Report

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

Volume VII – RFI Site Reports Appendix N

Building 100 Trench

Prepared for:

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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
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
Dioxins/Furans	(a) - *see table below*
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
ELV	expendable launch vehicle
EPC	exposure point concentration
ERA	ecological risk assessment
ESL	environmental screening level

ETEC	Energy Technology Engineering Center
FSDS	Former Sodium Disposal Facility
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
TDS	total dissolved solids
TEQ	toxicity equivalency quotient
TIC	tentatively identified compound
TCE	trichloroethene
TPH	total 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	microsiemens per centimeter
VOC	volatile organic compound
WPA	RFI Work Plan Addendum
WPAA	RFI Work Plan Addendum Amendments

(a) Definition of dioxin/furan congeners

PCDD/PCDDs	Polychlorinated dibenzo-p-dioxins/dibenzofurans
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
1,2,3,7,8-PeCDD	1,2,3,7,8-pentachlorodibenzo-p-dioxin
1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
OCDD	1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin
2,3,7,8-TCDF	2,3,7,8-tetrachlorodibenzofuran
1,2,3,7,8-PeCDF	1,2,3,7,8-pentachlorodibenzofuran
2,3,4,7,8-PeCDF	2,3,4,7,8-pentachlorodibenzofuran
1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-hexachlorodibenzofuran
1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-hexachlorodibenzofuran
2,3,4,6,7,8-HxCDF	2,3,4,6,7,8-hexachlorodibenzofuran
1,2,3,7,8,9-HxCDF	1,2,3,7,8,9-hexachlorodibenzofuran
1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-heptachlorodibenzofuran
1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-heptachlorodibenzofuran
OCDF	1,2,3,4,6,7,8,9-octachlorodibenzofuran
TEQ	toxicity equivalency quotient (normalized to 2,3,7,8 TCDD)

Appendix N

N.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 Building 100 Trench Site of the Santa Susana Field Laboratory (SSFL). The Building 100 Trench Site contains one solid waste management unit (SWMU)—the Building 100 Trench area (SWMU 7.5). The Building 100 Trench 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 Building 100 Trench Site is 1 of 17 RFI sites included in the Group 5 RFI Report. The location of the Building 100 Trench Site within the SSFL and Group 5 Reporting Area is shown in Figure N.1-1. An RFI Site is an area that includes at least one SWMU and/or an area of concern (AOC), and some adjacent land for the purpose of characterization. The other 16 Group 5 RFI sites are:

- Boeing Area IV Leach Field (AOC)
- 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)
- 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)
- Rockwell International Hot Laboratory (RIHL) (SWMU 7.7)
- Systems for Nuclear Auxiliary Power Facility (SNAP) (AOC).

The Building 100 Trench Site is located in the western-central portion of the Group 5 Reporting Area, north of the RIHL RFI Site, south and east of the Group 8 Reporting Area, and west of Buildings 4462 and 4463 in the unaffiliated areas (as shown in Figure N.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). The Building 100 Trench Site characterization presented in this appendix comprises data for the SMOU and summaries of the CFOU 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 includes Chatsworth formation bedrock and deeper groundwater that occurs within the unweathered bedrock of the Chatsworth formation.

N.1.1 Report Organization

This Building 100 Trench Site Report provides detailed sampling data and evaluation pertaining to the Building 100 Trench 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 N.2 – Site History, Chemical Use, and Current Conditions.** Presents the site history and chemical use, and the current conditions including geology and groundwater conditions. Changes in site conditions and soil disturbance areas are also described.
- **Section N.3 – Nature and Extent of Chemical Impacts.** Presents a summary of SMOU, NSGW, and CFOU characterization information for the Building 100 Trench Site.
- **Section N.4 – Summary of Risk Assessment Findings**. Presents the results of the human health risk assessment (HRA) and ecological risk assessment (ERA) for the Building 100 Trench Site. The complete risk assessment is included in Appendix A of the Group 5 RFI Report.
- **Section N.5 – Building 100 Trench Site Actions Recommendations**. Presents a summary of Building 100 Trench areas recommended for NFA or further evaluation in the CMS. CMS Areas recommended for interim measures to prevent contaminant migration are also identified, if any.
- **Section N.6 – References.** Includes a list of cited references.

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

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

Information regarding characterization for the Building 100 Trench Site is provided in the following figures and tables:

- **Figure N.1-1:** Presents the location of the Building 100 Trench Site within the SSFL and the Group 5 Reporting Area.
- **Figure N.2-1:** Presents a plan view of Building 100 Trench Site, showing known and potential chemical use areas. Tables N.2-1 through N.2-5 present summaries of buildings, tanks, transformers, other site features, and spills at the Building 100 Trench Site.
- **Figure N.2-2**: Presents a plan view of the Building 100 Trench Site, showing soil and vapor sampling locations, and nearby monitoring wells.
- **Figures N.2-3A through N.2-3D:** Present geologic cross-sections across the Building 100 Trench Site.
- **Figures N.3-1 through N.3-10:** Summarize soil and vapor sampling at the Building 100 Trench Site. Soil and vapor sampling results are shown on these maps and are also listed in Table N.3-2A.

Information regarding Group 5 area-wide conditions, transport and fate of chemicals between RFI sites, and other evaluations of area-wide 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 Building 100 Trench 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.

N.1.2 Historical Reference Documents

A searchable, historical document database 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 also included if they are relevant to Group 5. The Group 5 document database includes documents relevant to the Building 100 Trench Site. It is worth noting that information presented in this Building 100 Trench 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, 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.
- Annual and quarterly groundwater monitoring reports, including:
  - Annual 2007 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 includes:
  - Quality assurance/quality control (QA/QC) procedures to ensure that field and laboratory data quality and project work meet the data quality objectives (DQO).
  - Ensure 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

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

The Building 100 Trench Site comprises approximately 4.4 acres in the central portion of Area IV at the SSFL. The site location within the SSFL is shown in Figure N.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 N.2-1. The sampling locations across the site are shown in Figure N.2-2.

During the RFA, various SWMUs and AOCs within the SSFL were identified. The Building 100 Trench Site 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 Building 100 Trench Site as it is defined in this report (Figure N.1-1).

Based on site inspections, reviews of historical aerial photographs, drawings, and facility maps, as well as on interviews with site personnel conducted during the RFI, the Building 100 Trench Site boundary was defined to include operations associated with the SWMU identified above. In addition, facilities or features near this SWMU were included for assessment in the RFI. These include Building 4100, three aboveground storage tanks (ASTs), one electrical substation, and one leach field. The identified Chemical Use Areas at the Building 100 Trench Site are shown in Figure N.2-1 and described in Tables N.2-1 through N.2-4.

The following sections describe the SWMU, site history and operations, chemicals used, and current conditions at the Building 100 Trench Site.

N.2.1 SWMUs and/or AOCs at the Building 100 Trench Site

The Building 100 Trench Site contains one SWMU, the Building 100 Trench (SAIC, 1994). A brief description of the SWMU that is included in this RFI Site Report is presented below.

N.2.1.1 Building 100 Trench (SWMU 7.5)

The Building 100 Trench was used for burning and disposal of construction debris from 1960 through 1966. There were no facilities records of the wastes burned or disposed of. The Building 100 Trench disposal area consisted of three elongated pits (60 to 100 feet long, 20 to 40 feet wide, and 2 to 6 feet deep); the overall area measures approximately 100 feet by 100 feet). The trench was filled in and partially paved over in 1971. Further information is in Tables N.2-1 through N.2-4.

N.2.2 Building 100 Trench History

A summary of the site chronology, including descriptions of site operations and investigation activities for the Building 100 Trench 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 Section N.1.2.

N.2.2.1 Site Chronology

A summary of key historic investigation and remediation activities are presented in Tables N.2-6 and N.2-7. A more detailed description of the Building 100 Trench Site is presented below.

N.2.2.1.1 1960 through 1966

The Building 100 Trench was used to dispose of and burn construction debris.

N.2.2.1.2 1960 through 1980

Building 4100 was used to test 20 different reactor cores designs over time. The program ended in 1974. Decommissioning and decontamination were conducted after the completion of testing, and the building was released for unrestricted use in 1980.

N.2.2.1.3 1971

The Building 100 Trench was filled in and partially paved over.

N.2.2.1.4 1980 to Present

The high bay of Building 4100 was used for sodium suppression experiments and eventually switched to a high-energy computer-aided tomography facility.

N.2.2.1.5 1988

Rocketdyne surveyed the trench area for ambient gamma exposure rate measurements and for chemicals of potential concern (CPOCs). No shallow groundwater was found in the trench. The survey concluded that the area complied with unrestricted release criteria.

N.2.2.1.6 1999 through 2001

Extensive instrument surveys and soil sampling was performed in the trench area and the hummocky areas to the north and west of the trench. Soil and soil gas were sampled during these investigations to determine CPOCs. The Building 4100 sanitary leach field was removed in 2001.

N.2.2.1.7 2003

During the 2003 RFI investigation, approx. 330 cubic yards (767 tons) of material were excavated from the trenches and disposed of offsite. Non-impacted soil found around the debris was stockpiled, sampled, and (based on sample results) backfilled.

N.2.2.2 Site Inventories

Inventories of buildings, tanks, transformers, and chemicals used at the Building 100 Trench 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 N.2-1. The inventories are included as the following tables:

- Building inventory – Table N.2-1
- Storage tank inventory – Table N.2-2

- Transformer inventory – Table N.2-3
- Inventory of other site features – Table N.2-4

N.2.3 Building 100 Trench 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 historical document review, six Chemical Use Areas were identified within the Building 100 Trench RFI Site boundary. Chemicals that were potentially used or stored in these Chemical Use Areas are largely unknown. Chemical Use Areas at the Building 100 Trench are shown in Figure N.2-1 and described in detail in Table N.2-7.

N.2.4 Site Conditions

This section provides summaries of site conditions near the Building 100 Trench Site, including topography, geology, soil, groundwater, surface water, and biology.

N.2.4.1 General Conditions and Topography

The Building 100 Trench Site is located within the central portion of Area IV. The site is currently active and has two remaining structures—Building 4100 and the associated transformer. Surface topography of the site slopes to the east in the portions east of the hummocky area and northwest in the portions west of the hummocky area. The gently sloping area is bounded by northeast-trending hummocky outcrops in the north-central portion of the site. Current surface elevations at the Building 100 Trench Site range from a low of approximately 1800 feet above mean sea level (msl) at the NPDES Outfall in the northwest corner of the site to a high of approximately 1840 feet msl in the north-central portion of the site at the top of a hummock. A summary site conceptual model is presented in Table N.2-8. Figures N.2-3B and N.2-3C present cross-sections developed for the Building 100 Trench Site (Surficial Cross Sections J-J' and S-S'), detailing topography, locations and depths of alluvium, and the most recent available groundwater elevations. The location of the cross-section is shown in Figure N.2-3A.

One cleanup action has been conducted at the Building 100 Trench Site. The areal extent of the excavation is shown in Figure N.2-3A.

N.2.4.2 Geology

The Building 100 Trench Site is located north of the Coca fault, near the divide between the Upper Burro Flats Member, the ELV Member, and the Lower Burro Flats Member of the Upper Chatsworth Formation to the north of the fault (Dibblee, 1992; MWH, 2002 and 2007c). The Western and Eastern FSDF Structures are also present west of the Building 100 Trench Site. These structures generally trend north-south (MWH, 2007b). The FSDF structures are defined by two parallel aerial photo lineaments formed by drainages. There are no exposures of the structures along the lineaments. The lineaments are interpreted to be created by faults or deformation bands on the basis of an apparent left lateral displacement of stratigraphic units observed across the Eastern FSDF structure (MWH, 2007b).

Beds of the Upper Burro Flats Member, the ELV Member, and the Lower Burro Flats Member generally strike N70°E and dip 25°NW. The Upper Burro Flats Member is predominantly composed of fine- and medium-grained sandstone with minor interbeds of

siltstone and shale. The ELV Member is predominantly composed of interbedded fine-grained sandstone, siltstone, and shale. The Lower Burro Flats Member is predominantly composed of medium- to fine-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 locations of the Coca fault and the deformation bands are shown on Plate B-1 in Appendix B of the Group 5 RFI Report. Additional geologic information is presented in Appendix B of the Group 5 RFI Report.

N.2.4.3 Soil

Throughout most of the Building 100 Trench Site, soil is generally thin, typically ranging from approximately 1 foot to 11 feet thick. Following waste removal activities at the former trench area onsite (SWMU 7.5), the excavation depth ranged from 2 to 10 feet below current grade. This area was backfilled with excavated soils and DTSC-approved soil from an onsite borrow area fill obtained from an onsite source.

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 consists of DTSC-approved soil from an onsite borrow area. Fill soil is primarily composed of fine-grained silty sands, clayey-sandy silts, silty clays, and lean clay. Soil in the undisturbed areas of the site consist of weathered Chatsworth Formation materials, which are primarily fine-grained silty sands, lean clays, sandy silts, sandy lean clays, clayey sands, well-graded sands, and silts. Soil boring logs are included as Attachment N-2 to this appendix.

N.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-4 shows wells and piezometers that are used to monitor groundwater at and near the Building 100 Trench Site. Figure N.2-1 shows locations of wells in and around the Building 100 Trench Site.

Both CFOU Groundwater and NSGW at SSFL have been sampled and analyzed according to agency-approved work plans (GRC, 1995a and 1995b; Ogden, 2000b). At the Building 100 Trench RFI Site, two Chatsworth Formation wells (RD-20 and RD-91) are use to characterize CFOU Groundwater. No NSGW monitoring wells or piezometers are present within the Building 100 Trench RFI Site boundary. Construction details for the CFOU wells are shown in Tables B-2 and B-3 of Appendix B of the Group 5 RFI Report, and their locations are shown in Figure N.2-2 of this appendix.

NSGW is perched above CFOU groundwater in the Building 100 Trench Site area. A cross-sectional diagram of near-surface and Chatsworth formation groundwater occurrence is shown in Figure B-6 in Appendix B of the Group 5 RFI Report. While there are no wells screened in the NSGW within the Building 100Trench RFI Site, data for nearby wells indicate that NSGW groundwater is located at a depth of approximately 23 feet below ground surface (bgs) in nearby piezometer PZ-10311. NSGW flows to the east-southeast at a gradient of approximately 0.02 foot/foot (ft/ft). Further information related to NSGW at the Building 100 Trench RFI Site is presented in Appendix B of the Group 5 RFI Report. The NSGW in the Building 100 Trench Site area is laterally continuous, as shown in the plan view of Figure B-7 in Appendix B of the Group 5 RFI Report.

CFOU Groundwater at Building 100 Trench Site is encountered at depths ranging from 25 feet bgs (1793 feet msl) at well RD-91 to 44 feet bgs (1776 feet msl) in well RD-20. CFOU Groundwater at the Building 100 Trench RFI Site flows to the east-southeast at a hydraulic gradient of approximately 0.04 ft/ft. The occurrence of CFOU Groundwater in the Building 100 Trench Site area is shown in plan view in Figure B-8 in Appendix B of the Group 5 RFI Report. Depths to CFOU groundwater are quite variable at this site due to a combination of physical features that exist within the Group 5 Reporting Area. These physical features and their influence on groundwater occurrence are discussed further in Appendix B of the Group 5 RFI Report.

N.2.4.5 Surface Water

Surface water flow at the Building 100 Trench Site is shown in Figure 2-7 of the Group 5 RFI Report (Volume I). Surface water may exist intermittently at the Building 100 Trench Site as the result of seasonal precipitation events. Stormwater runoff in the eastern portion of the site would migrate via sheet flow generally to the southeast toward a topographic low that leads to an asphalt-lined drainage near G Street and ultimately draining to National Pollutant Discharge Elimination System (NPDES) Outfall 018 by the R-2 Ponds. Building 4100 is located west of a surface drainage divide, separating it from the remainder of the site. Stormwater flows generally north on the western half of the site to shallow asphalt-lined drainages and sheet flow, ultimately draining to the east and then north of Building 4100 to NPDES Outfall 007.

Surface water runoff at the site is regularly monitored as part of the NPDES monitoring program under the oversight of the Los Angeles Regional Water Quality Control Board (RWQCB. One monitoring location, Outfall 007, occurs north of Building 4100. One monitoring location, Outfall 018, occurs downgradient located 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.

N.2.4.6 Biology

In April 2008, a reconnaissance-level biological survey was conducted at the Group 5 RFI Sites. Biological conditions at the Building 100 Trench RFI 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.

N.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 Building 100 Trench 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 volatile organic compound (VOC) migration from groundwater to soil, soil to indoor air
- Group 5 RFI Report (Volume III), Appendix B, Groundwater Characterization – Potential migration from soil to groundwater, and groundwater migration

N.3.1 Sampling Objectives

Several soil and soil vapor samples were collected as part of the previous sampling events at the Building 100 Trench Site. Based on the review of historical documents, summarized in Section N.2, additional soil and soil vapor samples were collected to further characterize the site based on the RFI data quality objectives. The process of selecting sampling locations, depths, and analytical methods considered objectives set out in the Group 5 data quality objectives (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 N.3-1A and N.3-1Bwith 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 meet sitewide routine monitoring requirements and additional characterization objectives according to regulatory agency-approved work plans (see Section N.3.2). Based on detected RFI site chemicals, chemical distribution, and site conditions, additional groundwater sampling and analysis were 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).

N.3.2 Sampling Scope

A total of 82 soil matrix samples and 11 soil vapor samples was collected between June 1995 and June 2008 to assess potential impacts associated with the Chemical Use Areas at the Building 100 Trench 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 schedules are presented in Tables N.3-1A and N.3-1B. Sample locations are shown in Figure N.2-2.

Both Chatsworth formation groundwater and NSGW have been sampled and analyzed SSFL-wide according to agency-approved work plans (GRC, 1995a and 1995b; Ogden, 2000b). No wells or piezometers are screened in NSGW at the Building 100 RFI Site, but two Chatsworth formation wells (RD-20 and RD-91) were used to characterize CFOU groundwater specifically at the Building 100 Trench 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 was used for potential indirect groundwater exposures at that site. Groundwater characterization data for the Building 100 Trench 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 between 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, assessment of the performance of each laboratory, and 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 the samples 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 Building 100 Trench Site cleanup actions. Overall data quality is described in the RFI Program Report (MWH, 2004). Site-specific data quality summaries for the Building 100 Trench Site are described by media in the sections below.

This report presents the results of sampling conducted, if the media exists at the RFI site, during the RFI and previous investigations at the Building 100 Trench Site, including results for the following media:

- Soil vapor
- Soil matrix
- Groundwater
- Surface water

N.3.3 Key Decision Points

DTSC has been an integral part of the decision-making process during the SSFL RFI program. The Building 100 Trench Site was added to the RFI Program at the request of DTSC during a comprehensive SSFL RFI site review in 2000. At that time, DTSC requested soil sampling based on review of historical operations, sampling results, and physical site inspection. Evaluation of shallow groundwater conditions was also requested by DTSC and was included in the Shallow Groundwater Work Plan (Ogden, 2000b). DTSC provided review during the SSFL RFI field sampling, selected additional step-out sample locations, and reviewed field sampling protocols. Additional site assessment has recently been performed to address revised, DTSC-approved requirements for risk assessment (MWH, 2005) and to evaluate new potential Chemical Use Areas. Sampling of new chemical use areas and recent step-out sampling followed DTSC-approved work plan protocols for the RFI.

