: <u>“Table 7 of the final soil gas memorandum lists risk-based action levels for various volatile chemicals, including SVOCs and pesticides, that may pose an unacceptable risk via indoor inhalation of vapors. These soil gas action levels will be used for an initial risk-based screening of refined using data collected from during a future soil gas survey (such as the survey following active treatment (to be performed at Building 406 and VOC groundwater plumes following active treatment). After the initial risk-based screening, areas with unacceptable risk will be further evaluated using location-specific data (i.e., physical characteristics of the soil) to assess potential exposures consistent with the most current State of California and EPA vapor intrusion guidance. In addition, risks and hazards at these areas will be further characterized using the accepted methodology for risk assessments at HPNS. Section 2.9.2.1 provides additional information on the future soil gas survey, and potential actions that may be prompted based on the results of the risk and hazard evaluation. Future soil gas action levels would account for vapors from both soil and groundwater, and would be calculated based on a cumulative excess cancer risk level of 10<sup>-6</sup> using the accepted methodology for risk assessments at HPNS.”</u></p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by California Department of Toxic Substances Control Remedial Project Manager (Ryan Miya), dated August 9, 2013 (continued)**

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.                 | Section 2.9.2 – Description of Selected Remedy. Please add that soil gas surveys will be conducted in consultation with regulatory agencies (1) in focused areas where concerns continue about residual volatile organic compounds (VOCs) in soil or where VOCs are present in groundwater, (2) at the groundwater remediation areas following completion of the remedial action for groundwater (after the areas have re-equilibrated), and (3) to evaluate the need for remedial action or the reduction or retention of an Area Requiring Institutional Control (ARIC) for VOCs. | <p>Section 2.9.2.1 was revised to add the following text regarding future the soil gas survey at Parcel E: <u>“Additionally, a soil gas survey will be conducted, following a planning process performed in consultation with the regulatory agencies, in Parcel E to:</u></p> <ul style="list-style-type: none"> <li><u>• investigate soil gas in areas planned for mixed use where concerns continue about residual VOCs in soil (at concentrations that may pose an unacceptable risk via vapor intrusion);</u></li> <li><u>• identify COCs for which risk-based numeric action levels for VOCs in soil gas would be established (based on a cumulative excess cancer risk of 1 in a million); and</u></li> <li><u>• evaluate and map the extent to which areas with potential unacceptable risk via vapor intrusion require control (as described in Section 2.9.2.5, areas with unacceptable vapor intrusion risk will be subject to institutional controls, and the potential risk will be reduced by engineering controls or other design alternatives that meet the specifications set forth in the ROD, RD reports, and LUC RD report).</u></li> </ul> <p>Please note that Sections 2.9.2.1 and 2.9.2.2 already describe future soil gas monitoring at Building 406, IR-04, and other VOC groundwater plumes at Parcel E.</p> |
| 6.                 | Figure 10 – Soil Remediation Areas. Please verify if the area located along the shoreline at the northwestern corner of Parcel E is also slated to undergo soil and shoreline sediment removal, and then incorporate the approximate area into the figure accordingly.                                                                                                                                                                                                                                                                                                              | <p>The Navy is conducting an investigation near the shoreline in the northwestern corner of Parcel E, and this investigation may identify additional Tier 1, Tier 2, and TPH locations requiring excavation and offsite disposal. The investigation is ongoing, and the results are not available for inclusion in the Final ROD. However, the following revisions were made to clarify the path forward in this area:</p> <ul style="list-style-type: none"> <li>Section 2.5.3 was revised to identify the investigation area (in the figure now referred to as Figure 10) and note that the investigation may identify additional Tier 1, Tier 2, and TPH locations.</li> <li>Section 2.9.2.1 was revised to identify the investigation area (in the figure now referred to as Figure 11) and note that the investigation may identify additional Tier 1, Tier 2, and TPH locations requiring excavation and offsite disposal.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                            |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by California Department of Toxic Substances Control Remedial Project Manager (Ryan Miya), dated August 9, 2013 (continued)**

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.<br>(cont.)      | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Section 2.9.2.1 was revised to clarify that the RD will further evaluate soil concentrations at Tier 1, Tier 2, and TPH locations (using additional data collected during investigations performed in 2012 and 2013) and may refine the extent of the proposed excavations.</li> </ul> <p>In addition, as described in the response to EPA specific comment 17, Section 2.9.2.1 was revised to more clearly describe the proposed excavation of shoreline sediment throughout Parcel E: <u>“In addition, contaminated sediment along the Parcel E shoreline would be excavated to a depth of at least 2.5 feet (which aligns with the exposure depth for aquatic wildlife that may inhabit the shoreline) and disposed of at an approved offsite landfill. The shoreline excavations would be backfilled with natural materials (such as sand) and large rocks to prevent exposure to remaining contaminants in shoreline sediment (and to integrate with the durable covers at onshore areas).”</u></p>                                                                                                                                                                                                                                                                                                       |
| 7.                 | <p>Section 2.9.2.5 – Monitoring, Maintenance, and Institutional Controls.</p> <p>(a) Page 2-48, last paragraph. Please remove “and attached covenant models” from the Navy/DTSC MOA reference for clarification as it has the potential for misunderstanding that the referenced covenant models are provided as an attachment to the Draft Record of Decision.</p> <p>(b) Page 2-49, third paragraph. Please add the following underlined text as follows: “CCSF may prepare a risk management plan (RMP) to be approved by the FFA signatories that may set forth certain requirements and protocols used to conduct restricted activities <u>while under FFA signatory agencies’ oversight.</u>”</p> <p>(c) Page 2-50, General Activity Restrictions subsection. The item describing the prohibited activity of growing vegetables or fruits in native soil should be modified as followed in order to be consistent with the most recently agreed-upon Covenant to Restrict Use of Property (CRUP) language from Parcel B: “Growing vegetables, fruits, and any edible items in native soil for human consumption. Plants for human consumption may be grown if they are planted in raised beds (above the CERCLA-approved cover) containing non-native soil. Trees producing edible fruit (including trees producing edible nuts) may also be planted provided they are grown in containers with a bottom that prevents the roots from penetrating the native soil.”</p> | <p>(a) The subject sentence was revised as requested: “<i>The Navy has determined that it will rely on proprietary controls in the form of environmental restrictive covenants as provided in the ‘Memorandum of Agreement between the United States Department of the Navy and the California Department of Toxic Substances Control’ and attached covenant models (hereinafter referred to as the “Navy/DTSC MOA”).</i>”</p> <p>(b) This subject sentence was revised to read: “<i>CCSF may prepare a risk management plan (RMP) to be approved by the FFA signatories that may set forth certain requirements and protocols used to conduct restricted activities <u>that shall be overseen by the FFA signatories (and CDPH for restricted activities conducted within the radiological ARIC).</u></i>”</p> <p>(c) The subject bullet was revised as requested: “<i>Growing vegetables, <del>or</del> fruits, <u>and any edible items</u> in native soil for human consumption. <u>Plants for human consumption may be grown if they are planted in raised beds (above the CERCLA-approved cover) containing non-native soil. Trees producing edible fruit (including trees producing edible nuts) may also be planted provided they are grown in containers with a bottom that prevents the roots from penetrating the native soil.</u></i>”</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Toxic Substances Control Remedial Project Manager (Ryan Miya), dated August 9, 2013 (continued)**


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| Comment No.   | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| 7.<br>(cont.) | (d) Page 2-51, Activity Restrictions Related to Soil and Associated VOC Vapors or Specific Locations within Parcel E subsection, first paragraph. The text states that the ARIC for VOC vapors currently includes the entire ARIC for nonradioactive chemicals. However, the brief technical basis for not including the remaining portion of Parcel E (IR-02 and IR-03) within the ARIC for VOC vapors must also be included in the text accordingly. This also appears inconsistent with the third paragraph in this subsection regarding IR-02 and IR- 03. Please clarify.                                                               | <p>(d) The ARIC for VOC vapors is intended to include all of Parcel E, including IR-02 and IR-03. IR-02 and IR-03 is also subject to additional ICs. Specifically, IR-02 and IR-03 will be subject to activity restrictions related to radionuclides. IR-02 and IR-03 (along with the surrounding property within future open space reuse areas) will also be subject to land use restrictions regarding future open space reuse. The subject text and ARIC figure (now referred to as Figure 13) were revised for clarity as follows:</p> <ul style="list-style-type: none"> <li>• The legend of the ARIC figure was revised to identify the (1) ARIC for radionuclides and non-radioactive chemicals (i.e., the pink shaded area), and (2) ARIC for non-radioactive chemicals (i.e., the green shaded area).</li> <li>• The first paragraph in this subsection was revised to clarify that the ARIC for VOC vapors currently includes both the green and pink shaded areas on the ARIC figure.</li> <li>• The third paragraph in this subsection was revised to clarify the potential modifications to the VOC ARIC as follows : <i>“If IR-02 and IR-03 are involved, the FFA signatories, and CDPH may modify the ARIC as soil contamination areas and groundwater contaminant plumes that are producing unacceptable vapor inhalation risks are reduced over time or in response to further soil, vapor, and groundwater sampling and analysis for VOCs that establishes that areas now included in the ARIC do not pose unacceptable potential exposure risk to VOC vapors.”</i></li> </ul> |
| 8.            | Section 2.9.3 – Expected Outcomes of the Selected Remedy. Paragraph two. The text states that the classification of “radiologically impacted” may be removed if a final report of the site investigation is approved by FFA signatories and CDPH and the site is determined to require no further action. It is DTSC’s understanding that areas, buildings, and former building sites have only been removed from the “radiologically impacted” classification at HPNS to date after the CDPH provides a Radiological Unrestricted Release Recommendation (RURR) memorandum. Please add this to the description of the process accordingly. | The requested description was not added to the text because the Radiological Unrestricted Release Recommendation memorandum is procedural in nature and is not a document required by CERCLA. In addition, the subject text was deleted because the process of removing a “radiologically impacted” site designation is also procedural in nature and is not required to demonstrate completion of the CERCLA remedy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Public Health, Environmental Management Branch (Ronald Pilorin), dated August 12, 2013**


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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                 | Based on the selected remedies for Parcel E ROD, EMB will only recommend unrestricted release for the areas and buildings where complete removal of radiological material and an adequate Final Status Survey report has been provided. EMB cannot recommend unrestricted release for the entire Parcel E, for example Sites 2 and 3 are considered to be restricted. For sites not suitable for unrestricted release, the potential property recipient may apply to the Radiological Health Branch (RHB) for a license or exemption. If their application is insufficient to support a license or exemption, the Navy will need to retain the property or transfer it to another federal agency. | <p>The Navy acknowledges CDPH's comment regarding radiologically impacted sites that will not be suitable for unrestricted release following remediation (i.e., IR-02 and IR-03 that will require institutional controls for radionuclides). However, as the comment may pertain to other Parcel E sites that will be suitable for unrestricted release following remediation (i.e., sites that will not require institutional controls for radionuclides), the Navy wishes to clarify several points regarding CDPH's use of the term "complete removal":</p> <ul style="list-style-type: none"> <li>• The completeness of the remediation of radiologically impacted media will be evaluated with respect to the RAOs and RGs (as identified in Section 2.7 of the ROD) as well as pertinent ARARs (as identified in Attachment 4 of the ROD).</li> <li>• As described in Section 2.9.2.4 of the ROD, the remediation of several radiologically impacted sites at Parcel E is currently being performed under an early removal action that is designed to achieve the same RAOs and RGs identified in the ROD. The remediation of several of these radiologically impacted sites (e.g., Buildings 406, 414, 500, 521, and 810) has already been completed and documented in final status survey reports, which have facilitated CDPH's subsequent recommendation for unrestricted release of these sites.</li> </ul> |
| 2.                 | CDPH continues to assert, as more fully described previously, that Title 17 California Code of Regulations Section 30256 meets the requirements of an applicable or relevant and appropriate requirement for the cleanup of Hunters Point Naval Shipyard.                                                                                                                                                                                                                                                                                                                                                                                                                                         | The Navy and EPA do not agree that Title 17 Cal. Code Regs. § 30256 satisfies promulgated criteria, specified in CERCLA and the NCP, for a state chemical-specific ARAR. The Navy presented a detailed evaluation of the subject requirement in Appendix C of the Radiological Addendum to the FS Report (ERRG and RSRS, 2012), and determined that it is not an ARAR for the Parcel E CERCLA remedy because it is not (1) substantive, (2) either "applicable" or "relevant and appropriate," or (3) more stringent than federal standards. A state law or regulation must satisfy all of these criteria to meet CERCLA and NCP requirements for state ARARs and does not qualify as a state ARAR if any one of them is not satisfied. The Navy prepared, in consultation with EPA counsel, specific input regarding Title 17 Cal. Code Regs. § 30256 that was provided in Appendices C and E of the Radiological Addendum to the FS Report (ERRG and RSRS, 2012). The document was not revised in response to this comment.                                                                                                                                                                                                                                                                                                                                                                                          |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Public Health, Environmental Management Branch (Ronald Pilorin), dated August 12, 2013 (continued)**


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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                              | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| 3.                 | Since EMB did not comment on the document "Base wide Time Critical Removal Action Memorandum", [the Record of Decision] should include all applicable radiological information addressing all radiological impacted areas other than Site 2 and 3. The information should summarize the selected remedy, summary site risks and remedial action objectives. | <p>Section 2.3 refers to the Basewide Time-Critical Removal Action Memorandum because this document has guided the ongoing radiological removal actions at Parcel E (as supplemented by project-specific plans). The ROD includes all pertinent information on the selected remedy for radiologically impacted media. Specifically:</p> <ul style="list-style-type: none"> <li>• Section 2.1 describes the history of radiological operations at Parcel E, identifies the radiologically impacted sites, and includes an electronic reference to more specific information from the Radiological Addendum to the FS Report (ERRG and RSRS, 2012).</li> <li>• Section 2.3.4 summarizes the results of previous radiological investigations at Parcel E, and includes several electronic references to more specific information from the Radiological Addendum to the FS Report (ERRG and RSRS, 2012).</li> <li>• Section 2.5.1 describes the risk assessment findings for radiologically impacted sites, and includes electronic references to more specific information from the Radiological Addendum to the FS Report (ERRG and RSRS, 2012).</li> <li>• Section 2.7 identifies the RAOs and RGs for radiologically impacted media, which are identical to the criteria that are guiding cleanup at sites outside of IR-02 and IR-03 under the Basewide Time-Critical Removal Action (Navy, 2006).</li> <li>• Section 2.9.2.4 describes the selected remedy for radiologically impacted media, which includes (1) cleanup at sites outside of IR-02 and IR-03 that has been initiated under the Basewide Time-Critical Removal Action (Navy, 2006), and (2) cleanup at IR-02 and IR-03 that will be performed as part of the remedial action to address both radionuclides and nonradioactive chemicals.</li> </ul> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Public Health, Environmental Management Branch (Ronald Pilorin), dated August 12, 2013 (continued)**


