Report

Group 5 – Central Portion of Areas III and IV RCRA Facility Investigation Report Santa Susana Field Laboratory, Ventura County, California

Volume IX – RFI Site Reports
Appendix S

Rockwell International Hot Laboratory

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DRAFT IN PROGRESS

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Acronyms and Abbreviations

AI	Atomics International
AOC	Area of Concern
AST	aboveground storage tank
Boeing	The Boeing Company
bgs	below ground surface
BMP	best management practice
BTEX	benzene, toluene, ethylbenzene and xylenes
Cal-EPA	California Environmental Protection Agency
CCR	Current Conditions Report
CF	Chatsworth Formation
CFOU	Chatsworth Formation Operable Unit
CMS	Corrective Measures Study
COC	chemical of concern
COEC	chemical of ecological concern
COPC	chemical of potential concern
CPEC	chemical of potential ecological concern
CSM	conceptual site model
CTE	central tendency exposure
CUA	Chemical Use Area
DCA	dichloroethane
DCE	dichloroethene
DOE	United States Department of Energy
DQO	data quality objective
DTSC	Department of Toxic Substances Control
ECL	Engineering Chemistry Laboratory
EEL	Environmental Effects Laboratory
ELCR	estimated lifetime cancer risk
EPC	exposure point concentration
ERA	ecological risk assessment
ESL	ecological screening level

ETEC	Energy Technology Engineering Center
gpd	gallons per day
GRC	Groundwater Resource Consultants, Inc.
H&A	Haley & Aldrich, Inc.
HAR	Hydrogeologic Assessment Report
HI	hazard index
HMSA	Hazardous Material Storage Area
HQ	hazard quotient
HRA	human health risk assessment
HSA	Historical Site Assessment
ICF	ICF Kaiser Engineers
ILCR	incremental lifetime cancer risk
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
msl	mean sea level
MWH	Montgomery Watson Harza
NA	not applicable
ND	not detected
NDMA	n-nitrosodimethylamine
NFA	no further action
NPDES	National Pollutant Discharge Elimination System
NSGW	near-surface groundwater
Ogden	Ogden Environmental and Energy Services Company, Inc.
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
pCi/g	picocuries per gram
PDU	Coal Gasification Process Development Unit
pg/g	picograms per gram
ppb	parts per billion (µg/kg or µg/L)
ppm	parts per million (mg/kg or mg/L)

PRG	preliminary remediation goal
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RA	risk assessment
RBSL	risk-based screening level
RCRA	Resource Conservation and Recovery Act
RIHL	Rockwell International Hot Laboratory
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RME	reasonable maximum exposure
Rocketdyne	Rocketdyne Propulsion and Power
RWQCB	Los Angeles Regional Water Quality Control Board
SAIC	Science Applications International Corporation
SE Drum Yard	Southeast Drum Storage Yard
SMOU	Surficial Media Operable Unit
SNAP	Systems for Nuclear Auxiliary Power
SOP	Standard Operating Procedure
SQL	sample quantification limit
SRAM	Standardized Risk Assessment Methodology
SSFL	Santa Susana Field Laboratory
STL-IV	Systems Test Laboratory IV
STP-3	Area 3 Sewage Treatment Plant
SVOC	semivolatile organic compound
SWMU	solid waste management unit
3-D	three dimensional
TCDD-TEQ	2,3,7,8-tetrachlorodibenzodioxin toxicity equivalency quotient
TDS	total dissolved solids
TEQ	toxicity equivalency quotient
TIC	tentatively identified compound
TCE	trichloroethene
TPH	total petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons

TRV	toxicity reference value
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
UST	underground storage tank
µg/dl	micrograms per deciliter
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/Lv	micrograms per liter vapor
µs/cm	micro siemens per centimeter
VOC	volatile organic compound
WPA	RFI Work Plan Addendum
WPAA	RFI Work Plan Addendum Amendments

Appendix S

S.1 Introduction

This appendix to the Group 5 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report presents findings and recommendations based on the results of the investigation conducted at the Rockwell International Hot Laboratory (RIHL) RFI Site of the Santa Susana Field Laboratory (SSFL). The RIHL Site contains one solid waste management units (SWMU)—Building 4020 (SWMU 7.7). The RIHL Site, located within Area IV of the SSFL, was used in support of United States Department of Energy (DOE) operations. The RCRA Corrective Action Program at the SSFL is being conducted under the oversight of the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC).

The RIHL Site is 1 of 17 RFI sites included in the Group 5 RFI Report. The location of the RIHL Site within the SSFL and Group 5 Reporting Area is shown in Figure S.1-1. An RFI Site is an area that includes at least one SWMU and/or an AOC, and some adjacent land for the purpose of characterization. The other 16 Group 5 RFI sites are:

- Boeing Area IV Leach Field
- Compound A Facility (SWMU 6.4)
- Engineering Chemistry Laboratory (ECL) (SWMUs 6.1, 6.2, 6.3, and AOC)
- Environmental Effects Laboratory (EEL) (SWMU 6.9)
- Pond Dredge Area (AOC)
- Coal Gasification Process Development Unit (PDU) (SWMU 7.10)
- Area 3 Sewage Treatment Plant (STP-3) (AOC)
- Southeast Drum Storage Yard (SE Drum Yard) (AOC)
- Systems Test Laboratory IV (STL-IV) (SWMUs 6.5, 6.6, and 6.7)
- Building 65 Metals Laboratory Clarifier (Building 65) (AOC)
- Building 100 Trench (SWMU 7.5)
- Department of Energy Leach Field 1 (DOE LF1) (AOC)
- Department of Energy Leach Field 2 (DOE LF2) (AOC)
- Department of Energy Leach Field 3 (DOE LF3) (AOC)
- Hazardous Material Storage Area (HMSA) (AOC)
- Systems for Nuclear Auxiliary Power Facility (SNAP) (AOC)

The RIHL Site is located in the western portion of the Group 5 Reporting Area, north of the Pond Dredge RFI Site, south of the Building 100 Trench RFI Site, west of the DOE LF3 RFI Site, and east of Group 8 Reporting Area (Figure S.1-1).

The SSFL RFI was conducted to (1) characterize the presence of SSFL-operation-related chemicals in environmental media, (2) estimate risks to human health and the environment (the ecosystem, that is), and (3) gather data for the next phase of RCRA Corrective Action, support the recommendations included in this RFI Report regarding areas recommended

for no further action (NFA), corrective measures study (CMS) areas, and interim stabilization.

The SSFL has been divided into two operable units (OUs)—the Surficial Media Operable Unit (SMOU) and the Chatsworth Formation Operable Unit (CFOU) groundwater. The RIHL Site characterization presented in this appendix comprises data for the SMOU and summaries of the CFOU groundwater data. The SMOU includes soil, sediment, surface water, air, biota, and near-surface groundwater (NSGW) at the SSFL. NSGW is defined as groundwater occurring within alluvium or weathered bedrock of the Chatsworth Formation. The CFOU groundwater includes Chatsworth Formation bedrock and deeper groundwater that occurs within the unweathered bedrock of the Chatsworth Formation.

S.1.1 Report Organization

This RIHL Site Report provides detailed sampling data and evaluation pertaining to the RIHL Site, including a summary of the site history, a summary of the RFI sampling and analyses, risk assessment results, and site recommendations. This information is presented in sections organized as follows:

- **Section S.2 – Site History, Chemical Use, and Current Conditions.** Presents the site history and chemicals used, and the current conditions including geology and groundwater conditions. Changes in site conditions and soil disturbance areas are also described.
- **Section S.3 – Nature and Extent of Chemical Impacts.** Presents a summary of SMOU and CFOU groundwater characterization information for the RIHL Site.
- **Section S.4 – Risk Assessment Findings Summary**. Presents the results of the human health risk assessment (HRA) and ecological risk assessment (ERA) for the RIHL Site. The complete risk assessment is included in Appendix A of the Group 5 RFI Report.
- **Section S.5 – Site Actions Recommendations**. Presents a summary of the RIHL Site areas recommended for either NFA or further evaluation in the CMS. CMS areas recommended for interim measures to prevent contaminant migration are identified, if any.
- **Section S.6 – References.** Includes a list of cited references.

Site-specific additional information is provided in the following attachments:

- **Attachment S-1**: Site-specific regulatory agency documents and correspondence.
- **Attachment S-2**: Subsurface information (soil boring, trench, piezometer, and well logs).
- **Attachment S-3**: Data quality, validation, and laboratory reports.
- **Attachment S**-4: Building surveys.

Information regarding characterization for the RIHL Site is provided in the following figures and tables:

- Figure S.1-1: Presents the location of the RIHL Site within the SSFL and the Group 5 Reporting Area.

- Figure S.2-1: Presents a plan view of the RIHL Site, showing known and potential Chemical Use Areas. Tables S.2-1 through S.2-5 present summaries of buildings, tanks, transformers, other site features, and spills at the RIHL Site.
- Figure S.2-2: Presents a plan view of the RIHL Site, showing soil and vapor sampling locations, and nearby monitoring wells.
- Figures S.2-3A and S.2-3B: Present geologic cross-sections across the RIHL Site.
- Figures S.3-1 through S.3-8: Present summaries of soil and vapor sampling at the RIHL Site. Soil and vapor sampling results are shown on these maps and are also listed in Table S.3-2A.

Information regarding Group 5 areawide conditions, transport and fate of chemicals between RFI sites, and other evaluations of areawide issues are contained in the Group 5 RFI Report (Volume I) and appendices. Pertinent appendices to this Group 5 RFI Report are:

- **Appendix A:** Presents risk assessment information, including risk calculations, result tables, all transport-and fate-modeling (except groundwater), and a description of any methodology variances from the Standardized Risk Assessment Methodology (SRAM) Work Plan.
- **Appendix B:** Presents information regarding groundwater conditions in the Group 5 Reporting Area, including the RIHL Site. Information includes groundwater occurrence and quality, chemical transport, data set representativeness, and supporting data (monitoring results, time-series plots, and hydrographs), as well as an evaluation of naturally occurring constituents.

S.1.2 Historical Reference Documents

A searchable database of historical documents for the Group 5 Reporting Area is being submitted to DTSC along with this Group 5 RFI Report (Boeing, 2008). Included are facility records, maps and drawings, correspondence, and reports relevant to the RFI for each of Group 5 RFI sites. Documents pertaining to the entire SSFL are included if they are relevant to Group 5. The Group 5 document database includes documents relevant to the RIHL Site. It is worth noting that information presented in this RIHL Site report is supplemented by background documents that contain information about site and facility background, SMOU Program background, and methodologies/procedures. Key historical documents are listed below with brief descriptions:

- RCRA Facility Assessment (RFA) (Science Applications International Corporation [SAIC], 1994). This report contains:
  - A brief description of the SSFL facility, including an operational history, physical setting information, and regulatory programs and oversight during the late 1980s and early 1990s.
  - Visual inspection records performed at facility operations.
  - Definition and description of SWMUs and AOCs identified during the assessment.

- Current Conditions Report (CCR) (ICF Kaiser Engineers [ICF], 1993). This report contains:
  - A general description of the SSFL facility, including an operational history, physical setting information, and regulatory programs and oversight during the late 1980s and early 1990s.
  - Description of SWMUs and AOCs, including presentation of results from environmental sampling performed to assess current conditions.
  - A draft work plan for further investigation during the RFI for selected SWMUs and AOCs.
- RFI Work Plan Addendum (WPA) (Ogden Environmental and Energy Services Company, Inc. [Ogden], 1996), RFI Work Plan Addendum Amendments (WPAA) (Ogden, 2000a and 2000b]. These reports contain:
  - Sampling procedures and rationale.
  - RFI site descriptions and operational history.
  - Shallow groundwater characterization sampling and analysis plan for the SSFL.
- RFI Program Report (Montgomery Watson Harza [MWH], 2004). This report contains:
  - A general description of the SSFL facility, including an operational history, physical setting information, and regulatory programs and oversight.
  - A summary of the RCRA Corrective Action Program being conducted at the SSFL and a description of the OUs.
  - A comprehensive description of the SMOU field sampling program, including work plans followed, overall sampling scope performed, sampling methods and subcontractors used, and protocol followed.
  - Details of the analytical program for the SMOU RFI, including laboratories used, data validation findings, and Data Quality Assessment findings.
  - Programmatic key decision points or significant issues that influenced sampling, laboratory procedures, methodologies, or step-out requirements.
- Standardized Risk Assessment Methodology (SRAM) Work Plan, Revision 2 (MWH, 2005). This report contains:
  - Procedures for completing HRAs and ERAs.
  - Background soil concentrations and groundwater comparison concentrations.
  - A biological conditions report for the SSFL.
- Near-Surface Groundwater Characterization Report (MWH, 2003b). This report contains:
  - Nature and extent of NSGW at the SSFL.
  - Distribution, transport, and fate of trichloroethene (TCE) and other chemicals of concern (COCs), and the relationship of NSGW to CFOU groundwater.

- CFOU Characterization Reports (Montgomery Watson, 2000a; MWH, 2002 and 2003a). These reports contain:
  - Geologic framework at the SSFL and hydrogeologic conditions of both NSGW and CFOU groundwater.
  - Transport and fate of TCE, and the occurrence and transport of other chemicals of concern in the CFOU groundwater.
- Annual and quarterly groundwater monitoring reports, including:
  - Annual Groundwater Monitoring Report (Haley & Aldrich, Inc. [H&A], 2008a).
  - Second Quarter 2007 Groundwater Monitoring Report (H&A, 2007a).
  - Third Quarter 2007 Groundwater Monitoring Report (H&A, 2007b).
  - Fourth Quarter 2007 Groundwater Monitoring Report (H&A, 2008b).
  - First Quarter 2008 Groundwater Monitoring Report (H&A, 2008c).
- Historical Site Assessment (Sapere, 2005). This report contains:
  - Facility descriptions and historical operational information for buildings used for radiological research and development in Area IV.
  - Information regarding radiological demolition activities, surveys, releases, and removal actions conducted for radiological areas within Area IV.
- Debris Area Survey and Sampling Methodology (CH2M HILL document in progress). This standard operating procedure (SOP) provides general guidelines for performing the following activities:
  - Visual inspections of the SSFL for surficial evidence of solid waste disposal (referred to herein as debris areas).
  - Sampling for chemical analytes at debris areas.
- Quality Assurance Project Plan (QAPP) (MECx, 2008). This QAPP provides general guidelines, which include:
  - Quality assurance/quality control (QA/QC) procedures to ensure that field and laboratory data quality and project work achieve the data quality objectives (DQOs).
  - Ensuring that the project work performed is in accordance with professional standards and regulatory guidelines.
- Building Feature Evaluation and Sampling. (MWH, 2008) This SOP presents the procedures for evaluating environmental conditions associated with existing buildings, concrete pads, and supporting infrastructure under the following scenarios:
  - Environmental assessment prior to building demolition.
  - Environmental assessment during/after building demolition.
  - Environmental assessment for buildings not planned for demolition

S.2 Site History, Chemical Use, and Current Conditions

The RIHL Site is approximately 3.5 acres in the central portion of Area IV at the SSFL. The site location within the SSFL is shown in Figure S.1-1, which also shows the Group 5 Reporting Area boundary. The site layout and the locations of Chemical Use Areas are shown in Figure S.2-1. The sampling locations across the site are shown in Figure S.2-2.

During the RFA, various SWMUs and AOCs within the SSFL were identified. Building 4020 was identified as an SWMU in the RFA (SAIC, 1994). No other SWMUs or AOCs were identified in the RFA within the boundary of the RIHL Site as it is defined in this report (Figure S.1-1).

Based on site inspections, reviews of historical aerial photographs, drawings, and facility maps, as well as on interviews with site personnel that were conducted during the RFI, the RIHL Site boundary was defined to include operations associated with Building 4020. In addition, facilities or features near the SWMU were included for assessment in the RFI. These include, four aboveground storage tanks (ASTs), nine underground storage tanks (USTs), one electrical substation, and a hydraulic lift. The identified Chemical Use Areas at the RIHL Site are shown in Figure S.2-1 and described in Tables S.2-1 through S.2-4. A spill record is included in Table S.2-5.

The following sections describe the SWMU, site history and operations, chemicals used, and current conditions at the RIHL Site.

S.2.1 SWMUs and/or AOCs at the RIHL

The RIHL Site contains one SWMU—Building 4020 (SAIC, 1994). A brief description of the SWMU that is included in this RFI Site Report is presented below.

S.2.1.1 Building 4020 (SWMU 7.7)

Building 4020 was used for examination and preparation of irradiated nuclear reactor fuel and for decladding, cleaning, and repackaging fuel for reprocessing from 1959 through 1987. These activities included the disassembly and examination of irradiated nuclear assemblies from various nuclear reactors, decladding of irradiated plutonium-bearing fuels from offsite reactors, and remote handling of radioactive materials. The building contained four large radioactive-material-handling "hot cells." Additionally, there was a machine shop at the northern end of Building 4020. The chemicals used in the machine shop were stored in drums outside on a concrete pad on the eastern side of the building. Additional information is in Tables S.2-1 through S.2-4.

S.2.2 RIHL History

A summary of the site chronology, including descriptions of site operations and investigation activities for the RIHL Site, is presented below. Facility correspondence, investigation reports, waste disposal records, facility maps, drawings, photographs, and personnel interview records were reviewed and evaluated to compile the site history information presented below. Primary sources of information are summarized in Section S.1.2.

S.2.2.1 Site Chronology

A summary of key historical investigation and remediation activities are presented in Tables S.2-6 and S.2-7. A more detailed description of the RIHL Site is presented below.

S.2.2.1.1 1959 through 1987

The RIHL Site was used for the examination of irradiated fuels and decladding operations.

S.2.2.1.2 Early 1986 to 1996

The Department of Energy began the decommissioning and demolition (D&D) of building 4020 in 1986. In 1992, demolition of the building started. Decontamination to support the demolition occurred from 1992 to 1995. The building was finally removed in 1996.

S.2.2.1.3 1989

Three 5,000-gallon steel tanks (UT-8, UT-9, and UT-64) were removed. The tanks were designed for the storage of fission gases but were never utilized. Two former fuel oil storage tanks (UT-10 and UT-11) were also removed. Tank UT-10 was a 5,000-gallon tank that showed no indications of leakage upon removal and was confirmed through sampling results. Tank UT-11 was a 500-gallon tank that showed evidence of soil staining during removal. The excavation was deepened to 14 feet and widened. Approximately 42 cubic yards of soil were removed and disposed of offsite. All confirmation sampling indicated no further impacts to remaining soil. All tanks were removed under the oversight of Ventura County Environmental Health Department (VCEHD). Tanks UT-10 and UT-11 were closed by VCEHD in 1990 and 1994, respectively.

S.2.2.1.4 1993

Soil characterization was conducted at northeast portion of the RIHL Site to determine chemicals of potential concern (COPCs) as part of the RFA. Three soil samples were collected at 0.5 feet below ground surface (bgs) and analyzed for VOCs, TPH, metals and inorganics. Total recoverable petroleum hydrocarbons (TRPHs)s were detected in all three samples. Cadmium was detected above background levels in all three samples, and zinc was detected above background levels in one sample.

S.2.2.1.5 1998

Decontamination and decommissioning of the entire RIHL Site was completed.

S.2.2.2 Site Inventories

Inventories of buildings, tanks, transformers, and chemicals used at the RIHL Site were compiled during preparation of this RFI report. Historical reports and facility drawings were reviewed, and visual site inspections were conducted. The locations of identified buildings, tanks, transformers, and other site features are shown in Figure S.2-1. The inventories are included as the following tables:

- Building inventory – Table S.2-1
- Storage tank inventory – Table S.2-2
- Transformer inventory – Table S.2-3
- Inventory of other site features – Table S.2-4

- Spill Inventory – Table S.2-5

S.2.3 RIHL Chemical Use Areas

Chemical Use Areas are locations where chemicals were documented to have been (or potentially have been) used, stored, spilled, discharged, and/or disposed of. Based on the review of historical documents, five chemical use areas were identified within the RIHL Site boundary. Chemicals that were potentially used or stored in these Chemical Use Areas include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH), and metals. Chemical Use Areas at the RIHL Site are shown in Figure S.2-1 and described in detail in Table S.2-8.

S.2.4 Site Conditions

This section provides summaries of site conditions near the RIHL Site, including topography, geology, soil, groundwater, surface water, and biology.

S.2.4.1 General Conditions and Topography

The RIHL Site is located within the southwest portion of Area IV. The site is currently inactive, with no remaining structures. Topography in the central portion of the site slopes to the east. Current surface elevations at the RIHL Site range from approximately 1810 feet msl in the eastern portion to 1830 feet msl in the western portion of the site. A summary site conceptual model is presented in Table S.2-8. Figure S.2-4B presents a cross-section developed for the RIHL Site (Surficial Cross Section U-U'), detailing topography, locations and depths of alluvium, and the most recent available groundwater elevations. Location of the cross-section is shown in Figure S.2-4A.

Two cleanup actions have been conducted at the RIHL Site have altered the topography through extensive excavation, backfilling, and grading. The areal extent of the excavation is shown in Figure S.2-1.

S.2.4.2 Geology

The RIHL Site is located north of the Coca Fault, near the Lower Burro Flats member of the Upper Chatsworth Formation to the north of the fault (Dibblee, 1992; MWH, 2002 and 2007c).

Beds of the Lower Burro Flats Member generally strike N70°E and dip 25°NW. The Lower Burro Flats Member is predominantly composed of fine- and medium-grained sandstone with significant interbeds of siltstone and shale. Figure 2-5 of the Group 5 RFI Report (Volume I) shows the geologic units represented within the RFI site. The location of the Coca Fault is shown on Plate B-1 in Appendix B. Additional geologic information is also presented in Appendix B of the Group 5 RFI Report.

S.2.4.3 Soil

Soil is generally deep at the RIHL Site, typically ranging from 6 feet to greater than 14 feet thick. During removal of Building 4020, soil was excavated throughout the approximate footprint of the building. The maximum depth of backfill in the RIHL Site is up to 70 feet

below current grade based on excavation reports. A map depicting the distribution of alluvial soil within the Group 5 Reporting Area is provided as Figure 2-4 in the Group 5 RFI Report (Volume I). Soil within the excavation areas consist of DTSC-approved soil from an onsite borrow area. Fill soil are composed of primarily fine-grained sandy lean clays. Soil in the undisturbed areas of the site consist of weathered Chatsworth Formation materials, which are primarily fine-grained silty sands, sandy lean clays, lean clays, clayey sands, lean clays with sand, and silts. Soil boring logs are included as Attachment S-2 to this appendix.

S.2.4.4 Groundwater

The groundwater system and monitoring network in RFI Group 5 is discussed in detail in Appendix B of the Group 5 RFI Report. In that appendix, Figure B-1 shows the locations of wells and piezometers that are used to monitor groundwater at and near the RIHL Site. Figure S.2-2 shows locations of wells in and around the RIHL Site.

At the RIHL Site, one piezometer (PZ-103) was installed to monitor groundwater conditions in alluvium and weathered bedrock (that is, in NSGW). Additionally, no wells have been installed to monitor groundwater conditions in the unweathered bedrock (that is, in CFOU Groundwater). Construction details for the piezometer are discussed in Tables B-2 and B-3 of Appendix B of the Group 5 RFI Report, and their locations are shown in Figure S.2-2.

NSGW is encountered at a depth of approximately 24 feet bgs (1792 feet msl) at piezometer PZ-103, and flows to the east at a hydraulic gradient of approximately 0.02 foot per foot (ft/ft). The occurrence of NSGW in the RIHL Site area is shown in plan view in Figure B-7 in Appendix B of the Group 5 RFI Report.

Depth to CFOU groundwater at the RIHL Site is unknown due to the lack of deep wells in the vicinity of the site. While there are no wells within the RIHL Site, data for nearby wells indicate that CFOU groundwater flows to the east at a gradient of approximately 0.04 feet per foot (ft/ft). The occurrence of CFOU Groundwater in the RIHL Site area is shown in plan view in Figure B-8 in Appendix B of the Group 5 RFI Report. Further information related to the CFOU groundwater at the RIHL Site is presented in Appendix B.

S.2.4.5 Surface Water

Surface water flow at the RIHL Site is shown in Figure 2-7 of the Group 5 RFI Report (Volume I). Surface water may exist intermittently at the RIHL Site as the result of seasonal precipitation events. Surface water runoff flows generally to the east to the DOE LF 3 RFI Site then to the R-2 Discharge Ponds.

Surface water runoff at the site is regularly monitored as part of the National Pollutant Discharge Elimination System (NPDES) monitoring program under the oversight of the Los Angeles Regional Water Quality Control Board (RWQCB). One monitoring location, Outfall 018, is downgradient at the discharge of the R-2 Ponds (Figure 2-7 of the Group 5 RFI Report [Volume I]). This discharge point is the ultimate discharge point for a large portion of the western half of SSFL.

S.2.4.6 Biology

In April 2008, a reconnaissance-level biological survey was conducted at the Group 5 RFI Sites. Biological conditions at the RIHL Site, including habitat/vegetation types, are shown

on Figure 2-10 of the Group 5 RFI Report (Volume I). The results of the biological survey and a qualitative plant evaluation are presented in Appendix A, Attachment A18.

S.3 Nature and Extent of Chemical Impacts

This section describes the data used to define the nature and extent of chemical impacts to environmental media at the RIHL Site. The presentation includes sampling objectives, scope, key decision points related to characterization activities, and findings.

Transport-and-fate evaluations are discussed in the following sections of the report:

- Group 5 RFI Report (Volume I), Section 5, Contaminant Transport and Fate – Potential migration via surface water flow
- Group 5 RFI Report (Volume II), Appendix A, Risk Assessment - Potential VOC migration from groundwater to soil, and from soil to indoor air
- Group 5 RFI Report (Volume III), Appendix B, Groundwater Characterization – Potential migration from soil to groundwater, and groundwater migration

S.3.1 Sampling Objectives

Several soil and soil vapor samples were collected as part of the previous CCR, and preliminary RFI sample collection events (ICF Kaiser, 1993). Based on the historical document review summarized in Section S.2, additional soil and soil vapor samples were collected to further characterize the site based on the RFI DQOs. The process of selecting sampling locations, depths, and analytical methods considered objectives established in the Group 5 DQOs as summarized in the Group 5 RFI Report, Section 4.0 (Volume I).

To achieve these objectives, recent soil sampling was conducted as described in Tables S.3-1A and S.3-1B, with consideration of the following:

- Additional information regarding site use and observed site conditions
- Site sampling results and data trends
- Knowledge of chemical properties (such as mobility, volatility, and association with other chemicals)
- SSFL metals and dioxin background concentrations
- SSFL SRAM-based screening concentrations for human health and ecological receptors
- Risk assessment results and knowledge of areas recommended to require further evaluation during the CMS

Groundwater has been sampled to comply with site-wide routine monitoring requirements and additional characterization objectives according to regulatory agency-approved work plans (see Section S.3.2). Based on detected RFI site chemicals, chemical distribution, and site conditions, additional groundwater sampling and analysis was also conducted to complete characterization of individual RFI sites and provide data sufficient for risk assessment. Groundwater sampling was conducted as described in the Sampling Analysis Plans (GRC, 1995a and 1995b) and the Shallow Zone Groundwater Investigation Work Plan (Ogden, 2000b).

S.3.2 Sampling Scope

A total of 59 soil matrix samples and 13 soil vapor samples was collected between February 1993 and June 2008 to assess potential impacts associated with the Chemical Use Areas at the RIHL Site, not including samples from areas that have since been excavated. Sampling locations and analytical suites were based on DTSC requests, sampling results from previous investigations, additional facility information obtained from historical records, site inspections and/or personnel interviews, and historical and/or aerial photographs. Sampling summaries are presented in Tables S.3-1A through S.3-1B. Sample locations are shown in Figure S.2-2.

NSGW had been sampled and analyzed according to agency-approved work plans (GRC, 1995a and 1995b; Ogden, 2000b). One piezometer was used to characterize NSGW specifically at the RIHL Site. As described in the risk assessment, groundwater monitoring data from the most impacted well within the Group 5 Reporting Area were used to characterize the potential direct exposure route for human receptors. RFI site groundwater monitoring data were used for potential indirect groundwater exposures at that site. Groundwater characterization data for the RIHL Site are presented with the entire Group 5 groundwater data set in Appendix B of the Group 5 RFI Report.