Site-specific characterization decision points are listed below. These decision points represent 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).

N.3.4 Soil Matrix and Soil Vapor Findings

All soil and soil vapor sampling results and characterization findings are summarized in Table N.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 and soil vapor 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 and soil vapor 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 and soil vapor 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 Building 100 Trench Site are provided in Tables N.3-3A and N.3-3B.

N.3.4.1 Soil and Soil Vapor Data Presentation

Relevant site information, sampling rationale, analytical results, and evaluation of results are presented in Table N.3-2A. This table refers to chemical results that are shown by chemical group category in Figures N.3-1 through N.3-9. Table N.3-2A presents the following site characterization information by each Chemical Use Area (Figure N.2-1) for each relevant chemical group within the Chemical Use Area:

- 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 N.3.4.2 below.) 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 N.3-3A and N.3-3B.
- Column 6 – Assessment whether characterization of chemical concentration gradients 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 is defined sufficiently to estimate soil volumes (within a factor of 10) for areas that require further consideration in the CMS (if needed).

N.3.4.2 Soil and Soil Vapor Data Summary

As detailed in Table N.3-2A, six individual confirmed and potential Chemical Use Areas were investigated at the Building 100 Trench 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.

[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.

N.3.4.2.1 Volatile Organic Compounds

A total of 11 soil vapor samples was collected at 11 locations and analyzed for VOCs. No VOCs were detected in any of the soil vapor samples, and results are shown in Figures N.3-1A and N.3-8. Soil vapor sampling was attempted at one additional location (Figures N.2-2 and N.3-1A). However, no vapor samples could be collected at these locations due to the presence of shallow bedrock (i.e., less than 5 feet bgs) or insufficient flow from the vapor wells to allow sample collection.

A total of eight soil samples was collected at eight locations and analyzed for VOCs. Of the eight samples, two samples had detectable levels of VOCs, and results are shown in Figures N.3-1B and N.3-8.

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

No VOCs were detected in soil vapor, and VOCs detected in soil were below their respective RBSLs. Further characterization of VOCs is not required at the Building 100 Trench RFI Site.

N.3.4.2.2 Semivolatile Organic Compounds

A total of 40 soil samples was collected at 33 locations and analyzed for semivolatile organic compounds (SVOCs). Of the 40 samples, 16 samples had detectable levels of SVOCs, and results are shown in Figures N.3-2 and N.3-8.

- Di-n-butyl phthalate, di-n-octyl phthalate, butyl benzyl phthalate, and dimethyl phthalate were detected at concentrations that did not exceed their respective RBSLs.
- Various polynuclear aromatic hydrocarbons (PAHs) were detected in 15 samples collected. None of the detected concentrations exceeded their respective RBSLs.

Further characterization of SVOCs in soil is not required at the Building 100 Trench Site.

N.3.4.2.3 Total Petroleum Hydrocarbons

A total of 16 soil samples was collected at 12 locations and analyzed for total petroleum hydrocarbons (TPHs). Of the 16 samples, 8 samples had detectable levels of TPHs. Results are shown in Figures N.3-3 and N.3-8.

- Gasoline-range hydrocarbons (C8-C11) were detected above the Residential RBSL of 1.1 milligram per kilogram (mg/kg) in two samples collected from BHBS1010 at depths of 0 to 1 foot bgs (52.4 J mg/kg) and 4 to 5 feet bgs (14 J mg/kg). This boring was positioned northeast of Building 4100. No VOCs were detected in soil vapor samples collected at this location. Therefore, no additional characterization of gasoline-range hydrocarbons is required at this location.
- Kerosene-range hydrocarbons (C12-C14), diesel-range hydrocarbons (C15-C20), and lubricating oil-range hydrocarbons (C20-C30 and C21-C30) were detected at concentrations that did not exceed their respective RBSLs.

N.3.4.2.4 Polychlorinated Biphenyls

A total of two soil samples was collected at two locations and analyzed for PCBs. No polychlorinated biphenyls (PCBs) were detected, and results are presented in Figure N.3-4. Further characterization of PCBs is not required at the Building 100 Trench Site.

N.3.4.2.5 Metals/Inorganic Compounds

A total of 65 soil samples was collected at 51 locations and analyzed for metals. At least one or more metals were detected in nearly all sampling locations, and results are presented in Figures N.3-5, N.3-9A, and N.3-9B.

- Aluminum, barium, copper, lead, mercury, selenium, silver, and zinc concentrations were detected above their respective background concentration and Ecological RBSL and/or the Residential RBSL.
  - Aluminum (background of 20,000 mg/kg, Ecological RBSL of 12 mg/kg) was detected at concentrations ranging from 7,960 mg/kg to 21,000 J mg/kg. Aluminum was detected above background and Ecological RBSLs in one sample collected from BHBS1009 at a depth of 0 to 1 foot bgs (21,000 J mg/kg). The elevated concentrations of aluminum may be consistent with naturally occurring concentrations in the soil derived from the Santa Susana Formation. Additionally, step-out samples collected for this exceedance did not contain aluminum concentrations that exceeded background concentration or RBSLs. The above samples appear to be sufficiently bounded by sample locations with metals concentration less than below background, and no further characterization of aluminum is recommended at the Building 100 Trench RFI Site.
  - Barium (background of 140 mg/kg, Ecological RBSL of 15 mg/kg) was detected at concentrations ranging from 11 mg/kg to 980 J mg/kg. Barium was detected above background and Ecological RBSLs in six samples collected:
    - BHBS1000 at a depth of 0 to 1 feet bgs (980 mg/kg)
    - BHBS1007 at a depth of 4.5 to 5.5 feet bgs (280 mg/kg)
    - BHBS1002 at a depth of 0 to 1 feet bgs (274 mg/kg)
    - BHTS51S02 at a depth of 4.5 feet bgs (160 J mg/kg)
    - BHTS51S04 at a depth of 2 feet bgs (150 J mg/kg)
    - BHTS51S08 at a depth of 4.5 feet bgs (150 J mg/kg)

    The highest barium concentration was observed adjacent to the eastern edge of the Building 100 trench excavation area (BHBS1000). Barium concentrations decrease significantly with distance from this sample location. In addition, the soil samples with barium exceedances are bounded by nearby samples. Based on this information, no further investigation of Barium is recommended for the Building 100 Trench Site.
  - Copper (background of 29 mg/kg, Ecological RBSL of 1.1 mg/kg) was detected at concentrations ranging from 5.1 to 58 mg/kg. Copper was detected above background and Ecological RBSLs in three samples:
    - BHTS51S08 at a depth of 4.5 feet bgs (58 mg/kg)
    - BHTS50S03 at a depth of 6 feet bgs (30 mg/kg)

- BHTS51S02 at a depth of 4.5 feet bgs (30 mg/kg)

All of these samples were collected from the Building 100 trench excavation area and appear to be sufficiently bounded by sample locations with samples measuring below background. Therefore, no further characterization of copper is recommended at the Building 100 Trench Site.

- Lead (background of 34 mg/kg, Ecological RBSL of 0.013 mg/kg, Residential RBSL of 150 mg/kg) was detected at concentrations ranging from 0.24 J mg/kg to 2,550 mg/kg. Discussion of these results is provided below.
  - Lead was detected above background, Residential RBSL, and Ecological RBSL in one sample collected from BHTS26 at a depth of 1 to 1.5 feet bgs (2,550 mg/kg). Sampling at this location (approximately 20 feet south of the trench area) was performed during previous exploratory investigation activities at the trench area. This sample was collected from immediately beneath localized minor metallic debris (such as, small pieces of rebar, and wires) and other construction debris (concrete, asphalt, etc.). It is likely that the sample also contained pieces of metal, which resulted in the elevated lead detection.

    During the 2008 RFI activities at the Building 100 Trench RFI Site, supplemental exploratory trenching was performed at the previous BHTS26 sampling location. During these activities, no evidence of surficial or subsurface debris was encountered. In addition, lead concentrations were less than background in the two soil samples collected from the exploratory excavations (BHTS1000 at 5 to 6 feet bgs and BHTS1001 at 5.5 to 6 feet bgs). These results indicate that the elevated lead concentration previously detected in this area is limited to the upper portion of the shallow soil.

  - Lead was detected above background and Ecological RBSL in one sample from BHTS51S08 at a depth of 4.5 feet bgs (50.4 mg/kg). This sample, which was collected within the trench area onsite, appears to be sufficiently bounded by sample locations with samples measuring below background, and no further characterization of lead is recommended at this location.

- Mercury (background of 0.09 mg/kg, Ecological RBSL of 0.1 mg/kg) was detected at concentrations ranging from 0.0046 J mg/kg to 0.28 J mg/kg. Mercury was detected above background and Ecological RBSL in three samples:
  - BHTS1002 at a depth of 0 to 1 feet bgs (0.28 mg/kg)
  - BHBS1007 at a depth of 0 to 1 foot bgs (0.21 mg/kg)
  - BHTS21 at a depth of 1.5 to 2 feet bgs (0.12 mg/kg).

  The above samples appear to be sufficiently bounded by sample nearby sample locations with concentrations measuring below background, and no further characterization of mercury is recommended at the Building 100 Trench Site.

- Selenium (background of 0.655 mg/kg, Ecological RBSL of 0.17 mg/kg) was detected at concentrations ranging from 0.3 J mg/kg to 2 mg/kg. Selenium was detected above background and Ecological RBSL in nine samples:
  - BHBS1007 depths of 0 to 1 foot bgs (1.3 mg/kg) and 4.5 to 5.5 feet bgs (2 mg/kg)

- BHTS1001 at a depth of 5.5 to 6 feet bgs (1.2 mg/kg)
- BHTS1000 at a depth of 5 to 6 feet bgs (1.1 mg/kg)
- BHBS1009 at depths of 0 to 1 foot bgs (1 J mg/kg) and 5 to 6 feet bgs (0.87 J mg/kg)
- BHBS1405 at a depth of 0 to 1 foot bgs (0.873 mg/kg)
- BHBS1000 at a depth of 0 to 1 foot bgs (0.87 J mg/kg)
- BHBS1403 at a depth of 5 to 6 feet bgs (0.74 J mg/kg)

These sample locations appear to be sufficiently bounded by sample locations below background. In addition, the selenium concentrations observed are only slightly above the background level and, as such, are not considered to be dissimilar from background. Based on this information, no further characterization of selenium is recommended for the Building 100 Trench Site.

– Silver (background of 0.79 mg/kg, Ecological RBSL of 0.54 mg/kg) was detected at concentrations ranging from 0.026 J mg/kg to 5.6 J mg/kg. Silver was detected above background and Ecological RBSL in one sample from BHTS18 at a depth of 5.5 to 6 feet bgs (5.6 J mg/kg). The above samples appear to be sufficiently bounded by sample locations below background, and no further characterization of silver is recommended at the Building 100 Trench Site.

– Zinc (background 110 mg/kg, Ecological RBSL 21 mg/kg) was detected at concentrations ranging from 27 J mg/kg to 388.5 J mg/kg. Zinc was detected above background and Ecological RBSL in two samples from BHTS51S08 at a depth of 4.5 feet bgs (388.5 J mg/kg) and in sample BHTS50S03 at a depth of 6 feet bgs (140 mg/kg). The above samples appear to be sufficiently bounded by sample locations with samples measuring below background, and no further characterization of zinc is recommended at the Building 100 Trench Site.

- Metals detected above background (but below their respective RBSLs) include beryllium, lithium, sodium, and thallium. Background concentrations for metals are included in Table N.3-3A. Sodium was detected at concentrations ranging from 67.4 J mg/kg to 710 mg/kg. RBSLs for sodium have not been established.

- Perchlorate was not found to have been previously used at the Building 100 Trench Site and was not included for analysis at any sampling locations.

- Fluoride was detected above its background concentration of 6.7 mg/kg in two samples from BHBS1009 at depths of 0 to 1 foot bgs (13 mg/kg) and 5 to 6 feet bgs (24 mg/kg) but below its RBSLs. No further characterization of fluoride in soil is required at the Building 100 Trench Site.

N.3.4.2.6 Dioxins

A total of 27 soil samples was collected at 23 locations and analyzed for dioxins. Of the 27 samples, 19 had detectable levels of dioxins and/or furans at concentrations for which the Dioxin-Furan TEQ values did not exceed the SSFL background concentrations and the RBSLs. Results are presented in Figures N.3-6 and N.3-10. Background concentrations for dioxins are included in Table N.3-3A.

The dioxins detected soil in the Building 100 trench area appear to have been generated during historic debris burning activities. As mentioned above, however, no elevated dioxin concentrations were observed.

The source of dioxins detected in the dioxin screening areas situated west, north, and northeast of Building 4100, the source is not known. There is a low potential for migration via stormwater flow from the trench area to these screening sample locations based on local topography and stormwater migration pathways. A possible source of the dioxins observed in these soil samples and in stormwater samples collected at nearby NPDES Outfall 007 is ash deposited onsite during regional wildfires at and near SSFL (Boeing, 2005, 2006, 2007a). Additional discussion of NPDES sampling is provided in Section N.3.6.

Based on the low concentrations of dioxins observed in soil samples, no further characterization of dioxins in soil appears warranted at the Building 100 Trench Site.

N.3.4.2.7 Energetics

A total of six soil samples was collected at six locations and analyzed for energetics. None of the samples had detectable levels of energetics, and results are presented in Figure N.3-7. No further characterization of energetics in soil is required at the Building 100 Trench Site.

N.3.5 Groundwater Findings

Groundwater occurrence and impacts at the Building 100 Trench Site are described below.

N.3.5.1 Groundwater Data Presentation

Groundwater sampling results and characterization findings are summarized in Table N.3-2B. The purposes of the table 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 N.3-2A, Table N.3-2B describes groundwater data by chemical group (such as metals, VOCs, and SVOCs). Table N.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), 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.

N.3.5.2 Groundwater Data Summary

Groundwater conditions at the Building 100 Trench Site are characterized by two Chatsworth Formation wells (RD-20, RD-91) to characterize CFOU groundwater. No wells have been installed in the NSGW at the Building 100 Trench Site. Groundwater findings from these wells are presented in Table N.3-2B and in Appendix B of the Group 5 RFI Report.

As described in Appendix B of the Group 5 RFI Report, samples from the CFOU groundwater monitoring wells at the site (RD-20, RD-91) were analyzed for VOCs, SVOCs, hydrocarbons, metals, inorganics, energetics, and dioxins.

- 1,2-dichloroethane, cis-1,2-dichloroethene, and trichloroethene concentrations were detected above their respective groundwater screening levels.
  - 1,2-Dichloroethane (groundwater screening level of 0.5 µg/L) was detected above its groundwater screening level in two samples collected from RD-91 (0.57 µg/L and 0.34 µg/L).
  - Cis-1,2-Dichloroethene (groundwater screening level of 6 µg/L) was detected above its groundwater screening level in two samples collected from RD-91 (21 µg/L and 11 µg/L).
  - Trichloroethene (groundwater screening level of 5 µg/L) was detected above its groundwater screening level in two samples collected from RD-91 (130 µg/L and 81 µg/L).
  - Acetone, carbon disulfide, chloromethane, methyl ethyl ketone, methylene chloride, and toluene were detected at concentrations that did not exceed their respective screening levels.
- No SVOCs were detected in any of the groundwater samples collected.
- Petroleum hydrocarbons were detected but did not exceed any screening levels.

- Concentrations for dissolved metals detected (antimony, barium, calcium, chromium, magnesium, manganese, nickel, potassium, sodium, and zinc) were below screening levels, except the following metals:
  - Boron (groundwater screening level of 340 µg/L) was detected above its groundwater screening level in one sample collected from RD-20 (460 µg/L).
  - Cobalt (groundwater screening level of 1.9 µg/L) was detected above its groundwater screening level in one sample collected from RD-91 (2.6 µg/L).
  - Copper (groundwater screening level of 4.7 µg/L) was detected above its groundwater screening level in one sample collected from RD-91 (6.4 µg/L).
  - Lead (groundwater screening level of 11 µg/L, Ecological RBSL of 2.5 µg/L) was detected above its groundwater screening level in a sample collected from RD-91 (17 µg/L).
  - Molybdenum (groundwater screening level of 2.2 µg/L) was detected in two samples collected from RD-91 (3.3 and 2.6 µg/L).
  - Selenium (groundwater screening level of 1.6 µg/L) was detected in three samples from RD-91 (2.7, 2.4, and 2.2 µg/L).
  - Strontium (groundwater screening level of 800 µg/L) was detected in a sample from RD-20 (895 µg/L).
  - Thallium (groundwater screening level of 0.13 µg/L) was detected in a sample from RD-91(3.7 J µg/L).
  - Vanadium (groundwater screening level of 2.6 µg/L) was detected in a sample from RD-91(3.9 J µg/L).
- Concentrations for inorganic compounds detected (fluoride, bicarbonate, chloride, sulfate, and nitrate-NO_3) were below screening levels for all groundwater samples collected.
- No energetics were detected in any of the groundwater samples collected.
- No dioxins were detected in any of the groundwater samples collected.

It is not likely that the VOC impacts to CFOU groundwater noted above are due to releases at the Building 100 RFI Site, since these compounds were not detected in near-surface soil or soil vapor. Also, groundwater samples collected from NSGW wells in the area have not been analyzed for metals, so it is not possible to determine whether the metals concentrations observed in the CFOU may be site related. Groundwater exceedances of VOCs and metals above screening levels may require additional characterization/ monitoring at the Building 100 Trench Site. CFOU Groundwater will be evaluated further in Appendix B and the CFOU RFI Report.

N.3.6 Surface Water Findings

NPDES data have been collected from Outfall 007 since 1983 and analyzed for constituents specified in the NPDES permit. A summary of the NPDES sampling results, including information on permit limit exceedances, is provided in Table N.3-2C. Most exceedances are

considered sporadic detections related to background soil conditions, or those caused by naturally occurring metals or dioxins in ash deposited at the site following regional fires at or very near the SSFL (Boeing, 2005, 2006, and 2007a). Monitoring of stormwater quality at this outfall location is ongoing.

Soil within the site is not likely impacted by upgradient sites via surface water transport, since no sites are located upgradient of the Building 100 Trench Site. 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 Building 100 Trench Site downgradient via surface water transport unlikely.

N.4 Risk Assessment Findings

The objective of this risk assessment (RA) is to determine whether the Building 100 Trench could pose unacceptable risks that might require remedial action, or if it is eligible for an NFA designation.

The following sections summarize the findings of the HRA and ERA performed for the Building 100 Trench. 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 the site-specific HRA and ERA are presented in Appendix A, Attachment A11, of the Group 5 RFI Report.

N.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 A11 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. While both direct (drinking water) and indirect (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. No wells at the Building 100 Trench Site are screened in NSGW.
    - A review of time-series plots for chemical constituents, groundwater gradients, and source areas indicates that 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 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 Building 100 Trench RFI 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 summary of the sitewide assessment report of large home-range receptor risk.