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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| 3.<br>(cont.)      | (see above)                                                                                                                                                                                                                                                                                                                                                                                                   | The Navy wishes to clarify that the Parcel E ROD was streamlined in accordance with the EPA guidance from September 2011 (developed in collaboration with the Navy), and is consistent with similar RODs prepared for other HPNS parcels. The streamlined ROD format summarizes key information and provides electronic references (embedded within the document) to more detailed technical information contained in the administrative record. The document was not revised in response to this comment.                                                                                                                                                       |
| 4.                 | Page 2-1, Section 1.1, Radiological Impacted Media does not include a description of what radiological sources are found and how the radiological sources impact the media etc. Include a description of how radiological sources or spills have impacted the media?                                                                                                                                          | The requested information is briefly summarized in Sections 2.1 and 2.3.4 and further detailed in the Radiological Addendum to the FS Report (ERRG and RSRS, 2012).. As described in the response to comment 3, the Parcel E ROD was streamlined in a manner that summarizes key information and provides electronic references (embedded within the document) to more detailed technical information contained in the administrative record. Attachment 2 in the ROD includes electronic references to more detailed information in the Radiological Addendum to the FS Report (ERRG and RSRS, 2012). The document was not revised in response to this comment. |
| 5.                 | Page 1-4, Section 1.1 Selected Remedy Radionuclides also referred to as "radiological impacted media" states the following activities throughout IR 02 and IR 03; include a 2 foot thick soil cover, demarcation and existing surface soil cover. These selected remedies may require a radiological license or license exemption from RHB. EMB cannot concur with unrestricted release for IR Sites 2 and 3. | The Navy understands the expectations of the State of California regarding radiological license or license exemption following property transfer. However, the ROD was not revised to specify this expectation because remediation of Parcel E under CERCLA does not involve radiological licensing because Section 121(e) of CERCLA specifically provides that no federal, state or local permits shall be required for on-site remedial actions.                                                                                                                                                                                                               |
| 6.                 | Page 1-2 and 1-3, Section 1.1 Selected Remedy, based on the following actions listed in both pages it appears that the radiological work is separate from the non-radiological work. Explain how the DON plans to coordinated radiological remediation with non-radiological soil and ground water remediation.                                                                                               | Section 2.9.2.4 describes the elements of the selected remedy for radiologically impacted media and specifically notes that (1) the remediation of radiologically impacted sites outside of IR-02 and IR-03 has been initiated under the Basewide Time-Critical Removal Action, and (2) the radiological remediation at IR-02 and IR-03 will be performed concurrent with the remediation for nonradioactive chemicals in soil and shoreline sediment. Further information on the radiological remediation at IR-02 and IR-03 will be presented in the RD and remedial action work plan. The document was not revised in response to this comment.               |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by California Department of Public Health, Environmental Management Branch (Ronald Pilorin), dated August 12, 2013** *(continued)*

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                  | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7.                 | Page 2-2, Figure 2, "Areas with Historical Shipyard Operations at Parcel E", show IR Site boundary include a description and identification on how the boundary was established for Parcel E. Also include what sites or buildings the DON is seeking unrestricted release and what sites are identified as restricted release. | Figure 2 was revised to identify and label all IR sites within Parcel E. Section 2.1 includes electronic references to more specific information on the IR sites and the radiologically impacted sites at Parcel E. As described in Section 2.9.2.4, the area encompassing IR-02 and IR-03 will require institutional controls for radionuclides and will therefore not be suitable for unrestricted release following remediation. All other radiologically impacted sites at Parcel E will be remediated in a manner that will not require institutional controls for radionuclides and therefore these sites will be suitable for unrestricted release following remediation. The figure provided in Section 2.9.2.5 (now referred to as Figure 13) identifies the ARIC for radionuclides (i.e., the area encompassed by IR-02 and IR-03 that will be subject to activity restrictions for radionuclides following remediation). |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Fish and Wildlife (Tami Nakahara and Charlie Huang), dated August 23, 2013**


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| <b>Comment No.</b>      | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| <i>General Comments</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 1.                      | <p>CDFW-OSPR was not informed of, nor provided an opportunity to review the Parcel E Proposed Plan (PP) during the regulatory agency review period, nor during the public comment period. CDFW-OSPR similarly was not provided the opportunity to review the Draft Parcel E FS, and the Parcel E-2 PP during the regulatory agency review period. We again request the Navy include CDFW-OSPR on the regulatory agency document distribution list, for all future document reviews at Hunters Point Shipyard for parcels with natural resource concerns, including Preliminary Assessments, Site Inspections, Remedial Investigations, FSs, PPs, RODs, Remedial Designs, Work Plans, Restoration Plans, Operations and Maintenance Plans, and Action Completion Reports. This memorandum will serve to inform the Navy of our continuing interest in coordinating any natural resource issues, as one of the designated State natural resource Trustees.</p> | <p>The Navy has notified and extensively coordinated with CDFW in its cleanup efforts at HPNS in accordance with the NCP requirements for notice and coordination with state natural resources trustees. CDFW has been provided with the opportunity to review and comment on various documents related to the cleanup and has provided extensive commentary on the Navy's investigations, evaluation of remedial alternatives, and selection of the final remedy. The Navy has responded to all input provided by CDFW. Specific to the cleanup of Parcel E, the Navy has notified and coordinated with CDFW as follows:</p> <ul style="list-style-type: none"> <li>• The draft and draft final versions of the Revised RI Report, which presented the baseline ecological risk assessment and the associated biological surveys (that were used to inform the risk assessment), were submitted to CDFW for review and comment. The Navy responded to all CDFW comments, and the Revised RI Report was finalized in May 2008 (Barajas &amp; Associates, 2008), in accordance with Section 7.9 of the HPNS FFA (Navy, DTSC, and Water Board, 1991).</li> <li>• The draft final version of the FS Report, which developed and evaluated remedial alternatives, was submitted to CDFW for review and comment. The Navy, DTSC, and CDFW held a site visit and working meeting on May 8, 2012 to discuss and attempt to resolve CDFW's concerns related to the FS Report (as well as the ROD for Parcel E-2). The Navy subsequently responded to all CDFW comments, and the FS Report was finalized in August 2012 (ERRG, 2012), in accordance with Section 7.9 of the HPNS FFA (Navy, DTSC, and Water Board, 1991). At the time the draft version of the FS Report was published (in July 2009), the Navy was not aware of CDFW's expectation to review all CERCLA documents for Parcel E. After being made aware of this expectation, the Navy submitted the draft final version of the FS Report to CDFW for review and comment.</li> </ul> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Fish and Wildlife (Tami Nakahara and Charlie Huang), dated August 23, 2013 (continued)**


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| <b>Comment No.</b>                  | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <i>General Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 1.<br>(cont.)                       | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>The Proposed Plan, which summarized information provided in the Revised RI Report and FS Report, was submitted to CDFW during the public comment period (in February 2013). The document was sent to Mr. Charlie Huang from CDFW via US Mail on February 11, 2013. The Navy did not receive any written input from CDFW on this document. The distribution of the preliminary versions of the Proposed Plan for Parcel E was focused on representatives from the FFA signatories (EPA, DTSC, and Water Board). This approach is consistent with the manner in which proposed plans for other HPNS parcels were prepared, and reflects the fact that proposed plans do not present new technical information but rather summarize previously published information in a manner that is readily understandable to the general public.</li> <li>The draft version of the ROD, which summarizes information provided in the Revised RI Report and FS Report, was submitted to CDFW for review and comment. This document provides the responses to CDFW comments on the draft version of the ROD.</li> </ul> <p>The Navy will continue to work with CDFW and the FFA signatories (EPA, DTSC, and Water Board) to finalize the ROD for Parcel E and to develop the RD and remedial action work plan(s) (which will provide more specific information regarding implementation of the selected remedy for Parcel E).</p> |
| <i>Specific Comments</i>            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 1.                                  | <b>Page 2-2, Section 2.1.</b> Please clarify the description of Parcel E acreage and be consistent throughout the ROD. For example the first complete paragraph on Page 2-2 stated " <i>Parcel E, which includes about 128 acres shoreline and lowland coast along the southwestern part of HPNS.</i> " In Attachment 2, Section 2.2.1, the second paragraph stated " <i>Parcel E includes about 139 acres of relatively flat shoreline and lowland coast along the southwestern part of HPS.</i> " | The subject statement on page 2-2 of the Draft ROD properly describes the current area of Parcel E. This area is different than the information provided in the cited reference from Attachment 2, which was excerpted from the Final FS Report (ERRG, 2012). This difference is attributed to the fact that the Navy, in February 2013, divided Parcel E into two parcels (Parcels E and UC-3) to facilitate closure of Crisp Road, which will serve as a future utility corridor, and the adjoining railroad right-of-way. This boundary change was described on page 1-1 of the Draft ROD, and was accompanied by a footnote that stated:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Fish and Wildlife (Tami Nakahara and Charlie Huang), dated August 23, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1.<br>(cont.)                        | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p><i>"The division of Parcel E into Parcels E and UC-3 was documented in the Proposed Plan in February 2013. Discussions within this ROD that reference documents published prior to February 2013 refer to the portion of Parcel E that excludes Parcel UC-3."</i> The document was not revised in response to this comment.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 2.                                   | <p><b>Page 2-6, Section 2.2 Site Characteristics.</b> The text states, <i>"No threatened or endangered species are known to inhabit Parcel E or its immediate vicinity."</i> This statement is based on biological surveys conducted in 1997, 2001, 2002, and 2004 (Barajas and Associates, 2008), nine or more years ago. The surveys for the San Francisco Redevelopment Agency's (SFRA) recent Environmental Impact Report (SFRA, 2009) were also conducted five or more years ago, in 2007 and 2008. We believe all of these surveys are outdated, because site conditions on and adjacent to HPNS have changed since these surveys were conducted (e.g., due to removal activities, Yosemite Slough Restoration). As a result, State and/or Federally-listed species may now be present in the area. We have previously requested the Navy conduct updated biological surveys according to appropriate survey guidelines at these sites, prior to beginning remedial activities (Huang et al., 2011). The Navy has responded that the previous site-specific ecological assessment are adequate and indicated that additional surveys will not be conducted for Parcel E (Engineering/Remediation Resources Group, Inc. [EERG], 2012). The Navy has not provided CDFW-OSPR with sufficient technical evidence to support their assertion that the previous biological survey results still accurately reflect the current site conditions at Parcel E.</p> <p>The Navy also previously responded to CDFW-OSPR's request for updated biological surveys that, <i>"Although the Navy is not subject to CEQA [California Environmental Quality Act], CEQA is not considered to be a CERCLA ARAR, and the Navy is in no way relying upon CEQA determinations in its decisions ... "</i> (EERG, 2012). Avoidance and minimization measures such as conducting pre-construction biological surveys or having a qualified biological monitor present to prevent impacts to special status species do not pertain specifically to CEQA. These are</p> | <p>The Navy wishes to clarify that there is no promulgated requirement mandating the frequency of biological surveys for the CERCLA remedial action at Parcel E. The past ecological assessments at Parcel E, as documented in the Revised RI Report (Barajas &amp; Associates, 2008), serve as an adequate basis for identifying potential special-status species for future remedial actions, and that the ARARs identified in the Draft ROD for Parcel E are adequate to protect biological resources that have been identified at the site. The Navy does not agree that the recent removal actions or the Yosemite Slough restoration project have changed site conditions at Parcel E in a manner that warrants performing an updated biological survey.</p> <p>The Navy also wishes to clarify that the subject text on page 2-6 of the Draft ROD is consistent with information presented in the Revised RI Report (Barajas &amp; Associates, 2008) and the FS Report (ERRG, 2012). As described in the response to general comment 1, CDFW provided comments on the Draft Final version of the FS Report for Parcel E. The Navy responded to all CDFW comments, and the document was finalized in August 2012, in accordance with Section 7.9 of the HPNS FFA (Navy, DTSC, and Water Board, 1991). Considering the previously approved work, the Navy does not believe that sufficient technical basis exists to support CDFW's request to perform an updated biological survey at Parcel E.</p> <p>As documented in the Final FS Report and Draft ROD, the Navy has previously identified two fully protected bird species (under California Fish &amp; Game Code § 3511) as potentially present at Parcel E, and will implement reasonable measures to ensure adequate protection of fully protected bird species during the remedial action. The Navy will continue to comply with the provisions of the NCP regarding notification and coordination with state natural resources trustees (i.e., CDFW).</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by California Department of Fish and Wildlife (Tami Nakahara and Charlie Huang), dated August 23, 2013** *(continued)*