In 2008, soil samples collected were submitted to two California-certified environmental laboratories—GEL Engineering Laboratories in Atlanta, Georgia, and Test America, Inc. in Arvada, Colorado. As an ongoing, additional QA measure, the field sampling effort consisted of collecting blind duplicates and split samples at a frequency of approximately 5 percent of primary samples. Blind duplicates were submitted along with the primary samples to the two environmental laboratories. Split samples were submitted for analyses to Lancaster Laboratories in Lancaster, Pennsylvania, a California-certified environmental laboratory previously designated for analyzing split samples only. Highest concentrations of usable data from primary, duplicate, and split samples were used when evaluating contamination at the site.

Based on a QA review conducted on soil, soil vapor, sediment, and piezometer sampling results, data have been deemed usable and comply with RFI program requirements as defined by DTSC-approved Quality Assurance Project Plans (Ogden, 2000a). The RFI QA program included individual sample data validation and assessment of the performance of each laboratory, as well as a qualitative review of the precision, accuracy, representativeness, reliability, and completeness parameters for the datasets. Historical samples (collected prior to the beginning of the RFI in 1996) were typically not validated for the subsequent RFI, but are deemed useable for the RFI because they were collected and reviewed according to the QA protocols for those programs and used by agencies to make decisions for the RIHL Site cleanup actions. Overall data quality is described in the RFI Program Report (MWH, 2004). Site-specific data quality summaries for the RIHL Site are described by media in the sections below.

This report presents results of media sampling, if the media exists at the RFI site, conducted during the RFI and previous investigations at RIHL, including results for the following media:

- Soil vapor

- Soil matrix
- Groundwater
- Surface water

S.3.3 Key Decision Points

Site assessment was been performed to address revised, DTSC-approved requirements for risk assessment and evaluate new potential Chemical Use Areas. Sampling of new Chemical Use Areas and step-out sampling procedures followed the DTSC-approved work plan protocols for the RFI (MWH, 2005).

Site-specific characterization decision points are described in Table S.3-2A. These decision points represent either assumptions upon which sampling was based, or decisions made during step-out sampling or data evaluation. Programmatic decision points (those common to all RFI sites) are described and included in the RFI Program Report (MWH, 2004).

S.3.4 Soil Matrix and Soil Vapor Findings

All soil and soil vapor sampling results and characterization findings are summarized in Table S.3-2A. The goals of the table are to:

1. Present summaries of sampling results, including nature and extent of impacts.
2. Demonstrate that soil characterization is adequate and that no further sampling is warranted.
3. For areas recommended for CMS evaluation, indicate that soil volumes can be estimated within a factor of 10 for comparison of remedial alternatives.

Goals 2 and 3 are achieved through an iterative evaluation process that takes into account the risk assessment results and CMS recommendations, as well as the soil analytical data. For example, if detected concentrations are sufficiently high to indicate that further evaluation in the CMS will be necessary, the data are considered to be adequate for the purpose of risk assessment. Similarly, the risk assessment results can be used along with the soil analytical results to delineate CMS areas and estimate soil volumes within an order of magnitude (Goal 3). Other criteria used to evaluate characterization completeness include the sampling results compared to screening levels, the presence and magnitude of concentration gradients, the types of historical site operations and chemical uses, and analytical detection limits.

Data quality and risk assessment evaluation summaries for the RIHL Site are provided in Tables S.3-3A and S.3-3B.

S.3.4.1 Soil and Soil Vapor Data Presentation

The soil data results organized by chemical group are summarized in Figures S.3-1 through S.3-8. Relevant site information, sampling rationale, analytical results, and evaluation of results are presented in Table S.3-2A. This table discusses the sampling approach for each Chemical Use Area and a brief summary of the sampling results by chemical group, including:

- Column 1 –Chemical Use Area number.

- Column 2 – Chemical Use Area name.
- Column 3 – Chemical group sampled in a particular Chemical Use Area.
- Column 4 – Sampling scope and rationale for each chemical group in a particular Chemical Use Area.
- Column 5 – Abbreviated summary of sampling results for soil and soil vapor each chemical group in a particular Chemical Use Area. (A more detailed sitewide summary is presented in Section S.3.4.2 that follows.) As appropriate, sample results are compared to established SSFL background concentrations (metals and dioxins only) and/or SSFL risk-based screening levels (RBSLs).[1] The screening levels are also displayed in Tables S.3-3A and S.3-3B.
- Column 6 – Assessment of whether characterization is sufficient such that the risk assessment reflects the approximate maximum analyte concentration or a concentration sufficiently high to result in risk requiring a recommendation for evaluation during CMS.
- Column 7 – Assessment of whether the nature and extent of chemicals are defined sufficiently to estimate soil volumes (within a factor of 10) for areas that require further consideration in the CMS (if needed).

S.3.4.2 Soil and Soil Vapor Data Summary

As detailed in Table S.2-8, five confirmed and potential Chemical Use Areas were investigated at the RIHL Site. A summary of the chemicals detected above screening criteria is provided below by chemical analytical group. Concentrations denoted with a "J" flag indicate the results are estimated below the method reporting limits.

S.3.4.2.1 Volatile Organic Compounds

A total of 13 soil vapor samples was collected at 10 locations and analyzed for VOCs. Of the 13 soil vapor samples, 1 had detectable levels of VOCs, and results are shown in Figures S.3-1A and S.3-6.

- Benzene and toluene were detected at concentrations that did not exceed their respective RBSLs.

A total of 25 soil samples was collected at 14 sample locations. Of the 25 samples, two had detectable levels of VOCs, and results are shown in Figures S.3-1B and S.3-6.

- Acetone and methyl ethyl ketones were detected at concentrations that did not exceed their respective RBSLs.

Further characterization of VOCs is not recommended.

[1] The use of the SRAM-based screening levels for comparison purposes does not serve as a risk assessment. These screening levels are not used to determine the significance of detected chemical concentrations or if a Chemical Use Area will be recommended for further consideration in the CMS, but only to provide the reader another tool to evaluate the characterization data. The SRAM-based screening levels represent conservative concentrations that pose a low level of risk. See Appendix A of the Group 5 RFI Report.

S.3.4.2.2 Semivolatile Organic Compounds

A total of eight soil samples was collected at four locations and analyzed for SVOCs. Of the eight samples, seven had detectable levels of SVOCs, and results are shown in Figures S.3-2 and S.3-7.

- Bis(2-ethylhexyl), di-n-butyl phthalate, di-n-octyl phthalate, and n-nitrosodimethylamine were detected at concentrations that did not exceed their respective RBSLs.
- Various polynuclear aromatic hydrocarbons (PAHs) were detected in seven samples collected at concentrations that did not exceed their respective RBSLs.

Further characterization of SVOCs (or PAHs) in soil is not recommended.

S.3.4.2.3 Total Petroleum Hydrocarbons

A total of 11 soil samples was collected at seven locations and analyzed for TPH. Of the 11 samples collected, 9 had detectable concentrations of TPH.

- Diesel-range hydrocarbons (C15-C20), lubricating-oil-range hydrocarbons (C21-C30), and TRPH were detected at concentrations that did not exceed their respective RBSLs.

Further characterization of TPH in soil is not recommended.

S.3.4.2.4 Polychlorinated Biphenyls

A total of 11 soil samples was collected from eight locations and analyzed for PCBs. Of the 11 samples, 8 had detectable levels of PCBs and results are shown in Figures S.3-3 and S.3-7.

- Aroclor 1254 was detected above the Residential RBSL of 350 micrograms per kilogram (µg/kg) or Ecological RBSL of 77 µg/kg, or both, in two samples collected from: HLBX1000D at a depth of 0 to 1 foot bgs (375J µg/kg) and HLBX1000C at a depth of 0 to 1 foot bgs (258J µg/kg). These samples are bound by samples that did not contain PCBs above their respective RBSLs.
- Aroclor 1260 was detected above the Residential RBSL of 350 µg/kg or Ecological RBSL of 77 µg/kg, or both, in three samples collected from HLBX1000D at a depth of 0 to 1 foot bgs (960J µg/kg), the composite sample HLBX1000 at a depth of 0 to 1 foot bgs (696 µg/kg), and HLBX1000C at a depth of 0 to 1 foot bgs (280J µg/kg). These samples are bound by samples that did not contain PCBs above their respective RBSLs.

Further characterization of PCBs is not recommended.

S.3.4.2.5 Metals/Inorganics

A total of 34 soil samples was collected at 20 locations and analyzed for metals. At least one or more metals were detected in all sampling locations, and results are shown in Figures S.3-5 and S.3-8.

- Aluminum, barium, cadmium, mercury, nickel, selenium, vanadium, and zinc concentrations were detected above their respective background concentrations and Ecological RBSLs and/or Residential RBSLs.

- Aluminum (background of 20,000 milligrams per kilogram [mg/kg], Ecological RBSL of 12 mg/kg) was detected at concentrations ranging from 11,100 mg/kg to 27,000 mg/kg. Aluminum was detected above background and Ecological RBSLs in 24 samples collected. Results are presented in Figures S.3-5 and S.3-8. The elevated concentrations of aluminum may be consistent with naturally occurring concentrations in the soil derived from the Santa Susana Formation.

- Barium (background of 140 mg/kg, Ecological RBSL of 15 mg/kg) was detected at concentrations ranging from 83.6 mg/kg to 190 mg/kg. Barium was detected above its background concentration and Ecological RBSL in nine samples collected from:

  - U5BS1112 at a depth of 0 to 1 foot bgs (190 mg/kg) and 5 to 6 feet bgs (180 mg/kg)
  - U5BS1109 at a depth of 5 to 6 feet bgs (160 mg/kg)
  - U5BS1114 at a depth of 5 to 6 feet bgs (150 mg/kg)
  - U5BS1115 at a depth of 0 to 1 foot bgs (145 mg/kg)
  - U5BS1419 at a depth of 0 to 1 foot bgs (143 mg/kg) and 5 to 6 feet bgs (144 mg/kg)
  - U5BS1420 at a depth of 0.5 to 1.5 feet bgs (141 mg/kg) and 5 to 6 feet bgs (144 mg/kg)

  The elevated concentrations of barium may be consistent with naturally occurring concentrations in the soil derived from the Santa Susana Formation.

- Cadmium (background of 1 mg/kg, Ecological RBSL of 0.0045 mg/kg) was detected at concentrations ranging from 0.055J mg/kg to 1.8 mg/kg. Cadmium was detected above its background concentration and Ecological RBSL in three samples collected from: E-4-03 at a depth of 0 to 0.5 feet bgs (1.8 mg/kg), E-4-01 at a depth of 0 to 0.5 feet bgs (1.4 mg/kg), and E-4-02 at a depth of 0 to 0.5 feet bgs (1.2 mg/kg).

- Mercury (background of 0.09 mg/kg, Ecological RBSL of 0.1 mg/kg) was detected at concentrations ranging from 0.0069J mg/kg to 0.16 J mg/kg. Mercury was detected above its background concentration and Ecological RBSL in one sample collected from HLBS1001 at a depth of 0 to 1 foot bgs (0.16J mg/kg).

- Nickel (background of 29 mg/kg and Ecological RBSL of 0.1 mg/kg) was detected at concentrations ranging from 5.5J mg/kg to 38J mg/kg. Nickel was detected above its background concentration and Ecological RBSL in one sample collected from U5BS1109 at a depth of 5 to 6 feet bgs (38J mg/kg).

- Selenium (background of 0.655 mg/kg and Ecological RBSL of 0.17 mg/kg) was detected at concentrations ranging from 0.24J mg/kg to 1.5J mg/kg. Selenium was detected above its background concentration and Ecological RBSL in four samples collected from the following:

  - U5BS1109 at a depth of 5 to 6 feet bgs (1.5J mg/kg)
  - HLBS1001 at a depth of 0 to 1 foot bgs (0.85J mg/kg)
  - U5BS1112 at a depth of 5 to 6 feet bgs (0.71J mg/kg)

  - U5BS1110 at a depth of 0 to 1 feet bgs (0.665J mg/kg)

- Vanadium (background of 62 mg/kg and Ecological RBSL of 1.5 mg/kg) was detected at concentrations ranging from 26 mg/kg to 69 mg/kg. The maximum concentration detected at the RIHL Site was less than 10 percent above background concentrations. Vanadium was detected above its background concentration and Ecological RBSL in four samples collected from the following:

  - U5BS1112 at a depth of 0 to 1 foot bgs (63 mg/kg) and 5 to 6 feet bgs (69 mg/kg)
  - U5BS1109 at a depth of 5 to 6 feet bgs (68 mg/kg)
  - U5BS1110 at a depth of 0 to 1 foot bgs (65.5 mg/kg)

  The elevated concentrations of vanadiumm may be consistent with naturally occurring concentrations in the soil derived from the Santa Susana Formation.

- Zinc (background of 110 mg/kg and Ecological RBSL of 21 mg/kg) ranged from 42 mg/kg to 210 mg/kg. Zinc was detected above its background concentration and Ecological RBSL in one sample collected from E-4-03 at a depth of 0 to 0.5 feet bgs (210 mg/kg).

- Additional characterization of aluminum, mercury, nickel, selenium, and zinc might be required at the RIHL.

- Metals detected above respective background levels (but below their respective RBSLs) include beryllium, chromium, and sodium. Background concentrations for metals are included in Table S.3-3A. Sodium was detected at concentrations ranging from 200 mg/kg to 780 mg/kg. RBSLs for sodium have not been established. No further characterization of these metals will be required at the RIHL.

- Perchlorate was not found to have been previously used at the RIHL Site and was not included for analysis at any sampling locations.

S.3.4.2.6 Dioxins

Dioxins were not identified as having been previously used at the RIHL Site during the historical document review. Consequently, dioxins were not included for analysis at any sampling locations.

S.3.4.2.7 Energetics

Energetics were not identified as having been previously used at the RIHL Site during the historical document review. Consequently, energetics were not included for analysis at any sampling locations.

S.3.5 Groundwater Findings

Groundwater occurrence and impacts at the RIHL Site are described below.

S.3.5.1 Groundwater Data Presentation

Groundwater sampling results and characterization findings are summarized in Table S.3-2B and in Appendix B of the Group 5 RFI Report. The purposes of Table S.3-2B are to:

- Summarize soil impacts as they potentially relate to groundwater impacts.
- Summarize groundwater sampling results.
- Demonstrate that groundwater characterization is sufficient for the purposes of risk assessment, including:
  - That groundwater characterization is adequate for detected site-related chemical constituents.
  - That site soil characterization is adequate for detected groundwater chemical constituents.

Similar to Table S.3-2A, Table S.3-2B describes groundwater data by chemical group (such as metals, VOCs, and SVOCs). Table S.3-2B is organized as follows:

- Column 1 – Analytical group
- Column 2 – Summary of site soil impacts
- Column 3 – Confirmation that chemicals detected in site soil are monitored in groundwater
- Column 4 – Summary of groundwater impacts
- Column 5 – Discussion of whether chemicals are site-related
- Column 6 – Conclusion regarding adequacy of groundwater characterization

A detailed compilation of groundwater data is provided in Appendix B of the Group 5 RFI Report. The groundwater appendix contains a description of hydrogeologic conditions (such as occurrence, water levels, recharge, and yield, for example), groundwater quality, and transport and fate. These data include the following:

- Laboratory analytical results
- Hydrographs
- Time-series plots
- Cumulative distribution plots

A sitewide report on SSFL groundwater will be prepared as part of the RFI Program. This report will comprehensively address the same characterization and transport-and-fate issues addressed in Appendix B of the Group 5 RFI Report.

S.3.5.2 Groundwater Data Summary

Groundwater conditions at the RIHL Site are characterized by piezometer (PZ-103) in NSGW. Groundwater findings from these wells are presented in Tables S.3-2C and Appendix B of the Group 5 RFI Report.

As described in Appendix B of the Group 5 RFI Report, samples from the NSGW piezometer at the site (PZ-103) were analyzed for VOCs, SVOCs, TPH, metals, and inorganics.

- 1,1-Dichloroethene and TCE were detected, but detectable concentrations did not exceed their respected groundwater screening levels.
- Diethyl phthalate was detected on April 9, 2002, but detectable concentrations of this SVOC did not exceed its screening levels.
- TPH was not detected in any of the NSGW samples collected.
- Concentrations for dissolved metals detected (barium, calcium, chromium, iron, magnesium, potassium, and sodium) were all below their respective screening levels except:
  - Aluminum with a detected concentration of 306 µg/L at PZ-103 exceeded its groundwater screening level of 200 µg/L.
  - Manganese with a detected concentration of 185 µg/L at PZ-103 exceeded its groundwater screening level of 150 µg/L.
  - Silver with a detected concentration of 3.4J µg/L at PZ-103 exceeded its groundwater screening level of 0.17 µg/L.
- Concentrations for inorganic compounds detected (bromide, chloride, nitrate-NO_3, and sulfate) were all below their respective screening levels.

NSGW exceedences of aluminum, manganese, and silver above their respective groundwater screening levels may require additional characterization/monitoring at the RIHL Site. Silver was detected in soil below background and screening level concentrations at the RIHL Site. Manganese and aluminum were also detected, but these metals are naturally occurring in the Santa Susana Formation. Elevated concentrations of aluminum and manganese in NSGW at the RIHL Site may be related to site activities and may require additional consideration during the site-wide groundwater Corrective Measure Study. CFOU groundwater will be evaluated further in Appendix B and the CFOU RFI Report.

S.3.6 Surface Water Findings

Surface water exists intermittently at the RIHL Site primarily as a result of seasonal precipitation events. The RIHL Site is located along a surface water divide. As a result, the soil within the site is not likely impacted by upgradient sites via surface water transport. There are no features at the RIHL Site that indicate surface water flows from the site. However, it may be possible for the near-surface soil to become mobilized during storm events and subsequently deposited at downstream sites, including DOE Leachfield 3, STL-IV, the drainage south of the Compound A Facility, and ultimately the R-2 Ponds. However, the relatively flat topography and lack of defined drainages, makes the movement of impacted soil from the RIHL Site downgradient via surface water transport unlikely.

S.4 Risk Assessment Findings

The objective of this risk assessment (RA) is to determine whether the RIHL could pose unacceptable risks that might require remedial action, or is eligible for an NFA designation.

The following sections summarize the findings of the HRA and ERA performed for the RIHL. Details regarding how the HRA and ERA were conducted are presented in the SRAM (MWH, 2005) and in Appendix A of the Group 5 RFI Report. Details regarding how the site-specific HRA and ERA are presented in Appendix A, Attachment A16, of the Group 5 RFI Report.

S.4.1 Key Decision Points

Site-specific key decision points for the HRA and ERA are listed below and are described more fully in Appendix A and Attachment A16 of the Group 5 RFI Report. These decisions were made for the risk assessments based on site-specific conditions, chemical characteristics, and assessment findings. Programmatic decision points are described and included in the RFI Program Report (MWH, 2004). Site-specific key decision points include the following:

1. Both direct (drinking water) and indirect (soil vapor) exposures to groundwater COPCs were evaluated in the risk assessment (Appendix A).
2. Exposure point concentration (EPC) calculations were based on collected characterization data, as follows:
    - All CFOU Groundwater EPCs were based on maximum levels detected in a single highest-concentration well within Group 5, HAR-18, for both indirect and direct exposure. All NSGW EPCs were based on the maximum concentrations detected in all NSGW piezometers and wells within the ECL Site for both indirect and direct exposure.
    - A review of time-series plots for chemical constituents, groundwater gradients, and source areas indicates maximum concentrations detected during the last consecutive 3 years conservatively represent potential future conditions for the purpose of estimating future risks.
    - Soil EPCs were calculated using ProUCL 4.0 following methods specified in the SRAM (MWH, 2005). Two EPCs were used, the central tendency exposure (CTE) and the reasonable maximum exposure (RME). The CTE was the arithmetic mean of the data and the RME was the 95 percent upper confidence limit (95UCL) as calculated by ProUCL 4.0. In cases where the 95UCL exceeded the maximum detected concentration, the RME defaulted to the maximum detected concentration. In some cases, the CTE also exceeded either the RME or the maximum detected concentration due to differences in assumptions regarding distribution (the arithmetic mean assumes a normal distribution, whereas the method for calculating the 95UCL is based on data distribution) and handling of nondetected values in ProUCL 4.0. In these cases, the value selected as the RME EPC was also used for the CTE EPC.

3. Large home-range receptors were assumed to live only in source areas within the RIHL Site. Risks for these receptors using home-range adjusted exposures were calculated for the purpose of evaluating RFI-site-related risks. Large home-range receptor cumulative risk across the SSFL will be presented later in a sitewide summary report of the large home-range receptor risk assessment.

S.4.2 Summary of Human Health Risk Assessment Findings

Potential risks were estimated for future urban residents (child and adult) and future recreational users (child and adult) of the RIHL Site. A conceptual site model diagram for human health risk assessment is presented in Figure S.4-1 and a summary of COPCs and risk estimates for human health are presented in Table S.4-1 and Table S.4-2 respectively. Results of the risk characterization indicated the following:

- Soil – Aroclor 1254 and aroclor 1260 were identified as COCs for direct contact with soil. Aroclor 1260 was identified as a COC for direct contact with soil by future recreators. No COCs were identified for plant consumption by future residents.
- Soil Vapor – No COCs were identified for inhalation of indoor air by future residents. No COCs were identified for inhalation of ambient air by future residents or future recreators.
- Near-surface Groundwater – Nitrate-NO3 and trichloroethene were identified as COCs for domestic use of shallow groundwater by future residents.
- CFOU groundwater – COCs will be identified and addressed as part of the CFOU groundwater.

The general uncertainties associated with the Group 5 RFI Sites are discussed in Appendix A of the Group 5 RFI Report. Uncertainties associated specifically with the RIHL Site are presented in Table S.4-3.

S.4.3 Ecological Risk Assessment Findings

Potential risks were estimated for terrestrial plants, soil invertebrates, and terrestrial birds and mammals. A conceptual site model diagram for ecological receptors is presented in Figure S.4-2, and a summary of risk estimate and chemicals of ecological concern (COECs) are presented in Tables O.4-4 and O.4-5. Results of the risk characterization indicated the following:

- Soil –Cadmium, nickel, vanadium, Aroclor 1254, Aroclor 1260, and PCB_toxicity equivalency quotients (TEQs) (birds and mammals) were retained as chemicals of ecological concern (COECs). Aluminum, chromium, cobalt, and copper were not retained as COECs. The Aroclors and dioxin/furans (based on PCB_TEQ extrapolation) were retained based on individual results, as well as chemical-class results. Estimated risks were in the medium range for metals and Aroclors, and in the high range for dioxin/furans.
- Soil Vapor – No COECs. The assumed concentration of 1,1,2-trichloroethane (that is, the sample quantification limit (SQL) exceeded the inhalation toxicity reference value (TRV)

(hazard quotient is less than 1), but it was not retained as a COEC because it was never detected.

The general uncertainties associated with the Group 5 RFI Sites are discussed in Appendix A of the Group 5 RFI Report. Uncertainties associated specifically with the RIHL Site are presented in Table S.4-6.

S.4.4 RIHL Site Risk Assessment Conclusions

This section presents the overall conclusions for the RIHL Site according to this RA. The risk assessment provides a quantitative and qualitative appraisal of the actual or potential effects of contaminants on human health or terrestrial wildlife.

The potential sources of contamination to the RIHL Site consist of Building 4020, four aboveground storage tanks (ASTs), nine underground storage tanks (USTs), one electrical substation, and a hydraulic lift.

Potential risks associated with direct contamination of soil and soil vapor were assessed in this RA. Soil and soil vapor samples were collected and analyzed for VOCs. Soil samples were collected and analyzed for SVOCs, petroleum hydrocarbons, PCBs, metals, and inorganics. Data were considered adequate to evaluate potential risks.

Aroclor 1254 and aroclor 1260 were identified as COCs for direct contact with soil. Aroclor 1260 was identified as a COC for direct contact with soil by future recreators. No COCs were identified in soil vapor for human health. Cadmium, nickel, vanadium, Aroclor 1254, Aroclor 1260, and PCB_toxicity equivalency quotients (TEQs) (birds and mammals) were identified as COECs in soil. No COEC was identified in soil vapor for ecological receptors.

Near-surface groundwater was analyzed for VOCs, SVOCs, TPH, metals, and inorganics. Nitrate-NO3 and trichloroethene were identified as COCs for domestic use of shallow groundwater by future residents. Chatsworth groundwater will be addressed as part of the CFOU RFI Report.

The locations within the RIHL Site that will require further action to address human health or ecological risk, or both, include Substation 4720 and the Northeast RIHL Area.

S.5 RIHL Site Action Recommendations

This section presents a summary of RFI reporting requirements as applicable to the RIHL Site. Section S.5.1 describes the RFI reporting requirements, particularly with respect to the identification of areas recommended for further work, or "site action" recommendations. The process and criteria used for making site action recommendations are described in Section S.5.2. Site action recommendations for the RIHL Site are summarized in Sections S.5.3 and S.5.4.

S.5.1 RFI Reporting Requirements

As described in regulatory guidance documents for the SSFL RCRA Corrective Action Program (see Section 1.2.3 of Volume I), the purposes of the RFI are to: (1) characterize the nature and extent of contamination, and identify potential source areas; (2) assess potential migration pathways; (3) estimate risks to actual or potential receptors; and, (4) gather necessary data to support the CMS (DTSC, 1995). The RFI Report is required to (1) present findings regarding the above information, (2) describe completeness of the investigation, and (3) indicate if additional work is needed.

The RIHL Site Report accomplishes these requirements by:

1. Presenting detailed characterization findings, source area identification, and investigation completeness determinations by media and by chemical class for all chemical use areas (and associated down-drainage locations) (Tables S.3-2A and S.3-2B). Section S.3 summarizes the overall characterization of contamination nature and extent, potential source areas, and an assessment of investigation completeness.
2. Evaluating groundwater migration pathways in Appendix B of the Group 5 RFI Site Report and other potential transport pathways in Appendix A of the Group 5 RFI Site Report.
3. Identifying potential receptors and estimating potential risks at the RIHL Site (Section S.4 and Appendix A).
4. Identifying RIHL Site areas requiring further work (this section).

S.5.2 Basis for Site Action Recommendations

In summary, site action recommendations included in the RIHL Site Report identify areas for the following:

- Further evaluation in the CMS (CMS Areas)
- No further action (NFA Areas)
- Interim corrective measures to stabilize source areas and control contaminant migration (Stabilization Areas)

Site action recommendations are based on the characterization and risk assessment findings. Characterization findings provide definition of the nature and extent of site contaminants, based on chemical data and transport and fate evaluation. Risk assessments evaluate

characterization data, estimate human health and ecological risks based on specified land use scenarios, and identify chemicals that drive or contribute to those risks.

The site action recommendations listed above result from two evaluations described below. CMS or NFA Area recommendations are based on an integrated evaluation of characterization and risk assessment results. Stabilization Area recommendations rely on characterization evaluations, including transport and fate analysis, and comparison to risk based levels. Each process is described further below.

S.5.2.1 CMS and NFA Site Action Evaluation Process

CMS or NFA site action recommendations are based on a 4-step process. This process, which is presented in detail in Section 7.1 of the Group 5 RFI Report, is summarized as follows:

- **Site Action Evaluation Step 1.** Risk assessment results for human and ecological receptors are compared to "acceptable" levels published by the USEPA or DTSC as guidance for site managers (DTSC, 1992; USEPA, 1992). The low end of the risk range (i.e., 1×10^{-6}, or 1 in 1,000,000, or HI = 1.0) is used to conservatively estimate the areal extent that is recommended for site action.
- **Site Action Evaluation Step 2.** When estimated RFI site risks are greater than 1×10^{-6} (cancer risks) or HI values are greater than 1 (noncancer and ecological risks), the RFI site's risks are reviewed on a chemical-by-chemical basis to identify risk-drivers and significant risk contributors to the cumulative, total risk for each potential receptor.
- **Site Action Evaluation Step 3.** Characterization findings from the entire RFI site are evaluated to identify areas where higher concentrations of risk drivers and contributors are detected. The identified areas are termed in this report 'CMS Areas' and represent locations recommended for further evaluation during the CMS. Areas recommended for further evaluation during the CMS are comprehensive of all appropriate potential receptors or land use scenarios.
- **Site Action Evaluation Step 4.** The fourth step identifies any uncertainties in the RFI site characterization and risk assessments that may affect the findings. For example, some chemicals are assumed to be present in soil based on TPH extrapolation factors (e.g., benzene and PAHs) and contribute to total risk for the RFI site above acceptable levels. Since this assumption is often highly conservative, its use as a basis for CMS recommendations may be further evaluated in the CMS.