N.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 Building 100 Trench Site. A conceptual site model diagram for human health risk assessment is presented in Figure N.4-1 and summaries of COPCs and risk estimates for human health are presented in Table N.4-1 and Table N.4-2 respectively. Results of the risk characterization indicated the following:

- Soil – Lead was identified as a COC for direct contact with soil by future residents. No COCs were identified for plant consumption by future residents, or for direct contact with soil by future recreators.
- Soil Vapor – No COCs were identified for inhalation of ambient or indoor air by future residents or recreators.
- Near-surface Groundwater – No data were available for this zone and no COCs were identified.
- Chatsworth Groundwater – COCs will be identified and addressed as part of the Chatsworth Formation OU.

The uncertainties associated with the Group 5 RFI Sites in general were discussed in Appendix A. Uncertainties specific to the Building 100 Trench Site are summarized in Table N.4-3.

N.4.3 Summary of 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 risk assessment is presented in Figure N.4-2, and a summary of chemicals of Ecological concern (COECs) and Ecological risk estimates is presented in Table N.4-4 and Table 4-5. Results of the risk characterization indicated the following:

- Soil – Lead was identified as a COEC in soil. Aluminum was not retained based on United States Environmental Protection Agency (USEPA) Guidance (2003). 2,4-Dinitrophenol was not retained as a COEC because it was not detected.
- Soil Vapor – No COECs. 1,1,2-Trichloroethane was the only chemical with estimated risks to burrowing small mammals. However, it was never detected and was evaluated at the sample quantification limit (SQL). There were no estimated risks from other detected VOCs, and it is most likely that 1,1,2-trichloroethane was not present at the SQL concentration (which exceeds the toxicity reference value [TRV]).

The general uncertainties associated with the Group 5 RFI Sites are discussed in Appendix A of the Group 5 RFI Report. The uncertainties associated specifically with the Building 100 Trench are presented in Table N.4-6.

N.4.4 Building 100 Trench Risk Assessment Conclusions

This section presents the overall conclusions for Building 100 Trench 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 Building 100 Trench Site consist of Building 4100, the former Building 100 trench area, the former Building 4100 leach field, two areas of hummocky terrain, and a transformer location.

Potential risks associated with direct contamination of soil and soil vapor were assessed in this RA. Soil and soil gas samples were collected and analyzed for VOCs, and soil samples were collected and analyzed for SVOCs, TPH, PCBs, metals, inorganics, dioxins, and energetics. Data were considered adequate to evaluate potential risks. Lead was identified as a COC in soil for direct contact with soil by future residents. No COCs were identified in soil vapor for human health. Lead was identified as a COEC in soil. No COECs were identified in soil vapor for ecological receptors.

NSGW data was not available for this site. CFOU Groundwater will be addressed as part of the CFOU RFI Report.

The location within Building 100 Trench Site that will require further action to address human health and ecological risk is shallow soil located south of the former trench area where an elevated lead concentration was detected in a surface soil sample.

N.5 Building 100 Trench Site Action Recommendations

This section presents a summary of RFI reporting requirements as applicable to the Building 100 Trench Site. Section N.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 N.5.2. Site action recommendations for the Building 100 Trench Site are summarized in Sections N.5.3, N.5.4, and N.5.5.

N.5.1 RFI Reporting Requirements

As described in regulatory guidance documents for the SSFL RCRA Corrective Action Program (see Section 1.2.3 in Volume I of the Group 5 RFI Report), 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 present findings regarding the above information, describe completeness of the investigation, and indicate if additional work is needed.

The Building 100 Trench 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 F.3-2A and F.3-2B). Section F.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 Building 100 Trench Site (Section F.4 and Appendix A of Group 5 RFI Report).
4. Identifying Building 100 Trench Site areas requiring further work (this section).

N.5.2 Basis for Site Action Recommendations

In summary, site action recommendations included in the Building 100 Trench 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.

N.5.2.1 CMS and NFA Site Action Evaluation Process

CMS or NFA site action recommendations are based on a four-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 United States Environmental Protection Agency (USEPA) or DTSC as guidance for site managers (DTSC, 1992; USEPA, 1992). The low end of the risk range (that is, 1×10^{-6}, or 1 in 1,000,000, or Hazard Index [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 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 could affect the findings. For example, some chemicals are assumed to be present in soil based on TPH extrapolation factors (for example, 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 might 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 F.5-1. CMS Areas are also depicted graphically in Figure F.5-1 to illustrate locations and approximate areal extents, and summarized in Table F.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 (such as mule deer and hawk). The second is a

groundwater evaluation that will be reported in the Sitewide Groundwater Report. Updates to this report will be prepared as needed.

N.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 (for example, surface coatings and 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 could 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, 2006).

N.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 Building 100 Trench Site is recommended for CMS.

For the ecological risk assessment, lead is the only constituent retained as COEC in soil. Hazard quotients for multiple receptors exceed 1 due to the presence of an elevated lead concentration south of the former trench area at the Building 100 Trench Site. As a result, a CMS is recommended to address ecological risks.

The maximum cumulative human health risk and hazard index values for the Building 100 Trench Site are less than 1×10^{-6} and 1, respectively, for all exposure scenarios evaluated (refer to Table N.4-2). The hazard index values, however, do not account for potential health effects associated with the elevated lead concentration observed in surface soil south of the former trench area onsite. The reasonable maximum exposure (RME) exposure point concentration for lead at the site (724 mg/kg) results in an estimated blood lead level of greater than 10 micrograms per deciliter (μg/dL) for the hypothetical future residential child exposure scenario. Therefore, lead is considered a COC for soil, based on human health. Additional information on the evaluation of lead is presented in Appendix A.

The following CMS area was identified to address the human health and ecological risks for the Building 100 Trench Site:

- **B100-1:** Area situated south of the former trench area at the Building 100 Trench Site. The chemical risk driver is lead in surface soil.

The location of this CMS area is presented in Figure N.5-1 and described further in Table F.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.

N.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 Building 100 Trench Site except the six CMS areas 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.

The NFA recommendation for the Building 100 Trench Site will be reevaluated, and if appropriate revised, in the future after the existing structures are demolished. One building (Building 4100) and one transformer (Building 4710) remain at the Building 100 Trench Site. As part of the planned demolition of these structures, soil sampling will be performed, as needed, according to the process specified in the Building Feature Evaluation and Sampling SOP (MWH, 2008) to assess the potential for chemical impacts beneath the buildings. The NFA recommendation for the Building 100 Trench Site will be re-evaluated based on the data collected following building demolition.

N.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 Building 100 Trench 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 Building 100 Trench Site were investigated and the findings presented and considered herein.

The area recommended for NFA at the Building 100 Trench Site includes all portions of the site that are not recommended for CMS (Figure N.5-1), including the following Chemical Use Areas:

- Chemical Use Area 2 – Building 100 Area (Potential Source of VOCs and Dioxins)
- Chemical Use Area 3a – Hummocky Area – Western

- Chemical Use Area 3b - Hummocky Area – Eastern
- Chemical Use Area 4 – Building 100 Leach Field
- Chemical Use Area 6 – Transformer 4800 (4710)

Note that Chemical Use Area 5 (Building 4463) was originally associated with the Building 100 Trench Site. However, for RFI reporting purposes, it is included in the DOE Leach Fields 3 Site, which is situated east of the Building 100 Trench Site.

Available historical documentation indicates that operations at the Chemical Use Areas identified above might 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.

N.5.4.2 Sampling and Analysis Results

As presented in Section N.3, the Building 100 Trench Site, including the additional buildings and features identified within the site, were investigated during this RFI. Soil vapor samples were collected and analyzed for VOCs. Soil samples were collected and analyzed for VOCs, SVOCs, petroleum hydrocarbons, metals, inorganics, PCBs, and energetics. Of these, metals and gasoline-range hydrocarbons were detected at concentrations that exceed background levels (for metals) and their respective Residential and/or Ecological RBSLs.

Gasoline-range hydrocarbons (C8-C11) were detected above the Residential RBSL in two soil samples collected near the northeast corner of Building 4100. However, no VOCs were detected in soil vapor samples collected at this location and, as such, no further investigation is warranted in this area for petroleum hydrocarbons or VOCs.

Aluminum, barium, copper, mercury, selenium, silver, and zinc concentrations were detected above their respective background concentration and Ecological RBSL and/or the Residential RBSL. For each of these metals, the location(s) where exceedances occurred are generally well-bounded with samples where concentrations were not measured above background or the Ecological RBSLs. Therefore, no further characterization is warranted at these locations.

The data for samples collected in the area of the Building 100 Site recommended for NFA support the conclusion that previous uses of this portion of the site have not resulted in a significant impact to the environment.

N.5.4.3 Risk Assessment

The CMS recommendations address the constituent (lead, that is) that contributes to unacceptable risks to future potential human and ecological receptors at the Building 100 Trench Site. Therefore, an NFA designation is appropriate for the entire area outside the area recommended for CMS at the Building 100 Trench Site.

N.5.5 Source Area Stabilization Site Action Recommendations

The Building 100 Trench Site CMS area does not require stabilization measures, due to the distance from defined drainage pathways, and the relatively flat topography at the site.

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Tables

Table N.2-1
Building Inventory
Building 100 Trench RFI Site

Building Number	Start (Year)	End (Year)	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
4100	1960	Current	Advanced Epithermal Thorium Reactor (AETR) and Fast Critical Experiment Laboratory (FCEL). Built for the Southwest Atomic Power Association (association of private utility companies). 20 different reactor core configurations studied. Early reactors in the (AETR) were thorium and uranium fueled; later tests of reactors with high-energy (fast) neutrons were conducted at the FCEL. Program stopped in 1974. Building was decontaminated and decommissioned, and released by NRC for unrestricted use in 1980. The high bay is currently used as a high energy Computer Aided Tomography (CAT) facility. The labs are used by Radiation Safety for a radioactive sample counting lab and instrument calibration facility. Contains a shielded critical assemble room in one section. The other section contains a subassembly room, fuel fabrication area, control room, offices, laboratories, fuel storage vault, equipment room and change room. A water hold-up tank (see Table 2) was previously located outside the northeast corner of Bldg 100. This tank contained potable water that was stored in stand-by mode in the event perso	N/A	Available records do not indicate that hazardous substances were used in Building 100.	Sapere, 2005; Tripedda, 2007.

Table N.2-2
Tank Inventory
Building 100 Trench 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	Building 100 - Northeast corner	Unknown	Water	Unknown	Removed	N/A	Tank contained tap water that was stored in stand-by mode in the event personnel working in Building 4100 needed to be rinsed off in the event of a radiation exposure.	N/A		Tripedda, 2007.
T-3	Building 4463 About 200' West of Building	4,000	Sodium	1958	Removed	N/A	Stainless steel construction Located west of Building 4463.	N/A	Exact location not known.	Rockwell International, 1992.
T-5	Building 4463 About 200' West of Building	5,000	Sodium	1980	Removed	N/A	Stainless steel construction Located west of Building 4463.	N/A	Exact location not known.	Rockwell International, 1992.
Underground Tanks										
None										

Table N.2-3
Transformer Inventory
Building 100 Trench RFI Site

Transformer/ Substation Number	Location	Use Period	Use Status	Description	Chemical Use Area Number	Comments	Reference
4800 (4710)	Approx. 30 feet south of Building 4100.	Installed in 1962 (estimated); currently present onsite.	Active	Former electrical substation.	6	Building No. 4710 from 1962-1967; Building No. 4800 from 1971-1983.	Sapere, 2005.

Table N.2-4
Inventory of Other Site Features
Building 100 Trench RFI Site

Feature ID	Location	Use Period	Use Status	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
Building 100 Trenches	Approx. 5,000 feet east of Building 100	1960 to 1966	Inactive	The B100 Trench disposal area consisted of 3 elongated pits (60-100' long, 20-40' wide, 2-6' deep); overall area measures approximately 100' by 100'). Trench used for burning and disposal of construction debris and other materials; no facility records of wastes burned/disposed. 1961-67 aerial photos indicate darkly-stained soil in trench - presumably petroleum hydrocarbons. Filled and partially paved in 1971. In 1988, Rocketdyne surveyed trench area ambient gamma exposure rate measurements; survey concluded area met unrestricted release criteria. (Sapere - ETEC Document). In 1999, extensive instrument surveys and soil sampling were performed in the trench area. All instrument surveys and wipe tests of debris excavated from the trench were non-detect. (Sapere - Boeing Radiation Safety Records) During the 2003 RFI investigation (performed 1999-2000), extensive scrap metal, ACM, charred wood and ash observed (removed and disposed offsite).	1		ICF Kaiser, 2003; MWH, 2003; Sapere, 2005; ETEC, 1988; Boeing, 1999.
Building 100 Area - Potential Source of VOCs and Dioxins	Building 100 perimeter	NA	NA	No known chemical processes. Building 4100 area was identified in the Group 8 RFI Report as a potential source area for the following: * VOCs detected in downgradient groundwater monitoring well RD-91, which is located to the west. * Dioxins detected in surface water in NPDES Outfall 007 and detected in shallow soil in the drainage leading to the NPDES outfall at concentrations greater than the background.	2		MWH, 2007.
Hummocky Terrain Areas East and Northeast of Building 100	a) Approx. 100 feet northeast of Building 100 b) Approx. 400 feet northeast of Building 4100	Unknown	No activity	Two "hummocky terrain" features identified in 2000 DTSC Site Review Form and 2003 RFI Report by MWH. Area described as unknown, potential burial of construction debris and ACM in both areas (MWH, 2003). Hummocky terrain and disturbed soils were first identified on aerial photographs in 1978. No facility records exist regarding use or disposal of chemicals in these areas. Trenching performed did not indicate the presence of subsurface debris.	3a & 3b	Features identified and investigated by MWH during 2003; areas recommended for no further action in Draft RFI Report.	DTSC, 2000; MWH, 2003.
Building 100 Leach Field	Approx. 30 feet east of Building 4100	1960 to 2001	Not present	Received sanitary wastewater from Building 4100. Documentation does not specify installation date, but likely constructed same time as Building 100; indicates septic tank and leachfield removed in 2001. Instrument surveys and wipe tests of the tank and associated piping were non-detect (Sapere, 2005). Associated with LMFBR safety development (acronym unknown), no info on capacity/dimensions, "no drawings indicate the existence of leaching system for B100, however, both septic tank and leachfield have been located for building;" drawings found on "Hardy's email" (HDMSP00047220). Unnamed and undated facility drawing shows "abandoned" leach field approximately 80 feet east of Building 100 (approximately 20 south of northern edge of building).	4	Records identify a leach field associated with Building 100 (east side of building) (Leachfield/Septic Tank inventory). According to Sapere (2005), the leach field was removed in 2001. However, during 2001 excavation activities to remove leach field, it was discovered that the leach field had previously been removed. The outlet pipe (edge of asphalt pavement) was in place, but remainder of system absent. Screening for radioactivity indicated no elevated levels. Also, geophysical survey and trenching by MWH for 2003 RFI Report did not identify the presence of a leach field.	Sapere, 2005; Boeing, 2001; Boeing, 1999; MWH, 2003; Tripedda, 2007.

Table N.2-5
Site History - Investigation
Building 100 Trench RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	Purpose	COPCs Analyzed*	COPCs Reported*	Comments	Reference
1	Building 100 Trenches	Aug-88	Soil: 2 samples each from 2 trenches (2-4 ft bgs). No Soil Vapor sampling possible - alluvium is not thick enough.	VOCs (8240), SVOCs (8270), pH (9045), TPH (8015).	TPH (300-400 mg/kg)	GRC reported no indications of shallow groundwater observed during trenching activities onsite. The shallowness of the bedrock precluded the installation of monitoring wells in the shallow zone. CCR recommended site for no further action. Further investigation performed in 1999-2001 investigation as described below.	GRC, 1989; ICF, 1993.
1	Building 100 Trenches	Dec-99 through Nov-01	RFI Soil Vapor: 2 samples collected from eastern trench to assess presence of VOCs in trench area. Soil: 22 soil samples from excavation (trench) bottom and sidewalls. Stockpile: 8 samples of stockpiled trench soil. Soil Borings: 4 borings within trench after backfilling; samples @ 2'.	Soil Vapor: VOCs Soil: Trench: pH, dioxins/ furans, metals, asbestos, perchlorate, SVOCs At 2 southern trenches: pH, metals, TPH (DTSC also collected 2 samples for VOCs) Stockpile: same as main trench samples Borings: SVOCs (to evaluate PAHs)	Soil Vapor: ND Soil: VOCs=ND TPH=ND-300 mg/kg Metals>BG + Eco SLs within trenches; 1 location south of main trenches Lead (2550 mg/kg) > BG + HH SL + Eco SL SVOCs<Screening Levels (note that RFI Report identifies B(a)P > screening level, but exceedance not in EDMS) Dioxins>BG in trenches Perchlorate=ND Propellants=ND	2003 Draft RFI Report Risk Assessment Results: HHRA - Residential: HI <1 ELCR up to 2x10-6 due to lead (and B(a)P also cited as risk contributor) ECO: HI up to 29 (Thrush) due to lead detect in trench	MWH, 2003; MWH, 2004.
2	Building 4100 Area - Potential Source of VOCs and Dioxins	Mar-07	RFI Soil Vapor: 4 locations around perimeter of Building 100 to assess potential upgradient source of VOCs in Well RD-91. Soil: 4 surface soil samples locations west and northwest of Building 100 to identify potential source area for dioxins detected in NPDES Outfall #7 located NW of Building 100.	Soil Vapor: VOCs Soil: Dioxins/Furans Metals (subset of samples)	Soil Vapor: ND Soil: Dioxins > background at 3 locations, but not in 4th sample located nearest outfall.	Draft RFI Report for Building 56 Landfill recommends further surface soil sampling to the west of Building 100 (Data Gap).	MWH, 2007.
3a	Hummocky Terrain (western)	Oct-00	RFI Soil Vapor: 1 probe - 4' Soil: 3 trench samples in areas of geophysical anomalies	Soil Vapor: VOCs Soil: pH, metals, SVOCs, TPH.	Soil Vapor: ND (RFI Report identified Freon-113=2.4 J ug/L; however, EDMS indicates flag is UJ, which is non-detect) Soil: SVOCs/TPH: ND Metals: Background and Eco SL exceedances in all 3 locations. RFI Report indicated Silver was high-biased due to laboratory; therefore, not considered > background. No explanation for Thallium and Mercury exceedances in two southern samples.	Additional sampling may be required to satisfy DTSC with respect to "high-biased" silver results (consider co-locating sample to reproduce results; if exceedance replicated, perform step-out sampling).	MWH, 2003; MWH, 2004.
3b	Hummocky Terrain (northern)	Nov-01	RFI Soil Vapor: 1 soil vapor sample - 3' Soil: None collected because Soil Vapor was ND for VOCs.	Soil Vapor: VOCs Soil: N/A	Soil Vapor: ND Soil: N/A	Area recommended for no further action in RFI Report. Note that unknown why list of analytes differed for two areas of hummocky terrain. DTSC participated in investigation and evidently did not require consistent analyses at Chemical Use Area 3b.	MWH, 2003; MWH, 2004.
4	Building 100 Leach Field	2001	RFI Geophysical survey and trenching performed. No evidence of leach field identified. No soil sampling appears to have been performed.	N/A	N/A	Although leach field was not found, records indicate it was previously removed. Soil sampling appears warranted to assess whether releases hazardous substance releases occurred at the former location (location needs to be approximated from historic drawing).	MWH, 2003.