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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 2.<br>(cont.)                        | considered standard avoidance and minimization measures that have been agreed upon and implemented at various Department of Defense bases during CERCLA activities in order to prevent take and substantively comply with State and Federal natural resource regulations. Although the Navy has not accepted the State or Federal Endangered Species Acts as ARARs at HPNS, they have no authorization for any take of any listed species that may be present on site during future CERCLA activities, including incidental take. CDFW-OSPR will conduct periodic site visits during remedial activities to document any take of State and Federally protected species.                                                                                                                                                                                                | Specifically, the reasonable measures to ensure adequate protection of fully protected bird species will be developed in the RD and remedial action work plan(s), which will be submitted to CDFW for review and comment. Further, the Navy will coordinate with CDFW prior to implementation of such reasonable measures, and understands that CDFW reserves the right to conduct periodic site visits during removal or remedial activities to confirm implementation of avoidance measures. However, the Navy wishes to clarify that the ARARs identified for the Parcel E remedial action (provided in Attachment 4 of the ROD) do not identify specific avoidance and minimization measures for protecting natural resources. Therefore, the Navy believes that it is premature for to identify specific avoidance and minimization measures in the ROD. |
| 2.<br>(cont.)                        | <i>(Follow-on comment received on October 30, 2013)</i><br>Navy's response to CDFW-OSPR's original Specific Comment #2. Although the Navy responded to all CDFW comments on the Draft Final version of the Feasibility Study Report for Parcel E, and the document was finalized in August 2012 in accordance with Section 7.9 of the Hunters Point Naval Shipyard Federal Facilities Agreement, the Navy did not resolve all of CDFW-OSPR's concerns. CDFW-OSPR does not agree with the Navy's assertion that "past ecological assessments at Parcel E, as documented in the Revised RI Report (Barajas & Associates, 2008), serve as an adequate basis for identifying potential special-status species for future remedial actions" and will conduct periodic site visits during remedial activities to document any take of State and Federally protected species. | As described in the response to CDFW specific comment 2, the Navy understands that CDFW reserves the right to conduct periodic site visits during removal or remedial activities to confirm implementation of avoidance measures (that will be developed in the RD and RAWP[s]) and submitted to CDFW for review and comment prior to implementation). However, the Navy reiterates its position that the prior ecological assessments are adequate to identify potential special-status species that require avoidance measures during future remedial actions (in accordance with the ARARs identified in Attachment 4 of the ROD).                                                                                                                                                                                                                         |
| 3.                                   | <b>Page 2-15, Section 2.4.</b> The ROD states that the proposed future land use at the Shipyard Shoreline Open Space District of Parcel E includes recreational used such as wetlands. For purpose of this ROD, how will wetlands be considered for recreational use? Is public access planned for the wetlands?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | The subject text on page 2-15 of the Draft ROD describes potential development activities as identified in the 2010 HPNS Redevelopment Plan (SFRA, 2010). The potential development activities at Parcel E are independent of the Navy's planned remedial action that will be performed pursuant to CERCLA. The document was not revised in response to this comment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Fish and Wildlife (Tami Nakahara and Charlie Huang), dated August 23, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                          | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 4.                                   | <p><b>Page 2-20, Section 2.5.2.3.</b> This section states that metals, polychlorinated biphenyls and total petroleum hydrocarbons may pose a potential risk to aquatic wildlife. Please revise the discussion to include chemicals of potential concern to San Francisco Bay by runoff after the removal actions and add the continuation of this work to the Selected Remedy (Section 2.9).</p> | <p>The Revised RI Report (Barajas &amp; Associates, 2008) concluded that “<i>Migration of chemicals from soil to surface water through transport of solids with overland flow is expected to be limited at most of Parcel E because of the following conditions: (1) most of the storm water runoff is currently controlled by a storm sewer system across Parcel E and in the future will be controlled by engineered drainage swales; and (2) flat surface topography throughout Parcel E inhibits transport of solids with overland flow over significant distances.</i>” Accordingly, the SLERA did not evaluate the risk posed by discharge of surface water runoff to San Francisco Bay and, as a result, this information is not described in Section 2.5.2.3 of the ROD (which focuses on the results of the SLERA for shallow groundwater discharging into San Francisco Bay). However, as described in Section 2.5.3 of the ROD, the potential direct exposure of humans to soil contamination throughout Parcel E prompted the Navy to select an approach that removes the soil areas that posed the most significant risk to humans and contains the remaining soil areas that posed a lower risk to human.</p> <p>The Revised RI Report also concluded that the transport of shallow groundwater to San Francisco Bay was a primary contaminant migration pathway. The potential risk associated with this migration pathway was further evaluated in the Final FS Report (ERRG, 2012) and the results of the risk evaluation were summarized in Section 2.5.2.3 of the ROD. As described in Sections 2.5.3 and 2.7, the results of this risk evaluation informed the selected remedy, which will address the potential risks through actions involving removal, treatment, containment, monitoring, and ICs (to satisfy the RAOs identified in Section 2.7). Once the selected remedy for Parcel E is properly implemented, as briefly described in Section 2.9.2, the Navy will continue to monitor and maintain the remedy to ensure that it is protective of aquatic wildlife in San Francisco Bay. The monitoring and maintenance activities will ensure compliance with the ARARs identified in Attachment 4 of the ROD, which include erosion control requirements for the final covers. The document was not revised in response to this comment.</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by California Department of Fish and Wildlife (Tami Nakahara and Charlie Huang), dated August 23, 2013 (continued)**

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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 5.                                   | Page 2-21, Section 2.5.3 Basis for Response Action. The text states, "Following cleanup of ROCs [radionuclides of concern] within 1 foot of the existing ground surface, a cover (comprising clean imported soil and geosynthetic material) and institutional controls would effectively prevent unacceptable exposures to remaining concentrations of ROCs." Please include adequate maintenance and monitoring with the cover and institutional controls, as ways to prevent unacceptable exposures to remaining ROCs.                                                                                                     | The subject text in Section 2.5.3 was revised as follows: <i>"Following cleanup of ROCs within 1 foot of the existing ground surface, a cover (comprising clean imported soil and geosynthetic material <u>that would be inspected and maintained</u>) and institutional controls would effectively prevent unacceptable exposures to remaining concentrations of ROCs."</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 6.                                   | <p><b>Page 2-24, Section 2.7. Groundwater RAOs [Remedial Action Objectives].</b> The corresponding "surface water quality criteria for aquatic wildlife" to which this RAO applies appears in Table 6, Aquatic Wildlife Exposure to A-Aquifer Groundwater</p> <p>a. Given that groundwater discharges to the bay past the interface of the A-aquifer and that there are many other contaminants of concern (COCs) for A-aquifer identified for construction workers, these COCs (and perhaps others) should also be identified for aquatic wildlife and added to the "aquatic wildlife exposure scenario" under Table 6.</p> | <p>a. The potential risk associated with the discharge of A-aquifer groundwater to San Francisco Bay was evaluated in the Final FS Report (ERRG, 2012), and the results of the risk evaluation were briefly summarized in Section 2.5.2.3 of the ROD. Consistent with the methods used in recent FS reports at other HPNS parcels, the Navy developed trigger levels as conservative comparison values for chemicals in groundwater to indicate when additional evaluation may be necessary (because of the potential for migration of chemicals in groundwater at concentrations that could pose a risk to aquatic wildlife in the bay). The development of trigger levels is briefly described in this response, and Section 2.5.2.3 of the ROD includes an electronic reference to more detailed information (from Appendix A of the Final FS Report) on the development of trigger levels. The trigger levels were developed for specific groundwater plumes by applying attenuation factors to pertinent surface water quality criteria (as identified in the Basin Plan and CTR and, for select metals, adjusted for ambient levels). The attenuation factors vary based on several parameters (most notably, width of the contaminant plume and distance to the bay) and provide a conservative estimate of the advection and dispersion that reduces chemical concentrations as groundwater moves from an inland location to the bay. The Navy developed the trigger levels for individual groundwater plumes because a direct comparison of groundwater data with surface water quality criteria was not appropriate (because they are different environmental media). The Navy established RGs for total TPH in groundwater at IR-03 to ensure consistency with the approach developed at other HPNS parcels (groundwater at IR-03 contains both TPH and CERCLA-regulated chemicals and is therefore addressed by the CERCLA remedy).</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Fish and Wildlife (Tami Nakahara and Charlie Huang), dated August 23, 2013 (continued)**


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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 6.<br>(cont.)                        | <p>b. The San Francisco Water Quality Control Board (2008) has developed water quality criteria for the protection of marine aquatic life (Table F-2b). These values should be incorporated into Table 6. For example, arsenic is listed earlier as a COC to construction workers, and the corresponding remedial goal is 39 ug/L. The Criteria Continuous Concentration for arsenic is 36 ug/L (vs. 39 ug/L) (SF Water Board, 2008; California Toxics Rule). The Final Surface Water Screening Level, which corresponds to the Marine Aquatic Habitat Goal for benzo(a)anthracene is 0.0027 ug/L. The Remediation Goal in Table 6 of 0.65 ug/L is not protective of marine aquatic life. Please rectify this table for other COCs by providing values that are protective of marine aquatic life.</p> | <p>The RGs for total TPH vary based on distance from the bay, starting with the minimum acceptable concentration for nearshore groundwater (1,400 ug/L). Section 2.7 was revised to explain why RGs were not established for chemicals found in A-aquifer groundwater at concentrations that may pose a risk to aquatic wildlife: <u>“Remediation goals were not developed for COECs in groundwater because, except for total TPH, the water quality criteria referenced in the groundwater and NAPL RAOs are based on standards for aquatic wildlife in San Francisco Bay, apply to surface water at the interface of A-aquifer groundwater, and do not apply to in-situ A-aquifer groundwater at Parcel E. Plume-specific trigger levels will be used as groundwater monitoring criteria to evaluate the potential risk to aquatic wildlife in San Francisco Bay, but the RD may develop alternative monitoring criteria (using refined fate and transport modeling) to more rigorously assess the groundwater-to-surface water transport mechanism.”</u> Please refer to the response to EPA specific comment 18 for additional information. Table 6 was not revised in response to this comment.</p> <p>b. As explained in the response to “part a” of this comment, Section 2.7 was revised to explain why RGs were not established for chemicals found in A-aquifer groundwater at concentrations that may pose a risk to aquatic wildlife. Please refer to the response to EPA specific comment 18 for additional information. Table 6 was not revised in response to this comment.</p> |
| 6.<br>(cont.)                        | <p>(Follow-on comment received on October 30, 2013)</p> <p>Navy's response to CDFW-OSPR's original Specific Comment #6(a). CDFW-OSPR reviewed the criteria that were used to derive the trigger-levels – the water quality criteria for many heavy metals are water-hardness dependent. There are equations in the California Toxics Rule (accepted as an ARAR) and the US EPA Water Quality Criteria where one can plug-in the site-specific water hardness to come up with the correct criteria that is adjusted for water hardness, because toxicity for these metals have shown to be hardness-dependent.</p>                                                                                                                                                                                      | <p>The Navy wishes to clarify that the only hardness-dependent criteria specified in the CTR pertain to select metals in fresh water. Specifically, the CTR states that: <u>“Freshwater aquatic life criteria for certain metals are expressed as a function of hardness because hardness and/or water quality characteristics that are usually correlated with hardness can reduce or increase the toxicities of some metals.”</u> The water quality criteria that apply to discharges into San Francisco Bay are saltwater criteria that are not dependent on hardness. Accordingly, the ROD was not revised in response to this comment.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Fish and Wildlife (Tami Nakahara and Charlie Huang), dated August 23, 2013 (continued)**


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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 6.<br>(cont.)                        | <p>The values in the trigger-table (from the 2012 Final Parcel E Feasibility Study's Appendix A - Evaluation of Migration of Chemicals in Groundwater to the Aquatic Environment) do not indicate that they will be adjusted for water-hardness or that water-hardness has any role in this. The water quality criteria uses a default of 100 CaCO<sub>3</sub> mg/L as a placeholder but it must be adjusted because without knowing the water hardness, the criteria can under-estimate or over-estimate the toxic threshold. While CDFW-OSPR acknowledges and appreciates that the Navy already states that "...the RD may develop alternative monitoring criteria (using refined fate and transport modeling) to more rigorously assess the groundwater-to-surface water transport mechanism", please revise the RTC matrix to additionally clarify that the receptor water body's specific water hardness (Bay-specific water hardness) will also be used to refine the trigger-level in the RD (or footnote it under Table 6 of the ROD for example).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>The Navy also wishes to clarify that the response to CDFW specific comment 6 was revised to better explain the derivation of the trigger levels (as presented in Appendix A of the Final FS Report [ERRG, 2012]). This additional information was developed based on verbal input provided by CDFW (during a telephone conference on October 23, 2013).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 7.                                   | <p><b>Page 2-44, Section 2.9.2.1 Removal, Treatment, and Containment of Soil and Shoreline Sediment (Alternative S-4).</b> CDFW-OSPR still disagrees that the "durable covers", consisting of a 2-foot thick soil cover or the 2-foot soil cover over geosynthetic material, will be sufficient to prevent burrowing animals from breaching the cover and exposing the remaining contaminants. The Navy to date, has not provided sufficient technical evidence to show that burrowing animals present at HPNS (i.e., gophers, ground squirrels, etc.) will be unable to breach the 2-foot thick soil cover. CDFW-OSPR also reiterates that, similar to the situation at Parcel E-2, the Navy has not provided sufficient technical evidence to support their position that biotic barriers are not necessary at Parcel E (i.e., results from research studies that have specially examined and documented that burrowing animals cannot breach geosynthetic materials) (Huang and Nakahara, 2012).</p> <p>CDFW-OSPR has previously requested details on how the Navy will ensure the cover will not be damaged by burrowing animals and how it will be maintained in perpetuity (Huang et al., 2011), in order to determine whether the remedy is and will continue to be protective of ecological receptors. The Navy is not willing to provide this information until the Remedial Design phase, after the ROD has been finalized. CDFW-OSPR again reiterates our position that we do not support the use of pesticides to control burrowing animals in order to protect "durable covers". Pesticides have the ability and</p> | <p>The Navy acknowledges this comment but wishes to clarify the following points that were previously stated in responses to CDFW's comments on the Draft Final FS Report (ERRG, 2012):</p> <ul style="list-style-type: none"> <li>• The covers will be subject to post-closure inspections, maintenance, and monitoring necessary to prevent potential unacceptable exposure to humans and comply with pertinent ARARs. The planned maintenance activities will be detailed in the O&amp;M plan (to be prepared in conjunction with the RD).</li> <li>• The covers are not required to address potential risk to ecological receptors. The Revised RI Report concluded that risk to terrestrial wildlife is not significant and does not warrant a response action based only on ecological concerns. The Revised RI Report, which included this risk management decision, was finalized in May 2008 (Barajas &amp; Associates, 2008) in accordance with Section 7.9 of the HPNS FFA (Navy, DTSC, and Water Board, 1991).</li> </ul> <p>In addition, CDFW's comments on the Draft Final FS Report, as well as CERCLA documents prepared for Parcel E-2, imply that a final cover without a biotic barrier consisting of cobbles would require significant long-term maintenance (to repair damage from burrowing animals) and suggest that a biotic barrier is a requirement for any soil cover used to properly contain contaminated material.</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by California Department of Fish and Wildlife (Tami Nakahara and Charlie Huang), dated August 23, 2013 (continued)**