Site action recommendations are tabulated by chemical use area, and chemical risk drivers/contributors are identified for each appropriate receptor in Table S.5-1. CMS Areas are also depicted graphically in Figure S.5-1 to illustrate locations and approximate areal extents, and summarized in Table S.5-2.

Two additional aspects of RFI reporting will serve to confirm and/or finalize the areas recommended in Group RFI Reports for evaluation in the CMS. The first is an ecological evaluation for large-home range receptors (e.g., mule deer and hawk). The second is a groundwater evaluation that will be reported in the Site-Wide Groundwater Report. Updates to this report will be prepared as needed.

S.5.2.2 Source Area Stabilization Site Action Evaluation Process

Chemical data collected during the RFI are evaluated to determine the potential for contaminant migration. Resulting site action recommendations focus on stabilization measures related to sediment transport via the surface water pathway.

Criteria used to evaluate if source area stabilization measures are needed to control surface water migration include the following:

- Presence of chemical concentrations above background or RBSLs in surficial (not deeper) soils
- Proximity of surficial impacts to an active surface water drainage pathway
- Moderate to steep topography
- Absence of containment features (e.g., surface coatings, dams)
- Concentration gradients that indicate prior transport away from the source of surficial impacts

Each criterion is considered important, and a weight-of-evidence evaluation is used to make a recommendation for source area stabilization measures. Source area stabilization measures, which include the use of best management practices (BMPs), are used to prevent migration to surface water. BMPs may include the installation of straw bales, fiber rolls, and silt fencing, and/or covering of areas with plastic tarps. Erosion control measures have been applied to many surficial soil source areas at the SSFL to prevent contaminant migration. These are described in the SSFL Storm Water Pollution and Prevention Plan (MWH, 2006a).

S.5.3 CMS Site Action Recommendations

Based on the results of the RFI site investigation and the human health and ecological risk assessments, a portion of the RIHL Site is recommended for CMS.

As presented in Table S.4-2, the maximum cumulative human health risk for the RIHL Site is $9x10^{-6}$ under a hypothetical future residential exposure scenario, and the maximum hazard index is 5. For the hypothetical future recreational scenario, the risk and hazard index values are $3x10^{-6}$ and less than 1, respectively. The potential human health risks at the RIHL Site exceed the low end of the risk management range ($1 X 10^{-6}$) (excess lifetime cancer risk [ELCR]) and also exceed a hazard index of 1 (noncancer risks). Consequently, a CMS is recommended. As shown in Table S.5-1, the primary risk drivers for the hypothetical future residential scenario are PCBs in surface soil (cancer risk) and TCE (noncancer health effects) in NSGW.

As presented in Table S.4-4, Ecological HI values are greater than 1 for the hermit thrush and deer mouse due to two PCB detections in surface soil near former Substation 4720. In addition, Ecological HI values are greater than 1 for the hermit thrush, deer mouse, and mule deer due to detections of cadmium, nickel, and vanadium in the eastern portion of the RIHL Site. Because the hazard quotient values exceed 1, a CMS is recommended to address ecological risks.

The following two RIHL Site areas are recommended for evaluation in the CMS:

- **RIHL-1**: Substation 4720. The chemical risk drivers are PCBs in soil for both human and ecological receptors.
- **RIHL-2**: Northeast RIHL Area. The chemical risk drivers are cadmium, vanadium, and zinc in soil for ecological receptors.

The locations of these CMS areas are presented in Figure S.5-1 and described further in Table S.5-2.

While the HRA identified that the NSGW poses an unacceptable risk to future potential residential receptors, CMS areas were not developed to address COCs in NSGW. COCs in NSGW will be addressed in the forthcoming CFOU Groundwater RFI Report.

S.5.4 NFA Site Action Recommendations

Based on a detailed review of all available historical documents, an evaluation of sample data collected at the site during previous investigations and the current RFI, including the results of human health and ecological risk assessments performed for the site, all areas of the RIHL Site except the CMS area identified in the previous section are appropriate for an NFA designation. For the areas recommended for NFA, the sections below summarize the historical uses, the sampling data collected, and the results of the HRA and ERA.

S.5.4.1 Historical Uses

CH2M HILL performed a detailed review of all available historical documents, conducted site inspections, interviewed current and previous SSFL employees, and prepared comprehensive maps and tabulations of all information related to chemicals used, stored, or released at the RIHL Site. There are no records available to indicate that chemicals were used, stored, or released at locations outside the Chemical Use Areas identified during the review of historical records. Each of these Chemical Use Areas was subject to site investigation, and sample collection and analysis. In addition, a number of buildings and site features that had no record of historical chemical uses were investigated during the RFI. Consequently, all suspect areas of the RIHL Site were investigated and the findings presented and considered herein.

The areas recommended for NFA at the RIHL Site includes all portions of the site that are not recommended for CMS (Figure S.5-1), including the following Chemical Use Areas:

- Chemical Use Area 1 - Building 4020 and Hydraulic Lift
- Chemical Use Area 2 – Above Ground Tanks Area
- Chemical Use Area 3 – UT-10 & UT-11

Available historical documentation indicates that operations at the Chemical Use Areas identified above involved or may have involved the use of chemicals. However, the sampling data collected at and around these Chemical Use Areas demonstrate that historical activities have not resulted in significant impacts to the site. These sampling data are summarized in the following section.

S.5.4.2 Sampling and Analysis Results

As presented in Section S.3, several soil and soil vapor samples were collected in the area recommended for NFA. Soil and soil vapor samples were collected and analyzed for VOCs. Soil samples were also analyzed for SVOCs, petroleum hydrocarbons, metals, inorganics, and PCBs. Although several compounds were detected above their respective background concentrations (metals) and Ecological RBSLs, the exceedances appear to be isolated in nature, and not indicative of significant releases. These areas are not recommended for further consideration in a CMS.

S.5.4.3 Risk Assessment

The CMS recommendations address all of the constituents that contribute to unacceptable risks to future potential human and ecological receptors at the RIHL Site. Therefore, an NFA designation is appropriate for the entire area outside the areas recommended for CMS at the RIHL Site.

S.5.5 Source Area Stabilization Site Action Recommendations

The RIHL Site is generally flat. During storm events there is little surface flow from the site and it is unlikely that chemical constituents would be mobilized in a storm event. Therefore, the RIHL Site CMS areas do not require stabilization.

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Tables

Table S.2-1
Building Inventory
Rockwell International Hot Lab RFI Site

Building Number	Start (Year)	End (Year)	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
4020	1959 (constructed)	1996 (removed)	Oil related materials, alcohols, solvents, and acids were used at the machine shop at the northern end of Building 4020. These chemicals were also stored in drums outside on the eastern side of the building. TCE was used to clean equipment and parts. Clean TCE was dumped on the slope on the NW corner of the building to evaporate after use. Building 4020 is one of several nuclear facilities at SSFL. This building was used for examination and preparation of irradiated nuclear reactor fuel and for decladding, cleaning, and repackaging fuel for reprocessing. These activities included the disassembly and examination of irradiated nuclear assemblies from various nuclear reactors, decladding of irradiated plutonium bearing fuels from off-site reactors, and remote handling of radioactive materials. Asbestos waste was generated during the cleanup of Southwest Experimental Fast Oxide Reactor (SEFOR) fuel decladding operations. General physical processes performed at Building 4020 included sand blasting (or grit blasting) in the decon rooms. Mixed wastes generated at this site included radioactive lead, paint from sandblasting, acidic solutions, chemical wipes, and rinse water. Other chemicals and wastes used or handled at the RIHL included acidic and caustic solutions.	1		Rocketdyne, 2000a; Boeing, 2004a; Boeing, 2004b; Atomics International, 1962a; Atomics International, 1962b; Unknown, 1986; Boeing, 1998; Rockwell International, 1990; Committee to Bridge the Gap, 1980; Atomics International, 1987; Department of Energy, 1997a; Unknown, 1992a; Unknown, 2000; Atomics International, 1969; Rockwell International, 1987; Sapere, 2005; Department of Energy, 1997b; Rockwell International, 1994.
4323	Unknown	Unknown	Building 4323 was a guard shack.	NA	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4468	1959 (constructed)	1997 (demolished)	Building 4468 was a 10 X 22 feet concrete and cinderblock building with a steel roof. It was adjacent to the Hot Lab building and slightly below grade. The building housed a 3,000-gallon-capacity stainless steel radioactive waste holding tank connected to the Hot Lab. The liquids transported to and stored within Building 4468 were radioactive wastes.	NA	No chemical uses based on available information on operations at this building.	Rocketdyne, 1997.

Table S.2-2
Tank Inventory
Rockwell International Hot Lab RFI Site

Tank ID	Location	Size (gallons)	Contents	Use Period	Use Status	Regulatory Closure Status	Additional Information	Chemical Use Area Number	Comments	Reference
Aboveground Tanks										
Unknown #1	East of Substation 4720	Unknown	Unknown	Unknown	Removed	Regulated under Corrective Action	No records of the tank size, contents, or use period could be found. Further characterization is needed.	2		
Unknown #2	East of Substation 4720	Unknown	Unknown	Unknown	Removed	Regulated under Corrective Action	No records of the tank size, contents, or use period could be found. Further characterization is needed.	2		
Unknown #3	East of Substation 4720	Unknown	Unknown	Unknown	Removed	Regulated under Corrective Action	No records of the tank size, contents, or use period could be found. Further characterization is needed.	2		
Unknown #4	Building 4020	500	Diesel Oil	Active in December 1992	Unknown	Regulated under Corrective Action	Carbon Steel Tank	1		Rockwell International, 1992.
Underground Tanks										
UT-07	North of Building 4020	3,000	Rad waste	Unknown	Removed	Closed	Tank only contained radiological waste	N/A	No further analysis needed.	Ogden, 2000.
UT-08	North of Building 4020	5,000	None. Never used.	1959 to 1989	Removed	Closed	Tank was never used. Removed under VCEHD permit #1343	N/A	No further analysis needed.	Unknown, 1994; Unknown, 1989.
UT-09	North of Building 4020	5,000	None. Never used.	1959 to 1989	Removed	Closed	Tank was never used. Removed under VCEHD permit #1343	N/A	No further analysis needed.	Unknown, 1994; Unknown, 1989.
UT-10	North of Building 4020	5,000	Fuel oil/Diesel	1959 to 1989	Removed	Closed	Tank removed under permit #1286. There were no signs of contamination and no remediation was completed.	3		Unknown, 1994; Unknown, 1989.
UT-11	North of Building 4020	500	Fuel oil/Diesel	1959 to 1989	Removed	Closed	Tank removed under permit #424. 42 yards of contaminated soil was removed.	3		Unknown, 1994; Unknown, 1989.
Unknown	Building 4020	550	Fuel Oil	Removed 1988	Removed	Regulated under Corrective Action	Steel tank	1		Unknown, Unknown Date (HDMSE00411923).
UT-58	Building 4020	2,500	Rad waste	Removed 1975 to 1976	Removed	Closed	Tank contained radioactive waste and were located within Building 4020.	N/A	No further analysis needed.	Unknown, 1994.
UT-64	North of Building 4020	5,000	Rad waste	Removed 1989	Removed	Closed	Tank was removed under VCEHD permit #1343	N/A		Unknown, 1994.
UT-65	Building 4020	2,500	Rad waste	Removed 1975 to 1976	Removed	Closed	Tank contained radioactive waste and were located within Building 4020.	N/A	No further analysis needed.	Unknown, 1994.

Table S.2-3
Transformer Inventory
Rockwell International Hot Lab RFI Site

Transformer/ Substation Number	Location	Use Period	Use Status	Description	Chemical Use Area Number	Comments	Reference
4720	North of Building 4020	Unknown	Removed	Electrical substation	4		Sapere, 2005.

Table S.2-4
Inventory of Other Site Features
Rockwell International Hot Lab RFI Site

Feature ID	Location	Use Period	Use Status	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
Hydraulic Lift	Building 4020	Unknown	Removed	Hydraulic oils and lubricants likely used here	1	There was a hydraulic lift located within Building 4020	ICF, 1993; Unknown, 1992b.
Miscellaneous Pipelines	Across the Site	Unknown	Unknown	The purpose and uses of pipelines shown on site figures are unknown	NA	No chemical uses based on available information on this feature.	

Table S.2-5
Spill Inventory
Rockwell International Hot Lab RFI Site

Date	Building/ Feature	Chemical Spilled	Amount (gallons)	Comments	References
5/31/62	4020	Water and Mixed Fission Products	50	On 5/31/1962 a tank overflowed and released 50 gallons of radioactive waste consisting of water and mixed fission products. Estimated area of contamination was 3,000 square feet.	Atomics International, 1962b.
7/2/97	4020	Radioactive Material	Unknown	On 7/3/1997 an employee found a block on his shoe. This block originally had a drain pipe connected to it, which was highly contaminated and believed to be filled with concrete slurry. When the block was moved, some contamination leaked onto the soil and asphalt.	Boeing, 1998.
2/9/93	4020	Propane	Unknown	On 2/9/93, security notified plant services of a propane leak on a forklift inside Building 4020. The propane tank was shut off and the building was opened up to air out.	Unknown. 1992a.
N/A	4020	TCE	Unknown	It was common practice to dump Non radioactive TCE or "Clean Tric" on the slope outside building 20 (north of horseshoe pit) to evaporate. Radioactive TCE or "Dirty Tric" might have been dumped in the same area.	Rockwell International, 1993-1994; Interview by S.R. Ovendale, 1994; HDMSP001807982. Interview by S.R. Ovendale, 1993.
Unknown	4020	Radioactive Material	Unknown	Slight contamination was suspected on the floor of the south end of the battery room froma known spill in the hood on the north side of the adjacent hot laboratory.	Rocketdyne, 1997.

Table S.2-6
Site History - Investigations
Rockwell International Hot Lab RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	Purpose	COPCs Analyzed	COPCs Reported	Comments	Reference
1 through 4	RIHL	Feb-93	Characterize soil at RIHL	VOCs, TRPH, metals chloride, fluoride, nitrate, pH.	VOCs, TRPH, metals, hydrocarbons	VOCs (hydrocarbons) were detected in 1 sample. Barium and Zinc were detected at background levels.	Ogden, 2000.
3	RIHL	Dec-89	Removal of UT-10 and UT-11 at Building 4020	TPH, BTEX	TPH at UT-11	VOCs detected at UT-11. VCEHD oversaw excavation and resampling. VCEHD closed this site.	Ogden, 2000.

Table S.2-7
Site History - Soil Disturbance
Rockwell International Hot Lab RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	COPCs Targeted	Media	Key Activities	Status	Reference
3	UT-11	Dec-89	TPH, VOCs	Soil	42 yards of contaminated soil (petroleum) were removed. Soil removal was conducted under VCEHD permit #424 in conjunction with tank removal.	Closed by VCEHD	Unknown, 1994; Unknown, 1989.

Table S.2-8
Chemical Use Summary
Rockwell International Hot Lab RFI Site

Chemical Use Area Number	Chemical Use Area Name	Potential Chemicals Used/Stored	Chemical Use Area Types and Typical Target Analytical Suites														
			Solvent	Petroleum Fuels		Hydrazine-Related Compounds	Oil-Related Materials	Metal Wastes (exclusive of debris areas)	Debris Areas/ Fill	Energetic Constituents	Transformers	Leach Field	Non-metal Inorganic Compounds	Non-metal Inorganic Compounds		Acids/ Bases	
			VOCs	TPH, VOCs[1]	SVOCs	VOCs, SVOCs (Hydrazines, Formaldehyde, NDMA, UDMH, and MMH)	SVOCs, TPH, PCBs, Metals	Metals, pH	TPH, Metals, VOCs, SVOCs, PCBs, Dioxins[2]	Energetics, Metals	PCBs		Fluoride, Chloride, Nitrate, Sulfate, Bromide	Perchlorate	Dioxins, Furans	pH	Asbestos
1	Building 4020 and Hydraulic Lift	Oil related materials, alcohols, solvents, acids, metals	X	X	X		X	X									
2	Aboveground Tanks	Liquid Nitrogen	**No sampling is needed at this location. The above ground tanks at this location contained liquid nitrogen.**														
3	UT-10 and UT-11	Fuel-Oil	**Tanks were removed under Regulatory Closure Permits #1286 and #424 with no signs of contamination after remedial excavation.**														
4	Substation 4720	PCBs									X						
5	Northeast portion of RFI site	Metals						X									

Notes:
1. VOCs were a COPC for TPH-gasoline.
2. SVOCs and dioxins were evaluated as COPCs if burned materials were observed. PCBs were evaluated as COPCs if elevated concentrations of lubricant oil-range hydrocarbons were detected.

Table S.2-9
Conceptual Site Model
Rockwell International Hot Lab RFI Site

Chemical Use Area Name (or Site if appropriate)	Ground Surface Elevation (Feet MSL)	Alluvium Thickness (Feet)	Elevation of Unweathered Chatsworth (Feet MSL)	Depth to Near-Surface Groundwater (Feet)	Near-Surface Groundwater Horizontal Gradient/Flow Direction (foot/foot)	Elevation of Chatsworth Formation Groundwater (Feet MSL)	Chatsworth Formation Groundwater Horizontal Gradient/Flow Direction (foot/foot)	Surface Water Present? (Yes/No)	Surface Water Flow Information	Other Information?	Reference
RIHL	1810 to 1830	6 to 14	1800 to 1810	15	0.02/east	1795 to 1802	0.04/east	No	Surface water flow is generally to the east.		Boring logs and groundwater level contour maps.

MSL = above mean sea level

Table S.3-1A
Sampling Summary for Soil
Rockwell International Hot Lab RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	Hydrocarbons	Inorganics	Metals	PCBs	SVOC	VOC
E-4-01	Soil Boring	E-4-01	2/16/1993	0	0.5	Primary Sample	In Place	Rocketdyne	Soil	X	X	X			X
E-4-02	Soil Boring	E-4-02	2/16/1993	0	0.5	Primary Sample	In Place	Rocketdyne	Soil	X	X	X			X
E-4-03	Soil Boring	E-4-03	2/16/1993	0	0.5	Primary Sample	In Place	Rocketdyne	Soil	X	X	X			X
HLBS1000	Soil Boring		4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil						X
HLBS1000	Soil Boring		4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1000	Soil Boring	HLBS1000D01	4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X	X	X		X	
HLBS1000	Soil Boring	HLBS1000S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	
HLBS1001	Soil Boring		4/4/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1001	Soil Boring		4/4/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1001	Soil Boring	HLBS1001S01	4/4/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	
HLBS1001	Soil Boring	HLBS1001S02	4/4/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	
HLBS1002	Soil Boring		4/4/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1002	Soil Boring		4/4/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1002	Soil Boring	HLBS1002S01	4/4/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	
HLBS1002	Soil Boring	HLBS1002S02	4/4/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	
HLBS1003	Soil Boring		4/4/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1003	Soil Boring		4/4/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1003	Soil Boring	HLBS1003S01	4/4/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBS1003	Soil Boring	HLBS1003S02	4/4/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBS1004	Soil Boring		4/9/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1004	Soil Boring		4/9/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1004	Soil Boring	HLBS1004S01	4/9/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBS1004	Soil Boring	HLBS1004S02	4/9/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBS1005	Soil Boring		4/9/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1005	Soil Boring		4/9/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1005	Soil Boring	HLBS1005S01	4/9/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBS1005	Soil Boring	HLBS1005S02	4/9/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBS1006	Soil Boring		4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil						X
HLBS1006	Soil Boring		4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1006	Soil Boring	HLBS1006D01	4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				
HLBS1006	Soil Boring	HLBS1006S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBS1007	Soil Boring		4/4/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1007	Soil Boring		4/4/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1007	Soil Boring	HLBS1007S01	4/4/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBS1007	Soil Boring	HLBS1007S02	4/4/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBS1008	Soil Boring		4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil						X
HLBS1008	Soil Boring		4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1008	Soil Boring	HLBS1008S01	4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				
HLBS1008	Soil Boring	HLBS1008S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBS1009	Soil Boring		4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil						X
HLBS1009	Soil Boring		4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
HLBS1009	Soil Boring	HLBS1009D01	4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				
HLBS1009	Soil Boring	HLBS1009S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X				
HLBX1000	Soil Boring	HLBX1000C01	4/17/2008	0	1	Composite Sample	In Place	CH2M HILL	Soil		X		X		
HLBX1000A	Soil Boring	HLBX1000AS01	4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X		
HLBX1000B	Soil Boring	HLBX1000BS01	4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X		
HLBX1000C	Soil Boring	HLBX1000CS01	4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X		
HLBX1000D	Soil Boring	HLBX1000DS01	4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X		
HLBX1400	Soil Boring	HLBX1400S01	5/29/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X		X		
HLBX1400	Soil Boring	HLBX1400S02	5/29/2008	2	3	Primary Sample	In Place	CH2M HILL	Soil		X		X		
HLBX1401	Soil Boring	HLBX1401D01	5/29/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X		
HLBX1401	Soil Boring	HLBX1401S01	5/29/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				

Table S.3-1A
Sampling Summary for Soil
Rockwell International Hot Lab RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	Hydrocarbons	Inorganics	Metals	PCBs	SVOC	VOC
HLBX1401	Soil Boring	HLBX1401S02	5/29/2008	2	3	Primary Sample	In Place	CH2M HILL	Soil		X		X		
HLBX1402	Soil Boring	HLBX1402S01	5/29/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X		X		
HLBX1402	Soil Boring	HLBX1402S02	5/29/2008	2	3	Primary Sample	In Place	CH2M HILL	Soil		X		X		
U5BS1108	Soil Boring	U5BS1108S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1109	Soil Boring	U5BS1109S01	4/7/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1109	Soil Boring	U5BS1109S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1110	Soil Boring		4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil						X
U5BS1110	Soil Boring		4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil						X
U5BS1110	Soil Boring	U5BS1110D01	4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X	X	X		X	
U5BS1110	Soil Boring	U5BS1110S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	
U5BS1111	Soil Boring	U5BS1111S01	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1112	Soil Boring	U5BS1112S01	4/7/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1112	Soil Boring	U5BS1112S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1113	Soil Boring	U5BS1113S01	4/7/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1113	Soil Boring	U5BS1113S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1114	Soil Boring	U5BS1114S01	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1115	Soil Boring	U5BS1115S01	4/7/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X			
U5BS1115	Soil Boring	U5BS1115S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1116	Soil Boring	U5BS1116S01	4/7/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1116	Soil Boring	U5BS1116S02	4/7/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1416	Soil Boring	U5BS1416D01	5/13/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X			
U5BS1416	Soil Boring	U5BS1416S02	5/13/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1417	Soil Boring	U5BS1417S01	5/14/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1417	Soil Boring	U5BS1417S02	5/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1418	Soil Boring	U5BS1418S01	5/14/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1418	Soil Boring	U5BS1418S02	5/14/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X			
U5BS1418	Soil Boring	U5BS1418X02	5/14/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				
U5BS1419	Soil Boring	U5BS1419S01	5/14/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1419	Soil Boring	U5BS1419S02	5/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1420	Soil Boring	U5BS1420S01	5/14/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BS1420	Soil Boring	U5BS1420S02	5/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			

Table S.3-1B
Sampling Summary for Soil Vapor
Rockwell International Hot Lab RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	VOC
SV-LF020-1	Soil Vapor Sample	SVLF0201	8/24/1993	10	10	Primary Sample	In Place	ICF Kaiser Engineers	Soil Vapor	X
HLSV1000	Soil Vapor Sample		4/15/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
HLSV1001	Soil Vapor Sample		4/14/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
HLSV1002	Soil Vapor Sample		4/15/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
HLSV1002	Soil Vapor Sample		4/15/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
HLSV1002	Soil Vapor Sample	HLSV1002D01	4/15/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
HLSV1003	Soil Vapor Sample		4/14/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
HLSV1005	Soil Vapor Sample		4/15/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
HLSV1006	Soil Vapor Sample		4/14/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
HLSV1007	Soil Vapor Sample		4/15/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
HLSV1008	Soil Vapor Sample		4/16/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
HLSV1008	Soil Vapor Sample		4/16/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
HLSV1008	Soil Vapor Sample	HLSV1008D01	4/16/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
HLSV1009	Soil Vapor Sample		4/16/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
HLSV1009	Soil Vapor Sample		4/16/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X

Table S.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Rockwell International Hot Lab RFI Site

Chemical Use Area Number	**Chemical Use Area Name** (see Section 2 texts and tables for Site History)	**Potential Chemicals Used/Stored**	**Sampling Scope and Rationale** (see Figure S.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Area sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure S.5-1 for CMS area)
1	Building 4020	VOCs	Chemical uses for Building 4020 and adjacent area included VOCs. These chemicals were used in the building and were stored in areas surrounding the building. Screen for potential VOCs in and around former building. Soil Vapor: Samples were collected at 10 locations. Soil Matrix: Samples were collected at 10 locations.	VOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section S.3.4.2.1 and Figures S.3-1 and S.3-6.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Chemical uses for Building 4020 and adjacent area included SVOCs. These chemicals were used in the building and were stored in areas surrounding the building. Screen for potential SVOCs in and around former building. Soil samples were collected at three (3) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section S.3.4.2.2 and Figures S.3-2 and S.3-7.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		TPH	Chemical uses for Building 4020 and adjacent area included TPH. TPH was used in the building and was stored in areas surrounding the building. Screen for potential TPH in and around former building. Samples were collected at three (3) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section S.3.4.2.3 and Figures S.3-3 and S.3-7.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemical uses for Building 4020 and adjacent area included metals. These chemicals were used in the building and were stored in areas surrounding the building. Screen for potential metals in and around former building. Samples were collected at three (3) sample locations.	Several metals were detected above background and Eco RBSLs in many of the samples collected. HLBS1000 at 0-1 ft. bgs and at 5-6 ft. bgs (Aluminum) HLBS1001 at 0-1 ft. bgs (Aluminum, Mercury, and Selenium) HLBS1001 at 5-6 ft. bgs (Aluminum) HLBS1002 at 0-1 ft. bgs and at 5-6 ft. bgs (Aluminum) See detailed discussion of results presented in Section S.3.4.2.5 and Figures S.3-5 and S.3-8.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
2	Aboveground Tanks	**No sampling is needed at this location. The above ground tanks at this location contained liquid nitrogen.**				
3	UT-10 and UT-11	**Tanks were removed under Regulatory Closure Permits #1286 and #424 with no signs of contamination after remedial excavation.**				
4	Substation 4720	PCBs	No prior sampling had been performed. Screened for potential PCBs around substation. Samples collected at seven (7) sample locations.	PCBs were detected above Residential and/or ECO RBSLs in three (3) samples. HLBX1000 at 0-1 ft. bgs (composite sample) (Aroclor 1260) HLBX1000D at 0-1 ft. bgs (Aroclor 1254 and Aroclor 1260) HLBX1000C at 0-1 ft. bgs (Aroclor 1254 and Aroclor 1260) PCBs were detected but PCB concentrations in step out samples were not detected or were detected but below their respective RBSLs. Discussion of results is presented Section S.3.4.2.4 and Figures S.3-4 and S.3-7.	**Yes.** The extent of Aroclor 1254 and Aroclor 1260 impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**Yes.** **CMS Area - RIHL-1:** The extent of Aroclor 1254 and Aroclor 1260 impacts is defined and the area is not recommended for further characterization based on sampling and risk assessment results.
5	Northeast portion of RFI site	VOCs	Screened for potental VOCs in Northeast portion of the RFI Site. Soil Vapor: No soil vapor samples were collected for VOCs. Soil Matrix: Samples were collected at four (4) locations.	VOCs were not detected in any of the samples.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table S.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Rockwell International Hot Lab RFI Site

Chemical Use Area Number	**Chemical Use Area Name** (see Section 2 texts and tables for Site History)	**Potential Chemicals Used/Stored**	**Sampling Scope and Rationale** (see Figure S.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Area sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure S.5-1 for CMS area)
		SVOCs	Screened for potential SVOCs in the northeast portion of the RFI Site. Soil samples were collected at one (1) location.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section S.3.4.2.2 and Figures S.3-2 and S.3-7.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		TPH	Screened for potential TPH in the northeast portion of the RFI Site. Soil samples were collected at four (4) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section S.3.4.2.3 and Figures S.3-3 and S.3-7.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Screened for potential metals in northeast portion of RFI Site. Soil samples were collected at 17 locations.	Metals were detected above background and Eco RBSLs from samples collected at the following locations: E-4-01, E-4-02, E-4-03, U5BS1108, U5BS1108, U5BS1110, U5BS1112, U5BS1113, U5BS1114, U5BS1115, U5BS1116, U5BS1416, U5BS1417, U5BS1418, U5BS1419, and U5BS1420. See detailed discussion of results presented in Section S.3.4.2.5 and Figures S.3-5 and S.3-8.	**Yes.** Characterization is sufficient for risk assessment.	**No.** **CMS Area - RIHL-2:** Metals impacts to soil may require further characterization. Area is recommended for further characterization in CMS based on sampling and risk assessment results.