Table N.2-5
Site History - Investigation
Building 100 Trench RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	Purpose	COPCs Analyzed*	COPCs Reported*	Comments	Reference
6	Substation 4800 (4710)	Sep-03 Aug-04	Soil: 1 discrete (0-0.5') and 1 composite (0.5-1') soil samples collected adjacent to substation.	PCBs (8081) inorganics	Non-Detect for PCBs	No further action appears warranted: * PCB detection limits slightly exceed SRAM standard, but are comparable. * Sampling limited to 0-1 feet bgs, but considered to be representative of site conditions and no deeper sampling nor additional samples appear warranted.	MWH, 2004.
NA	Groundwater - CF Well RD-20	Ongoing	Ongoing groundwater monitoring	VOCs, SVOCs, hydrocarbons, metals, energetics, propellants	None	RD-20 is located approx. 25 feet north of the former disposal trenches. Open interval between 30 and 127 feet bgs. Generally monitors deeper CF groundwater, but well is also open to near-surface groundwater.	MWH, 2003; MWH, 2004.
NA	Groundwater - CF Well RD-91	Ongoing	Ongoing groundwater monitoring	VOCs, hydrocarbons, metals, dioxins, propellants	TCE, cis-1,2-DCE, 1,2-DCA	RD-91 is located approx. 320 feet west of Building 100. The source of VOCs detected in the well are unknown. The Group 8 RFI report recommended evaluation of the Building 100 area as a potential source given its proximity.	MWH, 2007; MWH, 2004.

Table N.2-6
Site History - Soil Disturbance
Building 100 Trench RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	COPCs Targeted	Media	Key Activities	Status	Reference
1	Building 100 Trench	2003	VOCs, TPH, metals	Soil	During the 2003 RFI investigation, approx. 330 CY (767 tons) of material were excavated from the trenches and disposed offsite. Non-impacted soil found around the debris was stockpiled, sampled, and (based on sample results) backfilled. RFI Report concluded that potential contaminants in debris did not migrate vertically or laterally, and no pockets of impacted soil or debris remain in the former disposal trenches. However, additional step-out/step-down sampling may be needed to support weight-of-evidence for site closure. One small area of subsurface metallic debris remains south of trenches (elevated lead detected). Consider using trenching to investigate the area and, thereby, remove debris in process. Dioxins detected > background levels in excavation samples. Dioxins not previously analyzed in adjacent well RD-20 (CF well).		MWH, 2003; MWH, 2004.

Table N.2-7
Chemical Use Summary
Building 100 Trench RFI Site

			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	
Chemical Use Area Number	Chemical Use Area Name	Potential Chemicals Used/Stored	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 100 Trench	Debris (dioxins and metals detected onsite)							X							X	
2	Building 4100 Area - Potential Source of VOCs and Dioxins	VOCs and dioxins suspected based on nearby groundater and soil sampling results, respectively	X											X			
3a	Hummocky Area - Western	Unknown (metals detected onsite)							X								
3b	Hummocky Area - Northern	Unknown							X								
4	Building 4100 Leach Field	Unknown										X					
5	Building 4463	**Moved to DOE LF3**															
6	Transformer 4800 (4710)	PCBs									X						

Notes:
1. VOCs are a COPCs for TPH-gasoline.
2. SVOCs and dioxins are evaluated as COPCs if burned materials are observed. PCBs are evaluated as COPCs if elevated concentrations of lubricant oil-range TPH are detected.
3. Leachfield COPCs are site specific, and chosen based on chemical usage at the building. Typical COPCs for leach fields are VOCs, TPH, and metals.

Table N.2-8
Conceptual Site Model
Building 100 Trench 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)	Depth to Chatsworth Formation Groundwater (Feet)	Chatsworth Formation Groundwater Horizontal Gradient/Flow Direction (foot/foot)	Surface Water Present? (Yes/No)	Surface Water Flow Information	Other Information?	Reference
Eastern Portion of Site - Area East of Building 4100 and Western Portion of Site - Building 100 Perimeter and Area West/Northwest of Building 100	1800 to 1840	1 to 11	1775	23	0.02/east-southeast	11.5 to 44.4 (2007 range for Wells RD-91 and RD-20)	0.04/east-southeast	No	No surface waters or major storm drainages present at site. Stormwater runoff would migrate via sheet flow generally to the southeast toward a topographic low that leads to an asphalt-lined drainage near Ave G. Building 100 is located west of a surface drainage divide, separating it from the remainder of the site. Based on site visits, stormwater flows via shallow asphalt-lined drainages and sheet flow, ultimately draining to the east and then north of Building 100 to NPDES Outfall 007.	Near-surface groundwater is continuous with CFOU Groundwater. Presence of ELV member onsite is not expected to be a barrier to flow for near surface groundwater in the vicinity of Building 100 (MWH, 2003) A dam has been constructed at NPDES Outfall 007 that captures stormwater drainage. The collected water is pumped to a separate location for treatment.	MWH, 2003; ICF, 1993. MWH, 2007.

MSL = above mean sea level

Table N.3-1A
Sampling Summary for Soil
Building 100 Trench RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	Dioxin, Furan	Energetics	Hydrocarbons	Inorganics	Metals	PCBs	SVOC	VOC
SB_B100-1	Soil Boring	SB_B100-1_2.0-2.5	8/23/1988	2	2.5	Primary Sample	In Place	Groundwater Resources Consultants, Inc.	Soil		X	X	X			X	X
SB_B100-2	Soil Boring	SB_B100-2_3.5	8/25/1988	3	3.5	Primary Sample	In Place	Groundwater Resources Consultants, Inc.	Soil		X	X	X			X	X
SB_B100-3	Soil Boring	SB_B100-3_3.0	8/25/1988	3	3	Primary Sample	In Place	Groundwater Resources Consultants, Inc.	Soil		X	X	X			X	X
SB_B100-4	Soil Boring	SB_B100-4_4.0	8/25/1988	4	4	Primary Sample	In Place	Groundwater Resources Consultants, Inc.	Soil		X	X	X			X	X
BHTS50S01	Trench		12/17/1999	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS50S01	Trench	RX001	12/17/1999	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS50S02	Trench		12/17/1999	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS50S02	Trench	RX002	12/17/1999	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS50S03	Trench		12/17/1999	6	6	MULTIPLE SAMPLE TYPES	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS50S03	Trench	RX003	12/17/1999	6	6	MULTIPLE SAMPLE TYPES	In Place	DTSC	Soil				X	X		X	
BHTS50S03	Trench	SX003	12/17/1999	6	6	MULTIPLE SAMPLE TYPES	In Place	DTSC	Soil		X						X
BHTS50S04	Trench		12/17/1999	6	6	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS50S04	Trench	RX004	12/17/1999	6	6	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS50S05	Trench	RX005	12/17/1999	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS50S06	Trench	RX006	12/17/1999	5	5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS50S07	Trench	RX007	12/17/1999	4.5	4.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS50S08	Trench		12/17/1999	5	5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS50S08	Trench	RX008	12/17/1999	5	5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS50S09	Trench		12/17/1999	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS50S09	Trench	RX009	12/17/1999	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS50S10	Trench		1/6/2000	4	4	MULTIPLE SAMPLE TYPES	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS50S10	Trench	RX023	1/6/2000	4	4	MULTIPLE SAMPLE TYPES	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS51S01	Trench		1/6/2000	2	2	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS51S01	Trench	RX015	1/6/2000	2	2	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS51S02	Trench		1/6/2000	4.5	4.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS51S02	Trench	RX016	1/6/2000	4.5	4.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS51S03	Trench		1/6/2000	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS51S03	Trench	RX017	1/6/2000	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS51S04	Trench		1/6/2000	2	2	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS51S04	Trench	RX018	1/6/2000	2	2	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS51S05	Trench		1/6/2000	3	3	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS51S05	Trench	RX019	1/6/2000	3	3	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS51S06	Trench		1/6/2000	2	2	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS51S06	Trench	RX020	1/6/2000	2	2	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS51S07	Trench		1/6/2000	2	2	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS51S07	Trench	RX021	1/6/2000	2	2	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS51S08	Trench		1/6/2000	4.5	4.5	MULTIPLE SAMPLE TYPES	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS51S08	Trench	RX022	1/6/2000	4.5	4.5	MULTIPLE SAMPLE TYPES	In Place	DTSC	Soil				X	X		X	
BHTS51S08	Trench	SX022	1/6/2000	4.5	4.5	MULTIPLE SAMPLE TYPES	In Place	DTSC	Soil		X						X
BHTS51S09	Trench		1/6/2000	1.5	1.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X							
BHTS51S09	Trench	RX029	1/6/2000	1.5	1.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X		X	
BHTS18	Grab Sample	RJ665	10/6/2000	5.5	6	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X			
BHTS21	Grab Sample	RJ667	10/6/2000	1.5	2	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil				X	X			
BHTS20	Grab Sample	RJ668	10/9/2000	3	3.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil			X	X	X		X	
BHTS26	Trench	MJ029	11/12/2001	1	1.5	Primary Sample	In Place	MWH	Soil			X	X	X			
BHBS01	Soil Boring	MJ039	11/20/2001	2	2	Primary Sample	In Place	MWH	Soil							X	
BHBS02	Soil Boring	MJ040	11/20/2001	2	2.5	Primary Sample	In Place	MWH	Soil							X	
BHBS03	Soil Boring	MJ041	11/20/2001	2	2	Primary Sample	In Place	MWH	Soil							X	
BHBS04	Soil Boring	MJ042	11/20/2001	2	2	Primary Sample	In Place	MWH	Soil							X	
BHTS25	Trench	MJ037	11/20/2001	1	1	Primary Sample	In Place	MWH	Soil			X	X	X			
XFBS05	Soil Boring	MT835	9/22/2003	0	0.5	Primary Sample	In Place	MWH	Soil				X		X		
XFBS13	Soil Boring	WD037	8/18/2004	0.5	1	Composite Sample	In Place	MWH	Soil				X		X		
BHBS0005	Soil Boring		2/13/2007	0.1	0.5	MULTIPLE SAMPLE TYPES	In Place	MWH	Soil	X							
BHBS0005	Soil Boring	BHBS0005S01	2/13/2007	0.1	0.5	MULTIPLE SAMPLE TYPES	In Place	MWH	Soil					X			
BHBS0005	Soil Boring	BHBS0005S01SP	2/13/2007	0.1	0.5	MULTIPLE SAMPLE TYPES	In Place	MWH	Soil				X				
BHBS0007	Soil Boring		4/2/2007	0.5	1	MULTIPLE SAMPLE TYPES	In Place	MWH	Soil	X							
BHBS0007	Soil Boring	BHBS0007S01	4/2/2007	0.5	1	MULTIPLE SAMPLE TYPES	In Place	MWH	Soil				X				
BHBS0008	Soil Boring		4/2/2007	0.5	1	Primary Sample	In Place	MWH	Soil	X							
BHBS0008	Soil Boring	BHBS0008S01	4/2/2007	0.5	1	Primary Sample	In Place	MWH	Soil				X				
BHBS0006	Soil Boring		4/2/2007	0.5	1	Primary Sample	In Place	MWH	Soil	X							

Table N.3-1A
Sampling Summary for Soil
Building 100 Trench RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	Dioxin, Furan	Energetics	Hydrocarbons	Inorganics	Metals	PCBs	SVOC	VOC
BHBS0006	Soil Boring	BHBS0006S01	4/2/2007	0.5	1	Primary Sample	In Place	MWH	Soil				X				
BHBS1002	Soil Boring	BHBS1002S010	4/8/2008	0	1	Primary Sample	In Place	MWH	Soil				X	X			
BHBS1001	Soil Boring	BHBS1001S010	4/8/2008	0	1	Primary Sample	In Place	MWH	Soil				X	X			
BHTS1000	Trench	BHTS1000S060	4/14/2008	5	6	Primary Sample	In Place	MWH	Soil				X	X			
BHTS1001	Trench	BHTS1001S060	4/14/2008	4.5	5.5	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHTS1003	Trench	BHTS1003S010	4/14/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHTS1003	Trench	BHTS1003S060	4/14/2008	3.5	4.5	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHTS1002	Trench	BHTS1002D010	4/14/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X				
BHTS1002	Trench	BHTS1002S010	4/14/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil					X			
BHTS1002	Trench	BHTS1002S058	4/14/2008	4.8	5.8	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1009	Soil Boring	BHBS1009S010	4/16/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X	X		X	
BHBS1009	Soil Boring	BHBS1009S060	4/16/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X	X		X	
BHBS1007	Soil Boring	BHBS1007S010	4/16/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1007	Soil Boring	BHBS1007S055	4/16/2008	4.5	5.5	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1000	Soil Boring	BHBS1000S010	4/16/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1010	Soil Boring	BHBS1010D010	4/17/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X	X		X	
BHBS1010	Soil Boring	BHBS1010S050	4/17/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil			X	X	X		X	
BHBS1006	Soil Boring		4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X							
BHBS1006	Soil Boring	BHBS1006S010	4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X				
BHBS1005	Soil Boring		4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X							
BHBS1005	Soil Boring	BHBS1005S010	4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X				
BHBS1003	Soil Boring		4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X							
BHBS1003	Soil Boring	BHBS1003S010	4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X				
BHBS1004	Soil Boring		4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X							
BHBS1004	Soil Boring	BHBS1004S010	4/17/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X				
BHBS1008	Soil Boring	BHBS1008S010	4/17/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X	X		X	
BHTS1003A	Trench	BHTS1003AS010	5/12/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHTS1003A	Trench	BHTS1003AS060	5/12/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1011	Soil Boring		5/15/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil								X
BHBS1011	Soil Boring	BHBS1011D01	5/15/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X	X		X	
BHBS1011	Soil Boring	BHBS1011S02	5/15/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X	X		X	
BHBS1012	Soil Boring		5/15/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil								X
BHBS1012	Soil Boring	BHBS1012S01	5/15/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X	X		X	
BHBS1012	Soil Boring	BHBS1012S02	5/15/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X	X		X	
BHBS1406	Soil Boring	BHBS1406S01	5/16/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1408	Soil Boring	BHBS1408S01	5/16/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1408	Soil Boring	BHBS1408S02	5/16/2008	5	5	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1400	Soil Boring	BHBS1400S01	5/16/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1407	Soil Boring	BHBS1407S01	5/16/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
U5BS1404	Soil Boring	U5BS1404S01	5/21/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1401	Soil Boring	BHBS1401D01	5/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X				
BHBS1401	Soil Boring	BHBS1401S01	5/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil					X			
BHBS1403	Soil Boring	BHBS1403S01	5/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1402	Soil Boring	BHBS1402S01	5/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1405	Soil Boring	BHBS1405S01	5/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X				
BHBS1405	Soil Boring	BHBS1405X01	5/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil					X			
BHBS1404	Soil Boring	BHBS1404S01	5/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1409	Soil Boring	BHBS1409S01	5/29/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1409	Soil Boring	BHBS1409S02	5/29/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1410	Soil Boring	BHBS1410S01	5/29/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil				X	X			
BHBS1410	Soil Boring	BHBS1410S02	5/29/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil				X	X			

Table N.3-1B
Sampling Summary for Soil Vapor
Building 100 Trench 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
BHSV01	Soil Gas Probe		9/29/1999	4	4.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil Vapor	X
BHSV02	Soil Gas Probe		9/29/1999	6	6.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil Vapor	X
BHSV03	Soil Gas Probe		8/2/2000	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil Vapor	X
BHSV04	Soil Vapor Sample		11/9/2001	8	8	Primary Sample	In Place	MWH	Soil Vapor	X
BHSV05	Soil Vapor Sample		11/19/2001	3	3	Primary Sample	In Place	MWH	Soil Vapor	X
BHSV0006	Soil Gas Probe		3/5/2007	3	3	Primary Sample	In Place	MWH	Soil Vapor	X
BHSV0008	Soil Gas Probe		3/5/2007	10	10	Primary Sample	In Place	MWH	Soil Vapor	X
BHSV0007	Soil Gas Probe		3/5/2007	8	8	Primary Sample	In Place	MWH	Soil Vapor	X
BHSV0009	Soil Gas Probe		3/5/2007	5	5	MULTIPLE SAMPLE TYPES	In Place	MWH	Soil Vapor	X
BHSV1000	Soil Vapor Sample	BHSV1000S050	4/9/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
BHSV1000	Soil Vapor Sample		4/9/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
BHSV1001	Soil Vapor Sample	BHSV1001S050	5/1/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
BHSV1001	Soil Vapor Sample		5/1/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X

Table N.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Building 100 Trench 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 N.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? (see Figure N.5-1 for CMS area)**
1	Building 100 Trench	VOCs	No prior sampling had been performed. Screen for VOCs to evaluate potential presence. <u>Soil Vapor:</u> Samples were collected at four (4) locations <u>Soil Matrix:</u> Soil samples were collected at six (6) locations.	No VOCs were detected in any of the samples.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		SVOCs	No prior sampling had been performed. Screen for SVOCs to evaluate potential presence. Soil samples were collected at 27 locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section N.3.4.2.2 and Figures N.3-2 and N.3-8.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		TPH	No prior sampling had been performed. Screen for TPH to evaluate potential presence. Soil samples were collected at six (6) locations.	TPH was detected but did not exceed the RBSLs. Discussion of results is presented in Section N.3.4.2.3 and Figures N.3-3 and N.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		Metals	Chemical uses at the trenches included burning of debris materials. No prior sampling had been performed. Screen for Metals to evaluate potential presence. Samples were collected at 32 locations.	Metals were detected above Background and Residential and/or Ecological RBSLs in 13 samples. BHTS26 at 1-1.5 ft bgs (Lead) BHBS1000 at 0-1 ft. bgs (Barium, Selenium) BHBS1002 at 0-1 ft. bgs (Barium) BHBS1403 at 5-6 ft. bgs (Selenium) BHBS1405 at 0-1 ft. bgs (Selenium) BHTS1000 at 5-6 ft. bgs (Selenium) BHTS1001 at 5.5-6 ft bgs (Selenium) BHTS50S03 at 6 ft. bgs (Copper, Zinc) BHTS51S02 at 4.5 ft bgs (Barium, Copper) BHTS51S04 at 2 ft. bgs (Barium) BHTS51S08 at 4.5 ft. bgs (Barium, Copper, Lead, Zinc) Discussion of results is presented in Section N.3.4.2.5 and Figures N.3-5, N.3-9A, and N.3-9B.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**Yes.** **CMS Area - B100-1:** The area with elevated lead in surface soil situated south of the former trench site is recommended for further evaluation in CMS based on sampling and risk assessment results. The lateral and vertical extent of lead appears to be sufficiently characterized for CMS purposes.
		Dioxins, Furans	Historic burning of debris in trench may have generated dioxins and furans. Screen for Dioxins and Furans to evaluate potential presence and distribution onsite. Samples were collected at 16 locations.	Dioxins and Furans were detected above Background in the following five locations but did not exceed their respective RBSLs. BHTS50S03, BHTS50S04, BHTS51S03, BHTS51S03, BHTS51S04 Discussion of results is presented in Section N.3.4.2.6 and Figures N.3-6 and N.3-10.	**Yes.** The extent of dioxins impacts is adequately defined by representative sampling locations. Concentration gradients are sufficient for risk assessment.	**N/A**
		Energetics	Screen for energetics to evaluate potential presence. Samples were collected at six (6) locations.	No energetics were detected in any of the samples.	**Yes.** The extent of energetics impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**