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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 7.<br>(cont.)                        | are known to kill non-target species. For this reason, CDFW-OSPR recommends the inclusion of biotic barriers with all soil covers. If the Navy or the Successor Agency, to which the land is transferred, use pesticides, they do so without the approval of CDFWOSPR, and will be required to conduct biological surveys which include pre-application burrow inspections to prevent impacts to non-target species. The Navy or Successor Agency will be required to document all take of target and non-target species. If take of non-target species occurs, the Navy or Successor Agency may be in violation of State and/or Federal regulations. Based on the issues outlined above, CDFW-OSPR cannot concur that the selected soil cover design will be protective of ecological receptors. This comment is for the DTSC project manager and the administrative record. | <p>Consistent with the responses to similar CDFW comments on the Parcel E-2 ROD (Navy, 2012b), the Navy continues to believe that CDFW has not presented sufficient technical information to support its assertion that burrowing animals would cause significant damage to the soil cover over time, or that a biotic barrier is a requirement for any soil cover used to properly contain contaminated material. Based on this information, the Navy does not believe that sufficient technical basis exists to support CDFW's request for changes to incorporate biotic barriers into the design of the soil covers.</p> <p>As described in the response to specific comment 2, the Navy has previously identified two fully protected bird species (under California Fish &amp; Game Code § 3511) as potentially present at Parcel E, and will implement reasonable measures to ensure adequate protection of fully protected bird species during the remedial action. The reasonable measures will be developed the RD and remedial action work plan(s), which will be submitted to CDFW for review and comment. The Navy wishes to clarify that the ARARs identified for the Parcel E remedial action (provided in Attachment 4 of the ROD) do not identify specific avoidance and minimization measures for protecting natural resources. Therefore, the Navy believes that it is premature for to identify specific avoidance and minimization measures in the ROD.</p> |
| 7.<br>(cont.)                        | <p>(Follow-on comment received on October 30, 2013)</p> <p>Navy's response to CDFW-OSPR's original Specific Comment #7. CDFW-OSPR will conduct periodic site visits during post-closure inspections, operations, maintenance, and monitoring activities to document any take of State and Federally protected species.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | The Navy acknowledges this comment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 8.                                   | <b>Table 7.</b> CDFW-OSPR checked the remedial goals (RGs) for radionuclides in soil originally developed to be protective of human health to determine whether they are also protective of ecological receptors as well. The proposed RGs are much lower than the generic biota concentration guides in soil, where absorbed doses should not exceed 1 rad/d (10 mGy/d) in terrestrial plants and 0.1 rad/d (1 mGy/d) in animals, respectively, from exposure to radiation or radioactive material (U.S. Department of Energy, 2002).                                                                                                                                                                                                                                                                                                                                        | The Navy acknowledges this comment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by San Francisco Bay Regional Water Quality Control Board (Tina Low) dated August 15, 2013**

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| 1.                 | <b>2.1 Site Description and History (p. 2-4):</b> The last sentence of the page refers to Figure 2 as showing the future open space areas adjoining Parcel E-2. Please correct the text to refer to Figure 4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | The text was revised to refer to the correct figure (now referred to as Figure 5).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 2.                 | <b>Figure 4 Reuse Areas:</b> Please revise the figure to clarify that the footprint of the existing buildings is included in the MU-1, MU-2, and MU-3 reuse areas. The gray shading shown for the building suggests the footprints are excluded from the Multi-Use Districts (which are shaded in purple).                                                                                                                                                                                                                                                                                                                                                                                                                             | The subject figure (now referred to as Figure 5) was revised to remove the existing features (both buildings and road edges).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 3.                 | <b>2.3.1 Nonradioactive Chemicals in Soil and Shoreline Sediment (p. 2-13):</b> The bases of screening criteria used in the Remedial Investigation (RI) for chemicals in soil and shoreline sediment are not clear in this paragraph. The hyperlink (reference 10) summarizes the findings of the screening process, but does not describe the methodology. Please briefly describe the RI screening process methodology in the text of this section, or include a hyperlink reference that describes the RI screening process.                                                                                                                                                                                                        | The subject reference was revised to include Table 4-1 from the Revised RI Report (Barajas & Associates, Inc., 2008), which identifies (and describes the basis for) all screening criteria used in the RI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 4.                 | <b>2.3.2 Nonradioactive Chemicals in Groundwater and Figure 7 Groundwater Plumes (p. 2-13):</b> Please clarify what the term “primary groundwater plumes” means. Do primary plumes refer to plumes with chemical concentrations corresponding to risks above 1 in 1,000,000? Figure 7 does not include all of the groundwater plumes described in the Remedial Investigation (Figures ES-3 through ES-5 of the RI). Why are the IR-12 nickel and IR-05 metals plumes not included in Figure 7? Please revise Figure 7 to include these plumes, or clarify in the text why they are excluded. Also, please include a discussion of the IR-39 benzene plume and state that the benzene plume will be addressed in the Petroleum Program. | <p>Section 2.3.2 was revised for clarity as follows: <i>“Figure 7 shows the primary groundwater plumes at Parcel E that required further evaluation in the FS Report (as determined by based on the risk evaluations described further in Section 2.5). An additional groundwater plume, which contained benzene, was identified in IR-39. This plume, however, is attributed to past releases from the underground storage tanks at Building 709 (former Navy exchange gas station), thus it is being addressed under the Navy’s TPH corrective action program.”</i></p> <p>In addition, Section 2.5.2.3 was revised to clarify the conclusions of the risk evaluation for the metals plumes at IR-05 and IR-12 as follows: <i>“Figure 8 identifies the groundwater plumes where these chemicals are present at concentrations exceeding the corresponding trigger levels. Two additional groundwater plumes, which contained metals, were identified at IR-05 and IR-12; however, groundwater concentrations at these plumes did not exceed the corresponding trigger levels, thus the plumes did not require further evaluation in the FS Report.”</i></p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by San Francisco Bay Regional Water Quality Control Board (Tina Low) dated August 15, 2013 (continued)**

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| 5.                 | <p><b>2.3.3 NAPLs at IR-03 (p.2-14):</b> This section states that “past site inspections have not identified any open discharge of NAPL to San Francisco Bay.” Please clarify what is meant by “open discharge” or delete the sentence. Without clarification, this statement implies there is no discharge of NAPL to San Francisco Bay. Suggested edit: “However, NAPL appears to be a continuing source to groundwater contamination, as evidenced by elevated chemical concentrations (most notably TPH and PCBs) in groundwater that may pose a risk to aquatic life in the bay...Groundwater monitoring wells located adjacent to the bay (bayside of the sheet pile wall) contain measureable NAPL, indicating potential for NAPL to be discharging to San Francisco Bay.” Please also revise section 2.6 Principle Threat Waste accordingly.</p> | <p>The term “open discharge” was meant to refer to the lack of any exposed/uncontrolled release of NAPL from IR-03 to the San Francisco Bay. However, the subject text was deleted as requested, and the revised language is as follows: <i>“The high viscosity of NAPL limits its mobility; <del>and past site inspections have not identified any open discharge of NAPL to San Francisco Bay.</del> However, NAPL appears to be a continuing source to groundwater contamination, as evidenced by elevated chemical concentrations (most notably TPH and PCBs) in groundwater that may pose a risk to aquatic wildlife in the bay (discussed further in Section 2.5). In addition, groundwater monitoring wells located adjacent to the shoreline (bayside of the sheet-pile wall) contain measureable NAPL, indicating that NAPL could discharge to San Francisco Bay.”</i></p> <p>In addition, Section 2.6 was revised to eliminate use of the term “open discharge,” and the revised language is as follows: <i>“However, as described in Section 2.3.3, the high viscosity of NAPL at IR-03 limits its mobility, <del>and past site inspections have not identified any open discharge of NAPL to San Francisco Bay. This information which</del> suggests that containment may be used at IR-03, in combination with removal and treatment, to address the potential risk associated with the NAPL source.”</i></p> |
| 6.                 | <p><b>2.3.4 Radionuclides in Soil, Shoreline Sediment, and Groundwater (p.2-15):</b> This section states that “future monitoring will include analysis for radionuclides in groundwater to demonstrate that radionuclides are not present at activity levels that are both statistically significant and pose an unacceptable risk to human health and the environment.” How will acceptable activity levels and risks be determined? As there are no remedial goals presented for radionuclides in groundwater, what levels/concentrations will the groundwater monitoring data be compared against?</p>                                                                                                                                                                                                                                                | <p>As described in the response to EPA specific comment 16, the ROD does not specify RGs for radionuclides in groundwater for the following reasons:</p> <ul style="list-style-type: none"> <li>• The objective of a groundwater detection monitoring program is to evaluate the statistical significance of a release from a regulated unit (in this case, the waste to be contained in place at IR-02 and IR-03). Accordingly, it is not necessary to specify numeric RGs in support of a detection monitoring program.</li> <li>• The specification of numeric RGs for radionuclides in groundwater is constrained by the fact that no such criteria exist for the pathway of concern (discharge of groundwater to aquatic wildlife in San Francisco Bay) and that surrogate criteria (drinking water MCLs) do not correlate to a complete exposure pathway (because the potentially impacted shallow groundwater is not a potential source of drinking water).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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**Comments by San Francisco Bay Regional Water Quality Control Board (Tina Low) dated August 15, 2013 (continued)**

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| Comment No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| 6.<br>(cont.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | As stated in Sections 2.7 and 2.9.2.4, the groundwater data for radionuclides will be evaluated for statistical significance in accordance with the substantive provisions of Title 22 Cal. Code Regs. § 66264.98(i). This regulation refers to Title 22 Cal. Code Regs. § 66264.97(e)(8), which identifies a range of potentially acceptable statistical methods that can be used to evaluate the statistical significance of a release from a regulated unit. The RD will develop specific decision criteria for the groundwater detection monitoring program for radionuclides. The document was not revised in response to this comment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| (Follow-on comment received on November 12, 2013)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Response to Water Board Comment #6 (2.3.4 Radionuclides in Soil, Shoreline Sediment, and Groundwater):</b> We have reviewed EPA's comment (dated October 28, 2013) on the issue of the monitoring program for radionuclides in groundwater and concur with EPA's request to revise the ROD to explain how risk-based remediation goals (RGs) for radionuclides in groundwater would be developed if radionuclides are detected in groundwater. As currently written, the ROD's intent, in the event that the detection monitoring program detects radionuclides in groundwater, is unclear. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Please refer to the revised response to EPA specific comment 16 (including the response to the follow-on comment received on October 28, 2013).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 7.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>2.7 Remedial Action Objectives:</b> It is not clear how the remedy will achieve the RAO of "Prevent exposure of humans to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors." Please outline how "future soil gas action levels" would be determined and how data from future soil gas surveys will be used to determine the soil gas action levels. This section further states that active treatment of VOC groundwater plumes would be performed to address unacceptable risk via indoor inhalation of vapors and would achieve the "remediation endpoints." So that the level of groundwater treatment provided by the remedy can be evaluated, please clarify and outline what the groundwater VOC "remediation endpoints" are or how they will be determined. | Section 2.7 was revised to explain how data from the future soil gas survey will be used to evaluate potential vapor intrusion risks. Please refer to the response to EPA specific comment 14 for the proposed text revisions.<br><br>As described in the response to DTSC comment 4, the subject text in Section 2.7 generally describes the actions proposed to address the soil, soil gas, and shoreline sediment RAOs, and was not intended to replace the more detailed discussion of the selected remedy in Section 2.9.2. However, the last paragraph describing the soil, soil gas, and shoreline sediment RAOs (within Section 2.7) was revised to provide a forward reference to Section 2.9.2: " <u>Section 2.9.2 provides further information on the actions required to satisfy the RAOs for soil, soil gas, and shoreline sediment.</u> "<br><br>The Navy wishes to clarify that the term "remediation endpoints" was intended to succinctly describe the point at which active treatment can be transitioned to MNA. Considering the Water Board's comment (and considering that the decision to end active treatment and transition to MNA will be based upon multiple factors), the ROD was revised to eliminate use of the term "remediation |

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**Comments by San Francisco Bay Regional Water Quality Control Board (Tina Low) dated August 15, 2013 (continued)**


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| Comment No.               | Comment | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| 7.<br>(cont.) (see above) |         | <p>endpoints” and replace it with a more thorough description of the process by which active treatment of VOC groundwater plumes will be transitioned to MNA. The revised text is consistent with Navy policy and guidance for optimizing remedial actions (Navy, 2012a; Battelle, 2010 and 2012). Specifically, Section 2.9.2.2 was revised for clarity as follows: “<del>The injection process will be developed in the RD to achieve remediation endpoints (to be specified in the RD) that will signify the completion of the active treatment and the beginning of MNA (to ensure that natural processes are degrading the remaining VOCs).</del> and will be implemented in a manner that allows for regular optimization so that the RAOs are met in a timely, cost-effective manner while minimizing negative environmental effects (e.g., energy consumption, greenhouse gas emissions, and accident risk). The optimization process will be informed by performance monitoring data for various factors that are critical to successful in-situ treatment (e.g., changes in VOC concentrations within the groundwater plume, and geochemical conditions that are conducive to natural degradation of VOCs). Potential optimization measures may include modifying the amount or type of treatment material, or modifying the injection method to improve the distribution of the treatment chemicals. Active treatment will be performed until the technology is no longer the most cost-effective or environmentally sustainable option, at which point a recommendation will be made to transition to MNA. The recommended transition to MNA, which would be subject to approval by the FFA signatories, will need to demonstrate that natural processes are adequately degrading the remaining VOCs (to allow RAOs to be achieved in a timely manner), and that continued active treatment would be less cost-effective and environmentally sustainable (in comparison to MNA).”</p> <p>A portion of Section 2.9.2.3 (regarding active treatment of groundwater at IR-03) was revised in a similar manner as Section 2.9.2.2. In addition, Sections 2.7 and 2.9.3 were revised to clarify the basis for which active treatment will be transitioned to MNA (and to provide a cross-reference to the more detailed discussion in Section 2.9.2).</p> |

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**Comments by San Francisco Bay Regional Water Quality Control Board (Tina Low) dated August 15, 2013 (continued)**


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| Comment No.   | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| 7.<br>(cont.) | <p data-bbox="275 367 852 397"><i>(Follow-on comment received on November 12, 2013)</i></p> <p data-bbox="275 407 1108 708"><b>Response to Water Board Comment #7: (Issue: remediation endpoints).</b> The Navy's response does not completely address the comment. We understand that actions and decisions to address the indoor inhalation of vapors in a mixed use scenario will be based on soil gas data and the soil gas action levels. We also understand that VOCs in groundwater are a likely source of VOCs in soil gas, and the remedy will remove VOCs in groundwater through active treatment and monitored natural attenuation (MNA). Furthermore, until soil gas surveys demonstrate there are no unacceptable risks via indoor inhalation, Institutional Controls will be required to prevent exposure.</p> <p data-bbox="275 719 1108 1266">We requested clarification of the term <i>remediation endpoints</i> so that the ROD is clear that active treatment of groundwater VOC plumes followed by MNA is the groundwater remedy that addresses indoor inhalation. The concern is that active treatment may be discontinued prematurely (before treatment has been optimized and maximized), while unacceptable soil gas levels persist, and while groundwater concentrations and conditions are not conducive to MNA achieving RAOs in a reasonable timeframe. To address this concern, we suggest a regulatory concurrence step prior to discontinuing active treatment and transitioning to MNA. Suggested edit to Section 2.9.2.2 (Treatment and Containment of Groundwater): "The injection process will be developed in the RD to achieve remediation endpoints (to be specified in the RD) that will signify the completion of the active treatment and the beginning of MNA (to ensure that natural processes are degrading the remaining VOCs.) <u>The remediation endpoints will be developed to demonstrate that treatment has been optimized and maximized (e.g., percent reduction or other technical criteria) or that acceptable soil gas levels have been achieved. There will be a regulatory review and concurrence step prior to discontinuing active groundwater treatment.</u>"</p> | <p>The Navy agrees with the Water Board's concern regarding the proper evaluation of site conditions prior to ending active treatment of VOC groundwater plumes and transitioning to MNA. The Navy also agrees that the transition to MNA should be subject to concurrence by the FFA signatories. To address these concerns, the ROD was revised to eliminate use of the term "remediation endpoints" and replace it with a more thorough description of the process by which active treatment of VOC groundwater plumes will be transitioned to MNA. The revised text is consistent with Navy policy and guidance for optimizing remedial actions (Navy, 2012a; Battelle, 2010 and 2012), and is summarized in the revised response to Water Board comment 7.</p> |