Table S.3-2B
Evaluation of Groundwater Sampling Results
Rockwell International Hot Lab RFI Site

Analytical Group	Site Soil Impacts (Summary of relevant impacts)	Monitored in Groundwater?	Constituent detected in groundwater? (Above screening criteria?)	Site related?	Groundwater characterized sufficiently for risk assessment?
VOCs	VOCs were detected in soils and soil vapor matrix samples but did not exceed their respective RBSLs.	**Yes.** Monitored at PZ-103 in NSGW.	**Yes.** 1,1-DCE and TCE were detected below screening levels in NSGW.	**No.** Low level concentrations of VOC compounds in soil do not match the profile in groundwater.	**NSGW - Yes** **CFOU Groundwater** [1]
SVOCs	SVOCs were detected but did not exceed their respective RBSLs.	**Yes.** Monitored at PZ-103 in NSGW.	**Yes.** Diethyl phthalate was detected from a sample collected at PZ-103, but did not exceed RBSLs.	**No.** Low level concentrations of SVOCs in soil do not match the profile in groundwater.	**NSGW - Yes** **CFOU Groundwater** [1]
TPH	TPHs were detected but did not exceed their respective RBSLs.	**Yes.** Monitored at PZ-103 in NSGW.	**No.** TPHs were not detected in samples collected.	**No.**	**NSGW - Yes** **CFOU Groundwater** [1]
PCBs	PCBs were detected above Ecological and Residential RBSLs in samples collected near former substation 4720.	**No.**	**N/A**	**No.**	**NSGW - Yes.** [2] **CFOU Groundwater** [1]
Metals	A variety of metals were detected above background, Ecological RBSLs, and/or Residential RBSLs in soil samples. See Section S.3.4.2.5 for further information.	**Yes.** Monitored at PZ-103 in NSGW.	**Yes.** Aluminum, manganese, and silver were detected above groundwater screening levels.	**Unlikely.** Metals in soil may migrate into NSGW but are more likely to be bound to soil. Aluminum concentrations from 24 soil samples exceeded background screening levels and Ecological RBSLs.	**NSGW - Yes** **CFOU Groundwater** [1]

Notes:

1. Chatsworth Formation Groundwater (CFOU Groundwater) is discussed further in Appendix B and will be evaluated for risk assessment purposes in the CFOU RFI Report.
2. Although PCBs have not been monitored in NSGW at the RIHL Site, NSGW is not expected to have been impacted by PCBs due to the high affinity of PCBs for soil.
3. NSGW - Near Surface Groundwater

Table S.3-3A
Data Screening and Statistical Summary for Soil
Rockwell International Hot Lab RFI Site

		Screening Levels			Detect Data Summary						
Constituent	Units	Residential RBSL	Ecological RBSL	Background	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL	Number of Detects > Background SL
Hydrocarbons											
Diesel Range Hydrocarbons (C15-C20)	mg/kg	1400			8	4	1.2	1.75			
Gasoline Range Hydrocarbons (C8-C11)	mg/kg	1.1			4						
Kerosene Range Hydrocarbons (C12-C14)	mg/kg	1400			8						
Lubricating Oil Range Hydrocarbons (C21-C30)	mg/kg	1400			8	6	1.5	16			
TRPH	mg/kg				3	3	12	110			
Inorganics											
% Solids	%				3	3	86.2	89.6			
Chloride	mg/kg				3	3	1	2.4			
Fluoride	mg/kg	4600		6.7	3	3	0.3	1.4			
Moisture	%				17	17	6.335	27.3			
Nitrate-N	mg/kg	120000			3						
pH	pH Units				17	17	6.3	8.8			
Total Solids	%				37	37	84	99			
Metals											
Aluminum	mg/kg	75000	12	20000	31	31	11100	27000		31	24
Antimony	mg/kg	30	0.095	8.7	8						
Arsenic	mg/kg	0.095	1.9	15	24	21	0.91	4.8	21	20	
Barium	mg/kg	15000	15	140	32	31	83.6	190		31	9
Beryllium	mg/kg	150	5	1.1	24	21	0.861	2.8			18
Boron	mg/kg	15000	6.76	9.7	21	20	1.7	4.4			
Cadmium	mg/kg	39	0.0045	1	24	24	0.055	1.8		24	3
Chromium	mg/kg	3400	930	36.8	24	24	7.6	38			2
Cobalt	mg/kg	1500	8.9	21	24	24	4.6	18		10	
Copper	mg/kg	3000	1.1	29	24	24	8.8	16		24	
Lead	mg/kg	150	0.013	34	24	22	2.1	17		22	
Lithium	mg/kg	1521.66006		37	21	21	17	27			
Mercury	mg/kg	23	0.1	0.09	24	19	0.0069	0.16		1	1
Molybdenum	mg/kg	380	0.11	5.3	24	5	0.17	0.46		5	
Nickel	mg/kg	1500	0.1	29	27	27	5.5	38		27	1
Potassium	mg/kg			6400	21	21	1900	3500			
Selenium	mg/kg	380	0.17	0.655	29	22	0.24	1.5		22	4
Silver	mg/kg	380	0.54	0.79	24	20	0.037	0.4245			
Sodium	mg/kg			110	21	15	200	780			15
Thallium	mg/kg	6.1	2.9	0.46	24	21	0.17	0.38			
Vanadium	mg/kg	76	1.5	62	32	32	26	69		32	4
Zinc	mg/kg	23000	21	110	24	24	42	210		24	1
Zirconium	mg/kg			8.6	21	21	1.9	5.4			
PCBs											
Aroclor 1016	mg/kg	3.9	1.6		11						
Aroclor 1221	mg/kg	0.35	1.6		11						
Aroclor 1232	mg/kg	0.35	0.077		11						
Aroclor 1242	mg/kg	0.35	0.079		11						
Aroclor 1248	mg/kg	0.35	0.0114		11						
Aroclor 1254	mg/kg	0.35	0.077		11	7	0.003	0.375	1	2	
Aroclor 1260	mg/kg	0.35	0.077		11	8	0.0059	0.96	2	3	
SVOC											
1-Methyl naphthalene	mg/kg	230			8	1	0.001	0.001			
2-Methylnaphthalene	mg/kg	230	210		8	1	0.0011	0.0011			
Acenaphthene	mg/kg	3400	2.46		6						

Table S.3-3A
Data Screening and Statistical Summary for Soil
Rockwell International Hot Lab RFI Site

		Screening Levels			Detect Data Summary						
Constituent	Units	Residential RBSL	Ecological RBSL	Background	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL	Number of Detects > Background SL
Acenaphthylene	mg/kg	1700	370		8	1	0.0053	0.0053			
Anthracene	mg/kg	17000	2.4		6	1	0.0002	0.0002			
Benzo(a)anthracene	mg/kg	0.6	5.6		5	3	0.00037	0.0055			
Benzo(a)pyrene	mg/kg	0.06	5.6		5	3	0.00035	0.0057			
Benzo(b)fluoranthene	mg/kg	0.6	5.6		6	4	0.00033	0.025			
Benzo(ghi)perylene	mg/kg		6.4		5	2	0.00085	0.0028			
Benzo(k)fluoranthene	mg/kg	0.6	5.8		8	3	0.00032	0.011			
bis(2-Ethylhexyl) phthalate	mg/kg	250	4.9		1	1	0.075	0.075			
Chrysene	mg/kg	6	2.4		5	3	0.00058	0.0074			
Dibenzo(a,h)anthracene	mg/kg	0.17	5.6		8	4	0.00079	0.0046			
Diethyl phthalate	mg/kg	46000	6940		4						
Dimethyl phthalate	mg/kg	570000	4.4		8	1	0.0035	0.0035			
Di-n-butyl phthalate	mg/kg	5700	0.49		4	4	0.0023	0.011			
Di-n-octyl phthalate	mg/kg	2300	39		8	3	0.0048	0.021			
Fluoranthene	mg/kg	2300	38		5	3	0.0005	0.0078			
Fluorene	mg/kg	2300	1.6		8	2	0.00033	0.0031			
Indeno(1,2,3-cd)pyrene	mg/kg	0.6	5.8		5	2	0.00089	0.0026			
Naphthalene	mg/kg	6	210		8						
n-Nitrosodimethylamine	mg/kg	0.045	20		8	1	0.00064	0.00064			
Phenanthrene	mg/kg	1700	1.3		5	1	0.0014	0.0014			
Pyrene	mg/kg	1700	18		2						
VOC											
1,1,1,2-Tetrachloroethane	mg/kg	0.00025	76		22						
1,1,1-Trichloroethane	mg/kg	0.49	4300		25						
1,1,2,2-Tetrachloroethane	mg/kg	0.0014	6		25						
1,1,2-Trichloro-1,2,2-trifluoroethane	mg/kg	16	583		25						
1,1,2-Trichloroethane	mg/kg	0.0012	8.3		25						
1,1-Dichloroethane	mg/kg	0.0016	210		25						
1,1-Dichloroethene	mg/kg	0.023	10.7		25						
1,1-Dichloropropene	mg/kg		22		22						
1,2,3-Trichlorobenzene	mg/kg	0.12460452	20		22						
1,2,3-Trichloropropane	mg/kg	0.000051	12		22						
1,2,4-Trichlorobenzene	mg/kg	0.12460452	20		22						
1,2,4-Trimethylbenzene	mg/kg	0.035	64		22						
1,2-Dibromo-3-chloropropane	mg/kg	0.029	22		22						
1,2-Dibromoethane	mg/kg		25		22						
1,2-Dichlorobenzene	mg/kg	1.8	370		25						
1,2-Dichloroethane	mg/kg	0.0005	76		25						
1,2-Dichloropropane	mg/kg		250		25						
1,3,5-Trimethylbenzene	mg/kg	0.036	64		22						
1,3-Dichlorobenzene	mg/kg	1.7	160		25						
1,3-Dichloropropane	mg/kg		22		22						
1,4-Dichlorobenzene	mg/kg	0.01	20		25						
2-Chloro-1,1,1-trifluoroethane	mg/kg				22						
2-Chloroethylvinyl ether	mg/kg	9.5691E-06	0.73		22						
2-Hexanone	mg/kg		1220		22						
Acetone	mg/kg	51	43		24	2	0.0054	0.026425			
Benzene	mg/kg	0.00013	110		25						
Bromobenzene	mg/kg		110		22						
Bromochloromethane	mg/kg		25		22						

Table S.3-3A
Data Screening and Statistical Summary for Soil
Rockwell International Hot Lab RFI Site

		Screening Levels			Detect Data Summary						
Constituent	Units	Residential RBSL	Ecological RBSL	Background	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL	Number of Detects > Background SL
Bromodichloromethane	mg/kg	0.00031	15		25						
Bromoform	mg/kg		38		25						
Bromomethane	mg/kg		25		25						
Carbon Tetrachloride	mg/kg	0.000042	1.5		25						
Chlorobenzene	mg/kg	0.097	40		25						
Chloroethane	mg/kg		190		25						
Chloroform	mg/kg	0.00077	11		25						
Chloromethane	mg/kg		25		25						
Chlorotrifluoroethylene	mg/kg		10.7		22						
cis-1,2-Dichloroethene	mg/kg	0.014	68		25						
cis-1,3-Dichloropropene	mg/kg		22		25						
Cumene	mg/kg	0.38255845	210		22						
Dibromochloromethane	mg/kg		46		25						
Dibromomethane	mg/kg		25		22						
Dichlorodifluoromethane	mg/kg	0.015	64		22						
Ethylbenzene	mg/kg	1.2	210		25						
Hexachlorobutadiene	mg/kg	9.2	0.85		22						
Methyl ethyl ketone	mg/kg	62	2540		22	1	0.005	0.005			
Methyl isobutyl ketone (MIBK)	mg/kg	19.6375697	2540		22						
Methyl tert-butyl ether	mg/kg		120		22						
Methylene chloride	mg/kg	0.004	25		25						
m-Xylene & p-Xylene	mg/kg	0.15	64		22						
n-Butylbenzene	mg/kg		210		22						
n-Propylbenzene	mg/kg	0.20326751	210		22						
o-Chlorotoluene	mg/kg	1222.09821	160		22						
o-Xylene	mg/kg	0.19	64		22						
p-Chlorotoluene	mg/kg	1222.09821	160		22						
p-Cymene	mg/kg		64		22						
sec-Butylbenzene	mg/kg	76.7640458	210		22						
sec-Dichloropropane	mg/kg		22		22						
Styrene	mg/kg	7.2	427		22						
tert-Butylbenzene	mg/kg		210		22						
Tetrachloroethene	mg/kg	0.00043	6		25						
Toluene	mg/kg	0.3	3.4		25						
trans-1,2-Dichloroethene	mg/kg	0.016	970		25						
trans-1,3-Dichloropropene	mg/kg		4.4		25						
Trichloroethene	mg/kg	0.0022	3		25						
Trichlorofluoromethane	mg/kg	0.11	300		25						
Vinyl chloride	mg/kg	0.0000096	0.73		25						
Xylenes, Total	mg/kg	0.15	64		22						
Xylenes, Total	mg/kg	0.15	64		3						

Table S.3-3B
Data Screening and Statistical Summary for Soil Vapor
Rockwell International Hot Lab RFI Site

		Screening Levels		Detect Data Summary					
Constituent	**Units**	**Residential RBSL**	**Ecological RBSL**	**Number of Samples**	**Number of Detects**	**Minimum Detected Value**	**Maximum Detected Value**	**Number of Detects > Residential RBSL**	**Number of Detects > Ecological RBSL**
VOC									
1,1,1,2-Tetrachloroethane	ug/L	0.048		12					
1,1,1-Trichloroethane	ug/L	640	38	12					
1,1,2,2-Tetrachloroethane	ug/L	0.048		12					
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/L	8800	91	12					
1,1,2-Trichloroethane	ug/L	0.17	0.057	12					
1,1-Dichloroethane	ug/L	1.7	36	12					
1,1-Dichloroethene	ug/L	58	0.6	12					
1,2-Dichloroethane	ug/L	0.13	42	12					
Benzene	ug/L	0.095	0.57	12	1	0.04	0.04		
Carbon Tetrachloride	ug/L	0.063	0.63	12					
Chloroethane	ug/L		992	12					
Chloroform	ug/L	0.5	0.24	12					
cis-1,2-Dichloroethene	ug/L	10	1.9	12					
Dichlorodifluoromethane	ug/L	58	91	12					
Ethylbenzene	ug/L	290	23	12					
Methylene chloride	ug/L	2.7	0.87	12					
m-Xylene & p-Xylene	ug/L		16	12					
o-Xylene	ug/L	29	16	12					
Tetrachloroethene	ug/L	0.45232	24	12					
Toluene	ug/L	110	0.084	12	1	0.05	0.05		
trans-1,2-Dichloroethene	ug/L	20	1.9	12					
Trichloroethene	ug/L	1.4	6.4	12					
Trichlorofluoromethane	ug/L	200	90.9	12					
Vinyl chloride	ug/L	0.035	0.56	12					
VOC in vapor screen (All ND)	ug/L			1					
Xylenes, Total	ug/L		16	12					

Table S.4-1
Chemicals of Potential Concern for Human Health
Rockwell International Hot Laboratory RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-2	1-Methyl naphthalene		Y	
Soil	0-2	2-Methylnaphthalene		Y	
Soil	0-2	Acenaphthylene		Y	
Soil	0-2	Acetone		Y	
Soil	0-2	Aluminum	Y	Y	
Soil	0-2	Anthracene		Y	
Soil	0-2	Aroclor 1254		Y	
Soil	0-2	Aroclor 1260		Y	
Soil	0-2	Arsenic	N	N	Below Background
Soil	0-2	Barium	N	N	Below Background
Soil	0-2	Benzo(a)anthracene		Y	
Soil	0-2	Benzo(a)pyrene		Y	
Soil	0-2	Benzo(b)fluoranthene		Y	
Soil	0-2	Benzo(ghi)perylene		Y	
Soil	0-2	Benzo(k)fluoranthene		Y	
Soil	0-2	Beryllium	Y	Y	
Soil	0-2	bis(2-Ethylhexyl) phthalate		Y	
Soil	0-2	Boron	N	N	Below Background
Soil	0-2	Cadmium	Y	Y	
Soil	0-2	Chromium	Y	Y	
Soil	0-2	Chrysene		Y	
Soil	0-2	Cobalt	Y	Y	
Soil	0-2	Copper	Y	Y	
Soil	0-2	Dibenzo(a,h)anthracene		Y	
Soil	0-2	Diesel Range Hydrocarbons (C15-C20)		N	See BTEX, PAHs
Soil	0-2	Dimethyl phthalate		Y	
Soil	0-2	Di-n-butyl phthalate		Y	
Soil	0-2	Di-n-octyl phthalate		Y	
Soil	0-2	Fluoranthene		Y	
Soil	0-2	Fluorene		Y	
Soil	0-2	Fluoride		Y	
Soil	0-2	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-2	Lead	N	N	Below Background
Soil	0-2	Lithium	N	N	Below Background
Soil	0-2	Lubricating Oil Range Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-2	Mercury	N	N	Below Background
Soil	0-2	Methyl ethyl ketone		Y	
Soil	0-2	Molybdenum	N	N	Below Background
Soil	0-2	Nickel	Y	Y	
Soil	0-2	n-Nitrosodimethylamine		Y	
Soil	0-2	Phenanthrene		Y	
Soil	0-2	Selenium	N	N	Below Background
Soil	0-2	Silver	N	N	Below Background
Soil	0-2	Thallium	N	N	Below Background
Soil	0-2	TRPH		N	See BTEX, PAHs
Soil	0-2	Vanadium	Y	Y	
Soil	0-2	Zinc	N	N	Below Background
Soil	0-2	Zirconium	N	N	Below Background
Soil	0-10	1-Methyl naphthalene		Y	
Soil	0-10	2-Methylnaphthalene		Y	
Soil	0-10	Acenaphthylene		Y	
Soil	0-10	Acetone		Y	
Soil	0-10	Aluminum	Y	Y	
Soil	0-10	Anthracene		Y	
Soil	0-10	Aroclor 1254		Y	
Soil	0-10	Aroclor 1260		Y	
Soil	0-10	Arsenic	N	N	Below Background
Soil	0-10	Barium	N	N	Below Background
Soil	0-10	Benzo(a)anthracene		Y	

Table S.4-1
Chemicals of Potential Concern for Human Health
Rockwell International Hot Laboratory RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-10	Benzo(a)pyrene		Y	
Soil	0-10	Benzo(b)fluoranthene		Y	
Soil	0-10	Benzo(ghi)perylene		Y	
Soil	0-10	Benzo(k)fluoranthene		Y	
Soil	0-10	Beryllium	Y	Y	
Soil	0-10	bis(2-Ethylhexyl) phthalate		Y	
Soil	0-10	Boron	N	N	Below Background
Soil	0-10	Cadmium	Y	Y	
Soil	0-10	Chromium	Y	Y	
Soil	0-10	Chrysene		Y	
Soil	0-10	Cobalt	Y	Y	
Soil	0-10	Copper	Y	Y	
Soil	0-10	Dibenzo(a,h)anthracene		Y	
Soil	0-10	Diesel Range Hydrocarbons (C15-C20)		N	See BTEX, PAHs
Soil	0-10	Dimethyl phthalate		Y	
Soil	0-10	Di-n-butyl phthalate		Y	
Soil	0-10	Di-n-octyl phthalate		Y	
Soil	0-10	Fluoranthene		Y	
Soil	0-10	Fluorene		Y	
Soil	0-10	Fluoride		Y	
Soil	0-10	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-10	Lead	N	N	Below Background
Soil	0-10	Lithium	N	N	Below Background
Soil	0-10	Lubricating Oil Range Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-10	Mercury	N	N	Below Background
Soil	0-10	Methyl ethyl ketone		Y	
Soil	0-10	Molybdenum	N	N	Below Background
Soil	0-10	Nickel	Y	Y	
Soil	0-10	n-Nitrosodimethylamine		Y	
Soil	0-10	Phenanthrene		Y	
Soil	0-10	Selenium	N	N	Below Background
Soil	0-10	Silver	N	N	Below Background
Soil	0-10	Thallium	N	N	Below Background
Soil	0-10	TRPH		N	See BTEX, PAHs
Soil	0-10	Vanadium	Y	Y	
Soil	0-10	Zinc	N	N	Below Background
Soil	0-10	Zirconium	N	N	Below Background
Soil Vapor	0-10	Benzene		Y	
Soil Vapor	0-10	Toluene		Y	
Groundwater	-	1,1-Dichloroethene		Y	
Groundwater	-	Aluminum		Y	
Groundwater	-	Barium	N	N	Below Background
Groundwater	-	Bromide		N	No Toxicity Factors
Groundwater	-	Chromium	N	N	Below Background
Groundwater	-	Diethyl phthalate		Y	
Groundwater	-	Iron	N	N	Below Background
Groundwater	-	Manganese	Y	Y	
Groundwater	-	Nitrate-NO3	N	N	Below Background
Groundwater	-	Silver	N	N	Below Background
Groundwater	-	Trichloroethene		Y	

Table S.4-2
Human Health Risk Estimates[1]
Rockwell International Hot Laboratory RFI Site

Receptor	Soil Media[2]						Groundwater[3]						Total for Site Media[4]					
	HI Range			CD[5]	Risk Range		CD	HI Range			CD	Risk Range			CD	HI Range			CD	Risk Range			CD
Future Adult Recreator	0.000001	-	0.00003		1E-08	-	3E-06	a	NA	-	NA		NA	-	NA		<0.01	-	<0.01		1E-08	-	3E-06	a
Future Child Recreator	0.00003	-	0.0001		2E-07	-	2E-06	a	NA	-	NA		NA	-	NA		<0.01	-	<0.01		2E-07	-	2E-06	a
Future Adult Resident	0.03	-	0.09		2E-07	-	4E-06	a	0.7	-	1		1E-07	-	5E-07		0.8	-	1		3E-07	-	5E-06	a
Future Child Resident	0.3	-	0.8		1E-06	-	8E-06	a, b	3	-	4	c, d	3E-07	-	5E-07		3	-	5	c, d	2E-06	-	9E-06	a, b
						-																		

Notes:
1. Risk estimates shown are a sum of all exposure pathways per media; the range reported is for the central tendency and reasonable maximum exposures, respectively.
2. Soil media risk estimates are a sum of all direct exposure routes, including incidental ingestion, dermal contact, and dust inhalation.
3. Groundwater media risk estimates are for domestic use of shallow groundwater.
4. Includes combined exposure from 1) direct contact with soil, 2) inhalation of indoor and ambient air vapors originating from soil gas, subsurface soil, and groundwater, and 3) domestic use of shallow groundwater.
5. Chemical risk drivers are those COPCs detected onsite with an HI > 1 or risk > 1x10-6. Only major risk contributors listed if cumulative HI >> 1 or cancer risk >> 1x10-6.

a = Aroclor-1260
b = Aroclor 1254
c = Nitrate-NO3
d = Trichloroethene

CD = Chemical risk driver
COPC = Chemical of potential concern
HI = Hazard index
NA = Not Applicable

Table S.4-3
Human Health Risk Assessment Uncertainty Analysis
Rockwell International Hot Laboratory RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
COPC Selection	Several inorganics were selected as a COPC since it could not be demonstrated to be consistent with background concentrations through the Wilcoxon Rank Sum test. For site data sets that are small, uncertainty is introduced into the comparisons.	Moderate	Conservative
	Benzene and toluene were selected as soil vapor COPCs since they were directly detected in soil vapor. Acetone and methyl ethyl ketone was also selected as soil vapor COPCs because they were detected in soil but not analyzed for in soil vapor.	Moderate	Conservative
	Petroleum hydrocarbons were not selected as COPCs since TPH-related constituents (BTEX and PAHs) were analyzed for.	Low	Realistic
Exposure Pathways	Risks associated with drinking of groundwater are not realistic because the groundwater beneath the SSFL is not currently used as a drinking water source and the presence of the contamination will likely require a restriction on its future use as well.	High	Conservative
	Future land use of the site is currently undecided but may be recreational, which has lower risks than for urban residential. If land use is assumed agricultural, risk estimates may be higher.	Moderate	Uncertain
	Risk estimates for fruit and vegetable consumption are based on conservative models that are based on associations with physical-chemical properties, such as Koc.	Moderate	Conservative
EPC Calculations	EPCs are based on some data that are over 10 years old. In these cases available analytical data may not accurately reflect current site conditions. Source concentrations assumed constant over time. Chemical concentrations may decline as a result of migration or degradation	Low	Conservative
	Use of upper confidence limits and maximum detected concentrations will likely overestimate site risks.	Low	Conservative
	Soil vapor exposure point concentrations for acetone and methyl ethyl ketone are estimated using soil to soil vapor partitioning extrapolations, introducing some degree of uncertainty.	Moderate	Conservative
	The 95% UCL concentration of some chemicals is greater than the maximum concentration, therefore the maximum was used as the EPC. This is considered to be a likely overestimation of the representative EPC because samples were collected in areas with the highest likelihoo to detect the highest concentrations at the site.	Moderate	Conservative
	The maximum detected concentration of each COPC detected in groundwater was used as the EPC.	Moderate	Conservative
	The extrapolation of soil Aroclor 1254 and Aroclor 1260 concentrations t individual PCB congener concentrations introduces some uncertainty int the EPC estimates for the PCB congeners.	Low	Conservative
	Vapor migration into indoor air has been estimated using a model which is being validated for the site. Migration estimates may be changed once the model validation is complete.	Moderate	Uncertain

Table S.4-3
Human Health Risk Assessment Uncertainty Analysis
Rockwell International Hot Laboratory RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Cancer Slope Factor	Extrapolation of dose-response data from laboratory animals to humans.	High	Conservative
	Assumes that all carcinogens do not have a threshold below which carcinogenic response occurs, and therefore, any dose, no matter how small, results in some potential risk.	Moderate	Conservative
	Not all slope factors represent the same degree of certainty. All are subject to change as new evidence becomes available. Some slope factors derived by OEHHA and considerably more conservative that corresponding factors derived by USEPA (e.g. arsenic, PCBs)	Moderate	Conservative
	Cancer slope factors derived from animal studies are the upper-bound maximum likelihood estimates based on a linear dose-response curve, and therefore, overstate carcinogenic potency.	Moderate	Conservative
Reference Dose	No dermal toxicity values are available, oral toxicity factors are used for the dermal route.	Moderate	Conservative
	High degree of uncertainty in extrapolation of dose-response data from laboratory animals to humans.	High	Conservative

Notes:
BTEX - benzene, toluene, ethylbenzene, and xylenes
COPC - chemical of potential concern
EPC - exposure point concentration
Koc - organic carbon sorption/adsorption coefficient
OEHHA - Office of Environmental Health Hazard Assessment
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
TPH - total petroleum hydrocarbons
UCL - upper confidence limit

Table S.4-4
Chemicals of Ecological Concern - Soil
Rockwell International Hot Lab RFI Site