Table N.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Building 100 Trench 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 N.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? (see Figure N.5-1 for CMS area)**
2	Building 4100 Area - Potential Source of VOCs and Dioxins	VOCs	The source of chlorinated VOCs detected in nearby Chatsworth Well RD-91 is unknown. No prior sampling had been performed. Screen for VOCs to evaluate potential presence. Soil Vapor: Samples were collected at four (4) locations. Soil Matrix: Samples were collected at two (2) locations.	Soil Vapor: No VOCs were detected in any of the soil vapor samples. Soil Matrix: VOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section N.3.4.2.1 and Figures N.3-1A, N.3-1B and N.3-8	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		SVOCs	No prior sampling had been performed. Screen for SVOCs to evaluate potential presence. Samples were collected at three (3) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section N.3.4.2.2 and Figures N.3-2 and N.3-8.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		TPH	Screen for TPH to evaluate potential presence. Samples were collected at three (3) locations.	Gasoline Range Hydrocarbons (C8-C11) were detected above Residential RBSLs in one sample. BHBS1010 at 0-1 ft. bgs and 4-5 ft. bgs Discussion of results is presented in Section N.3.4.2.3 and Figures N.3-3 and N.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		Metals	Screen for Metals to evaluate potential presence. Samples were collected at four (4) locations.	Metals were detected above background in two samples but did not exceed their respective RBSLs. Discussion of results is presented in Section N.3.4.2.5 and Figures N.3-5, N.3-9A, and N.3-9B.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		Dioxins, Furans	The source of dioxins detected in shallow soil west of Building 4100 and in stormwater samples at nearby NPDES Outfall 007 is unknown. There is a low potential for transport of dioxins from the Building 100 trench area to Building 4100 area and the NPDES outfall location via stormwater based on topography and local stormwater flow patterns. Possible dioxin source is recent wildfire onsite. Screen for Dioxins and Furans to evaluate potential presence. Samples were collected at seven (7) locations.	Dioxins and Furans were detected above Background but did not exceed their respective RBSLs BHBS0005, BHBS0007, BHBS0008, BHBS1005, BHBS1006 Discussion of results is presented in Section N.3.4.2.6 and Figures N.3-5 and N.3-10.	**Yes.** The extent of dioxins impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
3a	Hummocky Area - Western	VOCs	No prior sampling had been performed. Screen for VOCs to evaluate potential presence. Soil Vapor Samples were collected at one (1) location. Soil Matrix No soil samples were collected.	No VOCs were detected in any of the soil vapor samples.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		SVOCs	No prior sampling had been performed. Screen for SVOCs to evaluate potential presence. Samples were collected at one (1) location.	No SVOCs were detected in any of the soil samples.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**

Table N.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Building 100 Trench 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 N.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? (see Figure N.5-1 for CMS area)**
3a	Hummocky Area - Western	TPH	Screen for TPH to evaluate potential presence. Samples were collected at one (1) location.	TPH was detected but concentrations did not exceed the RBSLs.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		Metals	Metals exceed background levels and Eco RBSLs in southern portion of feature. The lateral and vertical extent of metals in this area require further characterization (Note that the background level exceedances observed to date have been attributed to shale onsite.) Screen for metals to evaluate potential presence. Samples were collected at 10 locations.	Metals were detected above Background and Residential and/or Eco RBSLs in five samples. BHTS18 at 5.5-6 ft bgs (Silver) BHTS21 at 1.5-2 ft. bgs (Mercury) BHTS1002 at 0-1 ft. bgs (Mercury) BHBS1007 at 0-1 ft. bgs (Mercury, Selenium) BHBS1007 at 4.5-5.5 ft. bgs (Barium, Selenium), Discussion of results is presented in Section N.3.4.2.5 and Figures N.3-5, N.3-9A, and N.3-9B.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
3b	Hummocky Area - Northern	VOCs	Screen for VOCs to evaluate potential presence. <u>Soil Vapor</u> Samples were collected at one (1) location. <u>Soil Matrix</u> No soil samples were collected.	No VOCs were detected in any of the soil vapor samples.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		SVOCs	Only one soil gas sample for VOC analysis has been performed prior to 2008. This investigation approach is inconsistent with the analytical suite performed for soil samples collected at the other Hummocky Area (Chemical Use Area 3a) identified at the site. Therefore, to assess the presence of impacted soil at this feature, shallow soil sampling for analysis SVOCs is needed. Samples were collected at one (1) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section N.3.4.2.2 and Figures N.3-2 and N.3-8.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		TPH	Only one soil gas sample for VOC analysis has been performed prior to 2008. This investigation approach is inconsistent with the analytical suite performed for soil samples collected at the other Hummocky Area (Chemical Use Area 3a) identified at the site. Therefore, to assess the presence of impacted soil at this feature, shallow soil sampling for analysis of TPH is needed. Samples were collected at one (1) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section N.3.4.2.3 and Figures N.3-3 and N.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		Metals	Only one soil gas sample for VOC analysis has been performed prior to 2008. This investigation approach is inconsistent with the analytical suite performed for soil samples collected at the other Hummocky Area (Chemical Use Area 3a) identified at the site. Therefore, to assess the presence of impacted soil at this feature, shallow soil sampling for analysis of metals is needed. Samples were collected at one (1) locations.	Metals were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section N.3.4.2.5 and Figures N.3-5, N.3-9A, and N.3-9B.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**

Table N.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Building 100 Trench 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 N.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? (see Figure N.5-1 for CMS area)**
4	Building 4100 Leach Field	VOCs	No prior sampling had been performed. Screen for VOCs to evaluate potential presence. <u>Soil Vapor</u> Samples were collected at one (1) location. <u>Soil Matrix</u> No soil samples were collected.	No VOCs were detected in any of the soil vapor samples.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		SVOCs	No prior sampling had been performed. Screen for SVOCs to evaluate potential presence. Samples were collected at one (1) location.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in N.3.4.2.2 and Figures N.3-2 and N.3-8.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		TPH	Screen for TPH to evaluate potential presence. Samples were collected at one (1) location.	No TPH was detected in any of the soil samples.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		Metals	Screen for Metals to evaluate potential presence. Samples were collected at four (4) locations.	Metals were detected above Background and Eco RBSLs in two samples. BHBS1009 at 0-1 ft. bgs (Aluminum, Selenium) BHBS1009 at 5-6 ft. bgs (Selenium) Discussion of results is presented in Section N.3.4.2.5 and Figures N.3-5, N.3-9A, and N.3-9B.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
		Inorganics	Screen for Inorganics to evaluate potential presence. Samples were collected at one (1) location.	Fluoride was detected above Background in two samples. BHBS1009 at 0-1 ft. bgs and 5-6 ft. bgs Discussion of results is presented in N.3.4.2.5, Figures N.3-9A, and N.3-9B.	**Yes.** The extent of inorganics impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**
5	Building 4463	**Moved to the DOE LF3 Site**				
6	Transformer 4800 (4710)	PCBs	No prior sampling had been performed. Screen for PCBs to evaluate potential presence. Samples were collected at two (2) locations.	No PCBs were detected in any of the soil samples.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization sufficient for risk assessment.	**N/A**

Table N.3-2B
Evaluation of Groundwater Sampling Results
Building 100 Trench 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	No VOCs were detected in soil vapor and acetone and methyl ethyl ketone were detected but below RBSLs in soil matrix samples.	**Yes.** NSGW: No wells onsite Monitored at RD-20 and RD-91 in CFGW.	**Yes.** TCE, cis-1,2 DCE, and 1,2-DCA concentrations from samples collected at RD-91 exceed groundwater SLs and/or tap water PRGs. All other detected compounds were below groundwater screening levels.	**No.** VOCs detected in soil samples were not detected.	**NSGW - N/A** **CFOU Groundwater [1]**
PCBs	No PCBs were detected in any of the soil samples.	**No.** NSGW: No wells onsite	**N/A**	**N/A**	**NSGW - N/A** **CFOU Groundwater [1]**
SVOCs	SVOCs were detected but below any RBSLs.	**No.** NSGW: No wells onsite	**N/A**	**No.** Low level concentrations of SVOCs detected will likely not impact groundwater quality.	**NSGW - N/A** **CFOU Groundwater [1]**
TPH	Gasoline Range Hydrocarbons (C8-C11) were detected above RBSLs in one sample.	**Yes.** NSGW: No wells onsite Monitored at RD-20 in CFGW.	**Yes.** Total petroleum hydrocarbons were detected but no carbon chain analysis was performed on historic samples collected.	**Unknown.** TPH concentrations in soil exceeded RBSLs at one location. Detections of total petroleum hydrocarbons at RD-20 could potentially be site related and additional groundwater	**NSGW - N/A** **CFOU Groundwater [1]**
Metals	A variety of metals were detected above background in soil samples. See Section N.3.2.5 for further information.	**Yes.** NSGW: No wells onsite Monitored at RD-20 and RD-91 in CFGW.	**Yes.** Boron, cobalt, copper, lead, molybdenum, selenium, strontium, thallium, and vanadium exceeded groundwater screening levels.	**Possibly.** Barium (detected in surface soils above RBSLs) was detected below screening levels. Metals in soil may migrate into CFGW but are more likely to be bound to soil.	**NSGW - N/A** **CFOU Groundwater [1]**
Dioxins and Furans	Dioxins and Furans were detected but below any RBSLs.	**No.** NSGW: No wells onsite	**N/A**	**No.** Although groundwater samples have not been analyzed for Dioxins and Furans, these chemicals were not detected above RBSLs and do not readily migrate to groundwater.	**NSGW - N/A** **CFOU Groundwater [1]**
Energetics	No energetics were detected in any of the soil samples.	**No.** NSGW: No wells onsite	**N/A**	**N/A**	**NSGW - N/A** **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.. NSGW - Near Surface Groundwater

Table N.3-2C
Evaluation of Outfall 007 Sampling Results
Building 100 Trench RFI Site

Analytical Group	**Site Soil Impacts** (Summary of revelant impacts)	**Monitored at Outfall?**	**Constituent detected at Outfall?** (Above NPDES Discharge Limitations (Daily Max)?)
TDS	N/A	**Yes.** **1983 to 2006**	**No.** TDS was detected (96 mg/L to 440 mg/L) but did not exceed permit levels.
VOCs	VOCs were detected below RBSLs.	**Yes.** **2004 to 2006**	**No.** One VOC (chloromethane) was detected but did not exceed the permit level.
PCBs	No PCBs were detected.	**Yes.** **2004-2006**	**No.** No PCBs were detected in any sample from Outfall 007.
SVOCs	SVOCs were detected below RBSLs.	**Yes.** **2004 to 2006**	**No.** No SVOCs were detected in any sample from Outfall 007.
TPH	TPHs were detected above Residential RBSLs.	**Yes.** **1983 to 2006**	**No.** Oil was detected but did not exceed the permit level.
Metals*	The following metals were detected above Background concentrations and Eco RBSLs and/or Residential RBSLs:	**Yes.** **1993 to 2006**	**Yes.** **Metals were detected above NPDES Limitations in 17 samples.** **Feb 1994 (NC) - Arsenic (3 ug/L), Zinc (21 ug/L)** **Jan 1995 (NC) - Copper (20 ug/L), Zinc (40 ug/L)** **Jan 1996 (NC) - Lead (14 ug/L), Nickel (10 ug/L), Zinc (110 ug/L)** **Dec 1996 (NC) - Lead (10 ug/L)** **Dec 1997 (NC) - Lead (1 ug/L), Zinc (40 ug/L)** **Feb 1998 (NC) - Copper (10 ug/L), Zinc (10 ug/L)** **Feb 1999 - Antimony (8 ug/L)** **Mar 1999 - Antimony (11 ug/L), Cadmium (4 ug/L)** **Feb 2000 - Copper, Mercury** **Mar 2000 - Antimony** **Jan 2001 - Lead (ND exceeded criteria at 3.9 ug/L)** **Oct and Dec 2004 - Mercury (0.14J, 0.19J ug/L)** **Jan/Feb 2005 - Mercury (0.14J, 0.18J, and 0.19J ug/L)** **Oct 2005 - Antimony (6.2 ug/L), Copper (19 ug/L)**

Table N.3-2C
Evaluation of Outfall 007 Sampling Results
Building 100 Trench RFI Site

Analytical Group	**Site Soil Impacts** (Summary of revelant impacts)	**Monitored at Outfall?**	**Constituent detected at Outfall?** (Above NPDES Discharge Limitations (Daily Max)?)
Inorganics	Fluoride was detected above background below RBSLs.	**Yes.** **1983 to 2006**	**No.** Chloride, cyanide, sulfate, and nitrate/nitrite were detected but did not exceed permit levels.
Dioxins and Furans	Dioxins and Furans were detected above background below RBSLs.	**Yes.** **2004 to 2006**	**Yes.** **Dioxins were detected above NPDES Limitations in 11 samples.** 2,3,7,8-TCDD TEQ (3.9E-08 ug/L to 1.4E-06 ug/L)

Relevant NPDES Limitations (Daily Max):

* Before 1999, metals were regularly detected but no criteria were established.
Antimony - 6 ug/L
Boron - 1 mg/L
Mercury - 0.012 ug/L
Cadmium - 3.7 ug/L
Chloride - 150 mg/L
Chlorine - 0.1 mg/L
Copper - 17 ug/L
Fluoride - 1 mg/L
Lead - 2.5 ug/L
N/A - Not Applicable
NC = No Criteria
Nitrate - 10 mg/L
Oil and grease - 15 mg/L
pH - 6-9
Sulfate - 250 mg/L
TCDD - 2.8E-08 ug/L
TDS (Total Dissolved Solids) - 850 mg/L

Table N.3-3A
Data Screening and Statistical Summary for Soil
Building 100 Trench 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**
Dioxin_Furans											
1,2,3,4,6,7,8-Heptachlorodibenzofuran	mg/kg	6.9E-04	4.9E-04	2.5E-06	24	10	1.1E-07	5.3E-06			5
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	mg/kg	6.9E-04	9.6E-04	1.3E-05	24	12	3.8E-07	6.1E-04			6
1,2,3,4,7,8,9-Heptachlorodibenzofuran	mg/kg	6.9E-04	4.3E-04	1.9E-07	24	5	2.9E-07	6.2E-07			5
1,2,3,4,7,8-Hexachlorodibenzofuran	mg/kg	6.9E-05	4.7E-05	7.3E-07	24	6	2.1E-07	2.3E-06			4
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	mg/kg	6.9E-05	4.5E-05	3.4E-07	24	7	3.3E-07	2.1E-06			6
1,2,3,6,7,8-Hexachlorodibenzofuran	mg/kg	6.9E-05	5.4E-05	3.0E-07	24	7	1.3E-07	1.4E-06			4
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	mg/kg	6.9E-05	4.6E-05	9.5E-07	24	10	3.2E-07	1.1E-05			6
1,2,3,7,8,9-Hexachlorodibenzofuran	mg/kg	6.9E-05	4.3E-05	4.3E-07	24	7	4.8E-07	1.2E-06			7
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	mg/kg	6.9E-05	4.4E-05	1.1E-06	24	10	5.9E-07	6.6E-06			4
1,2,3,7,8-Pentachlorodibenzofuran	mg/kg	2.3E-04	1.0E-04	5.9E-07	24	5	1.3E-07	1.5E-06			4
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	mg/kg	6.9E-06	4.4E-06	1.8E-07	24	7	2.1E-07	8.6E-07			7
2,3,4,6,7,8-Hexachlorodibenzofuran	mg/kg	6.9E-05	4.9E-05	4.5E-07	24	6	2.4E-07	1.8E-06			4
2,3,4,7,8-Pentachlorodibenzofuran	mg/kg	2.3E-05	9.8E-06	6.4E-07	24	5	3.8E-07	2.6E-06			4
2,3,7,8-TCDD	mg/kg	6.9E-06	4.3E-06	5.0E-07	24						
2,3,7,8-Tetrachlorodibenzofuran	mg/kg	6.9E-05	4.4E-06	1.8E-06	24	6	9.7E-08	2.1E-06			1
2,3,7,8-TCDD_TEQ	mg/kg	6.9E-06	4.3E-06	8.7E-07	24	16	6.9E-10	1.0E-05	0	0	0
Heptachlorodibenzofurans	mg/kg				24	12	1.1E-07	1.5E-05			
Heptachlorodibenzo-p-dioxins	mg/kg				24	15	3.5E-07	9.9E-04			
Hexachlorodibenzofurans	mg/kg				24	12	6.6E-07	1.6E-05			
Hexachlorodibenzo-p-dioxins	mg/kg				24	13	9.1E-07	9.1E-05			
Octachlorodibenzofuran	mg/kg	2.3E-02	9.7E-02	8.1E-06	24	9	1.2E-06	8.8E-06			2
Octachlorodibenzo-p-dioxin	mg/kg	2.3E-02	1.2E-01	1.4E-04	24	16	2.3E-06	3.6E-03			4
Pentachlorodibenzofurans	mg/kg				24	10	7.5E-07	3.3E-05			
Pentachlorodibenzo-p-dioxins	mg/kg				24	10	2.9E-07	1.1E-05			
Tetrachlorodibenzofurans	mg/kg				24	12	9.7E-08	7.0E-05			
Tetrachlorodibenzo-p-dioxins	mg/kg				24	6	7.4E-07	6.0E-06			
Energetics											
2,4-Dinitrotoluene	mg/kg		0.43		6						
2,6-Dinitrotoluene	mg/kg		1.71		6						
Nitrobenzene	mg/kg	29	2		6						
Hydrocarbons											
Kerosene Range Hydrocarbons (C12-C14)	mg/kg	1400			9	2	15.2	57.95			
Diesel Range Hydrocarbons (C14-C20)	mg/kg	1400			3						
Diesel Range Hydrocarbons (C15-C20)	mg/kg	1400			9	1	2	2			
Lubricating Oil Hydrocarbons (C20-C30)	mg/kg	1400			3	1	22	22			
Lubricating Oil Hydrocarbons (C21-C30)	mg/kg	1400			9	6	2.4	113.05			
Gasoline Range Organics (C8-C11)	mg/kg	1.1			9	2	14	52.4	2		
Gasoline Range Organics (C8-C11)	mg/kg	1.1			3						
Hydrocarbons	mg/kg				4						
Lubricating Oil Hydrocarbons C22-C30	mg/kg	1400			1	1	300	300			
Kerosene Range Hydrocarbons (C11-C14)	mg/kg	1400			3						
Total Petroleum Hydrocarbons	mg/kg				1						
Inorganics											
% Solids	%				2	2	94.4	96.7			
Bromide	mg/kg				2						
Chloride	mg/kg				2	2	3.5	35			
Fluoride	mg/kg	4600		6.7	2	2	13	24			2
Moisture	%				43	43	2.12	21			
Nitrate-N	mg/kg	120000			2	2	0.55	2			