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**Comments by San Francisco Bay Regional Water Quality Control Board (Tina Low) dated August 15, 2013 (continued)**

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| 8.                 | <p><b>Issue: Soil gas survey and soil gas action levels:</b> Please clarify, in all relevant sections of this ROD (2.7 Remedial Action Objectives and 2.9.2), the scope and purpose of the soil gas survey and include discussion of the soil gas survey in Section 2.9.2. The Feasibility Study (Section 3.1.1.1) states that “a focused soil gas survey is currently being implemented to identify locations where concentrations of COCs in soil gas may exceed SGALs and to evaluate the extent of the VOC area requiring institutional controls.” Has this survey been completed? Please revise relevant portions of the text to clarify that soil gas monitoring will be conducted to: 1) evaluate locations where concentrations of VOCs in soil gas (from soil or groundwater sources) may pose unacceptable risk via indoor inhalation of vapors; and 2) evaluate progress of groundwater treatment of VOC plumes towards meeting RAOs.</p> | <p>Section 2.7 was revised to explain how data from the future soil gas survey will be used to evaluate potential vapor intrusion risks. Please refer to the response to EPA specific comment 14 for the proposed text revisions.</p> <p>Section 2.9.2.1 was revised to describe the future soil gas survey at Parcel E. Please refer to the response to DTSC comment 5 for the proposed text revisions. In addition, the text in Section 2.9.2.1 describes the planned soil gas monitoring at areas of known VOC contamination as follows: <i>“Following active treatment, soil gas monitoring will be performed at Building 406, and VOC groundwater plumes requiring treatment (as described in Section 2.9.2.2), to <u>ensure that chemicals in soil gas are not present at concentrations greater than evaluate soil gas concentrations relative to risk-based action levels (as described in Section 2.7).</u>”</i></p> <p>The soil gas survey at Parcel E has not been completed, and the previous text in the Final FS Report (ERRG, 2012) (which used the term “currently”) referred to the soil gas surveys that were initiated in Parcels B, D-1, G, and UC-2 and were intended as the first phase of a multi-phase soil gas survey.</p> |
| 8.<br>(cont.)      | <p>(Follow-on comment received on November 12, 2013)</p> <p><b>Response to Water Board Comment #8 (Issue: Soil gas surveys and soil gas action levels):</b> We concur with EPA’s supplemental comment #2 (dated October 28, 2013), including the suggested text edit for Section 2.9.2.1 of the ROD.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>As described in the response to EPA supplemental comment 2 (dated October 28, 2013), Section 2.9.2.1 was revised to incorporate portions of EPA’s suggested text regarding the future soil gas survey at Parcel E. Please refer to the revised responses to DTSC comment 5 and SFDPH specific comment 22 for the proposed text revisions.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 9.                 | <p><b>2.7 Remedial Action Objectives- Groundwater RAOs (p.2-24):</b></p> <p>a. Suggested edit for the sentence following the bulleted list: “The RAOs for groundwater would be satisfied through actions involving treatment, containment, monitoring, and institutional controls.”</p> <p>b. How will attainment of the 3rd bulleted RAO, “Prevent or minimize migration of arsenic, copper, lead, nickel, zinc, Aroclor-1254, Aroclor-1260, alpha-chlordane, and 4,4’-DDE to prevent discharge (into San Francisco Bay) that would result in concentrations exceeding corresponding surface water quality criteria for aquatic wildlife”, be measured or evaluated? Will the</p>                                                                                                                                                                                                                                                                   | <p>(a) The subject sentence in Section 2.7 was revised as suggested.</p> <p>(b) The subject text in Section 2.7 generally describes the actions proposed to address the groundwater RAOs, and was not intended to replace the more detailed discussion of the selected remedy in Section 2.9.2. The text in Section 2.9.2.2 was revised (as well as Section 2.9.2.3) to more accurately describe the monitoring approach for groundwater plumes located near San Francisco Bay, consistent with the approach presented in the Parcel E-2 ROD. This approach uses plume-specific trigger levels as groundwater monitoring criteria to initially evaluate the potential risk to aquatic wildlife</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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**Comments by San Francisco Bay Regional Water Quality Control Board (Tina Low) dated August 15, 2013 (continued)**

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9.<br>(cont.)      | Navy, in consultation with regulatory agencies, develop monitoring criteria for groundwater and perform fate and transport modeling during the remedial design phase (consistent with the approach presented in the Parcel E-2 ROD)? Please revise the text to clarify.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | in San Francisco Bay, and may use alternative monitoring criteria (using refined fate and transport modeling) to more rigorously assess the groundwater-to-surface water transport mechanism. In addition, the last paragraph describing the groundwater RAOs (within Section 2.7) was revised to provide a forward reference to Section 2.9.2: <u>“Section 2.9.2 provides further information on the actions required to satisfy the RAOs for groundwater.”</u>                                                                                    |
| 10.                | <b>2.7 Remedial Action Objectives- RAOs for NAPL at IR-03 (Former Oily Waste Ponds) (p. 2-25):</b> Consistent with the language in the Feasibility Study, please insert a sentence after the bulleted list (at the top of page 2-25) clarifying that the COCs in soil and groundwater at IR-03 would be subject to the RAOs established for soil, soil gas, and groundwater.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | The subject text was revised to include the following sentence: <u>“The COCs and COECs in soil, soil gas, shoreline sediment, and groundwater at IR-03 would be subject to the pertinent RAOs, as previously described.”</u>                                                                                                                                                                                                                                                                                                                        |
| 11.                | <b>Table 6 Remediation Goals for Groundwater:</b> Biological treatment of groundwater containing TCE will produce daughter products. Therefore, RGs for TCE daughter products ( <i>cis</i> -1,2,-DCE, <i>trans</i> -1,2,-DCE, and vinyl chloride) should be included in Table 6. The groundwater RGs should be protective of all applicable exposure scenarios.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | The subject table (now referred to as Table 7) was revised to include RGs for daughter products of TCE. The groundwater RGs are focused on construction worker exposure to A-aquifer groundwater and domestic use exposure to B-aquifer groundwater. RGs are not established for vapor intrusion exposure to A-aquifer groundwater because, as discussed in Section 2.7, actions and decisions to address the indoor inhalation of vapors will be based on soil gas data and the soil gas action levels.                                            |
| 11.<br>(cont.)     | (Follow-on comment received on November 12, 2013)<br><b>Response to Water Board Comment #11 (Table 6 Remediation Goals for Groundwater):</b> We appreciate the Navy’s revision of Table 6 (now Table 7) to include groundwater RGs for TCE daughter products. In the now Table 7, the RGs for some chemicals of concern (COCs) under the Construction Worker exposure scenario differ from the RGs stated in the Feasibility Report. Please add a footnote to the table to explain the difference. In addition, under the Domestic Use exposure scenario, please list each form of dichloroethene (DCE) separately and revise the respective RGs to California MCLs (i.e., 1,1-DCE with RG of 6 ug/L, <i>cis</i> -1,2-DCE with RG of 6 ug/L, and <i>trans</i> -1,2-DCE with RG of 10 ug/L). The table currently lists “1,2-dichloroethene (total)” as a COC with a RG of 210 ug/L. | Table 7 was revised as requested. Specifically, Table 7 was revised to include a footnote explaining that select RGs for A-aquifer groundwater (based on the construction worker exposure scenario) were reduced slightly (relative to the risk-based criteria in the FS Report) to ensure consistency with the ROD for HPNS Parcel C. Table 7 was also revised to specify RGs for 1,1-dichloroethene, <i>cis</i> -1,2-dichloroethene, and <i>trans</i> -1,2-dichloroethene in the B-aquifer that are consistent with the State of California MCLs. |

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**Comments by San Francisco Bay Regional Water Quality Control Board (Tina Low) dated August 15, 2013** *(continued)*

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Response</b>                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12.                | <b>2.9.2.1 Removal, Treatment, and Containment of Soil and Shoreline Sediment (Alternative S-4):</b> We understand that Alternative S-4 entails excavation of soil where COCs are present at concentrations exceeding 5 times applicable RGs. Because RGs differ for each exposure scenario (residential, recreational, construction worker), please clarify the basis for determining Tier 1 and Tier 2 locations at each reuse area by including a table that lists each reuse area, corresponding exposure scenario, and corresponding Tier 2 action level (i.e., hot spot remediation goal). A table similar to Table 4 of the Parcel E-2 ROD would be helpful in conveying this information. Including this clarification would assist in describing the material that will be excavated and disposed of offsite as a result of this remedy. | As requested, a new table (referred to as Table 4) was added to the ROD to identify the COCs and soil action levels associated with the Tier 1 and Tier 2 locations at the open space and mixed use reuse areas. Similar to the Parcel E-2 ROD, this table is introduced within Section 2.5.3 of the ROD. |

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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013**

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| <b>Comment No.</b>       | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <i>General Comment</i>   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 1.                       | We would like to point out for the record that once the engineering controls and institutional controls are properly installed and maintained, the current design of the proposed remedies will cut off pathways for a) contact with soil contaminants and b) inhalation of indoor VOC vapors, and this means that the entire property will be health-protective for all types of uses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | The Navy acknowledges this comment but wishes to clarify that, as stated in Section 2.9.2.5 of the Draft ROD, areas designated for open space reuse will be subject to land use restrictions. While the Draft ROD provides flexibility to request approval (from the FFA signatories and CDPH) for alternative land uses in areas designated for open space reuse, the Navy does not believe that the noted statement that “ <i>the entire property will be health-protective for all types of uses</i> ” accurately reflects the selected remedy for Parcel E.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2.                       | <b>Figure 9, Figure 10 and Descriptions of Alternative S-4 throughout the document</b> The description of Alternative S-4 is confusing. Is the Navy planning to excavate all Tier 1 areas, defined as an already identified exceedance of greater than ten times the RG, using confirmation sampling so that the contamination in that excavation area is removed if the target COC that is being excavated exceeds five times the RG? And also excavate the Tier 2 areas, defined as an already identified exceedance of greater than five times the RG, using confirmation sampling so that the contamination in that excavation area is removed if the target COC that is being excavated exceeds five times the RG? The end result being that all Tier 1 and Tier 2 areas will have contamination removed so that the remaining contamination will be less than five times the RG? | Following removal of Tier 1 and Tier 2 locations, the remaining chemical concentrations at these locations will not exceed the soil action levels (which are defined as five times the corresponding RGs). The first sentence of Section 2.9.2.1 accurately describes the proposed approach: “ <i>Alternative S-4 includes excavation of Tier 1 and Tier 2 locations where remediation goals are exceeded (by more than five times) with offsite disposal at a permitted disposal facility.</i> ”<br>Section 2.9.2.1 was revised to further clarify the excavation approach as follows: “ <u><i>The RD will also specify the collection of soil confirmation samples <del>would be collected</del> to ensure that the Tier 1, Tier 2, and TPH locations are adequately removed, so remaining chemical concentrations at these locations do not exceed the soil action levels (corresponding to 5 times the remediation goals; see Table 4) or the petroleum source criterion (3,500 mg/kg of total TPH).</i></u> ” The revised text includes reference to a new table (referred to as Table 4) that summarizes the soil action levels and was included at the request of the Water Board. |
| <i>Specific Comments</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 3.                       | <b>Section 1.1 Selected Remedy, Soil, Soil Gas, and Shoreline Sediment, page 1-3, second bullet</b> You have used the word “eliminate” in this bullet and we think that is misleading to the reader. There are many areas of Parcel E, particularly in the Shipyard South Multi-Use District, where there will be multiple removals and re-installation of the durable cover during future redevelopment and maintenance activities and potential exposure to residual                                                                                                                                                                                                                                                                                                                                                                                                                 | The subject bullet item was revised as follows: “ <i>Install durable covers (consisting of either asphalt or soil) throughout Parcel E to <del>eliminate-prevent the exposure pathways to remaining contaminants in soil</del></i> ”. Similar revisions were made to the bullet items describing the shoreline protection (required to prevent exposure to contaminants in shoreline sediment) and the soil cover at IR-02 and IR-03 (required to prevent exposure to radionuclides in soil).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013 (continued)**


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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 3.<br>(cont.)                        | ubiquitous metals and other low level contaminants left below the ROD cleanup goals. And this exposure is anticipated and allowed because the residual levels will not cause a health concern during these types of activities. The handling of the soil under the durable cover in the Shipyard South Multi-Use District will not require any special soil handling requirements other than normal construction practices (e.g. minimize, monitor and control dust). The word you used in the Proposed Plan for this item was “prevent”. We think this summarizes the issue better.                                                                | The Navy wishes to clarify that future land-disturbing activities (such as excavation below the durable cover) are subject to restrictions that are detailed in Section 2.9.2.5 of the Draft ROD. While the Draft ROD provides flexibility to perform such activities, in accordance with documentation approved by the FFA signatories and CDPH, the Navy does not believe that the noted statement that “ <i>handling of the soil under the durable cover in the Shipyard South Multi-Use District will not require any special soil handling requirements other than normal construction practices</i> ” accurately reflects the selected remedy for Parcel E. |
| 4.                                   | <b>Section 2.3.2, Nonradioactive Chemicals in Groundwater, page 2-13 and Section 2.5, Summary of Site Risks, page 2-16:</b> The word atmosphere appears to be used to mean air – which could be described further as indoor or outdoor air. Would it be useful to specify so it is completely clear? The page 2-13 sentence could be reworded to state “... and volatilization of A-aquifer groundwater (in areas within VOC plumes) into <del>the atmosphere</del> outdoor and/or indoor air.” The page 2-16 sentence could be reworded to state “volatilization from soil or groundwater to <del>the atmosphere</del> outdoor and/or indoor air.” | The subject sentence was revised as follows: “ <i>Primary potential migration pathways for contaminated groundwater include migration and discharge of A-aquifer groundwater into San Francisco Bay and volatilization of A-aquifer groundwater (in areas within VOC plumes) into <u>the atmosphere-soil gas and then indoor air.</u></i> ” A similar edit was made to Section 2.5 based on input received from DTSC.                                                                                                                                                                                                                                             |
| 5.                                   | <b>Section 2.3.2, Nonradioactive Chemicals in Groundwater, last sentence and Figure 7, page 2-13:</b> It appears you are missing the IR-12 nickel plume (identified in the FS Figure 2-5) on Figure 7. Please reword the last sentence to state “Figure 7 shows the <del>primary</del> groundwater plumes at Parcel E that are associated with potential risk exposure pathways as described in Section 2.5 <del>(based on the risk evaluations)</del> .” Please also add the following, “ <i>Please note that the IR-39 benzene plume is scheduled for cleanup under the Petroleum Hydrocarbon Corrective Action Plan.</i> ”                       | Section 2.3.2 was revised to address the noted issue, which is consistent with input received from the Water Board. Please see the response to Water Board comment 4 for the specific text revisions that were made to Section 2.3.2 (as well as Section 2.5.2.3).                                                                                                                                                                                                                                                                                                                                                                                                |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013** *(continued)*