Preferred Analyte Name	Range of HQs - RME Exposure (Refined Calculations)							Range of Incremental HQs - RME Exposure (Refined Calculations)							Identification of COECs	
	Terrestrial Plant	Soil Invertebrate	Hermit Thrush	Red-Tailed Hawk	Deer Mouse	Bobcat	Mule Deer	Terrestrial Plants	Soil Invertebrates	Hermit Thrush	Red-Tailed	Deer Mouse	Bobcat	Mule Deer	COEC	Rationale
Aluminum	**478**	**9.6**	No TRV -- **26**	No TRV -- <1	**166** -- **1657**	<1 -- <1	**1.1** -- **11**	**222**	**4.4**	-- -- **12**	-- -- <1	**74** -- **743**	<1 -- <1	<1 -- **5**	No	-USEPA guidance indicates no risk to plants and wildlife from aluminum when soil pH is greater than 5.5. -Site pH ranged from 6.3 to 8.75.
Cadmium	<1	<1	<1 -- **47**	<1 -- <1	<1 -- **28**	<1 -- <1	<1 -- <1	<1	<1	<1 -- **18**	<1 -- <1	<1 -- <1	<1 -- <1	<1 -- <1	**Yes**	-Estimated risks >1 for two receptors (thrush and mouse) at the Low TRV only. -Incremental risks >1
Chromium	<1	<1	**6.8** -- **34**	<1 -- <1	No TRV -- <1	No TRV -- <1	No TRV -- <1	<1	<1	**2.1** -- **10**	<1 -- <1	-- -- <1	-- -- <1	-- -- <1	No	-Estimated risks >1 for thrush. -Incremental risks >1 -Max site concentration (35 mg/kg) < max background concentration (36.8 mg/kg) -Estimated risks are due to background concentrations.
Cobalt	<1	<1	No TRV -- No TRV	No TRV -- No TRV	<1 -- **1**	<1 -- <1	<1 -- <1	<1	<1	-- -- **--**	-- -- --	<1 -- <1	<1 -- <1	<1 -- <1	No	-Estimated risks =1 for mouse at the Low TRV only. -Max site concentration (18 mg/kg) < max background concentration (21 mg/kg). -Incremental risks <1 for all receptors -Risks likely due to background concentrations.
Copper	<1	<1	<1 -- **13**	<1 -- <1	<1 -- **6**	<1 -- <1	<1 -- <1	<1	<1	<1 -- <1	<1 -- <1	<1 -- <1	<1 -- <1	<1 -- <1	No	-Estimated risks >1 for two receptors (thrush and mouse) at the Low TRV only. -Max site concentration (16 mg/kg) < max background concentration (29 mg/kg). -Incremental risks <1 for all receptors. -Risks likely due to background concentrations.
Nickel	<1	<1	<1 -- **13**	<1 -- <1	<1 -- **196**	<1 -- <1	<1 -- **1.3**	<1	<1	<1 -- **3**	<1 -- <1	<1 -- **58**	<1 -- <1	<1 -- <1	**Yes**	-Estimated risks >1 for three receptors (thrush, mouse, and deer) at the Low TRV only. -Incremental risks >1 for thrush and mouse.
Vanadium	<1	<1	No TRV -- <1	No TRV -- <1	**3.3** -- **33**	<1 -- <1	<1 -- <1	<1	<1	-- -- <1	-- -- <1	**1.1** -- **11**	<1 -- <1	<1 -- <1	**Yes**	-Estimated risks >1 for mouse (Low and High TRV). -Incremental risks >1 for mouse (Low and High TRV).
Aroclor 1254	<1	<1	<1 -- **5**	<1 -- <1	<1 -- **3**	<1 -- <1	<1 -- <1	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	**Yes**	-Estimated risks >1 for two receptors (thrush and mouse) at the Low TRV only. -Summed risk estimate (Hazard Index) for Aroclors exceeded 1 for thrush and mouse (both Low and High TRV).
Aroclor 1260	<1	<1	**3.1** -- **44**	<1 -- <1	**2.2** -- **22**	<1 -- <1	<1 -- <1	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	**Yes**	-Estimated risks >1 for two receptors (thrush and mouse). -Summed risk estimate (Hazard Index) for Aroclors exceeded 1 for thrush and mouse (both Low and High TRV).
PCB_TEQ_Bird	No TRV	<1	**35** -- **354**	<1 -- <1	No TRV -- No TRV	No TRV -- No TRV	No TRV -- No TRV	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	**Yes**	-Estimated risks for this analyte (HQ) exceeded 1 for thrush only. -Summed risk estimate (Hazard Index) for Dioxin_Furans exceeded 1 for thrush (Low and High TRV).
PCB_TEQ_Mammal	No TRV	<1	No TRV -- No TRV	No TRV -- No TRV	**72** -- **717**	<1 -- <1	<1 -- <1	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	**Yes**	-Estimated risks for this analyte (HQ) exceeded 1 for mouse only. -Summed risk estimate (Hazard Index) for Dioxin_Furans exceeded 1 for mouse (Low and High TRV).

Notes:
n/a - not applicable
HQs listed are based on Refined Screen
Low hazard quotient = EPC/High TRV
High hazard quotient = EPC/Low TRV
COEC - chemical of ecological concern
CTE - central tendency exposure
HI - hazard index
HQ - hazard quotient
RME - reasonable maximum exposure
TRV - toxicity reference value

Table S.4-5
Chemicals of Ecological Concern - Soil Vapor
Rockwell International Hot Lab RFI Site

Preferred Analyte Name	Inhalation of Soil Vapor (Deer Mouse)	Identification of COECs	
		COEC	Rationale
1,1,2-Trichloroethane	**1.8**	No	-Analyte was not detected in soil or soil vapor. -It was retained for evaluation because SQL>ESL. -ESL and TRV are same value (based on a Low TRV) and have uncertainty regarding their derivation. -None of the other VOCs detected at the site exceeded TRVs. -Not likely that the analyte is present at levels of ecological concern.

Notes:
n/a - not applicable
HQs listed are based on Refined Screen
COEC - chemical of ecological concern
CTE - central tendency exposure
ESL - ecological screening level
HQ - hazard quotient
RME - reasonable maximum exposure
SQL - sample quantitation limit

Table S.4-6
Ecological Risk Assessment Uncertainty Analysis
Rockwell International Hot Lab RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Problem Formulation			
Fate and Transport	It is assumed that chemical concentrations will not change over time, and that concentrations are constant during the exposure duration. Natural attenuation and/or other degradation processes may be significant in some areas resulting in an over-estimation of exposure.	Moderate	Over-estimation of exposure/risk
Data Collection/Analysis	Variability in analyses, laboratories, representativeness of samples, sampling errors, and homogeneity of the sample matrix can influence quality and quantity of data used in the risk assessment. Data were validated, but historical sampling programs may not have had the same standards as more recent ones.	Unknown	Over- or under-estimation of exposure/risk
Data Collection/Analysis	Detection Limits. Historical data were noted to have overly high detection limits, especially in regard to metals. Recent sampling was designed to have detection limits meeting ESLs. However, as data are combined into the EPCs, high detection limits may influence the resulting mean and 95UCLs.	Moderate	Over-estimation of exposure/risk
Data Collection/Analysis	Surface water samples were not collected from surface drainages. Potential exposure and risk to aquatic receptors could not be evaluated.	Moderate	Under-estimation of exposure/risk
Representative Species	Representative species were selected to reduce uncertainty; however, differences among species including physiology, reproductive biology, and/or foraging habits can result in different exposures and sensitivities for different receptors.	Low	Over- or under-estimation of exposure/risk
CPEC Selection	Background Comparison. Background evaluation was based on the WRS test. For some inorganics, the WRS test indicated that the site exceeded background, but site maximum, CTE, and RME concentrations were similar to or below background maximum, CTE, and/or RME concentrations.	Low	Over-estimation of exposure/risk
CPEC Selection	VOC Comparison. VOCs that were detected in soil but were not analyzed for in soil gas were retained as CPECs under the matrix "Modeled Soil Vapor". Concentrations were modeled from soil concentrations using SRAM Appendix G Equation 18.	Low	Over-estimation of exposure/risk
CPEC Selection	SQL Comparison. Chemicals that were never detected at the site were included as CPECs if they met the criteria in the SQL screening process: a) SQL>ESL b) at least 5 samples were collected c) at least 2 other chemicals in the same chemical class were detected.	Low	Over-estimation of exposure/risk
Exposure Pathway Analysis	Dermal and inhalation (for surface-dwelling animals) exposure pathways were not quantified.	Low	Under-estimation of exposure/risk
Analysis			
Wildlife Exposure Factors	Assumptions regarding exposure - likelihood, contact with contaminated media, concentrations at exposure points, and frequency/duration of contact are based on available information and assumptions of wildlife habits at the SSFL. Assumptions tend to simplify actual site conditions and may over- or under-estimate actual exposure.	Moderate	Over- or under-estimation of exposure/risk

Table S.4-6
Ecological Risk Assessment Uncertainty Analysis
Rockwell International Hot Lab RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Bioaccumulation Factors	Site-specific data on CPEC concentrations in wildlife foods were used to derive BAFs for a limited number of CPECs (SRAM 2005). For the remaining CPECs, literature-based BAFs and regression models were used to estimate bioaccumulation. The suitability of these bioaccumulation models to conditions at the site is unknown. Therefore, concentrations of CPECs in biota present at the site and, consequently, the dietary exposures of birds and mammals, may be either higher or lower than values estimated in the Group 5 ERAs.	Moderate	Over- or under-estimation of exposure/risk
Bioavailability	Bioavailability of CPECs was assumed to be 100 percent. This likely overestimates risk to receptors at the site.	Low	Over-estimation of exposure/risk
Area Use Factors	Area use factors (AUFs) of less than 1 were applied to exposure estimates for wide-ranging receptors (red-tailed hawk, bobcat, and mule deer) in the "refined" assessment to account for the foraging range of the receptor. Use of the site may be greater or less than that predicted by the AUF.	Low	Over- or under-estimation of exposure/risk
Exposure Point Concentrations	CTE EPC. CTE EPC is based on the arithmetic mean per the SRAM (MWH 2005). This assumes normal distribution. In some cases the CTE was >RME and/or CTE was >Maximum detect. The mean (CTE) could be biased high by higher detection limits from historic data. The RME EPC was used for the CTE EPC when the CTE was >RME or CTE was >Maximum.	Moderate	Over-estimation of exposure/risk
Exposure Point Concentrations	RME EPC. The RME EPC is the 95UCL, unless the 95UCL exceeds the maximum detect in which case the maximum detect is used as the RME EPC. Use of the maximum detect is considered to be a likely overestimation of the representative exposure point concentration because samples were collected in areas likely to have the highest concentrations at the site.	Moderate	Over-estimation of exposure/risk
Exposure Point Concentrations	The extrapolation of soil Aroclor 1254 and Aroclor 1260 concentrations to individual dioxin-like PCB congener concentrations introduces some uncertainty into the EPC estimates for the PCB congeners.	Low	Over- or under-estimation of exposure/risk
Exposure Point Concentrations	Soil vapor concentrations extrapolated from soil concentrations were used to calculate soil vapor EPC.	Moderate	Over- or under-estimation of exposure/risk
Exposure Point Concentrations	Estimation of soil vapor concentrations overstates actual burrow concentrations: 1) Model is conservative. 2) Air flow in burrows is not accounted for. 3) Model does not account for attenuation between depth to soil and 0-6 ft bgs interval for burrows.	Moderate	Over- or under-estimation of exposure/risk
Toxicity Reference Values	Toxicity data were not available for all CPECs or media considered in the Group 5 ERAs. CPECs for which toxicity data were unavailable were not evaluated, or surrogate toxicity data were used. Risks may be overestimated or underestimated.	Moderate	Over- or under-estimation of exposure/risk

Table S.4-6
Ecological Risk Assessment Uncertainty Analysis
Rockwell International Hot Lab RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Toxicity Reference Values	Literature-derived toxicity data from laboratory studies were the only toxicity data used to evaluate risk to all receptor groups. Effects observed in laboratory species were assumed to be indicative of effects that would occur in wild species. The suitability of this assumption is unknown. Therefore, risk may be either overestimated or underestimated.	Moderate	Over- or under-estimation of risks
Toxicity Reference Values	There is uncertainty in extrapolation of dose-response data from laboratory animals to other wildlife.	Moderate	Over- or under-estimation of risks
Toxicity Reference Values	Use of standardized uncertainty factors to estimate chronic NOAEL-equivalent TRVs.	Moderate	Over- or under-estimation of risks
Toxicity Reference Values	Use of chronic NOAEL-equivalent TRVs may overestimate risk.	High	Over-estimation of exposure/risk
Toxicity Reference Values	TRVs based on high dose laboratory exposures (LD50) were adjusted to a NOAEL-equivalent TRV. The more variables that are normalized using uncertainty factors, the greater the uncertainty in the resulting value.	Moderate	Over-estimation of exposure/risk
Toxicity Reference Values	Sources of TRVs occasionally apply different uncertainty factors than those used in the SRAM to adjust a study to what they label a "Chronic NOAEL". When details of the study were available, SRAM-specified uncertainty factors were used. If the details of the study were not presented or were not sufficiently complete to make a determination, then the interpretations made by the source document were used.	Low	Over- or under-estimation of risks
Risk Characterization			
Risk Estimation	Potential ecological risks were quantified using the HQ approach. The magnitude of the HQ indicates potential for ecological risk, but is not an exact estimation of risk. For example, the actual risk from a chemical with an HQ of 70 could be less than that for a chemical with an HQ of 20 because of uncertainties involved in estimating exposure, selection of effects criteria (TRVs), or field conditions affecting exposure.	Moderate	Over- or under-estimation of risks
Risk Estimation	Data necessary to estimate potential risks from all pathways for all chemicals in the food-chain uptake model were not always available. For these chemicals and/or areas, the food-chain uptake model was completed using the available data.	Moderate	Under-estimation of exposure/risk
Risk Estimation	Risks estimated for exposure to some inorganics may represent a background risk, rather than a site-related risk. Although the WRS test sometimes indicated that the site exceeded background, the Maximum, CTE, and/or RME EPC concentrations, it was sometimes found that site values were less than or comparable to the background Maximum, CTE, and/or RME concentrations.	Moderate	Over- or under-estimation of exposure/risk

Table S.4-6
Ecological Risk Assessment Uncertainty Analysis
Rockwell International Hot Lab RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Risk Description	The soluble and toxic forms of aluminum are only present in soil under soil pH values of less than 5.5 (USEPA 2003), and the average pH for the soils at the Group 5 sites exceeds 5.5. Aluminum, while evaluated in the ERA as a CPEC and identified as a risk driver, most likely does not cause effects to the various ecological receptors due to the soil pH range.	Moderate	Over-estimation of exposure/risk

Notes:

BAF - bioaccumulation factor
CPEC - chemical of potential ecological concern
CTE - central tendency exposure
EPC - exposure point concentration
ERA - ecological risk assessment
ESL - ecological screening level
LD50 - lethal doses to 50% of test animals
NOAEL - no observed adverse effect level
RME - reasonable maximum exposure
SQL - sample quantitation limit
TRV - toxicity reference value
UCL - upper confidence limit on the mean
VOC - volatile organic chemical
WRS - Wilcoxon Rank Sum test

Table S.5-1
Surficial Media Site Action Recommendations
Rockwell International Hot Lab RFI Site

Chemical Use Area	Chemical Use Area Name	CMS Area [1]	Recommended for further consideration in CMS based on:				
			Residential Receptor [2]	Recreational Receptor [2]	Ecological Receptor [2]		
1	Building 4020 and Hydraulic Lift	NFA	HRA COC: ***Soil Results:*** Aroclor-1254 Aroclor-1260 ***Near Surface Groundwater Results:*** Trichloroethene	No HRA COCs identified	***Soil Results***		
					Any HQ>1?	COEC	Rationale
					Aluminum	No	ERA-1
					Cadmium	Yes	ERA-3
					Chromium	No	ERA-2
					Cobalt	No	ERA-2
					Copper	No	ERA-2
					Nickel	Yes	ERA-3
					Vanadium	Yes	ERA-3
					Aroclor 1254	Yes	ERA-6
					Aroclor 1260	Yes	ERA-6
					PCB_TEQ_Bird	Yes	ERA-5
					PCB_TEQ_Mammal	Yes	ERA-5
2	Aboveground Tanks	NFA			***Soil Vapor Results***		
3	UT-10 and UT-11	NFA			Any HQ>1?	COEC	Rationale
4	Substation 4720	RIHL-1			1,1,2-Trichloroethane	No	ERA-4
5	Northeast portion of RFI site	RIHL-2					

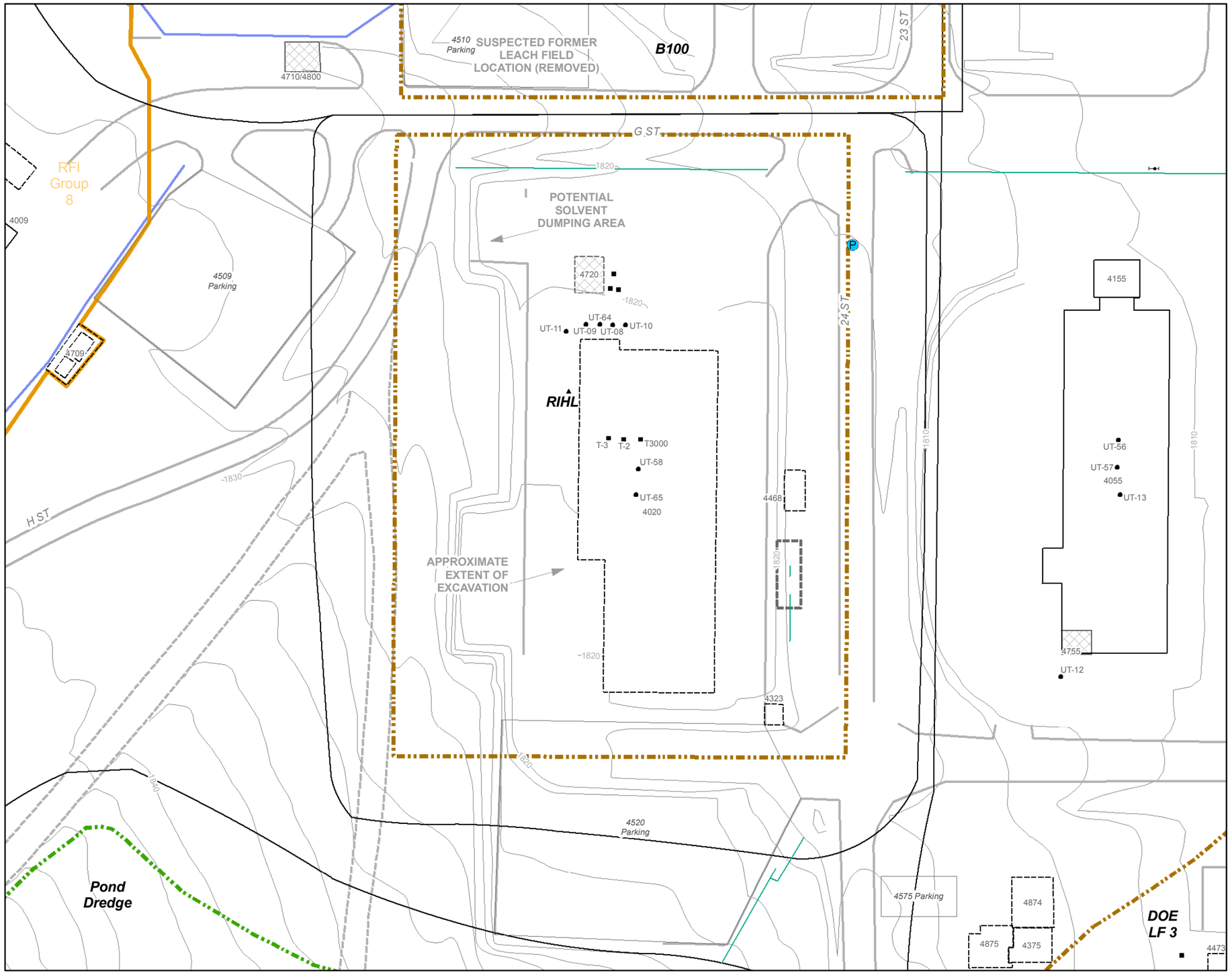
Notes:
1. NFA - Indicates area is recommended for No Further Action (NFA) for the CUA; not recommended for CMS evaluation.
2. CMS recommendations are based on compounds considered risk drivers (excess cancer risk > 1 x 10-6 or hazard index > 1) and/or significant risk contributors.

ERA-1 USEPA guidance indicates no risk from aluminum when pH is greater than 5.5. Site pH >5.5.
ERA-2 Site maximum concentration is below background maximum concentration. Site RME is similar to background RME.
ERA-3 Estimated risks and or incremental risks >1 for 1 or more receptors. Magnitude of exceedance indicate potential risk.
ERA-4 Analyte was not detected in either soil or soil vapor. It was retained for risk calcs because SQL> ESL. Estimated risk is Low. Actual presence is uncertain.
ERA-5 Estimated risks >1 for 1 or more receptors and chemical class hazard index>1. NOTE- eposure point concentrations were extrapolated from Aroclor 1254 and 1260 (not directly measured).
ERA-6 Estimated risks >1 for 1 or more receptors. Chemical class Hazard Index >1.

Table S.5-2
Summary of Site Surficial Media CMS Recommendations
Rockwell International Hot Lab RFI Site

CMS Area	Description	Chemical Risk Drivers and Contributors	Rationale
RIHL - 1	Substation 4720	Aroclor 1254 and Aroclor 1260 in soil	Cancer risk exceeded $1x10^{-6}$ for hypothetical future residential scenario, and HI exceeds 1 for ecological receptors.
RIHL - 2	Northeastern portion of RFI Site	Metals in soil	HI exceeds 1 for ecological receptors due to cadmium, nickel, and vanadium in soil.

Figures



Date: September 18, 2008 **WORKING DRAFT**

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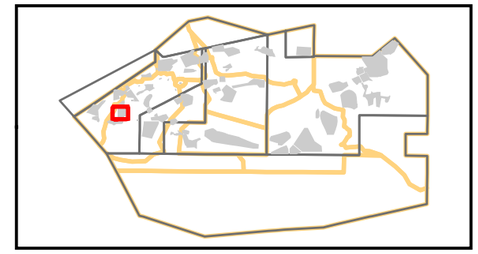
1 inch equals 60 feet

0 60 120 Feet

SANTA SUSANA FIELD LABORATORY



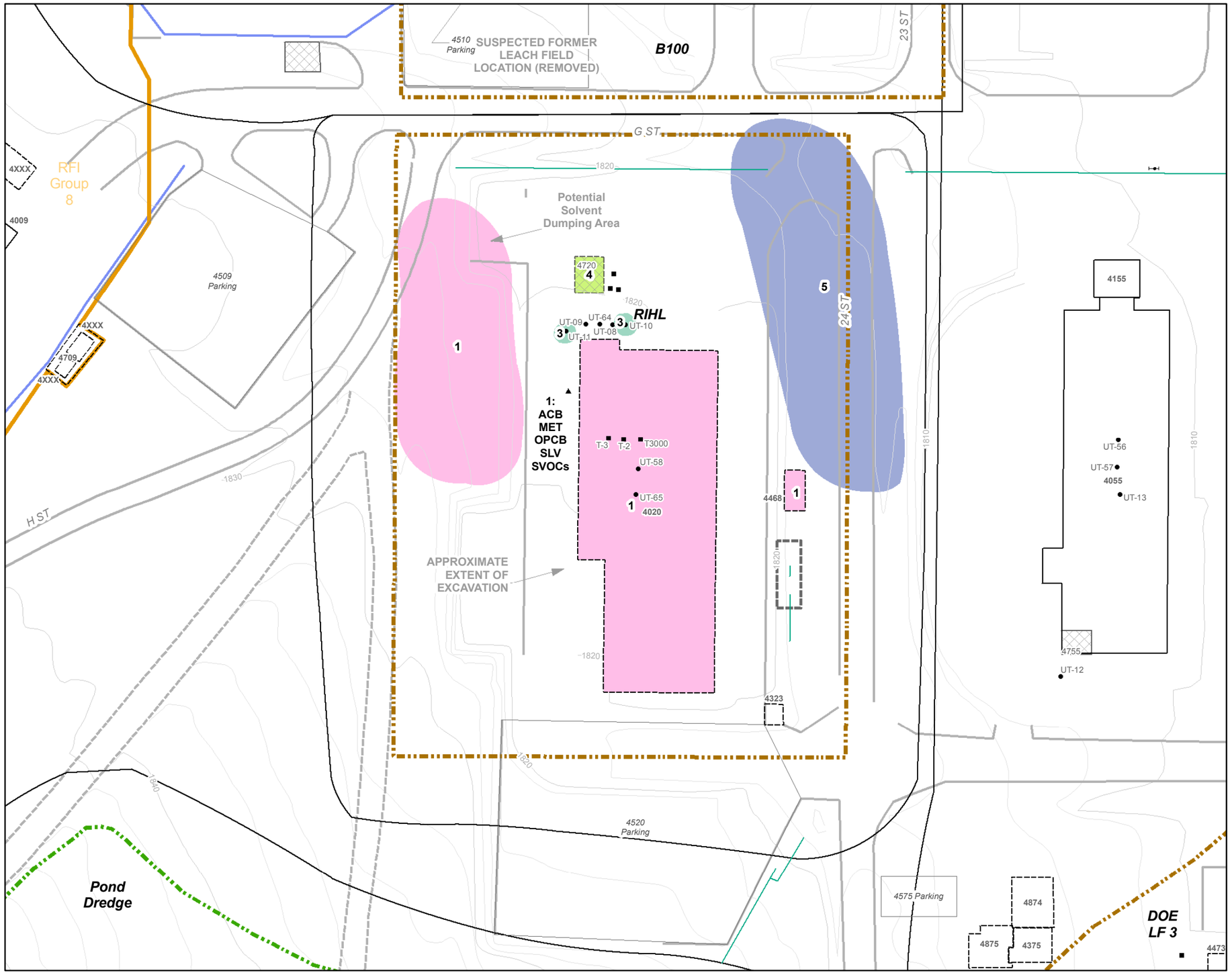
Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Pipe
- Surface Drainage Divide
- Leachfield
- Pond
- Groundwater Monitoring Well
- Piezometer
- Groundwater Extraction Well
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Rocks
- Streams

Site Location
RIHL RFI Site

CH2MHILL

Figure S.1-1



Date: September 18, 2008 **WORKING DRAFT**

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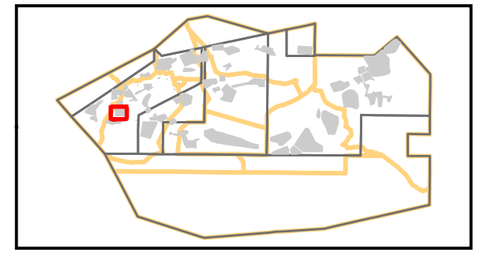
1 inch equals 60 feet

0 60 120 Feet

SANTA SUSANA FIELD LABORATORY



Chemical Use

- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Multiple Use Key

ACB - Acids and Bases
ASB - Asbestos
DEB - Debris
DIOX - Dioxins and Furans
ENC - Energetic Constituents
FRM - Formaldehyde
LCF - Leach Field
MET - Metals
NMIC - Non-metal Inorganic Constituents
OPCB - Oil/PCBs
PET - Petroleum
PRP - Propellants
SLV - Solvents
SVOC - SVOCs