Table N.3-3A
Data Screening and Statistical Summary for Soil
Building 100 Trench 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**
Nitrite-N	mg/kg				2						
Orthophosphate as P	mg/kg				2	2	0.62	1.1			
Perchlorate	mg/kg	9.1	0.000024		19						
pH	No Units				1	1	6.49	6.49			
pH	pH Units				39	39	5.5	8.6			
Sulfate	mg/kg				2	2	24	86			
Total Solids	%				24	24	86	97			
Metals											
Aluminum	mg/kg	75000	12	20000	41	41	7960	21000		41	1
Antimony	mg/kg	30	0.095	8.7	41	4	0.38	0.63		4	
Arsenic	mg/kg	0.095	1.9	15	40	40	2.2	11	40	40	
Barium	mg/kg	15000	15	140	44	44	11	980		43	6
Beryllium	mg/kg	150	5	1.1	41	35	0.415	1.9			5
Boron	mg/kg	15000	6.76	9.7	41	2	2.65	2.725			
Cadmium	mg/kg	39	0.0045	1	41	20	0.03	0.78		20	
Calcium	mg/kg				5	5	2100	4500			
Chromium	mg/kg	3400	930	36.8	41	41	1.6	32.2			
Cobalt	mg/kg	1500	8.9	21	41	41	3.1	19		5	
Copper	mg/kg	3000	1.1	29	39	39	5.1	58		39	3
Iron	mg/kg			28000	5	5	12800	23200			
Lead	mg/kg	150	0.013	34	42	42	0.24	2550	1	42	2
Lithium	mg/kg	1521.66006		37	17	17	13	39			1
Magnesium	mg/kg				5	5	2550	4850			
Manganese	mg/kg	1800	59	495	5	5	237	391		5	
Mercury	mg/kg	23	0.1	0.09	43	21	0.0046	0.28		3	4
Molybdenum	mg/kg	380	0.11	5.3	41	23	0.18	3.3		23	
Nickel	mg/kg	1500	0.1	29	41	41	1.3	25		41	
Potassium	mg/kg			6400	22	22	1200	3720			
Selenium	mg/kg	380	0.17	0.655	54	17	0.3	2		17	9
Silver	mg/kg	380	0.54	0.79	47	20	0.026	5.6		1	1
Sodium	mg/kg			110	22	13	67.4	710			7
Thallium	mg/kg	6.1	2.9	0.46	41	15	0.0073	0.6			3
Vanadium	mg/kg	76	1.5	62	41	41	9.8	57		41	
Zinc	mg/kg	23000	21	110	41	41	27	388.5		41	2
Zirconium	mg/kg			8.6	17	14	1.1	3.6			
PCBs											
Aroclor 1016	mg/kg	3.9	1.6		2						
Aroclor 1221	mg/kg	0.35	1.6		2						
Aroclor 1232	mg/kg	0.35	0.077		2						
Aroclor 1242	mg/kg	0.35	0.079		2						
Aroclor 1248	mg/kg	0.35	0.0114		2						
Aroclor 1254	mg/kg	0.35	0.077		2						
Aroclor 1260	mg/kg	0.35	0.077		2						
SVOC											
1-Methyl naphthalene	mg/kg	230			9	3	0.00094	0.117			
2,4,5-Trichlorophenol	mg/kg	5700	9		2						
2,4,6-Trichlorophenol	mg/kg	10	10		6						
2,4-Dichlorophenol	mg/kg	170	1.3		6						
2,4-Dimethylphenol	mg/kg	1100	110		6						
2,4-Dinitrophenol	mg/kg	110	0.59		6						

Table N.3-3A
Data Screening and Statistical Summary for Soil
Building 100 Trench 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
2-Chloronaphthalene	mg/kg		530		6						
2-Chlorophenol	mg/kg	290	21		6						
2-Methylnaphthalene	mg/kg	230	210		16	4	0.0013	0.255			
2-Nitroaniline	mg/kg		11		2						
2-Nitrophenol	mg/kg		11		6						
3,3'-Dichlorobenzidine	mg/kg		1.3		6						
3-Nitroaniline	mg/kg		5.9		2						
4,6-Dinitro-o-cresol	mg/kg	5.7	11		6						
4-Bromophenyl phenyl ether	mg/kg		4.3		6						
4-Chlorophenylphenyl ether	mg/kg		1.3		6						
4-Nitrophenol	mg/kg		7		6						
Acenaphthene	mg/kg	3400	2.46		37						
Acenaphthylene	mg/kg	1700	370		37						
Aniline	mg/kg	130	11		2						
Anthracene	mg/kg	17000	2.4		37	2	0.00023	0.00024			
Benzidine	mg/kg		2.3		4						
Benzo(a)anthracene	mg/kg	0.6	5.6		37	4	0.00031	0.021			
Benzo(a)pyrene	mg/kg	0.06	5.6		37	3	0.00026	0.021			
Benzo(b)fluoranthene	mg/kg	0.6	5.6		37	3	0.0006	0.021			
Benzo(ghi)perylene	mg/kg		6.4		37	3	0.00087	0.021			
Benzo(k)fluoranthene	mg/kg	0.6	5.8		37	2	0.0012	0.021			
Benzyl alcohol	mg/kg	17000	4.4		2						
bis(2-Chloroethoxy)methane	mg/kg		150		6						
bis(2-Chloroethyl) ether	mg/kg	0.29	150		6						
bis(2-Chloroisopropyl) ether	mg/kg	2300	150		6						
bis(2-Ethylhexyl) phthalate	mg/kg	250	4.9		13						
Butyl benzyl phthalate	mg/kg	11000	340		11	2	0.021	0.021			
Carbazole	mg/kg	36	34		2						
Chrysene	mg/kg	6	2.4		37	7	0.00052	0.042			
Dibenzo(a,h)anthracene	mg/kg	0.17	5.6		37						
Dibenzofuran	mg/kg	110	62		2						
Diethyl phthalate	mg/kg	46000	6940		13						
Dimethyl phthalate	mg/kg	570000	4.4		11	1	0.021	0.021			
Di-n-butyl phthalate	mg/kg	5700	0.49		13	1	0.00857	0.00857			
Di-n-octyl phthalate	mg/kg	2300	39		15	3	0.013	0.021			
Fluoranthene	mg/kg	2300	38		37	9	0.00043	0.021			
Fluorene	mg/kg	2300	1.6		37	1	0.00043	0.00043			
Hexachlorobenzene	mg/kg	0.4	0.34		6						
Hexachlorocyclopentadiene	mg/kg	340	13		6						
Hexachloroethane	mg/kg	18	2.1		6						
Indeno(1,2,3-cd)pyrene	mg/kg	0.6	5.8		37	2	0.0059	0.021			
Isophorone	mg/kg	750	320		6						
Naphthalene	mg/kg	6	210		37	4	0.00039	0.156			
n-Nitrosodimethylamine	mg/kg	0.045	20		37						
n-Nitrosodi-n-propylamine	mg/kg	0.1	28		6						
n-Nitrosodiphenylamine	mg/kg	80	20		6						
o-Cresol	mg/kg	2867.0661	110		2						
p-Chloroaniline	mg/kg		4.4		2						
p-Chloro-m-cresol	mg/kg		21		6						
p-Cresol	mg/kg	290	4.3		2						

Table N.3-3A
Data Screening and Statistical Summary for Soil
Building 100 Trench 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**
Pentachlorophenol	mg/kg	8.8	6		6						
Phenanthrene	mg/kg	1700	1.3		37	7	0.0075	0.023			
Phenol	mg/kg	18000	5		6						
p-Nitroaniline	mg/kg		3.3		2						
Pyrene	mg/kg	1700	18		37	11	0.00044	0.021			
VOC											
1,1,1,2-Tetrachloroethane	mg/kg	0.00025	76		2						
1,1,1-Trichloroethane	mg/kg	0.49	4300		6						
1,1,2,2-Tetrachloroethane	mg/kg	0.0014	6		6						
1,1,2-Trichloro-1,2,2-trifluoroethane	mg/kg	16	583		2						
1,1,2-Trichloroethane	mg/kg	0.0012	8.3		6						
1,1-Dichloroethane	mg/kg	0.0016	210		6						
1,1-Dichloroethene	mg/kg	0.023	10.7		6						
1,1-Dichloropropene	mg/kg		22		2						
1,2,3-Trichlorobenzene	mg/kg	0.124604521	20		2						
1,2,3-Trichloropropane	mg/kg	0.000051	12		2						
1,2,4-Trichlorobenzene	mg/kg	0.124604521	20		8						
1,2,4-Trimethylbenzene	mg/kg	0.035	64		2						
1,2-Dibromo-3-chloropropane	mg/kg	0.029	22		2						
1,2-Dibromoethane	mg/kg		25		2						
1,2-Dichlorobenzene	mg/kg	1.8	370		8						
1,2-Dichloroethane	mg/kg	0.0005	76		6						
1,2-Dichloropropane	mg/kg		250		6						
1,3,5-Trimethylbenzene	mg/kg	0.036	64		2						
1,3-Dichlorobenzene	mg/kg	1.7	160		8						
1,3-Dichloropropane	mg/kg		22		2						
1,3-Dichloropropene	mg/kg		22		4						
1,4-Dichlorobenzene	mg/kg	0.01	20		8						
2-Chloro-1,1,1-trifluoroethane	mg/kg				2						
2-Chloroethylvinyl ether	mg/kg	9.56905E-06	0.73		6						
2-Hexanone	mg/kg		1220		2						
Acetone	mg/kg	51	43		2	2	0.069	0.11			
Benzene	mg/kg	0.00013	110		6						
Bromobenzene	mg/kg		110		2						
Bromochloromethane	mg/kg		25		2						
Bromodichloromethane	mg/kg	0.00031	15		6						
Bromoform	mg/kg		38		6						
Bromomethane	mg/kg		25		6						
Carbon Tetrachloride	mg/kg	0.000042	1.5		6						
Chlorobenzene	mg/kg	0.097	40		6						
Chloroethane	mg/kg		190		6						
Chloroform	mg/kg	0.00077	11		6						
Chloromethane	mg/kg		25		6						
Chlorotrifluoroethylene	mg/kg		10.7		2						
cis-1,2-Dichloroethene	mg/kg	0.014	68		2						
cis-1,3-Dichloropropene	mg/kg		22		2						
Cumene	mg/kg	0.382558451	210		2						
Dibromochloromethane	mg/kg		46		6						
Dibromomethane	mg/kg		25		2						
Dichlorodifluoromethane	mg/kg	0.015	64		2						

Table N.3-3A
Data Screening and Statistical Summary for Soil
Building 100 Trench 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
Ethylbenzene	mg/kg	1.2	210		6						
Hexachlorobutadiene	mg/kg	9.2	0.85		8						
Methyl ethyl ketone	mg/kg	62	2540		2	2	0.017	0.03			
Methyl isobutyl ketone (MIBK)	mg/kg	19.63756975	2540		2						
Methyl tert-butyl ether	mg/kg		120		2						
Methylene chloride	mg/kg	0.004	25		4						
m-Xylene & p-Xylene	mg/kg	0.15	64		2						
n-Butylbenzene	mg/kg		210		2						
n-Propylbenzene	mg/kg	0.203267508	210		2						
o-Chlorotoluene	mg/kg	1222.098214	160		2						
o-Xylene	mg/kg	0.19	64		2						
p-Chlorotoluene	mg/kg	1222.098214	160		2						
p-Cymene	mg/kg		64		2						
sec-Butylbenzene	mg/kg	76.76404578	210		2						
sec-Dichloropropane	mg/kg		22		2						
Styrene	mg/kg	7.2	427		2						
tert-Butylbenzene	mg/kg		210		2						
Tetrachloroethene	mg/kg	0.00043	6		6						
Toluene	mg/kg	0.3	3.4		6						
trans-1,2-Dichloroethene	mg/kg	0.016	970		6						
trans-1,3-Dichloropropene	mg/kg		4.4		2						
Trichloroethene	mg/kg	0.0022	3		6						
Trichlorofluoromethane	mg/kg	0.11	300		2						
Vinyl chloride	mg/kg	0.0000096	0.73		6						
Xylenes, Total	mg/kg	0.15	64		2						

Table N.3-3B
Data Screening and Statistical Summary for Soil Vapor
Building 100 Trench RFI Site

		Screening Levels			Detect Data Summary					
Constituent	**Units**	**Residential RBSL**	**Residential PRG**	**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			11					
1,1,1-Trichloroethane	ug/L	640		38	11					
1,1,2,2-Tetrachloroethane	ug/L	0.048			11					
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/L	8800		91	11					
1,1,2-Trichloroethane	ug/L	0.17		0.057	11					
1,1-Dichloroethane	ug/L	1.7		36	11					
1,1-Dichloroethene	ug/L	58		0.6	11					
1,2-Dichloroethane	ug/L	0.13		42	11					
Benzene	ug/L	0.095		0.57	11					
Carbon Tetrachloride	ug/L	0.063		0.63	11					
Chloroethane	ug/L			992	11					
Chloroform	ug/L	0.5		0.24	11					
cis-1,2-Dichloroethene	ug/L	10		1.9	11					
Dichlorodifluoromethane	ug/L	58		91	11					
Ethylbenzene	ug/L	290		23	11					
Methylene chloride	ug/L	2.7		0.87	11					
m-Xylene & p-Xylene	ug/L			16	11					
o-Xylene	ug/L	29		16	11					
Tetrachloroethene	ug/L	0.45232		24	11					
Toluene	ug/L	110		0.084	11					
trans-1,2-Dichloroethene	ug/L	20		1.9	11					
Trichloroethene	ug/L	1.4		6.4	11					
Trichlorofluoromethane	ug/L	200		90.9	11					
Vinyl chloride	ug/L	0.035		0.56	11					
Xylenes, Total	ug/L			16	11					

Table N.4-1
Chemicals of Potential Concern for Human Health
Building 100 Trench RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-2	1,2,3,4,6,7,8-Heptachlorodibenzofuran	N	N	Below Background
Soil	0-2	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-2	1,2,3,4,7,8,9-Heptachlorodibenzofuran	N	N	Below Background
Soil	0-2	1,2,3,4,7,8-Hexachlorodibenzofuran	N	N	Below Background
Soil	0-2	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-2	1,2,3,6,7,8-Hexachlorodibenzofuran	N	N	Below Background
Soil	0-2	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-2	1,2,3,7,8,9-Hexachlorodibenzofuran	N	N	Below Background
Soil	0-2	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-2	1,2,3,7,8-Pentachlorodibenzofuran	N	N	Below Background
Soil	0-2	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-2	1-Methyl naphthalene		Y	
Soil	0-2	2,3,4,6,7,8-Hexachlorodibenzofuran	N	N	Below Background
Soil	0-2	2,3,4,7,8-Pentachlorodibenzofuran	N	N	Below Background
Soil	0-2	2,3,7,8-Tetrachlorodibenzofuran	N	N	Below Background
Soil	0-2	2-Methylnaphthalene		Y	
Soil	0-2	Acetone		Y	
Soil	0-2	Aluminum	N	N	Below Background
Soil	0-2	Anthracene		Y	
Soil	0-2	Antimony	N	N	Below Background
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	Boron	N	N	Below Background
Soil	0-2	Butyl benzyl phthalate		Y	
Soil	0-2	Cadmium	N	N	Below Background
Soil	0-2	Chromium	N	N	Below Background
Soil	0-2	Chrysene		Y	
Soil	0-2	Cobalt	Y	Y	
Soil	0-2	Copper	N	N	Below Background
Soil	0-2	Kerosene Range Hydrocarbons (C12-C14)		N	See BTEX, PAHs
Soil	0-2	Diesel Range Hydrocarbons (C15-C20)		N	See BTEX, PAHs
Soil	0-2	Lubricating Oil Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-2	Gasoline Range Hydrocarbons (C8-C11)		N	See BTEX, PAHs
Soil	0-2	Dimethyl phthalate		Y	
Soil	0-2	Di-n-octyl phthalate		Y	
Soil	0-2	DioxinFuran_TEQ_Mammal		Y	
Soil	0-2	Fluoranthene		Y	
Soil	0-2	Fluorene		Y	
Soil	0-2	Fluoride		Y	
Soil	0-2	Heptachlorodibenzofurans	N	N	Below Background
Soil	0-2	Heptachlorodibenzo-p-dioxins	N	N	Below Background
Soil	0-2	Hexachlorodibenzofurans	N	N	Below Background
Soil	0-2	Hexachlorodibenzo-p-dioxins	N	N	Below Background
Soil	0-2	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-2	Iron	N	N	Below Background
Soil	0-2	Lead	N	N	Below Background
Soil	0-2	Lithium	N	N	Below Background
Soil	0-2	Manganese	N	N	Below Background
Soil	0-2	Mercury	N	N	Below Background
Soil	0-2	Methyl ethyl ketone		Y	

Table N.4-1
Chemicals of Potential Concern for Human Health
Building 100 Trench RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-2	Molybdenum	N	N	Below Background
Soil	0-2	Naphthalene		Y	
Soil	0-2	Nickel	N	N	Below Background
Soil	0-2	Nitrate-N		Y	
Soil	0-2	Octachlorodibenzofuran	N	N	Below Background
Soil	0-2	Octachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-2	Pentachlorodibenzofurans	N	N	Below Background
Soil	0-2	Pentachlorodibenzo-p-dioxins	N	N	Below Background
Soil	0-2	Phenanthrene		Y	
Soil	0-2	Pyrene		Y	
Soil	0-2	Selenium	N	N	Below Background
Soil	0-2	Silver	N	N	Below Background
Soil	0-2	Tetrachlorodibenzofurans	N	N	Below Background
Soil	0-2	Tetrachlorodibenzo-p-dioxins	N	N	Below Background
Soil	0-2	Thallium	N	N	Below Background
Soil	0-2	Vanadium	N	N	Below Background
Soil	0-2	Zinc	N	N	Below Background
Soil	0-2	Zirconium	N	N	Below Background
Soil	0-10	1,2,3,4,6,7,8-Heptachlorodibenzofuran	N	N	Below Background
Soil	0-10	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-10	1,2,3,4,7,8,9-Heptachlorodibenzofuran	N	N	Below Background
Soil	0-10	1,2,3,4,7,8-Hexachlorodibenzofuran	N	N	Below Background
Soil	0-10	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-10	1,2,3,6,7,8-Hexachlorodibenzofuran	N	N	Below Background
Soil	0-10	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-10	1,2,3,7,8,9-Hexachlorodibenzofuran	N	N	Below Background
Soil	0-10	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-10	1,2,3,7,8-Pentachlorodibenzofuran	N	N	Below Background
Soil	0-10	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-10	1-Methyl naphthalene		Y	
Soil	0-10	2,3,4,6,7,8-Hexachlorodibenzofuran	N	N	Below Background
Soil	0-10	2,3,4,7,8-Pentachlorodibenzofuran	N	N	Below Background
Soil	0-10	2,3,7,8-Tetrachlorodibenzofuran	N	N	Below Background
Soil	0-10	2-Methylnaphthalene		Y	
Soil	0-10	Acetone		Y	
Soil	0-10	Aluminum	Y	Y	
Soil	0-10	Anthracene		Y	
Soil	0-10	Antimony	N	N	Below Background
Soil	0-10	Arsenic	N	N	Below Background
Soil	0-10	Barium	N	N	Below Background
Soil	0-10	Benzo(a)anthracene		Y	
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	Boron	N	N	Below Background
Soil	0-10	Butyl benzyl phthalate		Y	
Soil	0-10	Cadmium	N	N	Below Background
Soil	0-10	Chromium	N	N	Below Background
Soil	0-10	Chrysene		Y	
Soil	0-10	Cobalt	Y	Y	
Soil	0-10	Copper	N	N	Below Background
Soil	0-10	Diesel Range Organics (C12-C14)		N	See BTEX, PAHs