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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 6.                                   | <b>Section 2.7, Remedial Action Objectives, page 2-23, first bullet:</b> We think the first word “prevent” should be changed to “minimize” or “prevent or minimize”. All of the activities listed are anticipated and allowed because the residual levels in the soil will not cause a health concern during the listed activities. All of the activities are anticipated to occur during normal construction and redevelopment. The handling of the soil under the durable cover will not require any special soil handling requirements other than normal construction practices (e.g. minimize, monitor and control dust). And once the work is done the durable cover will be reinstalled to once again “minimize” exposure until the next time it is removed. | Consistent with the responses to similar comments received from SFDPH on the Proposed Plan, the Navy does not agree that the requested changes are appropriate for the ROD. The Navy wishes to clarify that the requested change would be inconsistent with RAOs developed for other HPNS parcels with similar final remedies as Parcel E. Further, as described in the response to specific comment 3, the Navy does not believe that the noted statement that “ <i>handling of the soil under the durable cover will not require any special soil handling requirements other than normal construction practices</i> ” accurately reflects the selected remedy for Parcel E. The document was not revised in response to this comment. |
| 7.                                   | <b>Section 2.7, Remedial Action Objectives, page 2-23, second major bullet point:</b> The ROD does not include a table of remediation goals (RG) for soil gas – shouldn’t there be one similar to the Tables 4 through 7 of the other media (soil, groundwater, etc). Why not extract the soil gas risk-based action levels in Table 7 of the final soil gas memorandum (referenced in Section 2.7) as the ROD Remediation Goals? We appreciate that the Navy states that these action levels may be refined. Clarification about possible future refinement could be included in the text or as a footnote on this new soil gas RG table.                                                                                                                         | Section 2.7 was revised to more specifically discuss the application of soil gas action levels and to better explain how data from the future soil gas survey will be used to evaluate potential vapor intrusion risks. Please refer to the response to EPA specific comment 14 for the proposed text revisions.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 8.                                   | <b>Section 2.7, Table 6, Remediation Goals for Groundwater, page 2-29:</b> Please include a remediation goal for groundwater (or sediments, as appropriate) indicating that seeps from Parcel E to the Bay should not contain a visible sheen. This would address situations such as the current petroleum seep situation at the Parcel E-2 shoreline and clarify that visible sheens will need to be addressed regardless of whether sampling at the seeps shows an exceedance of a compound-specific ROD remediation goal.                                                                                                                                                                                                                                       | Water samples were collected at the petroleum seep along the Parcel E-2 shoreline, and results indicated total TPH concentrations exceeded 1,400 µg/L, which is the most stringent RG for groundwater. Accordingly, the Navy believes that the existing groundwater and NAPL RAOs for TPH are adequately protective of potential petroleum seeps that could be encountered along the Parcel E shoreline. The document was not revised in response to this comment.                                                                                                                                                                                                                                                                       |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 8.<br>(cont.)                        | <p><i>(Follow-on comment received on October 29, 2013)</i></p> <p><b>Response to Specific Comment 8, Section 2.7, Table 6, Remediation Goals for Groundwater, page 2-29:</b> We disagree with this response. The Basin Plan states that “Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.” Please include a remediation goal for groundwater (or sediments, as appropriate) indicating that seeps from Parcel E to the Bay should not contain a visible sheen. Oil sheens/seeps should be addressed to satisfy Water Board Basin Plan objectives and to avoid a negative community perception.</p> | <p>The Navy evaluated the substantive provisions of the Basin Plan as potential ARARs and determined that only the numeric criteria specified in Table 3-3 of the Basin Plan qualify as ARARs for Parcel E. The Navy’s evaluation of the pertinent Basin Plan requirements for Parcel E are consistent with the ARAR determinations made in the final RODs for other HPNS parcels.</p> <p>Further, the Navy’s response to SFDPH specific comment 8 noted that the visible sheen observed along the Parcel E-2 shoreline corresponded with a total TPH concentration that exceeded 1,400 µg/L, which is the most stringent RG for groundwater. The subject comment appears to imply that the narrative standard in the Basin Plan would be more stringent than the total TPH RG for groundwater, but the Navy does not believe that adequate information is available to support such an assertion. Accordingly, the Navy reiterates its belief that existing groundwater and NAPL RAOs for TPH are adequately protective of human health and the environment, and the RAOs adequately address potential petroleum seeps that could be encountered along the Parcel E shoreline.</p> <p>The ROD was not revised based on this comment.</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013 (continued)**

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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 9.                                   | <p><b>Section 2.8.1, Description of Remedial Alternatives, page 2-31 and Table 8 for Radiologically Impacted Media, page 2-35:</b> Under the presentation of the cost estimates for the selected remedy, the Navy has inserted a zero dollar amount under the O&amp;M line item for the remedial alternative for radiologically impacted media. This does not seem possible – there is going to be an O&amp;M cost associated with the remedy for this area. Does the O&amp;M cost for the soil remedy (approx. \$8MM) include O&amp;M associated with the remedy for radiologically impacted media? Please either separate the radiological remedy O&amp;M costs from the soil remedy and/or craft additional language (or point out in your response to this comment where it already exists) that clearly states O&amp;M duties tied to the radiological remedy will be executed under the soil remedy. Additionally, the preparation and implementation of the RAD RMP (not yet started) could also create a set of as yet unknown duties and costs.</p> | <p>The subject table (now referred to as Table 9) was revised to include a footnote that explains why no O&amp;M costs were attributed to the remedial alternatives for radiologically impacted media: <u>“The O&amp;M activities associated with the radiological remedial alternatives are attributed to the soil cover, shoreline protection, and ICs at IR-02 and IR-03, and include inspection, landscaping maintenance, 5-year reviews, and IC implementation. However, these O&amp;M activities are also required to implement the selected remedy for soil. Therefore, consistent with information presented in the Radiological Addendum to the FS Report, the costs associated with these O&amp;M activities were evaluated in the FS Report as part of the analysis of the soil remedial alternatives.”</u> In addition, Sections 1.1 and 2.9.2.4 were revised to clarify that the O&amp;M activities specified in the selected remedy for soil will ensure the integrity of the soil cover at IR-02 and IR-03.</p> |
| 10.                                  | <p><b>Section 2.9.2.1, Removal, Treatment, and Containment of Soil and Shoreline Sediment (Alternative S-4), page 2-43, first paragraph:</b> The study of elevated concentrations of soil gas at IR-04 that is referenced to Table 1 does not appear to exist in Table 1. Please clarify.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>The subject text intended to refer to the groundwater characterization and treatability study that was performed between 2009 to 2012 at various VOC groundwater plumes and included the collection of soil and soil gas data (Shaw, 2011 and 2013). The subject text in Section 2.9.2.1 was revised for clarity as follows: <u>“As noted in <del>Table 1</del> Section 2.3.2, a recent study (completed in performed from 2009 to 2012) identified elevated concentrations of VOCs in soil and soil gas at IR-04 (near Building 810).”</u> In addition, Section 2.3.2 was revised (based on input received from DTSC) to describe the VOCs in soil gas that were reported at various groundwater plumes. Please refer to the response to DTSC comment 2 for the proposed text revisions (which will be supplemented by an electronic reference to pertinent information describing the studies).</p>                                                                                                                       |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013** *(continued)*

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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 11.                                  | <p><b>Section 2.9.2.1, Removal, Treatment, and Containment of Soil and Shoreline Sediment (Alternative S-4), page 2-43, first paragraph, last sentence:</b> Please describe what criteria will be used to determine whether the RD will propose to expand the excavation at the Tier 1 location at IR-04 near Building 810 (for example, if needed to meet ROD remediation goals for soil in areas outside the area currently proposed for cleanup). The soil gas contamination appears to be related to the IR-04 VOC plume shown in Figure 11. Can you please clarify?</p> | <p>As described in the response to specific comment 10, the groundwater characterization and treatability study that was performed between 2009 to 2012 identified elevated concentrations of VOCs in soil and soil gas at IR-04 (near Building 810) (Shaw, 2011 and 2013). The initial phase of work (performed in 2009) identified elevated concentrations of TCE in soil gas at one location, where TCE concentrations in the underlying groundwater were relatively low. A second phase of work was performed in 2012 to evaluate potential TCE sources in the vadose zone, and identified TCE in one soil sample (out of four samples collected in a small area, measuring about 30 feet by 30 feet, near the location with elevated TCE concentrations in soil gas) at a concentration that exceeded the RG but was less than five times the RG. The TCE concentrations in soil are not indicative of a Tier 2 location requiring excavation; therefore, the decision for future excavation will be determined based on whether the volume of TCE in vadose zone warrants removal to prevent unacceptable risk via indoor inhalation of vapors. The subject text in Section 2.9.2.1 was revised for clarity as follows: <i>“The <u>elevated VOC concentrations in soil and soil gas</u> appear to be limited to a small area that is directly adjacent to a Tier 1 location where excavation and offsite disposal is required for metals and PCBs (see Figure 10). The RD will further evaluate <u>VOCs in soil and soil gas</u> in this area and may propose expanding the excavation at this Tier 1 location to address VOCs in vadose zone soil (up to 10 feet bgs), <u>if deemed necessary to satisfy the soil gas RAO.</u>”</i></p> |
| 12.                                  | <p><b>Section 2.9.2.1, Removal, Treatment, and Containment of Soil and Shoreline Sediment (Alternative S-4), page 2-44, second paragraph:</b> Please change the sentence to read “Durable covers would be applied across all of Parcel E as physical barriers to <del>cut off</del> <u>minimize</u> potential exposure to residual...” Durable covers are allowed and anticipated to be removed from the Shipyard South Multi-Use District and some Open Space areas (designated in green on Figure 12) during and after redevelopment.</p>                                  | <p>As described in the response to specific comment 6, the Navy does not agree that the requested change (use of the term “<i>minimize</i>” instead of “<i>cut off</i>” or “<i>prevent</i>”) are appropriate for the ROD. The Navy wishes to clarify that the requested change would be inconsistent with the established RAO for soil, as well as similar RAOs developed for other HPNS parcels with similar final remedies as Parcel E. The document was not revised in response to this comment.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013 (continued)**

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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 12.<br>(cont.)                       | The resultant exposure to the soil will not cause a health concern during the listed activities. The handling of the soil under the durable cover will not require any special soil handling requirements other than normal construction practices (e.g. minimize, monitor and control dust). And once the work is done the durable cover will be reinstalled to once again “minimize” exposure until the next time it is removed.                                                                                                                                                                                                                                                                                                                                     | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 13.                                  | <b>Section 2.9.2.1, Removal, Treatment, and Containment of Soil and Shoreline Sediment (Alternative S-4), page 2-44, second paragraph:</b> Please describe what criteria will be used to determine whether methane control measures (such as passive vents) are required to protect human health.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The potential presence of subsurface methane, and the potential need to implement control measures, will be evaluated based on the criteria identified at Title 27 Cal. Code Regs. § 20921(a). Section 2.9.2.1 was revised for clarity as follows: <i>“In addition, the cover design will also require the evaluation of subsurface methane, which was previously reported in isolated areas within IR-03 and IR-12, to determine if control measures (such as passive vents) are required to protect human health in accordance with Title 27 California Code of Regulations § 20921(a).”</i> This requirement was also added to Attachment 4 as chemical-specific ARAR.                                                                                                                                                                                             |
| 14.                                  | <b>Section 2.9.2.2, Treatment and Containment of Groundwater (Alternative GW-3), page 2-45:</b> The FS states that contaminant migration will be monitored to verify plume stability and that additional groundwater monitoring wells may be required to monitor changing flow direction. These requirements are relevant to possible changes in groundwater flow direction and lateral migration of contaminants caused by the installation of below-ground barriers. Additionally, the FS states that groundwater will be monitored for COECs and that monitoring results will be compared with trigger levels. Please reiterate these requirements in Section 2.9.2.2 and include a table of COEC trigger levels (already included in Administrative Record Index). | Section 2.9.2.2 (as well as Section 2.9.2.3) was revised to more accurately describe the monitoring approach for VOC groundwater plumes and other groundwater plumes located near San Francisco Bay. The specific changes are presented below. <ul style="list-style-type: none"> <li>A new sentence was added to the first paragraph as follows: <i>“Groundwater quality (as well as flow direction) will be monitored at the VOC groundwater plumes to evaluate the breakdown of VOCs to less toxic compounds, and soil gas will be monitored to evaluate concentrations relative to risk-based action levels (as described in Section 2.7). Groundwater monitoring will continue until chemical concentrations meet remediation goals, and soil gas monitoring will continue until chemical concentrations are less than risk-based action levels.”</i></li> </ul> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013** *(continued)*

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| <b>Comment No.</b> | <b>Comment</b>                                                                                                                                                                                                  | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| 14.<br>(cont.)     | (see above)                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>The end of the second paragraph was revised to state: <u>“Groundwater quality (as well as flow direction) <del>would</del> will be monitored at all plumes, including those the plumes behind the below-ground barrier to ensure that contamination is not discharged into San Francisco Bay at concentrations greater than the corresponding surface water quality criteria for aquatic wildlife (to comply with the groundwater RAO specified in Section 2.7). Plume-specific trigger levels will be used as groundwater monitoring criteria to evaluate the potential risk to aquatic wildlife in San Francisco Bay, but the RD may develop alternative monitoring criteria (using refined fate and transport modeling) to more rigorously assess the groundwater-to-surface water transport mechanism.”</u></li> </ul> <p>The Draft ROD includes two electronic references that describe the trigger levels:</p> <ul style="list-style-type: none"> <li>The reference provided in Section 2.5.2 (associated with the phrase “risks to aquatic wildlife”) describes the screening-level risk assessment for aquatic wildlife from exposure to potentially contaminated groundwater, and includes a table of trigger levels (as developed in the Final FS Report [ERRG, 2012]).</li> <li>The reference provided in Section 2.5.2.3 (associated with the phrase “trigger levels”) identifies the methodology used to calculate the trigger levels.</li> </ul> <p>As described in the FS Report (ERRG, 2012) (and in the references provided in the Draft ROD), the trigger levels can vary for each plume (and individual monitoring wells around each plume) depending on its distance from San Francisco Bay. In addition, as noted in the revised text in Section 2.9.2.2, the RD may develop alternative monitoring criteria to more rigorously assess the groundwater-to-surface water transport mechanism. Accordingly, the ROD was not revised to include a table of trigger levels.</p> |
| 15.                | <b>Section 2.9.2.2. Treatment and Containment of Groundwater (Alternative GW-3) and Figure 11, page 2-45:</b> Please identify the IR-12 nickel plume (identified in the FS Figure 2-5) for MNA (if applicable). | As described in the response to Water Board comment number 4, Section 2.5.2.3 was revised to explain that the IR-12 nickel plume did not require evaluation in the FS Report (ERRG, 2012) (and is therefore not included in the selected remedy).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013** *(continued)*