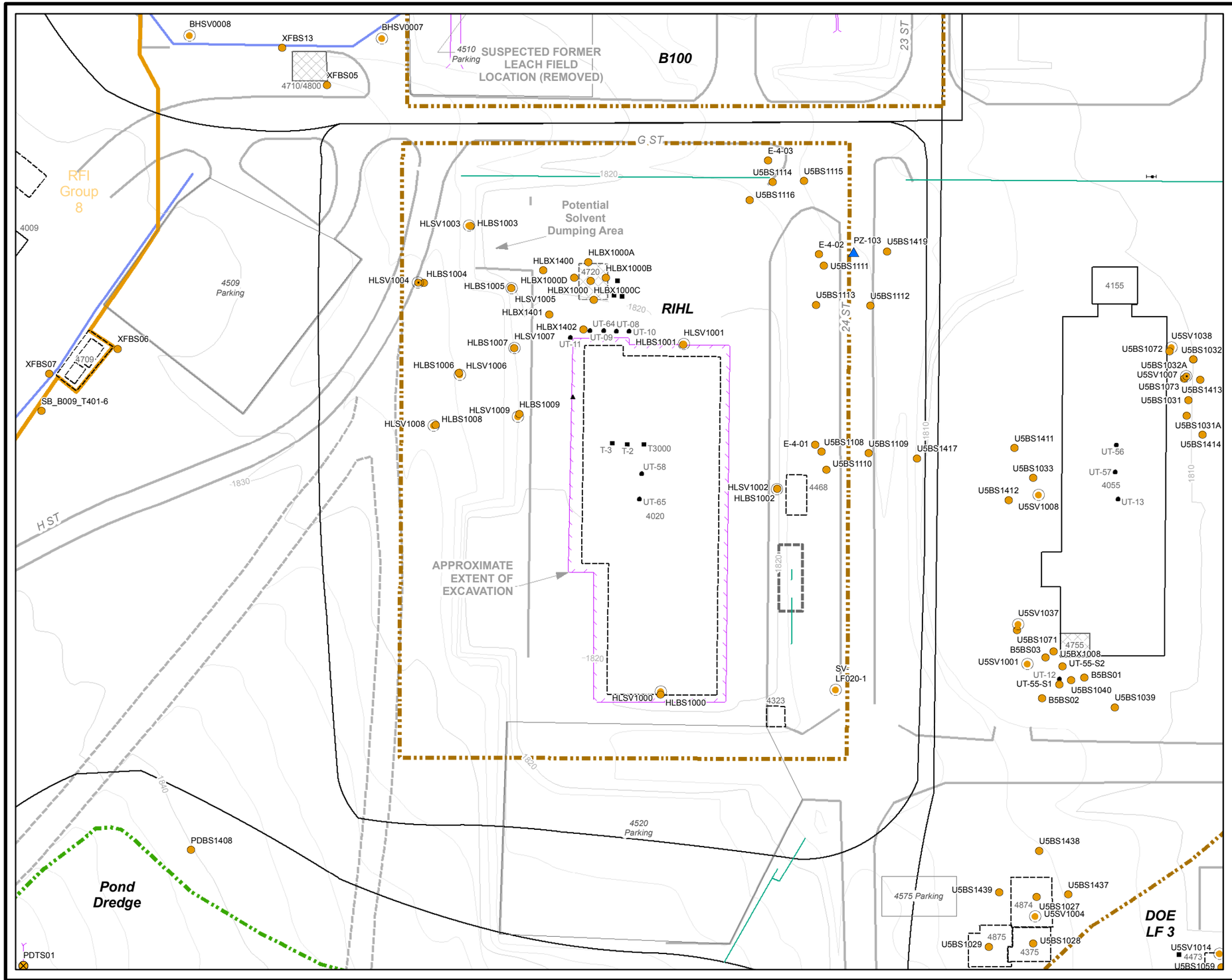
Basemap Legend

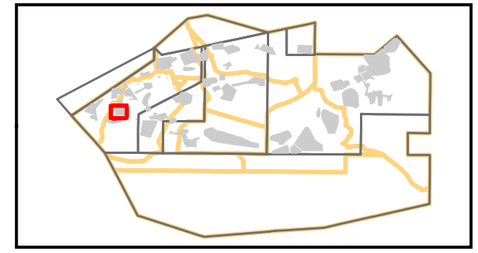
- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Leachfield
- Pipe
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Waste Debris Area

Chemical Use Areas RIHL RFI Site

CH2MHILL

Figure S.2-1





Sample Type

- Soil
- Soil - Composite
- Soil - Sediment
- Soil - Surface
- Air - Soil Vapor
- SV points that were not sampled due to refusal or poor air flow
- Air
- Groundwater
- Groundwater - Lysimeter
- Groundwater - Spring
- Water - Artificial
- Water - Discharge
- Water - Surface
- Water - Surface (Seep)
- B Biological
- MO Other
- MS Sump

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Trench
- Leachfield
- Pipe
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary

Sample Locations RIHL RFI Site

Date: October 30, 2008

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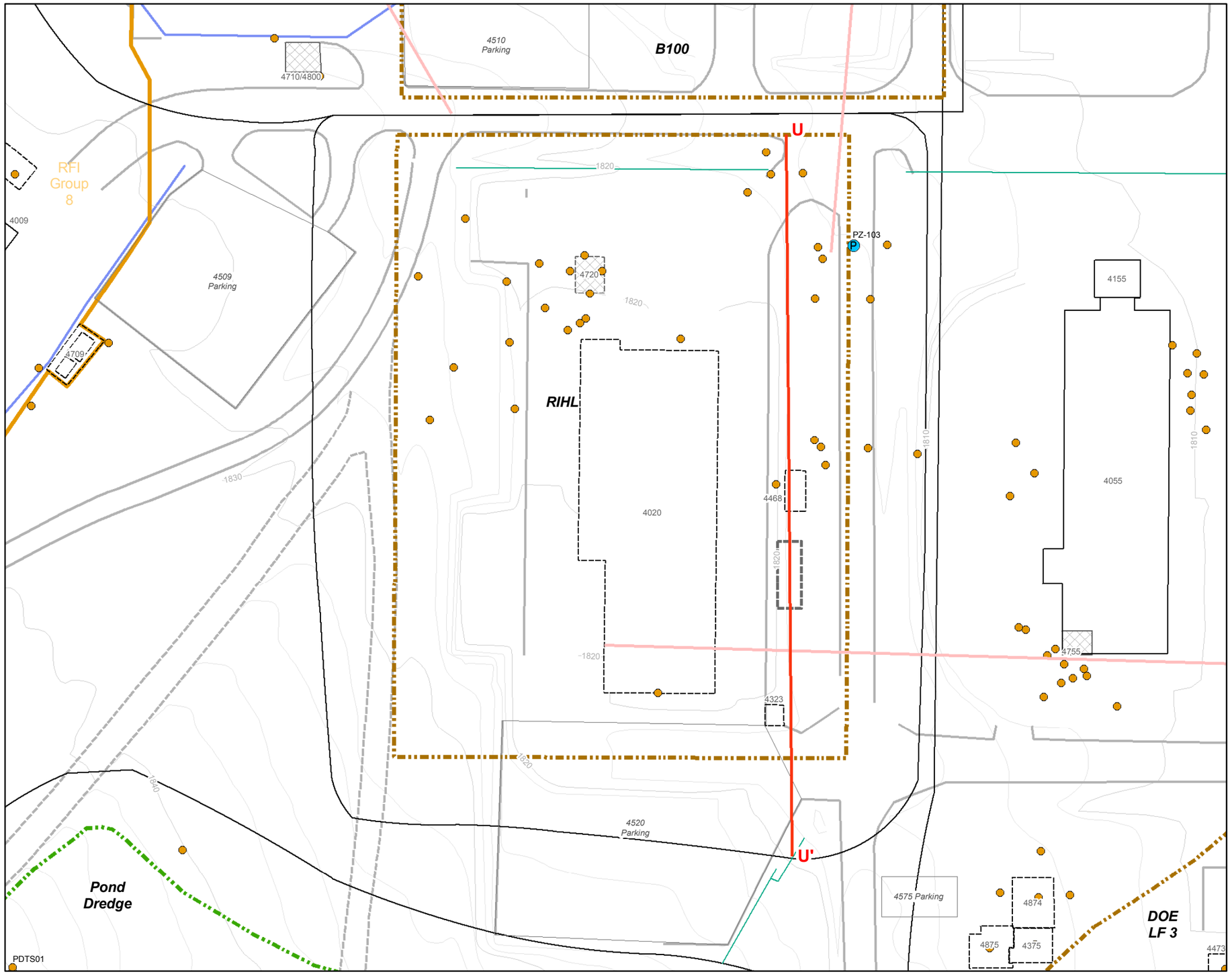
1 inch equals 60 feet

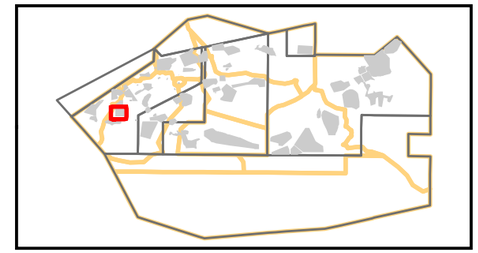
0 60 120 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure S.2-2





Cross-section Line

Basemap Legend

- Soil Boring
- Confirmation Sample
- Groundwater Monitoring Well
- Piezometer
- Groundwater Extraction Well
- Abandoned Groundwater Monitoring Well
- Leachfield
- Pipe
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary

RIHL Cross Section Location
U-U'

Date: September 18, 2008 **WORKING DRAFT**

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1 inch equals 60 feet

0 60 120 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure S.2-3A

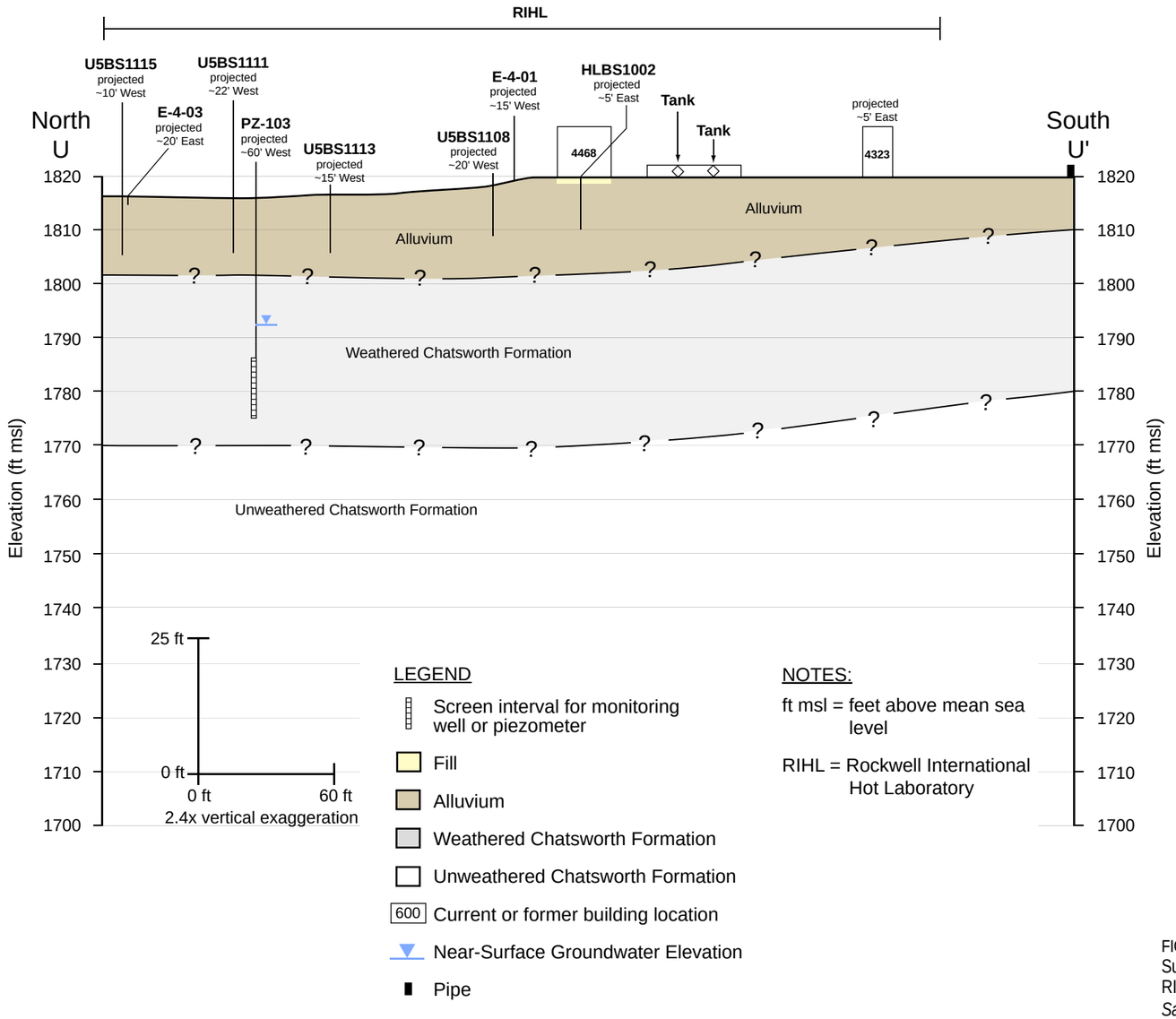
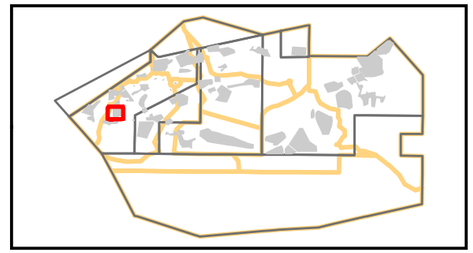


FIGURE 5.2-3B
Surficial Cross Section U-U'
RIHL
Santa Susana Field Laboratory

CH2MHILL



Approximate Areas of Soil Disturbance

- Grading
- Excavation - Backfill

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Pipe
- Surface Drainage Divide
- Leachfield
- Pond
- Excavation
- Trench
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Rocks
- Streams

Soil Disturbance Area
RIHL RFI Site

Date: November 05, 2008 **WORKING DRAFT**

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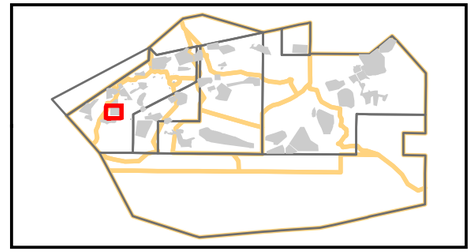
1 inch equals 60 feet

0 60 120 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure S.2-4



VOCs in Soil Vapor

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect
- SV points that were not sampled due to refusal or poor air flow

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Trench
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary

VOCs in Soil Vapor
RIHL RFI Site

Date: September 16, 2008 **WORKING DRAFT**

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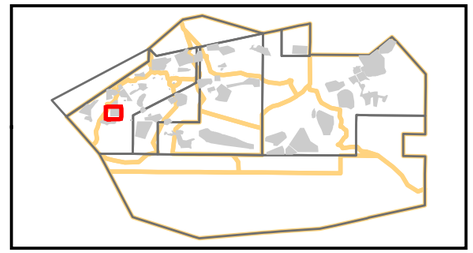
1 inch equals 60 feet

0 60 120 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure S.3-1A



VOCs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary

VOCs in Soil
RIHL RFI Site

Date: September 16, 2008 WORKING DRAFT

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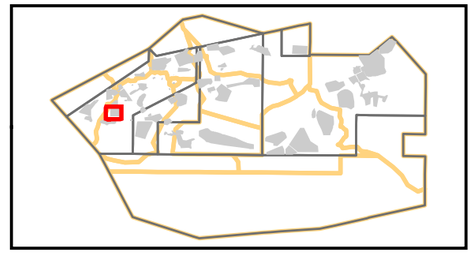
1 inch equals 60 feet

0 60 120 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure S.3-1B



SVOCs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond

SVOCs in Soil
RIHL RFI Site

Date: September 16, 2008 WORKING DRAFT

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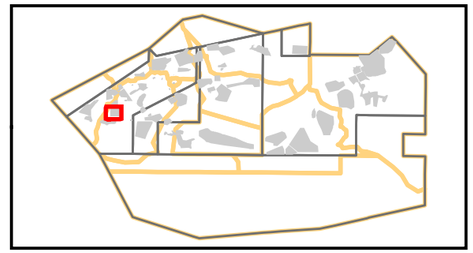
1 inch equals 60 feet

0 60 120 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure S.3-2



TPH in Soil

- **Exceeds Residential RBSL**
- **Detect, Below Residential RBSL**
- **Non-detect**

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond

TPH in Soil
RIHL RFI Site

Date: September 16, 2008 **WORKING DRAFT**

\\..RFI_05\RFI_Report\CDot_BL_PLTS\RFIGrp5_CDotTPHSoil_BL_PLTS.mxd

1 inch equals 60 feet

0 60 120 Feet

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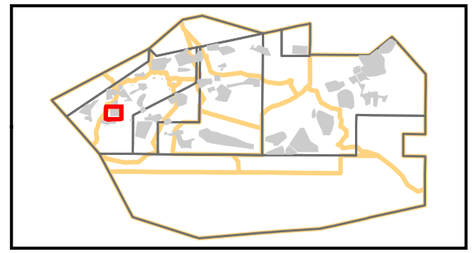
Figure S.3-3



PCBs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary

PCBs in Soil
RIHL RFI Site

Date: September 11, 2008 **WORKING DRAFT**

\\..RFI_05\RFI_Report\CDot_BL_PLTS\RFIGrp5_CDotPCBsSoil_BL_PLTS.mxd

1 inch equals 60 feet

0 60 120 Feet

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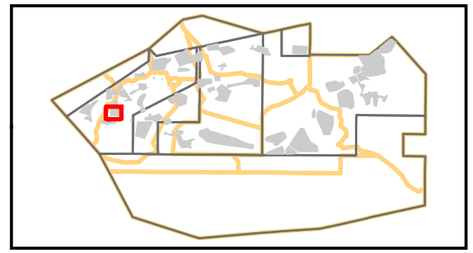
Figure S.3-4



Metals in Soil

- Exceeds Background + Residential RBSL + Eco RBSL
- Exceeds Background + Eco RBSL
- Exceeds Background
- Dectect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond

Metals in Soil
RIHL RFI Site

Date: September 11, 2008 WORKING DRAFT

\\..RFI_05\RFI_Report\CDot_BL_PLTS\RFIGrp5_CDotMtlsSoil_BL_PLTS.mxd

1 inch equals 60 feet

0 60 120 Feet

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Figure S.3-5

Soil Sample Locations

- Soil Sample Location With Detected VOCs Data
- Soil Sample Location Not Analyzed for VOCs Data
- Soil Sample Location With No Detected VOCs Data

Data Box Information

Sample Location ID: **B9BS01**

1.00	Depth in Feet
Primary	Sample Type
B9BS01S01	Unique Sample Identifier
7/10/2005	Date

Note: "12.05" and "<0.06" are for reference only and may not represent actual sample results.

12.05	Detect with sample concentration shown
< 0.06	Non-Detect with lab detection limit shown
J	Analyte positively identified; Associated numerical value is considered estimated
NA and [-]	Analysis not conducted
[#]	If more than one result per sample depth, the maximum is presented, with number of results in backets.

Detect	Non-Detect	
12.05	<0.06	Exceeds Background (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL or Exceeds Background + Res RBSL (Metals +Dioxins Only)
12.05	<0.06	Exceeds Eco RBSL or Exceeds Background + Eco RBSL (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL + Eco RBSL or Exceeds Background + Res RBSL + Eco RBSL (Metals + Dioxins Only)

= 2008 Data

= Pre-2008 Data

Basemap Legend

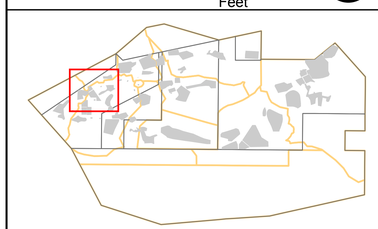
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

\\MapFiles\RFI_05\RFI_Report\SpiderDiagramRFIGrp5_SpiderDiagram_EL.mxd

0 140

1 inch equals 70 feet

Feet



SASS1000	3 Primary SASV1000S00 4/7/2000
VOC (NA)	
Acetone	-
Methyl ethyl ketone	-
Styrene	-
VOC (ug/L)	
1,1-Dichloroethene	< 0.1
Benzene	< 0.1
cis-1,2-Dichloroethene	< 0.1
Ethylbenzene	< 0.1
Methylene chloride	< 4
m,p-Xylene & p-Xylene	< 0.2
o-Xylene	< 0.1
Tetrachloroethene	< 0.1
Toluene	< 0.1
Trichloroethene	< 0.1

SASS1000	7 Primary SASS1000S010 3/28/2008	8 Primary SASS1000S063 3/28/2008	6 Split SASS1000S060 3/28/2008
VOC (ug/kg)			
1,1-Dichloroethene	< 0.973	< 106	< 5
Acetone	< 4.87	< 9.3	< 21
Benzene	< 0.973	< 1.06	< 5
cis-1,2-Dichloroethene	< 0.973	< 106	< 5
Ethylbenzene	< 0.973	< 106	< 5
Methyl ethyl ketone	< 4.87	2.8 J	< 10
Methylene chloride	< 4.87	< 5.32	< 5
m,p-Xylene & p-Xylene	< 195	< 2.13	< 5
o-Xylene	< 0.973	< 106	< 5
Styrene	0.28 J	0.268 J	< 5
Tetrachloroethene	< 0.973	< 106	< 5
Toluene	< 0.973	< 106	< 5
Trichloroethene	< 0.973	< 106	< 5

SASS1003	7 Primary SASS1003S010 3/26/2008	8 Primary SASS1003S060 3/26/2008	10 Primary SASS1003S100 3/26/2008
VOC (ug/kg)			
1,1-Dichloroethene	0.93 J	< 4.8	< 4.9
Acetone	< 11	51 J	< 25
Benzene	< 2.1	< 1.9	< 2
cis-1,2-Dichloroethene	< 2.1	< 19	< 2
Ethylbenzene	< 2.1	< 19	< 2
Methyl ethyl ketone	< 11	52 J	-
Methylene chloride	< 5.3	< 4.8	< 4.9
m-Xylene & p-Xylene	< 2.1	< 19	< 2
o-Xylene	< 2.1	< 19	< 2
Styrene	< 2.1	< 19	< 2
Tetrachloroethene	< 2.1	< 1.9	< 2
Toluene	< 2.1	< 19	< 2
Trichloroethene	< 2.1	< 19	< 2

SASS1002	8 Primary SASV1002S090 5/1/2008	9 Primary SASV1002S050 3/28/2008	9 Primary SASV1002S090 3/28/2008
VOC (NA)			
Acetone	-	-	-
Methyl ethyl ketone	-	-	-
Styrene	-	-	-
VOC (ug/L)			
1,1-Dichloroethene	< 0.1	< 0.1	< 0.1
Benzene	< 0.1	0.052 J	< 0.1
cis-1,2-Dichloroethene	< 0.1	< 0.1	< 0.1
Ethylbenzene	< 0.1	< 0.1	< 0.1
Methylene chloride	< 5	< 5	< 5
m-Xylene & p-Xylene	< 0.2	0.18 J	< 0.2
o-Xylene	< 0.1	< 0.1	< 0.1
Tetrachloroethene	< 0.1	0.25	< 0.1
Toluene	< 0.1	< 0.1	< 0.1
Trichloroethene	< 0.1	< 0.1	< 0.1

SASS1002	5 Primary SASS1002S090 3/28/2008	6 Duplicate SASS1002D090 3/28/2008	6 Primary SASS1002S060 3/28/2008
VOC (ug/kg)			
1,1-Dichloroethene	< 5.2	< 4.6	< 4.5
Acetone	19 J	16 J	< 9.1
Benzene	< 2.1	< 1.8	< 1.8
cis-1,2-Dichloroethene	< 2.1	< 1.8	< 1.8
Ethylbenzene	< 2.1	< 1.8	< 1.8
Methyl ethyl ketone	2.4 J	3 J	< 9.1
Methylene chloride	< 5.2	< 4.6	< 4.5
m-Xylene & p-Xylene	< 2.1	< 1.8	< 1.8
o-Xylene	< 2.1	< 1.8	< 1.8
Styrene	< 2.1	< 1.8	< 1.8
Tetrachloroethene	< 2.1	< 1.8	< 1.8
Toluene	< 2.1	< 1.8	< 1.8
Trichloroethene	< 2.1	< 1.8	< 1.8

USSV1210	5 Primary USSV1210S01 5/15/2008	9 Primary USSV1210S02 5/15/2008
VOC (NA)		
Acetone	-	-
Methyl ethyl ketone	-	-
Styrene	-	-
VOC (ug/L)		
1,1-Dichloroethene	< 0.1	< 0.1
Benzene	< 0.1	0.064 J
cis-1,2-Dichloroethene	< 0.1	< 0.1
Ethylbenzene	< 0.1	0.06 J
Methylene chloride	< 5	< 5
m-Xylene & p-Xylene	< 0.2	0.29
o-Xylene	< 0.1	0.09 J
Tetrachloroethene	< 0.1	< 0.1
Toluene	< 0.1	0.28
Trichloroethene	< 0.1	< 0.1

SASS1051	5 Primary SASS1051S10 3/26/2008	6 Split SASS1051S10 3/26/2008	7 Primary SASS1051S70 3/26/2008
VOC (ug/kg)			
1,1-Dichloroethene	< 5	< 5	< 3.4
Acetone	< 10	9 J	13.5 J
Benzene	< 2	< 5	< 10
cis-1,2-Dichloroethene	< 2	< 5	< 10
Ethylbenzene	< 2	< 5	< 10
Methyl ethyl ketone	< 10	< 10	26 J
Methylene chloride	< 5	< 5	< 3.4
m-Xylene & p-Xylene	< 5	< 5	< 10
o-Xylene	< 2	< 5	< 10
Styrene	< 2	< 5	< 10
Tetrachloroethene	< 2	< 5	< 10
Toluene	< 2	< 5	< 10
Trichloroethene	< 2	< 5	< 10

USBS1203	5 Primary USBS1203S10 3/28/2008
VOC (ug/kg)	
1,1-Dichloroethene	< 4.8
Acetone	< 9.6
Benzene	< 1.9
cis-1,2-Dichloroethene	< 19
Ethylbenzene	< 19
Methyl ethyl ketone	< 9.6
Methylene chloride	< 4.8
m-Xylene & p-Xylene	< 19
o-Xylene	< 19
Styrene	< 19
Tetrachloroethene	< 1.9
Toluene	< 19
Trichloroethene	< 19

USBS1029	5 Primary USBS1029S10 3/28/2008
VOC (ug/kg)	
1,1-Dichloroethene	< 105
Acetone	< 527
Benzene	< 1.84
cis-1,2-Dichloroethene	< 105
Ethylbenzene	< 105
Methyl ethyl ketone	< 527
Methylene chloride	< 4.21
m-Xylene & p-Xylene	< 105
o-Xylene	0.261 J
Styrene	< 1.84
Tetrachloroethene	< 105
Toluene	< 105
Trichloroethene	< 105

SASV1006	5 Primary SASV1006S01 5/16/2008	6 Duplicate SASV1006D01 5/16/2008	10 Primary SASV1006S02 5/16/2008
VOC (NA)			
Acetone	-	-	-
Methyl ethyl ketone	-	-	-
Styrene	-	-	-
VOC (ug/L)			
1,1-Dichloroethene	< 0.1	< 0.1	< 0.1
Benzene	< 0.1	0.033 J	0.1
cis-1,2-Dichloroethene	< 0.1	< 0.1	< 0.1
Ethylbenzene	< 0.1	0.04 J	0.11 J
Methylene chloride	< 5	< 5	< 5
m-Xylene & p-Xylene	0.05 J	0.07 J	0.4 J
o-Xylene	0.05 J	0.05 J	0.2 J
Tetrachloroethene	0.1	0.12	0.5
Toluene	0.1	0.2	0.58 J
Trichloroethene	< 0.1	< 0.1	< 0.1

USBS1401	5 Primary USBS1401S1 4/29/2008	6 Duplicate USBS1401D1 4/29/2008
VOC (NA)		
Acetone	-	-
Methyl ethyl ketone	-	-
Styrene	-	-
VOC (ug/L)		
1,1-Dichloroethene	< 0.1	< 0.1
Benzene	< 0.1	< 0.1
cis-1,2-Dichloroethene	< 0.1	< 0.1
Ethylbenzene	< 0.1	< 0.1
Methylene chloride	< 5	< 5
m-Xylene & p-Xylene	< 0.2	< 0.2
o-Xylene	< 0.1	< 0.1
Tetrachloroethene	< 0.1	< 0.1
Toluene	< 0.1	< 0.1
Trichloroethene	< 0.1	< 0.1