Table N.4-1
Chemicals of Potential Concern for Human Health
Building 100 Trench RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-10	Diesel Range Organics (C15-C20)		N	See BTEX, PAHs
Soil	0-10	Diesel Range Organics (C20-C30)		N	See BTEX, PAHs
Soil	0-10	Diesel Range Organics (C21-C30)		N	See BTEX, PAHs
Soil	0-10	Diesel Range Organics (C8-C11)		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	DioxinFuran_TEQ_Mammal		Y	
Soil	0-10	Fluoranthene		Y	
Soil	0-10	Fluorene		Y	
Soil	0-10	Fluoride		Y	
Soil	0-10	Heptachlorodibenzofurans	N	N	Below Background
Soil	0-10	Heptachlorodibenzo-p-dioxins	N	N	Below Background
Soil	0-10	Hexachlorodibenzofurans	N	N	Below Background
Soil	0-10	Hexachlorodibenzo-p-dioxins	N	N	Below Background
Soil	0-10	Hydrocarbons C22-C30		N	See BTEX, PAHs
Soil	0-10	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-10	Iron	N	N	Below Background
Soil	0-10	Lead	N	N	Below Background
Soil	0-10	Lithium	N	N	Below Background
Soil	0-10	Manganese	N	N	Below Background
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	Naphthalene		Y	
Soil	0-10	Nickel	N	N	Below Background
Soil	0-10	Nitrate-N		Y	
Soil	0-10	Octachlorodibenzofuran	N	N	Below Background
Soil	0-10	Octachlorodibenzo-p-dioxin	N	N	Below Background
Soil	0-10	Pentachlorodibenzofurans	N	N	Below Background
Soil	0-10	Pentachlorodibenzo-p-dioxins	N	N	Below Background
Soil	0-10	Phenanthrene		Y	
Soil	0-10	Pyrene		Y	
Soil	0-10	Selenium	N	N	Below Background
Soil	0-10	Silver	N	N	Below Background
Soil	0-10	Tetrachlorodibenzofurans	N	N	Below Background
Soil	0-10	Tetrachlorodibenzo-p-dioxins	N	N	Below Background
Soil	0-10	Thallium	N	N	Below Background
Soil	0-10	Vanadium	N	N	Below Background
Soil	0-10	Zinc	N	N	Below Background
Soil	0-10	Zirconium	N	N	Below Background
Soil Vapor	0-10	No analyses			
Groundwater	-	No analyses			

Table N.4-2
Human Health Risk Estimates[1]
Building 100 Trench 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	0.0000002 - 0.000009		2E-09 - 2E-07		NA - NA		NA - NA		<0.01 - <0.01		2E-09 - 2E-07	
Future Child Recreator	0.000003 - 0.00003		2E-08 - 3E-07		NA - NA		NA - NA		<0.01 - <0.01		2E-08 - 3E-07	
Future Adult Resident	0.01 - 0.03		2E-08 - 2E-07		NA - NA		NA - NA		0.01 - 0.03		4E-08 - 3E-07	
Future Child Resident	0.1 - 0.2		1E-07 - 4E-07		NA - NA		NA - NA		0.1 - 0.3		2E-07 - 4E-07	

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.

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

Table N.4-3
Human Health Risk Assessment Uncertainty Analysis
Building 100 Trench RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
COPC Selection	Several inorganics were selected as COPCs since it could not be demonstrated that they are consistent with background concentrations through the Wilcoxon Rank Sum test. The site data set was small, introducing uncertainty into the comparisons.	Moderate	Conservative
	No VOCs were directly detected in soil vapor. Acetone, methyl ethyl ketone, and naphthalene were 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 20 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 concentration for acetone, methyl ethyl ketone, and naphthalene 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 likelihood 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
	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
Cancer Slope Factor	Extrapolation of dose-response data from laboratory animals to humans.	High	Conservative

Table N.4-3
Human Health Risk Assessment Uncertainty Analysis
Building 100 Trench RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Cancer Slope Factor	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 N.4-4
Chemicals of Ecological Concern - Soil
Building 100 Trench RFI Site

	Range of HQs - RME Exposure (Refined Calculations)														Identification of COECs	
Preferred Analyte Name	**Terrestrial Plant**	**Soil Invertebrate**	**Hermit Thrush**	**Red-Tailed Hawk**	**Deer Mouse**	**Bobcat**	**Mule Deer**	**Terrestrial Plants**	**Soil Invertebrates**	**Hermit Thrush**	**Red-Tailed Hawk**	**Deer Mouse**	**Bobcat**	**Mule Deer**	**COEC**	**Rationale**
Aluminum	Not CPEC	Not CPEC	Not CPEC -- Not CPEC	Not CPEC -- Not CPEC	**109 -- 1093**	Not CPEC -- Not CPEC	Not CPEC -- Not CPEC	--	--	-- -- --	-- -- --	**18 -- 179**	-- -- --	-- -- --	No	-Aluminum is only considered a COEC if site pH is >5.5. -Site pH for Building 100 Trench ranges from 6.02 to 8.6 with an average pH of 7.64.
Lead	**6.6**	<1	**18.1** -- 11303	<1 -- **3.6**	<1 -- **110**	<1 -- <1	<1 -- **2.0**	**6.4**	<1	**17.7 -- 11033**	<1 -- **2.9**	<1 -- **104**	<1 -- <1	<1 -- **2.0**	**Yes (hot spot)**	-Lead exceeded background at only two locations (BHTS26 = 2550 mg/kg and BHTS51S08 = 50.35 mg/kg). -Estimated risks driven by high detect at BHTS26.
2,4-Dinitrophenol	Not CPEC	Not CPEC	Not CPEC -- Not CPEC	Not CPEC -- Not CPEC	<1 -- **13**	Not CPEC -- Not CPEC	Not CPEC -- Not CPEC	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	No	-Chemical was never detected. -It was retained through the SQL Comparison step for CPEC selection. -No other analytes in the same chemical class showed HQs>1. -Actual presence and concentration is uncertain, but it is unlikely that it is present at the SQL.

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
HI - hazard index
HQ - hazard quotient
RME - reasonable maximum exposure
TRV - toxicity reference value

Table N.4-5
Chemicals of Ecological Concern - Soil Vapor
Building 100 Trench RFI Site

Preferred Analyte Name	Inhalation of Soil Vapor (Deer Mouse)	Identification of COECs	
		COEC	Rationale
1,1,2-Trichloroethane	**18**	No	-Analyte was not detected in any samples collected from either soil or soil vapor. -It was retained for evaluation because SQL>ESL. -ESL and TRV are same value and have uncertainty regarding their derivation. -Risk estimates for other VOCs detected on site were <1. -Not likely that the analyte is present at levels of ecological concern.

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 N.4-6
Ecological Risk Assessment Uncertainty Analysis
Building 100 Trench 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

Table N.4-6
Ecological Risk Assessment Uncertainty Analysis
Building 100 Trench RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
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
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	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 N.4-6
Ecological Risk Assessment Uncertainty Analysis
Building 100 Trench 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 N.4-6
Ecological Risk Assessment Uncertainty Analysis
Building 100 Trench 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 N.5-1
Suficial Media Site Action Recommendations
Building 100 Trench RFI Site

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	Bldg 100 Trench	B100-1	HRA COC:	No HRA COCs identified	***Soil Results***		
2	Building 100 Area - Potential Source of VOCs and Dioxins	NFA			Any HQ>1?	COEC?	Rationale
			Soil Results:		Aluminum	No	ERA-1
3a	Hummocky Area - Western	NFA	Lead		Lead	Yes	ERA-2
3b	Hummocky Area - Northern	NFA			2,4-Dintrophenol	No	ERA-3
4	Bldg 100 Leach Field	NFA			***Soil Vapor Results***		
5	Bldg 4463	Moved to DOE LF3			Any HQ>1?	COEC?	Rationale
6	Transformer 4800 (4710)	NFA			1,1,2-Trichloroethane	No	ERA-3

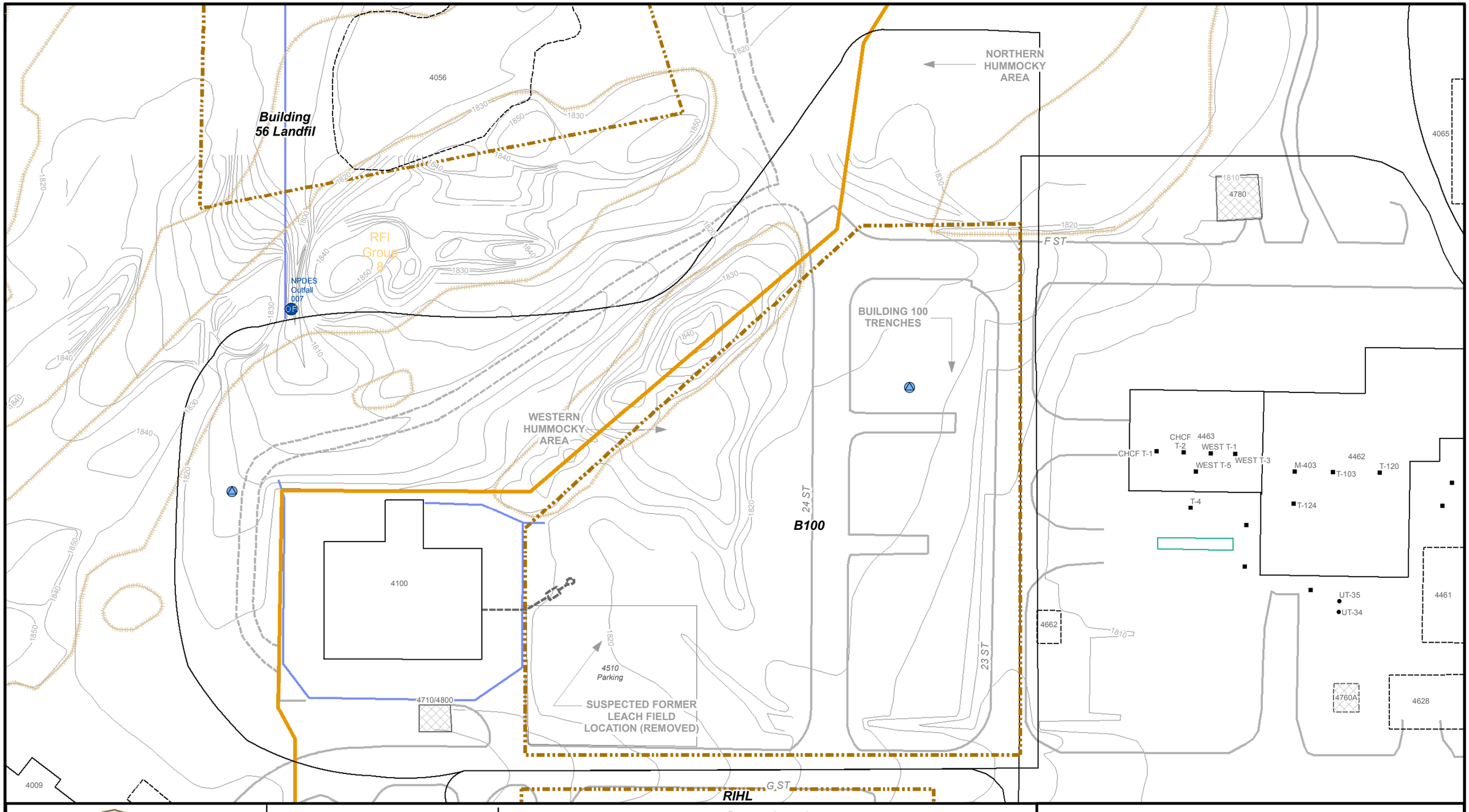
Notes:
1. NFA - Indicates area is recommended for No Further Action (NFA) for the CUA; not recommended for CMS evaluation.
2. CMS recommendations are based on compounds considered risk drivers (excess cancer risk > 1 x 10-6 or hazard index > 1) and/or significant risk contributors.

ERA-1 USEPA guidance indicates no risk from aluminum when pH is greater than 5.5. Site pH >5.5.
ERA-2 Lead exceeded background at only two locations (BHTS26 = 2550 mg/kg and BHTS51S08 = 50.35 mg/kg).
ERA-3 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.

Table N.5-2
Summary of Site Surficial Media CMS Recommendations
Building 100 Trench RFI Site

CMS Area	Description	Chemical Risk Drivers and Contributors	Rationale
B100-1	Area situated approximately 20 feet south of the former trench area	Lead in soil	Human health and ecological health effect values driven by one sample collected at 1 to 1.5 feet bgs south of the former trench area.

Figures



Basemap Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Extraction Well
- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Leachfield
- 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
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Pipe

Site Location
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 03, 2008

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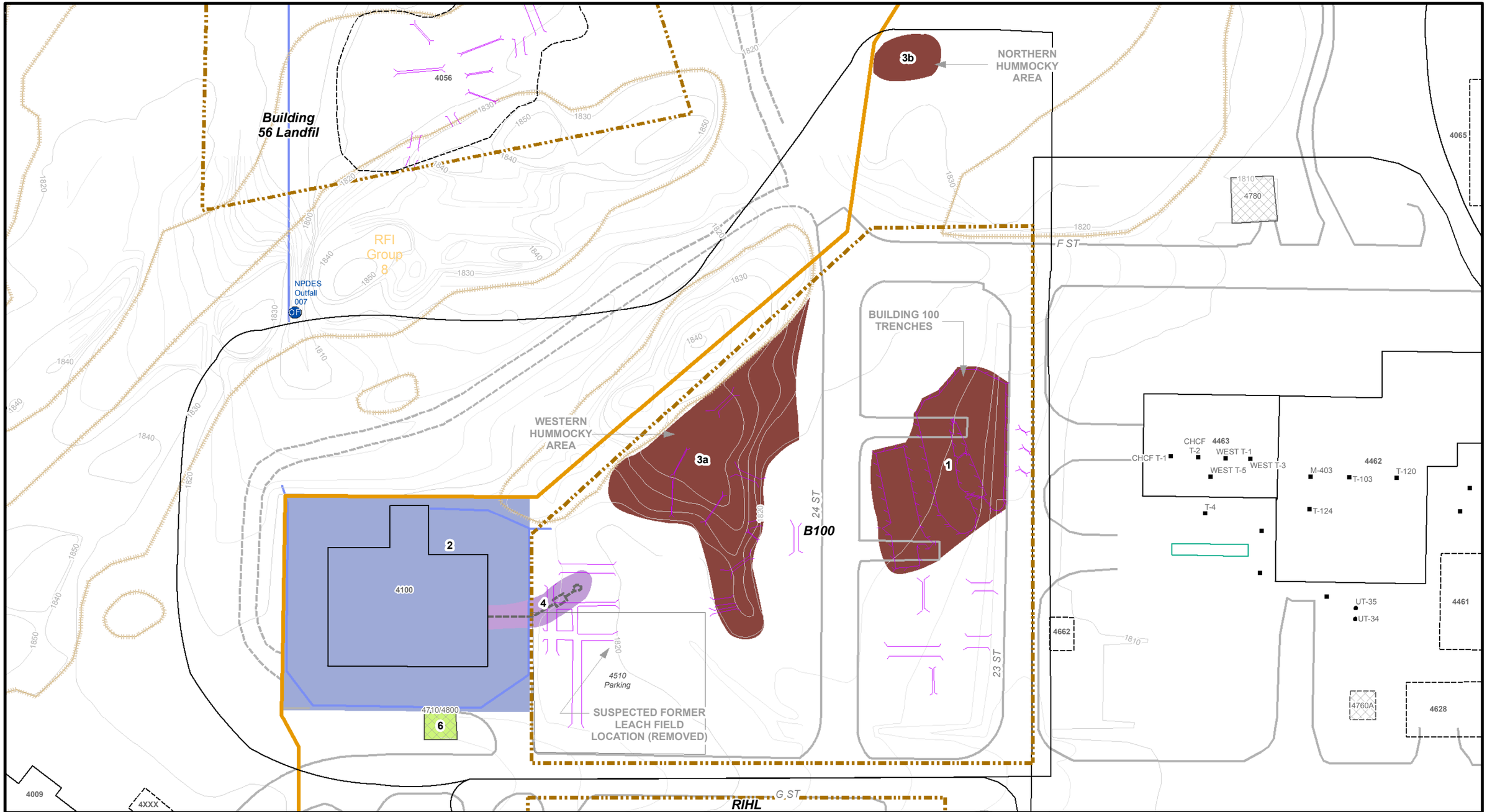
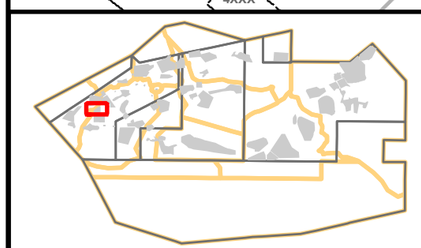
\\...MapFiles\RFI_05\RFI_Report\RFIGrp5_SiteLoc_BL_PLTS.mxd

WORKING DRAFT

FIGURE N.1-1





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
- Excavation
- Trench
- 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
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Waste Debris Area