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| <b>Comment No.</b>                   | <b>Comment</b>                                                                                                                                                                                                                                                         | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 16.                                  | <b>Section 2.9.2.2, Treatment and Containment of Groundwater (Alternative GW-3), page 2-45, first paragraph:</b> Please describe what criteria will be used to determine whether ZVI will be used in addition to the biological substrate for groundwater remediation. | <p>The Navy wishes to clarify that site-specific characteristics of the Building 406 VOC plume (where additional ZVI treatment may be used to supplement the proposed in-situ bioremediation) continue to be evaluated following the ZVI injection performed in 2009. The ongoing groundwater monitoring results will be evaluated in the RD and will consider multiple factors (e.g., pre-treatment soil and groundwater conditions, fate and transport of VOCs within the vadose and saturated zones, etc.) to determine whether or not site conditions warrant more aggressive treatment to prevent unacceptable risk via indoor inhalation of vapors.</p> <p>The subject text in Section 2.9.2.2 was revised to state: <i>“The Building 406 plume may require more aggressive treatment using injected zero-valent iron (potentially mixed with biological nutrients), if determined necessary in the RD to satisfy the soil gas RAO (as described in Section 2.7).”</i> The Navy believes that the proposed text revisions are adequately descriptive and that further clarification of the evaluation methodology should be deferred to the RD.</p> |
| 17.                                  | <b>Section 2.9.2.2, Treatment and Containment of Groundwater (Alternative GW-3), page 2-45, first paragraph:</b> Please state how soil gas sampling will be used to assist in determining the completion of active treatment and beginning of MNA.                     | <p>The subject text in Section 2.9.2.2 was revised to discuss the required soil gas monitoring at the VOC groundwater plumes. The specific text revisions are provided in the response to specific comment 14.</p> <p>In addition, the Navy wishes to clarify that the text in Sections 2.7 and 2.9.2.2 specifies that remediation endpoints will be identified in the RD and will signify the completion of the active treatment and the beginning of MNA to ensure that natural processes are degrading the remaining VOCs. Further, the Navy wishes to clarify that site-specific characteristics of each VOC plume may warrant different implementation approaches for in-situ treatment, and that identifying remediation endpoints will need to consider multiple factors (e.g., pre-treatment soil and groundwater conditions, volume and type of substrate used to treat VOCs, and fate and transport of VOCs within the vadose zone). Accordingly, the Navy believes that the existing text in the ROD is adequately descriptive and that further clarification of the term “remediation endpoints” should be deferred to the RD.</p>            |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013** *(continued)*

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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 18.                                  | <b>Section 2.9.2.3, Removal, Treatment, and Containment of NAPL at IR-03 (Alternative O-4), page 2-46, first paragraph:</b> Please describe what criteria will be used to determine whether the NAPL removal and treatment area will be increased or decreased (for example, increased to include areas outside those currently proposed if additional characterization finds more NAPL and/or concentrations above the ROD goals).                                                                                                                               | Section 2.9.2.3 was revised for clarity as follows: <u>“During development of the RD will evaluate the data from recent studies and determine the extent to which removal and treatment technologies can cost-effectively satisfy the NAPL RAOs (as described in Section 2.7). Based on this determination to be provided in the RD, the NAPL removal and treatment area may be increased or decreased based on additional characterization results, with the remaining NAPL contamination being addressed by containment, monitoring, and ICs.”</u>                                                                                                                                                                                                                                                                   |
| 19.                                  | <b>Section 2.9.2.3, Removal, Treatment, and Containment of NAPL at IR-03 (Alternative O-4), page 2-46, first paragraph, second sentence:</b> Please add at the end of this sentence “to achieve the Total TPH remedial goal”.                                                                                                                                                                                                                                                                                                                                     | The suggested revision was not made because it would be inconsistent with the NAPL RAOs identified in Section 2.7. These RAOs focus on preventing or minimizing the migration of NAPL to prevent unacceptable discharge to San Francisco Bay and do not reference the RG for total TPH in soil (as suggested by the reviewer). Section 2.9.2.3 was instead revised for clarity as follows: <u>“The Navy will perform additional studies to select the best combination of technologies to cost-effectively remove or treat the NAPL contaminant source at IR-03; as noted in Table 1, the Navy is conducting a study at IR-03, concurrent with this ROD, that will further characterize the area and test two technologies (in-situ stabilization/solidification and thermally-enhanced extraction) in the field.”</u> |
| 20.                                  | <b>Section 2.9.2.5, Activity Restrictions Relating to Soil and Associated VOC Vapors at Specific Locations within Parcel E, page 2-51 and Figure 12 page 2-48:</b> Please clarify, was the pink area on Figure 12 already sampled for soil vapor in a gridded fashion and restrictions related to VOCs removed (except at the IR-03 Oily Waste Ponds where significant work is ongoing)? Your last sentence in paragraph one implies that there is no VOC ARIC for the Figure 12 pink area “Restriction Related to Radioactive Chemicals and Other Contaminants”. | Section 2.9.2.5 was revised to address the noted issue, which is consistent with input received from DTSC. Please see the response to DTSC comment 7 (part d) for the specific text revisions that were made to Section 2.9.2.5 (as well as the subject figure, which is now referred to as Figure 13).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013** *(continued)*

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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 21.                                  | <p><b>Section 2.9.2.5, Monitoring, Maintenance, and Institutional Controls, Land Use and Activity Restrictions, page 2-51, 3rd paragraph:</b> Assuming that the pink area on Figure 12 should have been included in the VOC ARIC, please delete the phrase at the beginning of paragraph three “If IR-02 and IR-03 are involved,” and please reword the rest of the sentence as “The FFA signatories, and CDPH for the area with restrictions related to radioactive chemicals, may modify...” This edit is necessary because demonstrating a reduction in VOC concentrations in soil gas could be conducted for any location within the VOC ARIC.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>Section 2.9.2.5 was revised to address the noted issue, which is consistent with input received from DTSC. Please see the response to DTSC comment 7 (part d) for the specific text revisions that were made to Section 2.9.2.5.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 22.                                  | <p><b>Section 2.9.2.5, Activity Restrictions Relating to Soil and Associated VOC Vapors at Specific Locations within Parcel E, page 2-51</b></p> <p>You have forgotten to include a description of the gridded soil vapor sampling work that you will be performing in the future related to the VOC ARIC as designated on Figure 12. The steps that will be performed in the future need to be included in this ROD. We think the steps should be listed as: “In addition to the focused soil gas surveys that will be conducted in SVE and groundwater treatment areas (Section 2.7 and 2.9.2.2), conduct a gridded soil gas survey in the entire VOC ARIC prior to transfer for the following purposes:</p> <ul style="list-style-type: none"> <li>• To identify where the VOC ARIC would be retained or areas where the VOC ARIC can be released</li> <li>• To verify that all areas needing remedial action for soil gas were identified and treated.”</li> </ul> <p>It is important to limit the restrictions related to soil gas issues (indoor air inhalation risk) to the areas where these issues might exist. Land use restrictions are meant to be used when there is no practical and cost effective way to reduce a hazard not as a way to pass on the uncertainty and cost of protecting against a potential hazard that may not exist. The post-transfer cost of restricting all construction due to the possibility of an indoor air inhalation risk is significant. Please limit the restrictions related to this issue to the areas where it is needed.</p> | <p>Consistent with the RODs for other HPNS parcels, the subject language in Section 2.9.2.5 generally describes the activity restrictions related to soil and associated VOC vapors and is not intended to describe the future soil gas survey. As described in the response to DTSC comment 5, Section 2.9.2.1 was revised to add the following text regarding the future soil gas survey at Parcel E (in areas outside of the VOC groundwater plumes): <u>“Additionally, a soil gas survey will be conducted, following a planning process performed in consultation with the regulatory agencies, in Parcel E to:</u></p> <ul style="list-style-type: none"> <li>• <u>investigate soil gas in areas planned for mixed use where concerns continue about residual VOCs in soil (at concentrations that may pose an unacceptable risk via vapor intrusion);</u></li> <li>• <u>identify COCs for which risk-based numeric action levels for VOCs in soil gas would be established (based on a cumulative excess cancer risk of 1 in a million); and</u></li> <li>• <u>evaluate and map the extent to which areas with potential unacceptable risk via vapor intrusion require control (as described in Section 2.9.2.5, areas with unacceptable vapor intrusion risk will be subject to institutional controls, and the potential risk will be reduced by engineering controls or other design alternatives that meet the specifications set forth in the ROD, RD reports, and LUC RD report).</u></li> </ul> <p>Please note that Sections 2.9.2.1 and 2.9.2.2 already describe future soil gas monitoring at Building 406, IR-04, and other VOC groundwater plumes at</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 22.<br>(cont.)                       | <p>Please include the steps in this ROD, including collecting the necessary soil gas data and identifying the impacted areas. You have already discussed the soil gas risk based action levels in this ROD (see comment #4 above) and the possibility of refinement of these levels – thank you for that.</p> <p>You have previously made commitments to do this work in meetings and responses to comments. You have also included these concepts in previous RODs. You have already performed this work at Parcels B, D-1, G, and UC-2 and will be performing it shortly at UC-1. By the way, after many years of discussing this issue and witnessing, on other parcels, the reduction of VOC soil gas contamination (usually post groundwater treatment), we are comfortable with the Navy’s possible need to delay implementing these steps until after some or all of the following actions: a) SVE, b) groundwater treatment c) backfilling of hot spot excavations with clean fill and d) installation of remedies (e.g. durable covers etc). This comfort level presumes that the Navy does not think any new areas of soil gas contamination that might require treatment would be discovered during the gridded sampling.</p> <p>As a reminder to your previous commitments on this subject we include the following:</p> <p>Our comment #2 dated November 27, 2012 on the draft Parcel E Proposed Plan was: “Soil gas RAOs should be included in the Proposed Plan and the ROD. If the establishment of chemical-specific soil gas remediation goals is delayed until after the ROD, then the description and the cost for this evaluation and regulatory process needs to be added to the Proposed Plan and ROD. We did not find any wording on this subject in the Proposed Plan.</p> <p>It is important to limit the restrictions related to soil gas issues (indoor air inhalation risk) to the areas where these issues might exist. Land use restrictions are meant to be used when there is no practical and cost effective way to reduce a hazard not as a way to pass on the uncertainty and cost of protecting against a potential hazard that may or may not exist. The post-transfer cost of restricting all construction due to the possibility of an indoor</p> | <p>Parcel E. In addition, as described in the response to specific comments 14 and 17, Section 2.9.2.2 was revised to discuss the required soil gas monitoring at the VOC groundwater plumes. The Navy believes that the added text regarding the future soil gas survey at Parcel E, which is consistent with information provided in the ROD for Parcel C, is adequately descriptive and that further discussion of the future soil gas survey should be deferred to the RD (or appropriate planning documents for the soil gas survey). However, the Navy wishes to clarify its intent to develop the soil gas survey at Parcel E using a similar approach as used at other HPNS parcels (and to implement the soil gas survey either in conjunction with or following the remedial action). Specifically, the available soil, soil gas, and groundwater data within areas planned for mixed use would be evaluated to identify potential areas of concern (where chemical concentrations may pose an unacceptable risk via vapor intrusion). Following the data analysis, a soil gas sampling and analysis plan would be developed and implemented (following approval by the regulatory agencies) to quantify residual VOC concentrations in soil gas at the areas of concern. Similar to the approach used at other HPNS parcels, the Navy expects to establish a grid system (other HPNS parcels used 1 acre) that would correspond to the minimum sampling frequency within the areas of concern. The data from the soil gas survey would be used in a risk evaluation, as briefly described in Section 2.7 of the ROD, the results from which would be used to evaluate the extent to which areas with potential unacceptable risk via vapor intrusion require control.</p> |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Response    |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |
| 22.<br>(cont.)                       | <p>air inhalation risk is significant. Please limit the restrictions related to this issue to the areas where it is needed by collecting the necessary soil gas data and establishing the soil gas RAO's and identifying the impacted areas."</p> <p>Your reply in your RTCs dated December 21, 2012 was:</p> <p>Page 9 of the Proposed Plan includes the following RAO for soil gas: <i>"Protect people from exposures to vapors in soil gas at concentrations greater than those considered safe for humans."</i></p> <p>This RAO corresponds to a more detailed RAO provided in Section 3.1.1.1 of the Final FS Report; the RAO in the FS Report references the Navy's current soil gas action levels and a future soil gas survey to identify the extent of the area requiring ICs for VOCs. The Navy believes this information adequately explains the approach for addressing risk from soil gas, and no further clarification is needed for the Proposed Plan.</p> <p>Our comment #1 dated October 2, 2009 on the draft Parcel E FS was:</p> <p>"Vapor Intrusion remedial goals need to be established and soil gas samples collected to analyze the vapor intrusion pathway. It is inappropriate to restrict the entire Parcel E with a blanket Institutional Control (e.g. VOC ARIC) for all of Parcel E when the Navy has 5 years before it expects to transfer Parcel E. We have been discussing this soil vapor issue with the Navy since at least 2006. Please see the attached meeting summary (Attachment A) from a meeting held in March 2007 discussing this issue for Parcel B. Part of the reasoning for the chosen remedy on Parcel B for a blanket VOC restriction was to prevent further delays in the transfer process. However assurances were given at the time that soil gas sampling and establishment of soil vapor remedial goals would be required for future parcels. The Navy stated in its July 2007 cover letter to its draft revised RI for Parcel E that it would complete a soil gas survey. Can we please meet with the regulators to discuss this issue and resolve when and how this will be done for Parcel E and other parcels?"</p> | (see above) |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013 (continued)**