SASS1035	5 Primary SASV1035S04 4/28/2008	5 Primary SASV1035S05 4/7/2008	6 Duplicate SASV1035D05 4/7/2008
VOC (NA)			
Acetone	-	-	-
Methyl ethyl ketone	-	-	-
Styrene	-	-	-
VOC (ug/L)			
1,1-Dichloroethene	< 0.1	< 0.1	< 0.1
Benzene	0.042 J	0.038 J	0.041 J
cis-1,2-Dichloroethene	< 0.1	0.09 J	0.1
Ethylbenzene	< 0.1	< 0.1	< 0.1
Methylene chloride	< 5	< 5	< 5
m-Xylene & p-Xylene	< 0.2	< 0.2	< 0.2
o-Xylene	< 0.1	< 0.1	< 0.1
Tetrachloroethene	0.5	0.48	0.49
Toluene	< 0.1	< 0.1	< 0.1
Trichloroethene	0.16	0.15	0.13

SASV1007	5 Primary SASV1007S01 5/16/2008	5 Primary SASV1007S02 5/16/2008
VOC (NA)		
Acetone	-	-
Methyl ethyl ketone	-	-
Styrene	-	-
VOC (ug/L)		
1,1-Dichloroethene	< 0.1	< 0.1
Benzene	0.04 J	0.061 J
cis-1,2-Dichloroethene	< 0.1	< 0.1
Ethylbenzene	0.05 J	0.09 J
Methylene chloride	< 5	< 5
m-Xylene & p-Xylene	0.2	0.31
o-Xylene	0.06 J	0.09 J
Tetrachloroethene	< 0.1	< 0.1
Toluene	0.16	0.25
Trichloroethene	< 0.1	< 0.1

SASS1025	5 Primary SASS1025S10 3/28/2008	5 Primary SASS1025S05 3/28/2008
VOC (ug/kg)		
1,1-Dichloroethene	< 11	< 0.96
Acetone	< 55	< 4.8
Benzene	< 1.1	< 0.96
cis-1,2-Dichloroethene	< 11	< 0.96
Ethylbenzene	< 11	< 0.96
Methyl ethyl ketone	< 55	1.72 J
Methylene chloride	< 5.5	< 4.8
m-Xylene & p-Xylene	< 22	< 1.92
o-Xylene	< 11	< 0.96
Styrene	< 11	0.244 J
Tetrachloroethene	< 1.1	< 0.96
Toluene	< 11	< 0.96
Trichloroethene	< 11	< 0.96

USBS1027	5 Primary USBS1027S05 10 3/26/2008	6 Primary USBS1027S060 3/26/2008
VOC (ug/kg)		
1,1-Dichloroethene	< 4.6	< 5.6
Acetone	5.1 J	5.6 J
Benzene	< 1.9	< 2.6
cis-1,2-Dichloroethene	< 19	< 2.6
Ethylbenzene	< 19	< 2.6
Methyl ethyl ketone	< 9.3	< 10
Methylene chloride	< 4.6	< 5.6
m-Xylene & p-Xylene	< 19	< 2.6
o-Xylene	< 19	< 2.6
Styrene	< 19	< 2.6
Tetrachloroethene	< 1.9	< 2.6
Toluene	< 19	< 2.6
Trichloroethene	< 19	< 2.6

USBS1024	5 Primary USBS1024S070 4/7/2008
VOC (NA)	
Acetone	-
Methyl ethyl ketone	-
Styrene	-
VOC (ug/L)	
1,1-Dichloroethene	< 0.1
Benzene	< 0.1
cis-1,2-Dichloroethene	< 0.1
Ethylbenzene	< 0.1
Methylene chloride	< 5
m-Xylene & p-Xylene	0.1 J
o-Xylene	< 0.1
Tetrachloroethene	0.05 J
Toluene	0.04 J
Trichloroethene	< 0.1

USBS1400	5 Primary USBS1400S02 5/2/2008	Split USBS1400X02 5/2/2008
VOC (ug/kg)		
1,1-Dichloroethene	1.4 J	< 5
Acetone	< 2.1	< 22
Benzene	< 2.1	< 5
cis-1,2-Dichloroethene	< 2.1	< 5
Ethylbenzene	3.2 J	< 5
Methyl ethyl ketone	< 5	< 5
Methylene chloride	< 2.1	< 5
m-Xylene & p-Xylene	< 2.1	< 5
o-Xylene	< 2.1	< 5
Styrene	< 2.1	< 5
Tetrachloroethene	< 2.1	< 5
Toluene	< 2.1	< 5
Trichloroethene	< 2.1	< 5

USBS1401	5 Primary USBS1401S01 5/2/2008	5 Primary USBS1401S02 5/2/2008
VOC (NA)		
Acetone	-	-
Methyl ethyl ketone	-	-
Styrene	-	-
VOC (ug/kg)		
1,1-Dichloroethene	< 10	1.5 J
Acetone	< 52	< 2.1
Benzene	< 2.1	< 2.1
cis-1,2-Dichloroethene	< 2.1	< 2.1
Ethylbenzene	< 2.1	< 2.1
Methyl ethyl ketone	< 10	< 4.2
Methylene chloride	< 5.2	< 2.1
m-Xylene & p-Xylene	< 2.1	< 2.1
o-Xylene	< 2.1	< 2.1
Styrene	< 2.1	< 2.1
Tetrachloroethene	< 2.1	< 2.1
Toluene	< 2.1	< 2.1
Trichloroethene	< 2.1	< 2.1

USBS1205	5 Primary USBS1205S05 4/7/2008
VOC (NA)	
Acetone	-
Methyl ethyl ketone	-
Styrene	-
VOC (ug/L)	
1,1-Dichloroethene	< 0.1
Benzene	< 0.1
cis-1,2-Dichloroethene	< 0.1
Ethylbenzene	< 0.1
Methylene chloride	< 5
m-Xylene & p-Xylene	< 0.2
o-Xylene	< 0.1
Tetrachloroethene	0.8
Toluene	< 0.1
Trichloroethene	< 0.1

USBS1208	5 Primary USBS1208S10 3/28/2008	5 Primary USBS1208S05 3/28/2008
VOC (ug/kg)		
1,1-Dichloroethene	< 103	< 0.969
Acetone	< 516	< 4.84
Benzene	< 103	< 0.969
cis-1,2-Dichloroethene	< 103	< 0.969
Ethylbenzene	< 103	< 0.969
Methyl ethyl ketone	< 516	< 4.84
Methylene chloride	< 5.16	< 4.84
m-Xylene & p-Xylene	< 206	< 1.94
o-Xylene	< 103	< 0.969
Styrene	0.335 J	0.244 J
Tetrachloroethene	< 103	0.064 J
Toluene	< 103	< 0.969
Trichloroethene	< 103	< 0.969

USBS1402	5 Primary USBS1402S02 5/2/2008	10 Primary USBS1402S03 5/2/2008
VOC (ug/kg)		
1,1-Dichloroethene	< 4.7	< 5.4
Acetone	< 19	< 22
Benzene	< 1.9	< 2.1
cis-1,2-Dichloroethene	< 19	< 2.1
Ethylbenzene	< 19	< 2.1
Methyl ethyl ketone	< 9.3	< 11
Methylene chloride	3.1 J	1.3 J
m-Xylene & p-Xylene	< 19	< 2.1
o-Xylene	< 19	< 2.1
Styrene	< 19	< 2.1
Tetrachloroethene	9.1	37 J
Toluene	< 19	< 2.1
Trichloroethene	< 19	< 2.1

SASS1034	5 Primary SASV1034S10 3/26/2008	6 Duplicate SASV1034D10 3/26/2008	6 Primary SASV1034S060 3/26/2008
VOC (ug/kg)			
1,1-Dichloroethene	< 5.1	< 5.6	< 4.5
Acetone	5.1 J	5.2 J	9 J
Benzene	< 2	< 2.2	< 1.8
cis-1,2-Dichloroethene	< 2	< 2.2	< 1.8
Ethylbenzene	< 2	< 2.2	< 1.8
Methyl ethyl ketone	< 10	< 11	< 9.1
Methylene chloride	< 5.1	< 5.6	< 4.5
m-Xylene & p-Xylene	< 2	< 2.2	< 1.8
o-Xylene	< 2	< 2.2	< 1.8
Styrene	< 2	< 2.2	< 1.8
Tetrachloroethene	1.9 J	< 2.2	6 J
Toluene	< 2	< 2.2	< 1.8
Trichloroethene	< 2	< 2.2	< 1.8

SANTA SUSANA FIELD LABORATORY

CH2MHILL

VOC Data Results SNAP RFI Site

FIGURE T.3-6

Soil Sample Locations

- Soil Sample Location With Detected SVOCs, TPH, and PCBs Data
- Soil Sample Location Not Analyzed for SVOCs, TPH, and PCBs Data
- Soil Sample Location With No Detected SVOCs, TPH, and PCBs Data

Data Box Information

Sample Location ID: B9BS01

1.00	Depth in Feet
Primary	Sample Type
B9B301S01	Unique Sample Identifier
7/10/2005	Date

12.05	Detect with sample concentration shown
< 0.06	Non-Detect with lab detection limit shown
J	Analyte positively identified; Associated numerical value is considered estimated
NA and [-]	Analysis not conducted
[#]	If more than one result per sample depth, the maximum is presented, with number of results in backets.

Note: "12.05" and "<0.06" are for reference only and may not represent actual sample results .

Detect	Non-Detect	
12.05	<0.06	Exceeds Background (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL or Exceeds Background + Res RBSL (Metals +Dioxins Only)
12.05	<0.06	Exceeds Eco RBSL or Exceeds Background + Eco RBSL (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL + Eco RBSL or Exceeds Background + Res RBSL + Eco RBSL (Metals + Dioxins Only)

= 2008 Data

= Pre-2008 Data

Basemap Legend

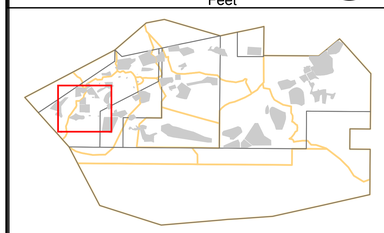
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

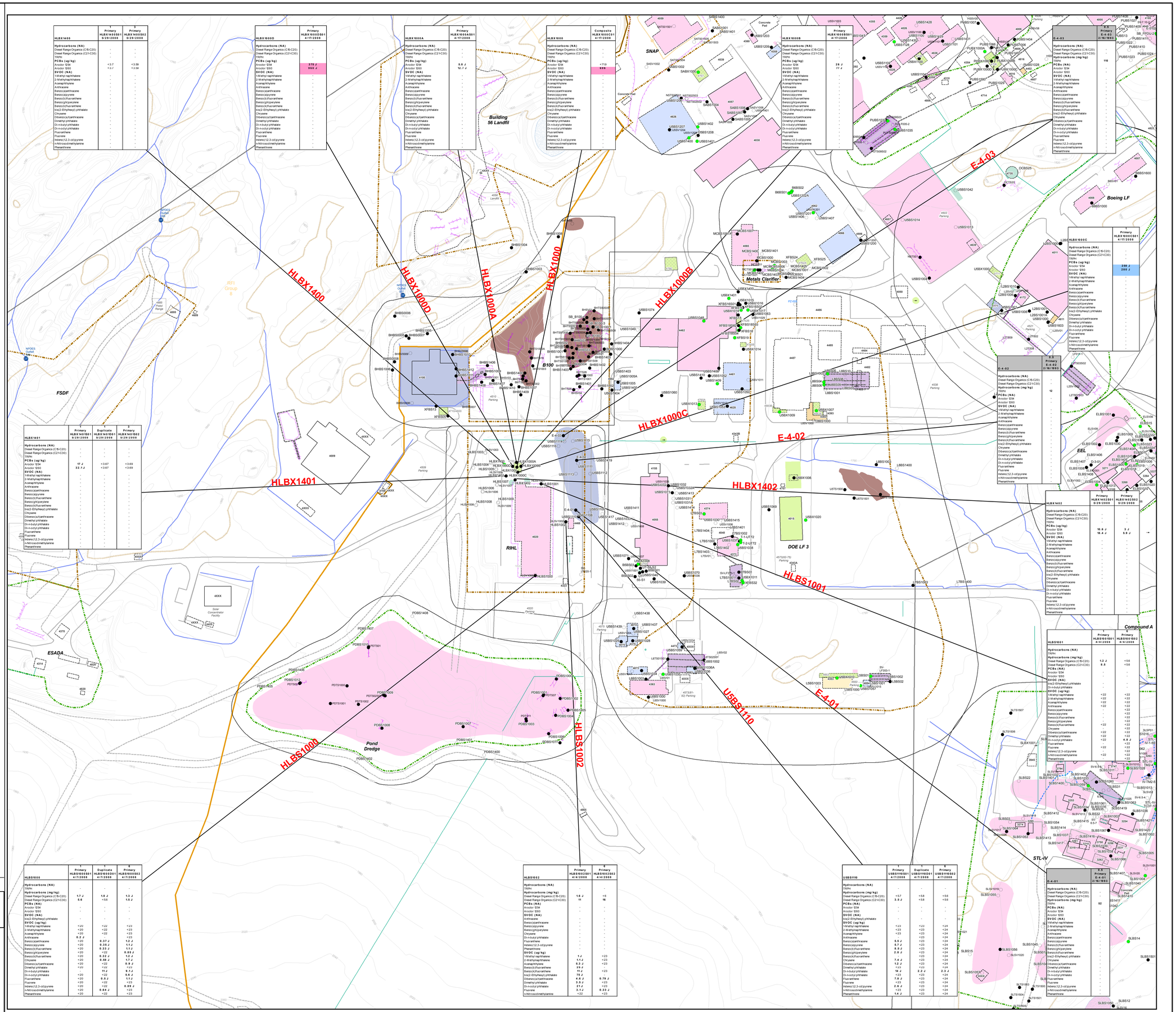
\\MapFiles\RFI_05\RFI_Report\SpiderDiagram\RFIGrp5_SpiderDiagram_EL.mxd

0 75 150

1 inch equals 75 feet

Feet





HLBX1400	Primary HLBX1400SS01 5/29/2008	Primary HLBX1400SS02 5/29/2008
Hydrocarbons (NA)		
Diesel Range Organics (C8-C20)	-	-
Diesel Range Organics (C21-C30)	-	-
TRPH	-	-
PCBs (ug/kg)		
Aroclor 1254	<3.7	<3.59
Aroclor 1260	<3.7	<3.59
SVOC (NA)		
1-Methyl naphthalene	-	-
2-Methylnaphthalene	-	-
Acenaphthylene	-	-
Anthracene	-	-
Benzo(a)anthracene	-	-
Benzo(a)pyrene	-	-
Benzo(b)fluoranthene	-	-
Benzo(g,h)perylene	-	-
Benzo(k)fluoranthene	-	-
bis(2-Ethylhexyl) phthalate	-	-
Chrysene	-	-
Dibenz(a,h)anthracene	-	-
Dimethyl phthalate	-	-
Di-n-butyl phthalate	-	-
Di-n-octyl phthalate	-	-
Fluoranthene	-	-
Fluorene	-	-
Indeno(1,2,3-cd)pyrene	-	-
n-Nitrosodimethylamine	-	-
Phenanthrene	-	-

HLBX1000D	Primary HLBX1000DS01 4/17/2008
Hydrocarbons (NA)	
Diesel Range Organics (C8-C20)	-
Diesel Range Organics (C21-C30)	-
TRPH	-
PCBs (ug/kg)	
Aroclor 1254	370 J
Aroclor 1260	990 J
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
n-Nitrosodimethylamine	-
Phenanthrene	-

HLBX1000A	Primary HLBX1000AS01 4/17/2008
Hydrocarbons (NA)	
Diesel Range Organics (C8-C20)	-
Diesel Range Organics (C21-C30)	-
TRPH	-
PCBs (ug/kg)	
Aroclor 1254	5.8 J
Aroclor 1260	12 J
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
n-Nitrosodimethylamine	-
Phenanthrene	-

HLBX1000	Composite HLBX1000SC01 4/17/2008
Hydrocarbons (NA)	
Diesel Range Organics (C8-C20)	-
Diesel Range Organics (C21-C30)	-
TRPH	-
PCBs (ug/kg)	
Aroclor 1254	710
Aroclor 1260	690
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
n-Nitrosodimethylamine	-
Phenanthrene	-

HLBX1000B	Primary HLBX1000BS01 4/17/2008
Hydrocarbons (NA)	
Diesel Range Organics (C8-C20)	-
Diesel Range Organics (C21-C30)	-
TRPH	-
PCBs (ug/kg)	
Aroclor 1254	28 J
Aroclor 1260	77 J
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
n-Nitrosodimethylamine	-
Phenanthrene	-

E-4-03	Primary E-4-03 2/16/1993
Hydrocarbons (NA)	
Diesel Range Organics (C8-C20)	-
Diesel Range Organics (C21-C30)	-
Hydrocarbons (mg/kg)	110
TRPH	
PCBs (NA)	
Aroclor 1254	-
Aroclor 1260	-
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
n-Nitrosodimethylamine	-
Phenanthrene	-

HLBX1000C	Primary HLBX1000CC01 4/17/2008
Hydrocarbons (NA)	
Diesel Range Organics (C8-C20)	-
Diesel Range Organics (C21-C30)	-
TRPH	-
PCBs (ug/kg)	
Aroclor 1254	200 J
Aroclor 1260	200 J
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
n-Nitrosodimethylamine	-
Phenanthrene	-

E-4-02	Primary E-4-02 2/16/1993
Hydrocarbons (NA)	
Diesel Range Organics (C8-C20)	-
Diesel Range Organics (C21-C30)	-
Hydrocarbons (mg/kg)	12
TRPH	
PCBs (NA)	
Aroclor 1254	-
Aroclor 1260	-
SVOC (NA)	
bis(2-Ethylhexyl) phthalate	-
SVOC (ug/kg)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
n-Nitrosodimethylamine	-
Phenanthrene	-

HLBX1401	Primary HLBX1401SS01 5/29/2008	Duplicate HLBX1401SD01 5/29/2008	Primary HLBX1401SS02 5/29/2008
Hydrocarbons (NA)			
TRPH	-	-	-
Hydrocarbons (mg/kg)			
Diesel Range Organics (C8-C20)	17 J	<3.67	<3.69
Diesel Range Organics (C21-C30)	32.1 J	<3.67	<3.69
PCBs (ug/kg)			
Aroclor 1254	-	-	-
Aroclor 1260	-	-	-
SVOC (NA)			
1-Methyl naphthalene	-	-	-
2-Methylnaphthalene	-	-	-
Acenaphthylene	-	-	-
Anthracene	-	-	-
Benzo(a)anthracene	-	-	-
Benzo(a)pyrene	-	-	-
Benzo(b)fluoranthene	-	-	-
Benzo(g,h)perylene	-	-	-
Benzo(k)fluoranthene	-	-	-
bis(2-Ethylhexyl) phthalate	-	-	-
Chrysene	-	-	-
Dibenz(a,h)anthracene	-	-	-
Dimethyl phthalate	-	-	-
Di-n-butyl phthalate	-	-	-
Di-n-octyl phthalate	-	-	-
Fluoranthene	-	-	-
Fluorene	-	-	-
Indeno(1,2,3-cd)pyrene	-	-	-
n-Nitrosodimethylamine	-	-	-
Phenanthrene	-	-	-

HLBX1402	Primary HLBX1402SS01 5/29/2008	Primary HLBX1402SS02 5/29/2008
Hydrocarbons (NA)		
TRPH	-	-
Hydrocarbons (mg/kg)		
Diesel Range Organics (C8-C20)	10.4 J	3 J
Diesel Range Organics (C21-C30)	16.4 J	5.9 J
PCBs (ug/kg)		
Aroclor 1254	-	-
Aroclor 1260	-	-
SVOC (NA)		
1-Methyl naphthalene	-	-
2-Methylnaphthalene	-	-
Acenaphthylene	-	-
Anthracene	-	-
Benzo(a)anthracene	-	-
Benzo(a)pyrene	-	-
Benzo(b)fluoranthene	-	-
Benzo(g,h)perylene	-	-
Benzo(k)fluoranthene	-	-
bis(2-Ethylhexyl) phthalate	-	-
Chrysene	-	-
Dibenz(a,h)anthracene	-	-
Dimethyl phthalate	-	-
Di-n-butyl phthalate	-	-
Di-n-octyl phthalate	-	-
Fluoranthene	-	-
Fluorene	-	-
Indeno(1,2,3-cd)pyrene	-	-
n-Nitrosodimethylamine	-	-
Phenanthrene	-	-

HLBS1001	Primary HLBS1001S01 4/4/2008	Primary HLBS1001S02 4/4/2008
Hydrocarbons (NA)		
TRPH	-	-
Hydrocarbons (mg/kg)		
Diesel Range Organics (C8-C20)	1.2 J	<5.6
Diesel Range Organics (C21-C30)	8.5	<5.6
PCBs (NA)		
Aroclor 1254	-	-
Aroclor 1260	-	-
SVOC (ug/kg)		
bis(2-Ethylhexyl) phthalate	-	-
Di-n-butyl phthalate	-	-
SVOC (NA)		
1-Methyl naphthalene	<22	<22
2-Methylnaphthalene	<22	<22
Acenaphthylene	<22	<22
Anthracene	<22	<22
Benzo(a)anthracene	-	<22
Benzo(a)pyrene	-	<22
Benzo(b)fluoranthene	-	<22
Benzo(g,h)perylene	<22	<22
Benzo(k)fluoranthene	-	<22
Chrysene	<22	<22
Dibenz(a,h)anthracene	<22	<22
Dimethyl phthalate	<22	<22
Di-n-octyl phthalate	<22	4.8 J
Fluoranthene	-	<22
Fluorene	<22	<22
Indeno(1,2,3-cd)pyrene	-	<22
n-Nitrosodimethylamine	<22	<22
Phenanthrene	-	<22

HLBS1002	Primary HLBS1002S01 4/4/2008	Primary HLBS1002S02 4/4/2008
Hydrocarbons (NA)		
TRPH	-	-
Hydrocarbons (mg/kg)		
Diesel Range Organics (C8-C20)	1.6 J	<6
Diesel Range Organics (C21-C30)	11	16
PCBs (NA)		
Aroclor 1254	-	-
Aroclor 1260	-	-
SVOC (NA)		
Anthracene	-	-
Benzo(a)anthracene	-	-
Benzo(a)pyrene	-	-
Chrysene	-	-
Dibenz(a,h)anthracene	-	-
Fluoranthene	-	-
Indeno(1,2,3-cd)pyrene	-	-
Phenanthrene	-	-
SVOC (ug/kg)		
1-Methylnaphthalene	1.2	<23
2-Methylnaphthalene	1.1 J	<23
Acenaphthylene	5.3 J	<23
Benzo(b)fluoranthene	29 J	-
Benzo(k)fluoranthene	11 J	<23
bis(2-Ethylhexyl) phthalate	75 J	-
Dibenzo(a,h)anthracene	4.6 J	0.79 J
Dimethyl phthalate	3.5 J	<23
Di-n-butyl phthalate	21 J	<23
Fluorene	3.1 J	0.33 J
n-Nitrosodimethylamine	<22	<23

HLBS1030	Primary HLBS1030S01 4/7/2008	Duplicate HLBS1030D01 4/7/2008	Primary HLBS1030S02 4/7/2008
Hydrocarbons (NA)			
TRPH	-	-	-
Hydrocarbons (mg/kg)			
Diesel Range Organics (C8-C20)	1.7 J	1.8 J	1.3 J
Diesel Range Organics (C21-C30)	9.6	<5.6	10 J
PCBs (NA)			
Aroclor 1254	-	-	-
Aroclor 1260	-	-	-
SVOC (NA)			
bis(2-Ethylhexyl) phthalate	-	-	-
SVOC (ug/kg)			
1-Methyl naphthalene	<20	<22	<23
2-Methylnaphthalene	<20	<22	<23
Acenaphthylene	<20	<22	<23
Anthracene	0.21 J	-	<23
Benzo(a)anthracene	<20	0.37 J	1.1 J
Benzo(a)pyrene	<20	0.35 J	1.1 J
Benzo(b)fluoranthene	<20	0.33 J	1.1 J
Benzo(g,h)perylene	<20	<22	0.65 J
Benzo(k)fluoranthene	<20	0.32 J	1.2 J
Chrysene	<20	0.38 J	1.7 J
Dibenz(a,h)anthracene	<20	<22	0.3 J
Dimethyl phthalate	<20	<22	<23
Di-n-butyl phthalate	-	11 J	9.1 J
Di-n-octyl phthalate	<20	<22	0.6 J
Fluoranthene	<20	0.5 J	1.1 J
Fluorene	<20	<22	<23
Indeno(1,2,3-cd)pyrene	<20	<22	0.69 J
n-Nitrosodimethylamine	<20	0.44 J	<23
Phenanthrene	<20	<22	<23

USBS1110	Primary USBS1110S01 4/7/2008	Duplicate USBS1110D01 4/7/2008	Primary USBS1110S02 4/7/2008
Hydrocarbons (NA)			
TRPH	-	-	-
Hydrocarbons (mg/kg)			
Diesel Range Organics (C8-C20)	<57	<58	<56
Diesel Range Organics (C21-C30)	3.5 J	<58	<56
PCBs (NA)			
Aroclor 1254	-	-	-
Aroclor 1260	-	-	-
SVOC (NA)			
bis(2-Ethylhexyl) phthalate	-	-	-
SVOC (ug/kg)			
1-Methyl naphthalene	<23	<23	<24
2-Methylnaphthalene	<23	<23	<24
Acenaphthylene	<23	<23	<24
Anthracene	-	<23	<24
Benzo(a)anthracene	5.5 J	<23	<24
Benzo(a)pyrene	5.7 J	<23	<24
Benzo(b)fluoranthene	9.6 J	<23	<24
Benzo(g,h)perylene	2.8 J	<23	<24
Benzo(k)fluoranthene	-	<23	<24
Chrysene	7.4 J	<23	<24
Dibenz(a,h)anthracene	1.2 J	<23	<24
Dimethyl phthalate	<23	<23	<24
Di-n-butyl phthalate	16 J	2.3 J	2.3 J
Di-n-octyl phthalate	<23	<23	<24
Fluoranthene	7.6 J	<23	<24
Fluorene	<23	<23	<24
Indeno(1,2,3-cd)pyrene	2.6 J	<23	<24
n-Nitrosodimethylamine	<23	<23	<24
Phenanthrene	1.4 J	<23	<24

E-4-01	Primary E-4-01 2/16/1993
Hydrocarbons (NA)	
Diesel Range Organics (C8-C20)	-
Diesel Range Organics (C21-C30)	-
Hydrocarbons (mg/kg)	52
TRPH	
PCBs (NA)	
Aroclor 1254	-
Aroclor 1260	-
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
n-Nitrosodimethylamine	-
Phenanthrene	-

CH2MHILL

SANTA SUSANA FIELD LABORATORY

SVOCs, TPH, and PCBs Data Results RIHL RFI Site

FIGURE S.3-7

Soil Sample Locations

- Soil Sample Location With Detected Metals and Inorganics Data
- Soil Sample Location Not Analyzed for Metals and Inorganics Data
- Soil Sample Location With No Detected Metals and Inorganics Data

Data Box Information

Sample Location ID: B9BS01

1.00	Depth in Feet
Primary	Sample Type
B9BS01S01	Unique Sample Identifier
7/10/2005	Date

12.05	Detect with sample concentration shown
< 0.06	Non-Detect with lab detection limit shown
J	Analyte positively identified; Associated numerical value is considered estimated
NA and (-)	Analysis not conducted
[#]	If more than one result per sample depth, the maximum is presented, with number of results in backets.

Note: "12.05" and "<0.06" are for reference only and may not represent actual sample results .

Detect	Non-Detect	
12.05	<0.06	Exceeds Background (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL or Exceeds Background + Res RBSL (Metals +Dioxins Only)
12.05	<0.06	Exceeds Eco RBSL or Exceeds Background + Eco RBSL (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL + Eco RBSL or Exceeds Background + Res RBSL + Eco RBSL (Metals + Dioxins Only)

= 2008 Data

= Pre-2008 Data

Basemap Legend

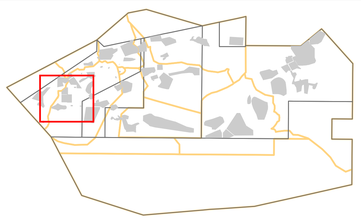
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

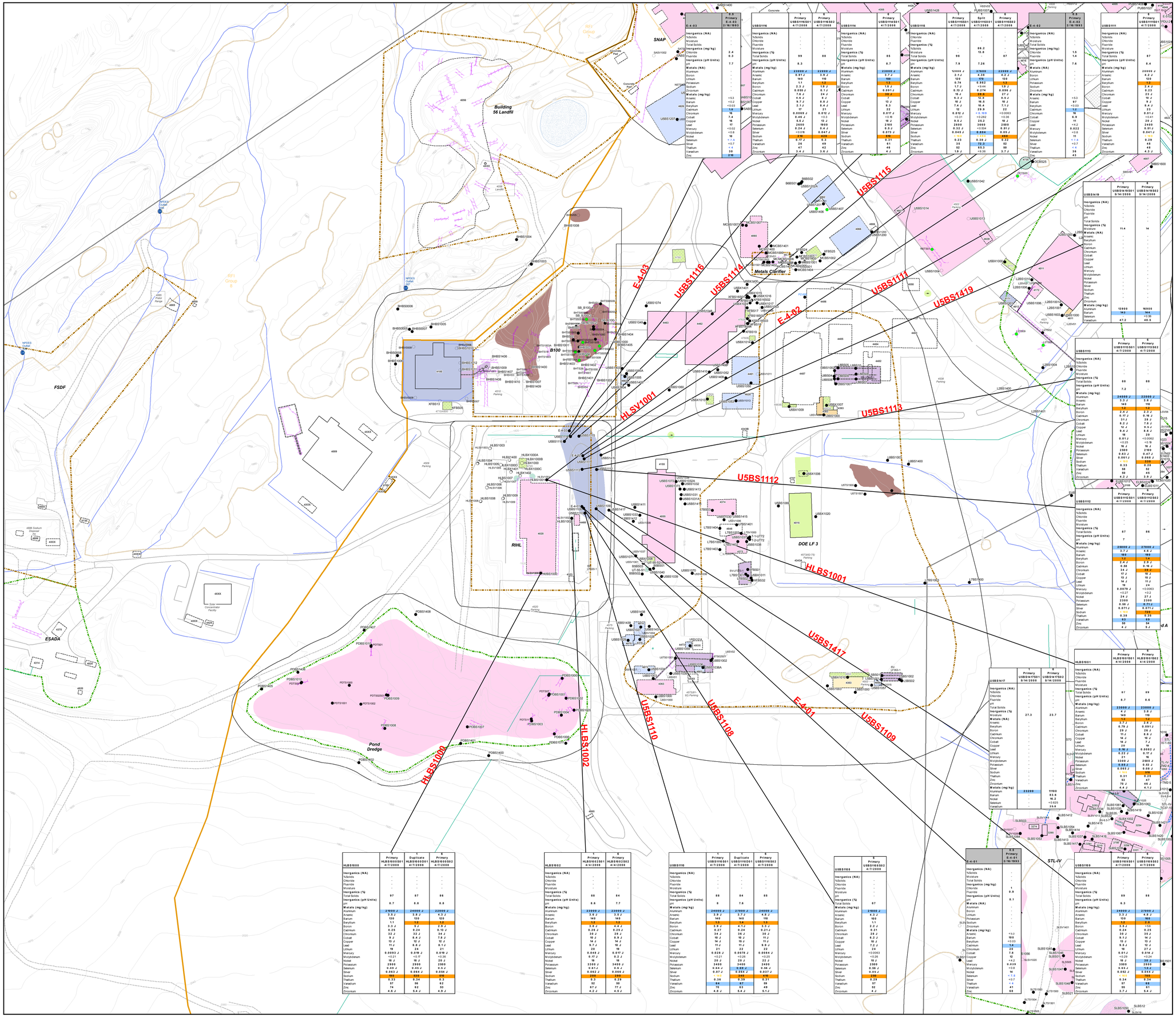
\\MapFiles\RFI_05\RFI_Report\SpiderDiagram\RFIGrp5_SpiderDiagram_EL.mxd

0 70 140

1 inch equals 75 feet

Feet





HLBS1000	1 Primary HLBS1000S01 4/7/2008	1 Duplicate HLBS1000D01 4/7/2008	6 Primary HLBS1000S02 4/7/2008
Inorganics (NA)			
%Solids	-	-	-
Chloride	-	-	-
Fluoride	-	-	-
Moisture	-	-	-
Inorganics (%)			
Total Solids	97	97	95
Inorganics (pH Units)			
pH	8.7	8.8	8.8
Metals (mg/kg)			
Aluminum	27000 J	24000 J	22000 J
Arsenic	3.8 J	3.8 J	4.3 J
Barium	130	130	120
Beryllium	1.1	1.0	1.0
Boron	3.3 J	3 J	2.9 J
Cadmium	0.25	0.24	0.13 J
Chromium	32 J	32 J	34 J
Cobalt	9 J	8.4 J	7.8 J
Copper	13 J	12 J	12 J
Lead	11 J	8.8 J	8.1 J
Lithium	19	24	21
Mercury	0.0093 J	0.019 J	0.019 J
Molybdenum	<0.21	<0.17	<0.28
Nickel	18 J	18 J	20 J
Potassium	2900	2900	2900
Selenium	0.49 J	0.49 J	0.5 J
Silver	0.053 J	0.064 J	0.056 J
Sodium	230	230	230
Thallium	0.33	0.34	0.3
Vanadium	57	56	52
Zinc	74	62	53
Zirconium	4.6 J	5.4 J	4.9 J

HLBS1002	1 Primary HLBS1002S01 4/4/2008	6 Primary HLBS1002S02 4/4/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Inorganics (%)		
Total Solids	88	84
Inorganics (pH Units)		
pH	8.6	7.7
Metals (mg/kg)		
Aluminum	23000 J	23000 J
Arsenic	3.6 J	3.5 J
Barium	120 J	120 J
Beryllium	1.0	1.0
Boron	3.8 J	4.4 J
Cadmium	0.28 J	0.25 J
Chromium	30 J	28 J
Cobalt	10 J	9.9 J
Copper	14 J	14 J
Lead	9.7 J	10 J
Lithium	25	19
Mercury	0.048 J	0.017 J
Molybdenum	0.17 J	0.2 J
Nickel	19	19
Potassium	3300 J	3400 J
Selenium	0.67 J	0.6 J
Silver	0.062 J	0.066 J
Sodium	230	230
Thallium	0.3	0.29
Vanadium	62	60
Zinc	67 J	77 J
Zirconium	4.2 J	4.8 J

USBS1110	1 Primary USBS1110S01 4/7/2008	1 Duplicate USBS1110D01 4/7/2008	6 Primary USBS1110S02 4/7/2008
Inorganics (NA)			
%Solids	-	-	-
Chloride	-	-	-
Fluoride	-	-	-
Moisture	-	-	-
Inorganics (%)			
Total Solids	88	84	85
Inorganics (pH Units)			
pH	8	7.6	7.7
Metals (mg/kg)			
Aluminum	24000 J	27000 J	24000 J
Arsenic	3.9 J	3.7 J	4.8 J
Barium	140	150	110
Beryllium	1.0	1.4	1.0
Boron	3.5 J	4.1 J	3.3 J
Cadmium	0.27	0.24	0.21 J
Chromium	34 J	36 J	30 J
Cobalt	10 J	10 J	11 J
Copper	14 J	15 J	11 J
Lead	11 J	11 J	9.9 J
Lithium	21	22	22
Mercury	0.028 J	0.0078 J	0.0084 J
Molybdenum	<0.21	<0.26	<0.25
Nickel	20 J	20 J	22 J
Potassium	3400	3400	2400
Selenium	0.64 J	0.69 J	0.56 J
Silver	0.077 J	0.084 J	0.057 J
Sodium	230	230	230
Thallium	0.36	0.39	0.31
Vanadium	64	67	59
Zinc	79	83	49
Zirconium	4.8 J	5.4 J	5.1 J

USBS1103	6 Primary USBS1103S02 4/7/2008
Inorganics (NA)	
%Solids	-
Chloride	-
Fluoride	-
Moisture	-
Inorganics (%)	
Total Solids	87
Inorganics (pH Units)	
pH	8.3
Metals (mg/kg)	
Aluminum	21000 J
Arsenic	4.3 J
Barium	100
Beryllium	1.1
Boron	2.2 J
Cadmium	0.31
Chromium	28 J
Cobalt	8.2 J
Copper	10 J
Lead	7.2 J
Lithium	24
Mercury	<0.0063
Molybdenum	<0.26
Nickel	19 J
Potassium	2300
Selenium	0.56 J
Silver	0.05 J
Sodium	230
Thallium	0.23
Vanadium	57
Zinc	52
Zirconium	4 J

E-4-01	9.5 Primary E-4-01 2/16/1993
Inorganics (NA)	
%Solids	-
Total Solids	-
Inorganics (mg/kg)	
Chloride	1
Fluoride	0.9
Inorganics (pH Units)	
pH	8.1
Metals (mg/kg)	
Aluminum	-
Boron	-
Lithium	-
Potassium	-
Sodium	-
Metals (mg/kg)	
Arsenic	<5.3
Barium	10.0
Beryllium	<0.53
Cadmium	1.6
Chromium	7.8
Cobalt	12
Copper	<4.2
Lead	0.019
Molybdenum	<0.8
Nickel	7.5
Selenium	0.53
Silver	0.053
Thallium	0.24
Vanadium	57
Zinc	55
Zirconium	5.1

USBS1111	1 Primary USBS1111S01 4/7/2008	6 Primary USBS1111S02 4/7/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Inorganics (%)		
Total Solids	98	97
Inorganics (pH Units)		
pH	7.9	8.4
Metals (mg/kg)		
Aluminum	12000 J	20000 J
Arsenic	2.1 J	4.2 J
Barium	100	120
Beryllium	0.74	1.0
Boron	1.7 J	2.4 J
Cadmium	0.13 J	0.23
Chromium	16 J	23 J
Cobalt	6.3 J	10 J
Copper	10 J	9 J
Lead	7.4 J	8.4 J
Lithium	12	23
Mercury	0.012 J	0.011 J
Molybdenum	<0.31	<0.41
Nickel	14 J	24 J
Potassium	2400	3500
Selenium	0.33 J	0.61 J
Silver	0.045 J	0.064 J
Sodium	230	230
Thallium	0.23	0.38 J
Vanadium	38	72.3
Zinc	52	65.3
Zirconium	3.8 J	<6.39

USBS1113	1 Primary USBS1113S01 4/7/2008	6 Primary USBS1113S02 4/7/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Inorganics (%)		
Total Solids	88	88
Inorganics (pH Units)		
pH	7.3	8.3
Metals (mg/kg)		
Aluminum	24000 J	27000 J
Arsenic	3.3 J	4.8 J
Barium	140	150
Beryllium	1.0	1.4
Boron	2.4 J	3.3 J
Cadmium	0.16 J	0.16 J
Chromium	31 J	28 J
Cobalt	8.2 J	7.8 J
Copper	12 J	9.3 J
Lead	8.4 J	8.6 J
Lithium	16	20
Mercury	0.011 J	<0.0062
Molybdenum	<0.25	<0.19
Nickel	16 J	12
Potassium	2500	2700
Selenium	0.63 J	0.47 J
Silver	0.061 J	0.049 J
Sodium	230	230
Thallium	0.33	0.28
Vanadium	58	44
Zinc	50	39 J
Zirconium	4.2 J	5.2

USBS1112	1 Primary USBS1112S01 4/7/2008	6 Primary USBS1112S02 4/7/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Inorganics (%)		
Total Solids	87	86
Inorganics (pH Units)		
pH	7	8.6
Metals (mg/kg)		
Aluminum	25000 J	27000 J
Arsenic	3.7 J	4.8 J
Barium	130	150
Beryllium	1.0	1.4
Boron	2.4 J	3.3 J
Cadmium	0.36	0.25
Chromium	30 J	28 J
Cobalt	9.1 J	8.2 J
Copper	13 J	10 J
Lead	9.2 J	8.6 J
Lithium	18	27 J
Mercury	0.01 J	0.014 J
Molybdenum	<0.26	<0.34
Nickel	19 J	20 J
Potassium	2900	2600
Selenium	0.55 J	0.52 J
Silver	0.052 J	0.044 J
Sodium	230	230
Thallium	0.34	0.34
Vanadium	57	55
Zinc	55	51
Zirconium	3.7 J	5.4 J

USBS1417	1 Primary USBS1417S01 5/14/2008	6 Primary USBS1417S02 5/14/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Inorganics (%)		
Total Solids	27.3	23.7
Inorganics (pH Units)		
pH	-	-
Metals (mg/kg)		
Aluminum	-	-
Arsenic	3.7 J	2.6 J
Barium	0.79 J	0.59 J
Beryllium	29 J	26 J
Boron	8.6 J	11 J
Cadmium	14 J	10 J
Chromium	14 J	7 J
Cobalt	29	19
Copper	0.76 J	0.69 J
Lead	0.22 J	0.17 J
Lithium	21	16
Mercury	3300 J	2900 J
Molybdenum	0.55 J	0.33 J
Nickel	0.065 J	0.06 J
Potassium	570	370
Selenium	0.31	0.23
Silver	47	46 J
Sodium	0.2	4.1 J
Thallium	46 J	
Vanadium	0.2	
Zinc	46 J	
Zirconium	4.6 J	
Metals (mg/kg)		
Aluminum	23200	11100
Barium	-	83.6
Nickel	-	16 J
Selenium	-	<0.625
Silver	-	39.8

HLBS1001	1 Primary HLBS1001S01 4/4/2008	6 Primary HLBS1001S02 4/4/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Inorganics (%)		
Total Solids	87	89
Inorganics (pH Units)		
pH	8.7	8.6
Metals (mg/kg)		
Aluminum	23000 J	23000 J
Arsenic	4 J	3.3 J
Barium	140	110
Beryllium	1.0	1.0
Boron	3.7 J	2.6 J
Cadmium	0.79 J	0.59 J
Chromium	29 J	26 J
Cobalt	8.6 J	11 J
Copper	14 J	10 J
Lead	10 J	7 J
Lithium	29	19
Mercury	0.76 J	0.0092 J
Molybdenum	0.22 J	0.17 J
Nickel	21	16
Potassium	3300 J	2900 J
Selenium	0.55 J	0.33 J
Silver	0.065 J	0.06 J
Sodium	370	370
Thallium	0.31	0.25
Vanadium	53	47
Zinc	49 J	46 J
Zirconium	4.6 J	4.1 J

USBS1109	1 Primary USBS1109S01 4/7/2008	6 Primary USBS1109S02 4/7/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Inorganics (%)		
Total Solids	89	88
Inorganics (pH Units)		
pH	8.3	8.6
Metals (mg/kg)		
Aluminum	24000 J	27000 J
Arsenic	3.3 J	4.8 J
Barium	140	160
Beryllium	1.0	1.5
Boron	2.5 J	<5.3
Cadmium	0.24	0.25
Chromium	30 J	29 J
Cobalt	9.1 J	14 J
Copper	13 J	13 J
Lead	9.2 J	12 J
Lithium	16	27 J
Mercury	0.01 J	0.014 J
Molybdenum	<0.26	<0.34
Nickel	19 J	28 J
Potassium	2600	2600
Selenium	0.55 J	0.54 J
Silver	0.052 J	0.044 J
Sodium	230	230
Thallium	0.34	0.34
Vanadium	56	58
Zinc	51	61
Zirconium	3.7 J	5.4 J

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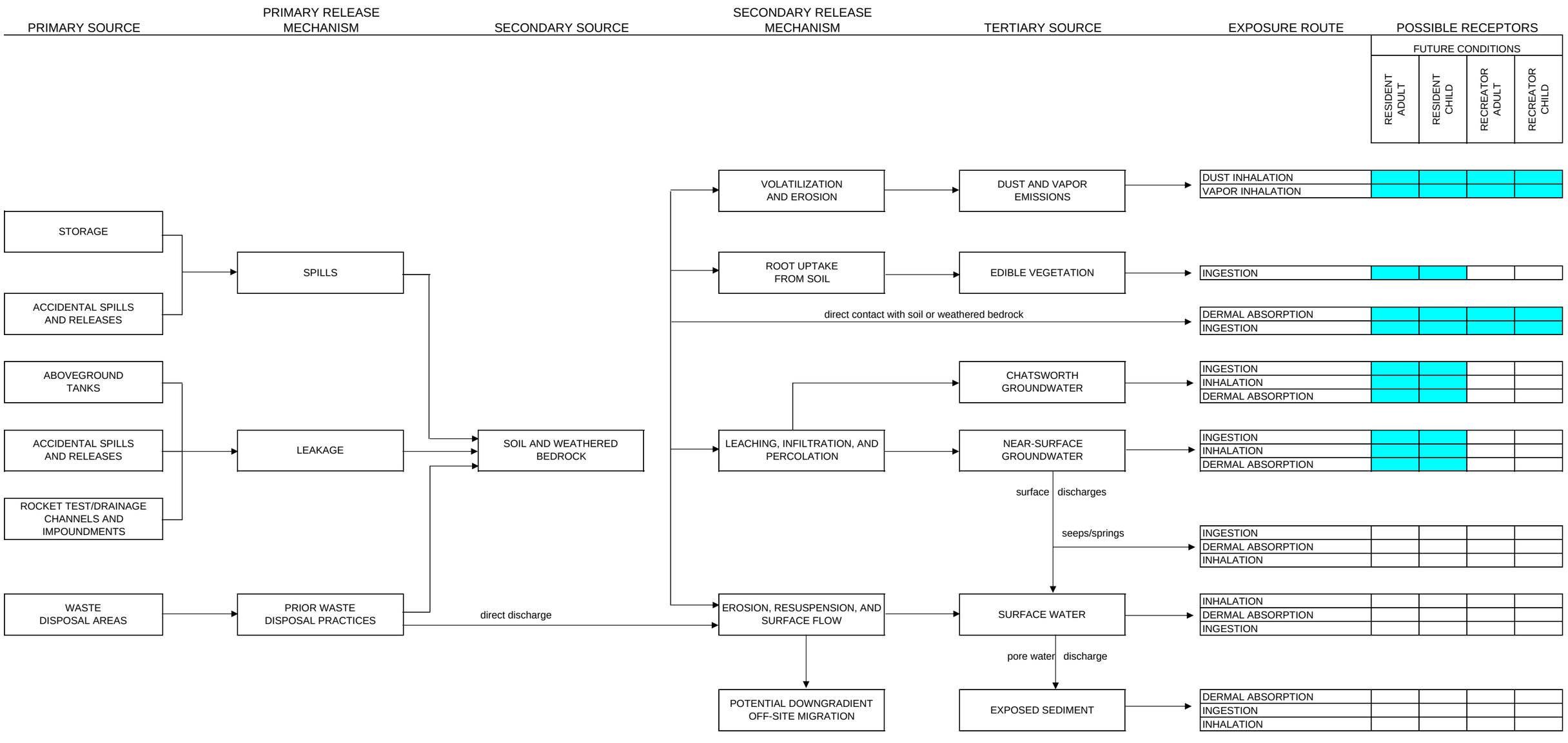
Metals and Inorganics Data Results RIHL RFI Site

FIGURE S.3-8

Figure S.4-1

Human Health Risk Assessment Conceptual Site Model

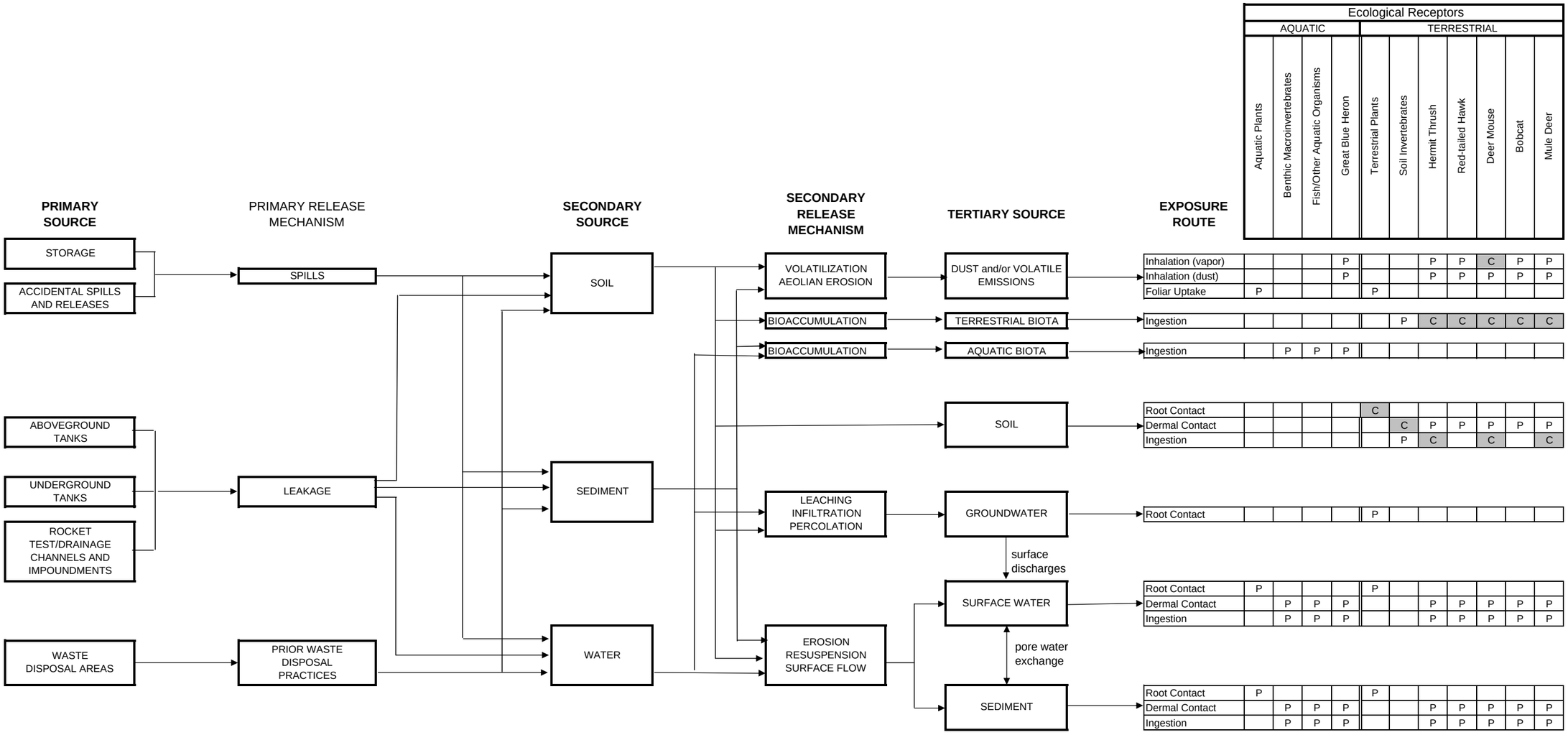
Rockwell International Hot Laboratory RFI Site



NOTES:
As described in the SRAM (MWH 2005), note that risk estimates for the potential future recreational user (recreator) are used as surrogate risk estimates for the trespasser.

- complete and potentially complete exposure pathways evaluated in this risk assessment

- incomplete exposure pathways not evaluated in this risk assessment



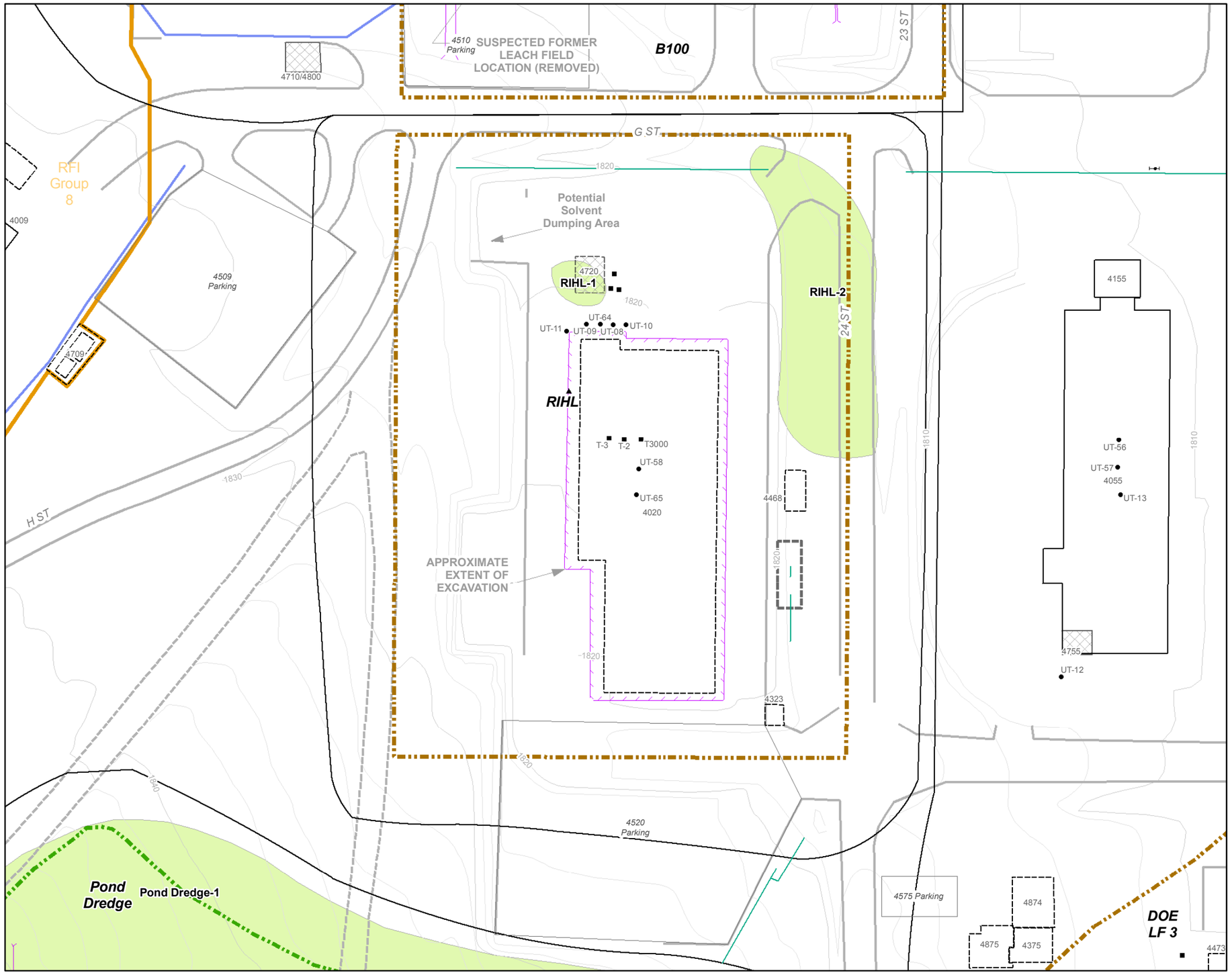
C - Pathway considered complete for purposes of ecological risk assessment

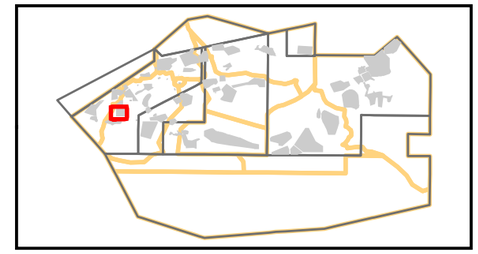
P - Pathway considered potentially complete

Q - Pathway evaluated qualitatively unless site conditions indicate need for quantitative evaluation

Pathways evaluated qualitatively or quantitatively in ecological risk assessment

Figure S.4-2
Ecological Conceptual Site Model
Group 5 RFI Report, Rockwell International Hot Laboratory
Santa Susana Field Laboratory





Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Trench
- Leachfield
- Pipe
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Waste Debris Area
- CMS Area
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary

Surficial Media Site Action Recommendations RIHL RFI Site

Date: September 09, 2008 **WORKING DRAFT**

\\..MapFiles\RFI_05\RFI_Report\RFISites_CMS_BL_PLTS.mxd

1 inch equals 60 feet

0 60 120 Feet

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Figure S.5-1

Attachments