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| Comment No.                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Response    |
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| <i>Specific Comments (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |             |
| 22.<br>(cont.)                       | <p>Your reply in the RTCs dated October 2009 was:</p> <p>“The Navy regrets that the agreements made during previous meetings were not reflected in the Draft FS Report for Parcel E. The Navy plans to perform a soil gas survey at Parcel E in accordance with the clarifications made in the Final Revised RI Report and as stated during previous working meetings. The Draft Final FS Report was revised to briefly discuss the planned soil gas survey at Parcel E; specific changes will include noting the objectives of the survey and the schedule for submitting the planning documents.”</p> <p>Here is an excerpt from a meeting summary that was held on March 13, 2007 (attended by EPA, DTSC, RWQCB, Navy, SFDPH and Lennar) when we first started discussing the details of soil vapor sampling is:</p> <p>“A soil gas sampling plan would be prepared to support a soil gas sampling program throughout Parcel B. The plan would follow appropriate regulatory vapor intrusion guidance for residential land use to identify any existing hot spots, as well as areas where no soil gas concerns are present, and would be approved by all parties. The resulting sampling would be a grid type sampling plus focused sampling around known groundwater plumes and VOC hot spots identified during the vapor sampling effort. The data objectives, including action levels indicating the need for vapor mitigation measure(s), would be clearly defined up front and sampling would take place in the dry season. This plan would be developed and implemented with the intent of defining the areas of vapor concerns prior to amending the ROD. The result of this approach would be to limit soil vapor barriers in new construction to only those areas where it is shown to be necessary, with appropriate buffers, and consideration of engineering controls for utilities that traverse vapor barrier areas and could create preferential pathways for soil vapor.”</p> | (see above) |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Comments by San Francisco Department of Public Health (Amy Brownell) dated August 12, 2013 (continued)**


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| <b>Comment No.</b>    | <b>Comment</b>                                                                                                    | <b>Response</b>                               |
|-----------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| <i>Minor Comments</i> |                                                                                                                   |                                               |
| 23.                   | <b>Section 2.3, Previous Investigations and Removal Actions, Table 1, page 2-8, first row:</b> Typo “evaluate[d]” | The noted error within Table 1 was corrected. |
| 24.                   | <b>Section 2.5.1.3, Groundwater Risk Summary, Table 3, page 2-19:</b> Typo “100,0000.”                            | The noted error within Table 3 was corrected. |

*Additional Comment, dated August 13, 2013*


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| 25. | <b>Section 2.9.2.5 Monitoring, Maintenance and Institutional Controls, Land Use and Activity Restrictions, Page 2-50</b><br>Please correct the last item on the page, #b after the phrase "the following activities are prohibited throughout HPNS Parcel E. It should have been written:<br>b. Use of groundwater<br>It currently reads "Use of or access to groundwater". A prohibition on access to groundwater is not acceptable in an area where redevelopment activities are going to occur.<br>The Parcel B, C, D-1, G, UC-1, and UC-2 RODs all list the prohibition as only "Use of groundwater". | The subject bullet was revised to read: “ <i>Use of <del>or access to</del> groundwater.</i> ” |
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*Additional Comment, dated August 21, 2013*


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| 26. | I can not find a reference in the Draft Parcel E ROD about the boundary line between the Parcel E shoreline and Parcel F. It is important to include a statement in the ROD about this boundary issue. The sentences you included on Page 2-3 of the Parcel E-2 ROD were:<br>"Contaminated sediments above msl will be addressed by the selected remedy for Parcel E-2. Contaminated sediments below msl will be addressed by the selected remedy for Parcel F, the Navy’s property offshore of HPNS."<br>Please add sentence(s) about the Parcel E/F boundary to the Parcel E ROD. | Section 2.3.1 was revised to include the following statement: “ <i>Contaminated sediments above msl will be addressed by the selected remedy for Parcel E. Contaminated sediments below msl will be addressed, as necessary, by the selected remedy for Parcel F, the Navy’s property offshore of HPNS.</i> ” |
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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Additional Comments by San Francisco Department of Public Health (Amy Brownell) dated October 29, 2013**

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| <b>Comment No.</b>                                 | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Response</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <i>Supplemental Comments on Record of Decision</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1.                                                 | <p><b>Section 2.7, Remedial Action Objectives, Soil, Soil Gas, and Shoreline Sediment RAOs, page 2-27, second major bullet point:</b> Prior to future soil gas surveys, soil gas action levels may need to be updated based on up-to-date toxicity data. Chronic inhalation reference concentrations and inhalation unit risk values, which were previously used to calculate soil gas action levels, may have been updated by the time that risk based screening is performed. The referenced Table 7 from the final soil gas memorandum may need to be updated in the future.</p>                                                                               | <p>The Navy conducted soil gas surveys to support the development of the soil gas action levels presented in the “Revised Final Memorandum, Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Naval Shipyard” (ChaduxTt, 2011). The soil gas action levels presented in the aforementioned document are incorporated into the RAOs provided in Section 2.7 of the ROD. These soil gas action levels have been and will continue to be used to support the soil gas surveys in all HPNS parcels. The Navy does not believe that it is necessary to reevaluate the established soil gas action levels each time it performs an investigation, given that the soil gas action levels are used to perform an initial risk-based screening of soil gas data. In accordance with the soil gas evaluation methodology used at other HPNS parcels (and briefly described in Section 2.7 of the ROD), after the initial risk-based screening, areas with unacceptable risk are further evaluated using location-specific data (i.e., physical characteristics of the soil) to assess potential exposures consistent with the State of California and EPA vapor intrusion guidance. In addition, risks and hazards at these areas will be further characterized using the accepted methodology for risk assessments at HPNS. The risk evaluation process will consider the most current toxicity data and reference concentrations. The ROD was not revised based on this comment.</p> |
| 2.                                                 | <p><b>Section 2.9.2.1 Removal, Treatment, and Containment of Soil and Sediment (Alternative S-4), page 2-49:</b> Thank you for revising some of your wording to respond to some of our comments on these soil gas issues. Unfortunately, the proposed wording still appears to be limiting the areal extent of soil gas surveys rather than stating that you will conduct the needed surveys in the entire Shipyard South Multi-use District which is designated as a VOC ARIC. For suggested revised wording, the SFDPH agrees with the USEPA’s Supplemental Comment 2, dated October 28, 2013, regarding the scope of soil gas surveys planned at Parcel E.</p> | <p>The Navy has revised the response to SFDPH specific comment 22 to explain the general approach for performing the soil gas survey, but this additional information was not added to the text of the ROD. The Navy believes that the additional ROD text (as presented in the response to SFDPH specific comment 22) regarding the future soil gas survey at Parcel E, which is consistent with information provided in the ROD for Parcel C, is adequately descriptive and that further discussion of the future soil gas survey should be deferred to the RD (or appropriate planning documents for the soil gas survey). As described in the response to EPA supplemental comment 2, Section 2.9.2.1 was revised to incorporate portions of EPA’s suggested text regarding the future soil gas survey at Parcel E. The Navy wishes to clarify that some of EPA’s suggested text would be inconsistent with the successful process by which soil gas surveys were developed for HPNS Parcels B, D-1, and G.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**


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**Additional Comments by San Francisco Department of Public Health (Amy Brownell) dated October 29, 2013**


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| Comment No.                                                    | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <i>Supplemental Comments on Record of Decision (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 2.<br>(cont.)                                                  | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Specifically, EPA’s recommendation that the Navy “investigate soil gas in all areas planned for mixed use” does not reflect the comprehensive process of evaluating the available soil, soil gas, and groundwater data (in areas planned for mixed use) to identify areas of concern that require soil gas sampling. During development of the soil gas surveys at HPNS Parcels B, D-1, and G, the Navy’s data analysis determined that there were areas where no potential soil gas concerns existed (and thus did not require soil gas sampling). The Navy anticipates that the data analysis at Parcel E may yield similar findings and wishes to avoid using prescriptive wording in the ROD (specifically the phrase “investigate soil gas in all areas planned for mixed use”) that could unnecessarily expand the scope of the soil gas survey. |
| 3.                                                             | <p><b>Section 2.9.2.1 Removal, Treatment, and Containment of Soil and Sediment (Alternative S-4), Figure 11 and second paragraph on page 2-51:</b> We would like to point out for the record that the remedies for the shoreline areas designated as “sand with underlying rock armor” will be further evaluated in the Remedial Design and that alternatives such as articulated concrete mats will be considered. As you stated in your RTC, “The Navy acknowledges the potential benefits of articulating concrete mats in facilitating vegetative growth and enhancing site aesthetics and will further evaluate this product during the RD.” Your specific response in the RTCs on the draft final Feasibility Study about this issue was:</p> <p>“As stated in Section 4.2.2.3 (bottom of page 4-6), the Navy will further evaluate the shoreline protection options during the RD. Section 4.2.2.3 further states that: “Refinements to conceptual designs may be prompted by additional site information or stakeholder input, and may include changes to the alignment of or construction materials used in the shoreline protection option. However, the refined design must continue to satisfy the RAOs identified in Section 3.1.2 and provide equivalent (or improved) performance relative to effectiveness, implementability, and cost.” The Navy acknowledges the potential benefits of articulating concrete mats in facilitating vegetative growth and enhancing site aesthetics and will further</p> | The Navy acknowledges its prior statements regarding the potential refinements to the conceptual design for the shoreline protection at Parcel E.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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**Draft Record of Decision for Parcel E, Hunters Point Naval Shipyard**

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**Additional Comments by San Francisco Department of Public Health (Amy Brownell) dated October 29, 2013 (continued)**

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| Comment No.                                                    | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Supplemental Comments on Record of Decision (continued)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3.<br>(cont.)                                                  | evaluate this product during the RD. However, the Navy believes that more information is needed to verify the ability of articulating concrete mats to serve as a robust containment structure that is effective in the long-term. In the absence of such information, the Navy believes that rock armor is an appropriate and adequately conservative option to compare against the NCP criteria.”                                                                                                                        | (see above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4.                                                             | <b>Section 2.9.2.5 Monitoring, Maintenance and Institutional Controls, page 2-55, first full paragraph, second sentence</b> For clarity, please consider revising the sentence as follows: “In Parcel E, <del>the objectives of the ICs are to implement</del> include the land use and activity restrictions that are used to limit the exposure of future landowner(s) or user(s) of the property to hazardous substances present on the property and in groundwater. The ICs <del>and to</del> ensure the integrity...” | The requested change was not made because the existing language in Section 2.9.2.5 of the ROD has been reviewed and approved by legal counsel from the Navy, EPA, and DTSC, and is consistent with language provided in the Final FS Report for Parcel E (ERRG, 2012) and the Final ROD for Parcel E-2 (Navy, 2012b). In addition, the suggested revisions would not be consistent with the definition of ICs as provided in the Final FS Report. Specifically, ICs are defined in Section 3.3.2.1.2 of the Final FS Report as “ <i>legal and administrative mechanisms used to implement land use restrictions that are used to limit the exposure of future landowner(s) or user(s) of the property to hazardous substances present on the property, and to ensure the integrity of the remedial action.</i> ” Consistent with U.S. Department of Defense guidance (2001), the Navy will continue to use the term “institutional controls” to describe the portion of the CERCLA remedy where certain legal mechanisms will be used to enforce land use and activity restrictions. |

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**ABBREVIATIONS AND ACRONYMS**

|                 |                                                                       |
|-----------------|-----------------------------------------------------------------------|
| ARARs           | applicable or relevant and appropriate requirements                   |
| ARIC            | area requiring institutional controls                                 |
| ASTM            | ASTM International                                                    |
| Cal. Code Regs. | California Code of Regulations                                        |
| CCSF            | City and County of San Francisco                                      |
| CDFW            | California Department of Fish and Wildlife                            |
| CDPH            | California Department of Public Health                                |
| CERCLA          | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR             | Code of Federal Regulations                                           |
| COCs            | chemicals of concern                                                  |
| COECs           | chemicals of ecological concern                                       |
| COPECs          | chemicals of potential ecological concern                             |
| CTR             | California Toxics Rule                                                |
| DTSC            | Department of Toxic Substances Control                                |
| EOS             | Parcel E open space (reuse area)                                      |
| EMB             | Environmental Management Branch                                       |
| EPA             | U.S. Environmental Protection Agency                                  |
| ERRG            | Engineering/Remediation Resources Group, Inc.                         |
| FFA             | Federal Facility Agreement                                            |
| FS              | Feasibility Study                                                     |
| HGAL            | Hunters Point groundwater ambient level                               |
| HHRA            | human health risk assessment                                          |
| HPAL            | Hunters Point ambient level                                           |
| HPNS            | Hunters Point Naval Shipyard                                          |
| ICs             | institutional controls                                                |
| IR              | Installation Restoration                                              |
| LUC             | land use control                                                      |
| MCLs            | maximum contaminant levels                                            |
| mg/kg           | milligram per kilogram                                                |
| MOA             | Memorandum of Agreement                                               |
| MNA             | monitored natural attenuation                                         |
| msl             | mean sea level                                                        |
| MU              | multi-use (reuse area)                                                |

**ABBREVIATIONS AND ACRONYMS** *(continued)*

|             |                                                                  |
|-------------|------------------------------------------------------------------|
| NAPL        | nonaqueous-phase liquid                                          |
| Navy        | Department of the Navy                                           |
| NCP         | National Oil and Hazardous Substances Pollution Contingency Plan |
| NRDL        | Naval Radiological Defense Laboratory                            |
| O&M         | operation and maintenance                                        |
| OSPR        | Office of Spill Prevention and Response                          |
| PCBs        | polychlorinated biphenyls                                        |
| pCi/g       | picocurie per gram                                               |
| PLs         | prediction limits                                                |
| POC         | point of compliance                                              |
| RAOs        | remedial action objectives                                       |
| RAWP        | remedial action work plan                                        |
| RCRA        | Resource Conservation and Recovery Act                           |
| RD          | remedial design                                                  |
| RGs         | remediation goals                                                |
| RI          | Remedial Investigation                                           |
| ROCs        | radionuclides of concern                                         |
| ROD         | Record of Decision                                               |
| RMP         | risk management plan                                             |
| RSRS        | Radiological Survey and Remedial Services, LLC                   |
| SFDPH       | San Francisco Department of Public Health                        |
| SFRA        | San Francisco Redevelopment Agency                               |
| Shaw        | Shaw Environmental, Inc.                                         |
| SLERA       | screening-level ecological risk assessment                       |
| SVE         | soil vapor extraction                                            |
| SVOCs       | semivolatile organic compounds                                   |
| TCE         | trichloroethene                                                  |
| TPH         | total petroleum hydrocarbons                                     |
| Triple A    | Triple A Machine Shop, Inc.                                      |
| VOCs        | volatile organic compounds                                       |
| Water Board | San Francisco Bay Regional Water Quality Control Board           |
| ZVI         | zero-valent iron                                                 |
| §           | Section                                                          |
| µg/L        | micrograms per liter                                             |

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