Chemical Use Areas
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

June 24, 2008

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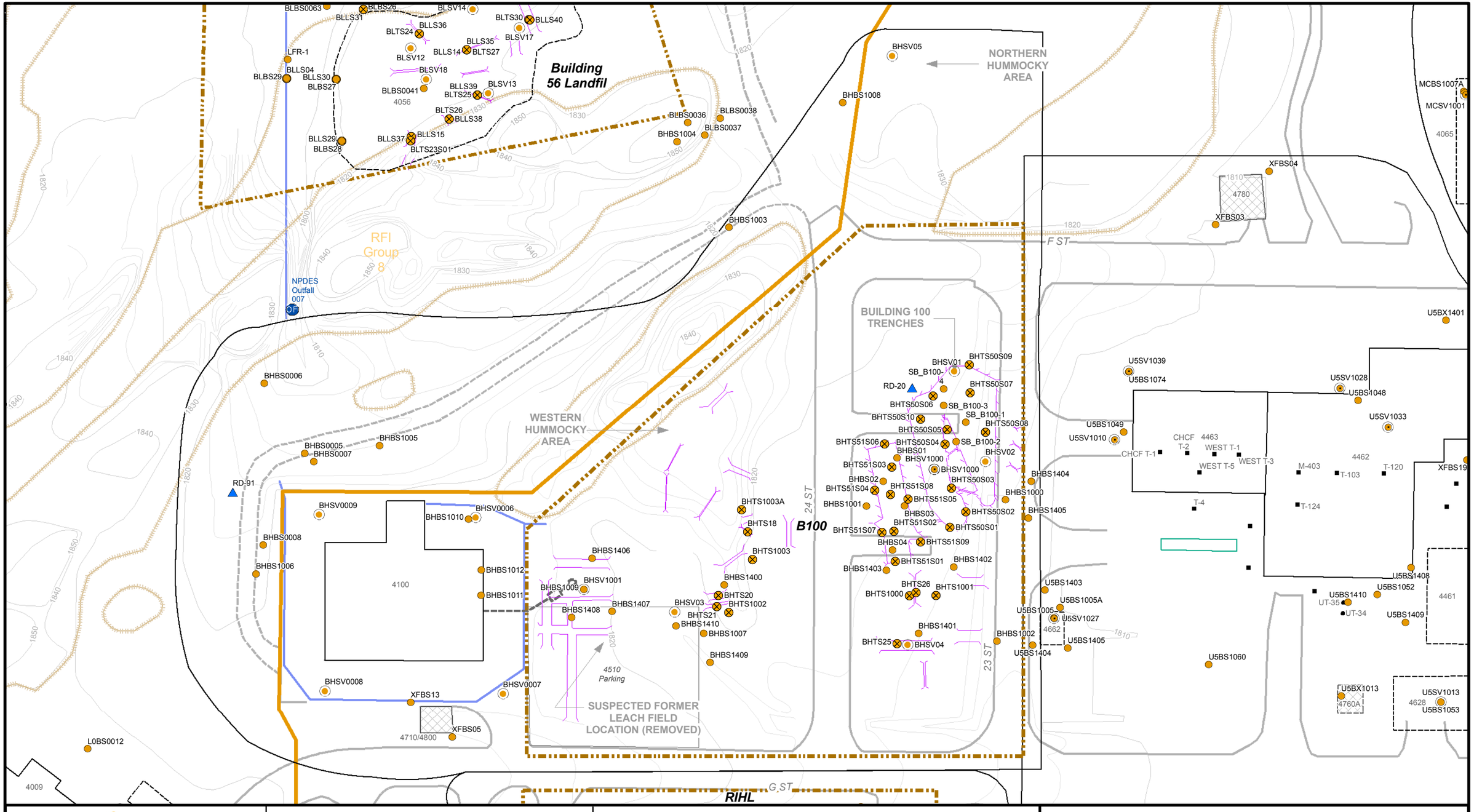
WORKING DRAFT

FIGURE N.2-1



Sample Type

Basemap Legend

Sample Locations
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 04, 2008

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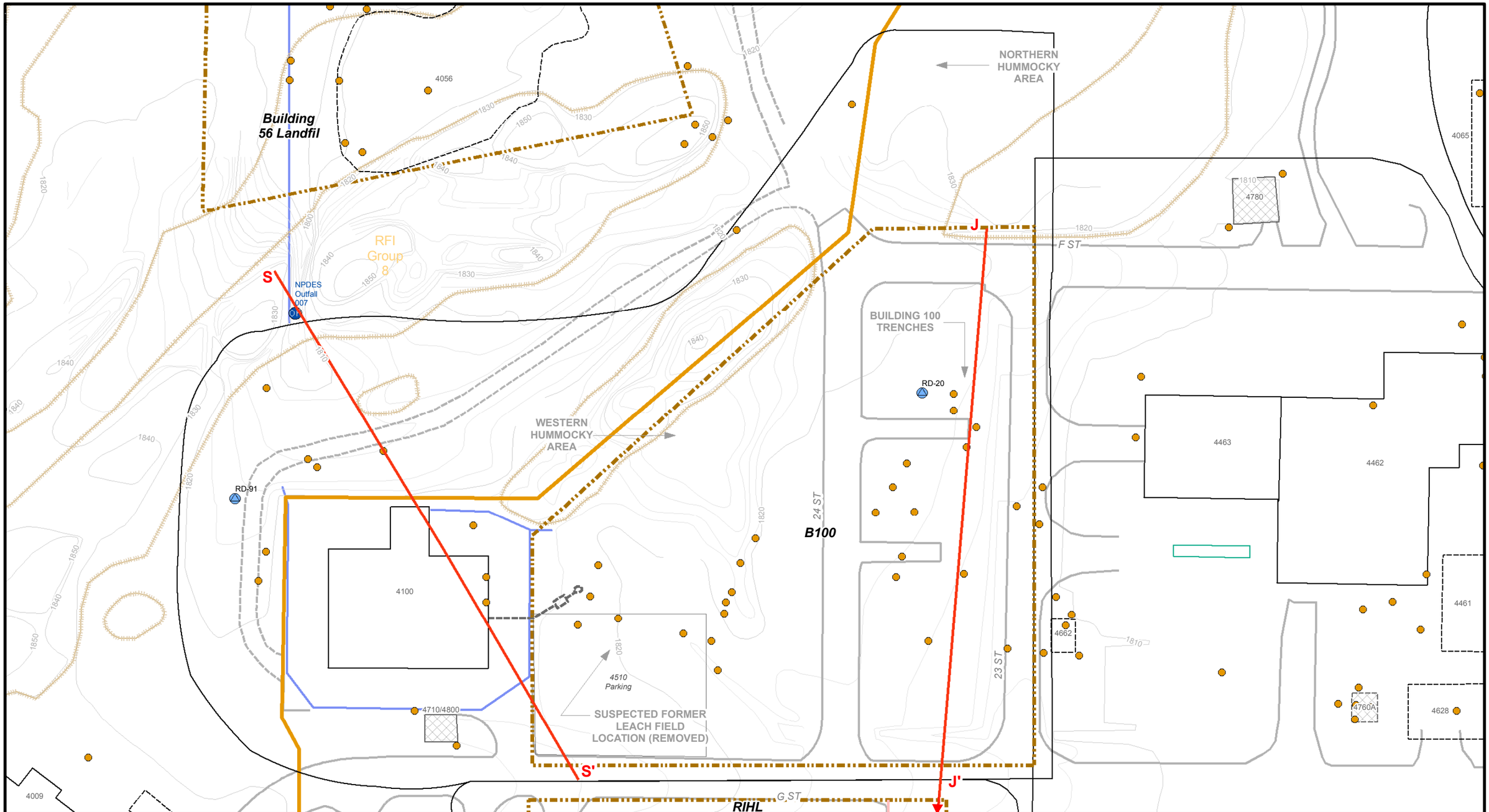
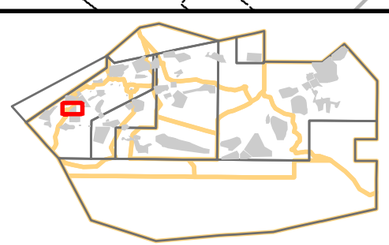
WORKING DRAFT

FIGURE N.2-2





Cross-section Line

- Soil Boring
- Confirmation Sample
- Groundwater Monitoring Well
- Piezometer
- Groundwater Extraction Well
- Abandoned Groundwater Monitoring Well

Basemap Legend

- 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
- Leachfield
- Pipe

Building 100 Trench Cross Section Locations

Z-Z'

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 04, 2008

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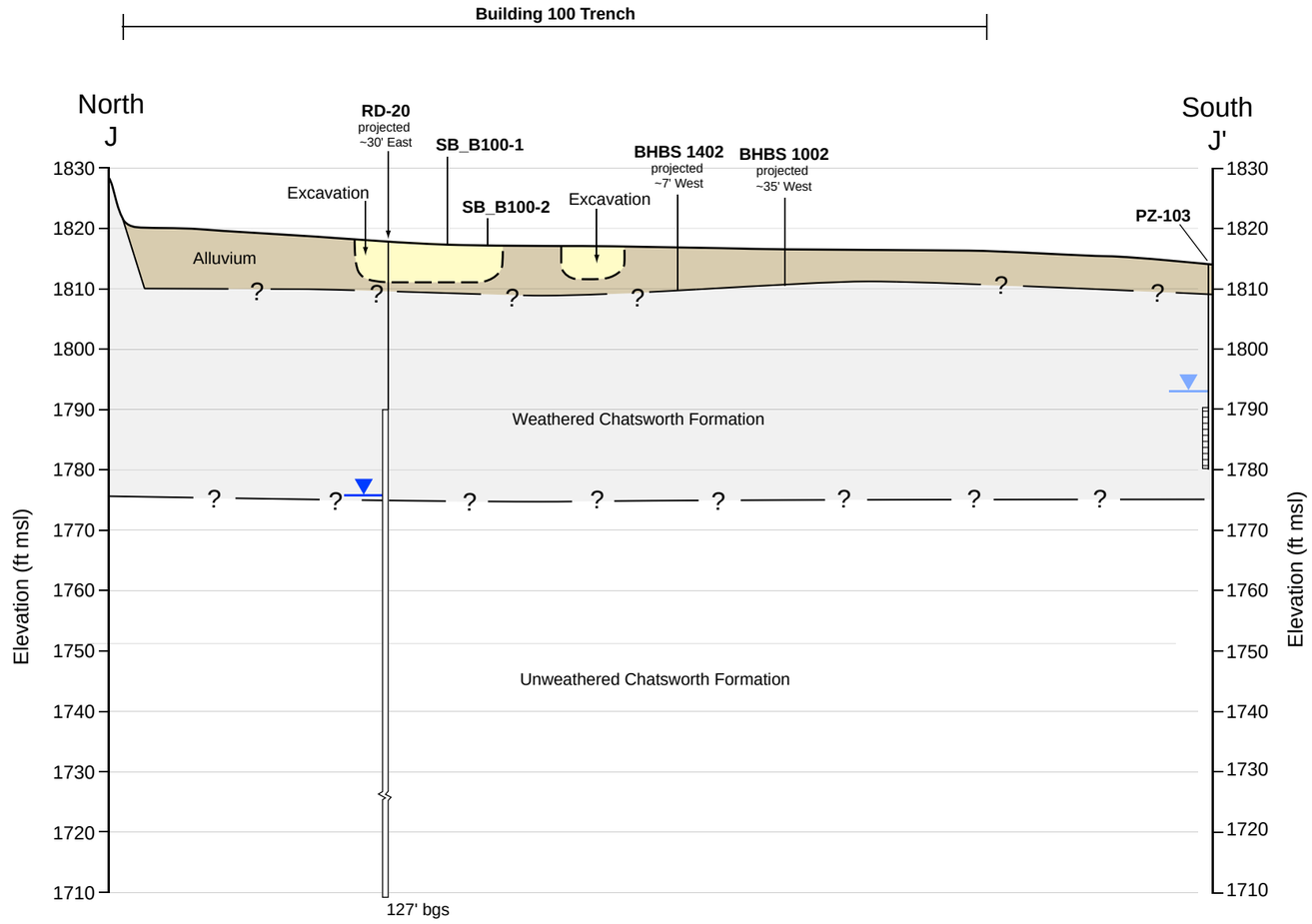
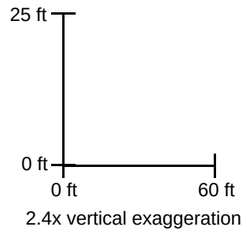
WORKING DRAFT

FIGURE N.2-3A





LEGEND

- Open hole interval for monitoring well
- Fill
- Alluvium
- Weathered Chatsworth Formation
- Unweathered Chatsworth Formation
- 600 Current or former building location
- Near-Surface Groundwater Elevation
- Chatsworth Formation Groundwater Elevation

NOTES:

ft msl = feet above mean sea level

FIGURE N.2-3B
Surficial Cross Section J-J'
Building 100 Trench
Santa Susana Field Laboratory

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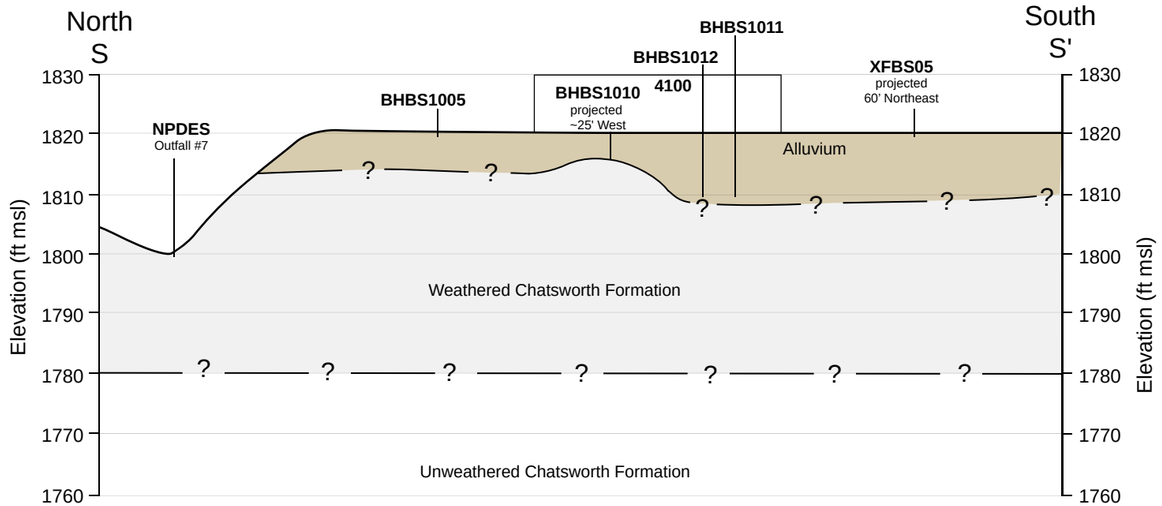
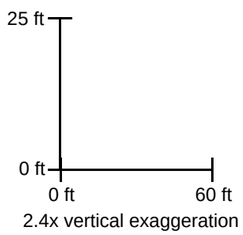




LEGEND

- Screen interval for monitoring well or piezometer
- Alluvium
- Weathered Chatsworth Formation
- Unweathered Chatsworth Formation
- 600 Current or former building location

NOTES:

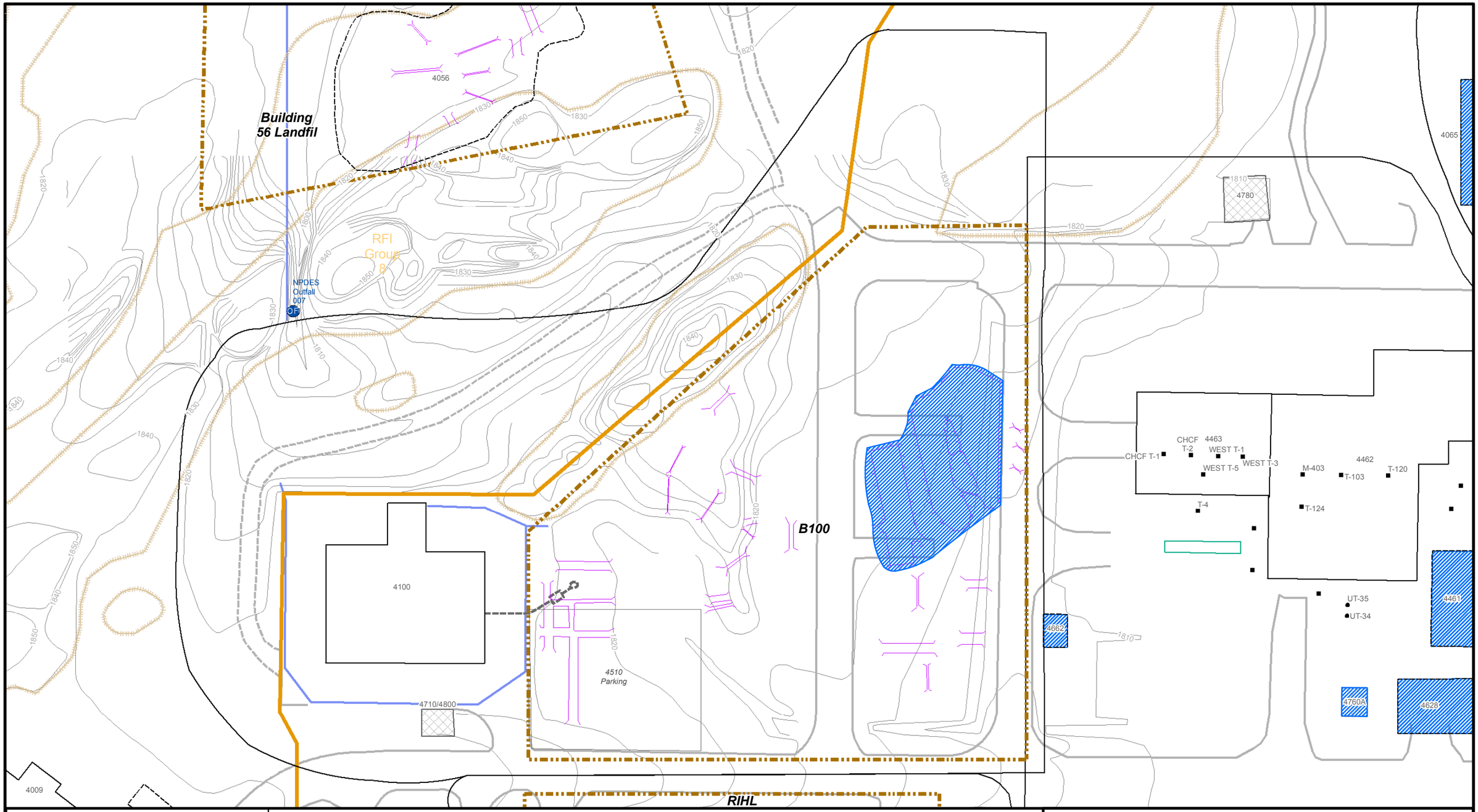
ft msl = feet above mean sea level

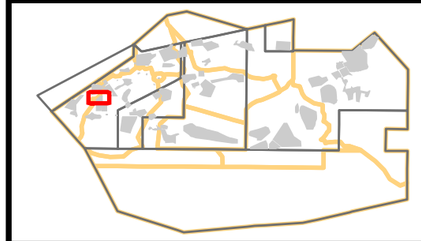
NPDES = National Pollutant Discharge Eliminiation System

FIGURE N.2-3C
Surficial Cross Section S-S'
Building 100 Trench
Santa Susana Field Laboratory

CH2MHILL

ES072007017SCO362070.FP.5A.05.BO CrossSect_SS.ai 9/08





Approximate Areas of Soil Disturbance

- Grading
- Excavation - Backfill

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Leachfield
- Excavation
- Trench
- 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
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Pipe

Soil Disturbance Areas
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 06, 2008

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WORKING DRAFT

FIGURE N.2-4

Building 56 Landfil

RFI Group 8

NPDES Outfall 007

B100

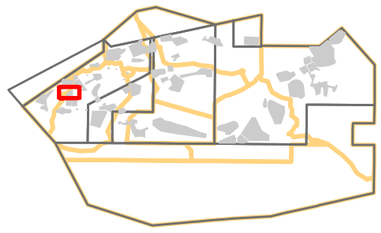
4510 Parking

RIHL

4056
4100
4710/4800
4009
4065
4780
4463
4462
4461
4662
4760A
4628

CHCF T-1
CHCF T-2
WEST T-1
WEST T-3
WEST T-5
M-403
T-103
T-120
T-4
T-124
UT-35
UT-34

1810
1820
1830
1840
1850
1800



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
- 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
- Trench

VOCs in Soil Vapor
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 03, 2008

CH2MHILL

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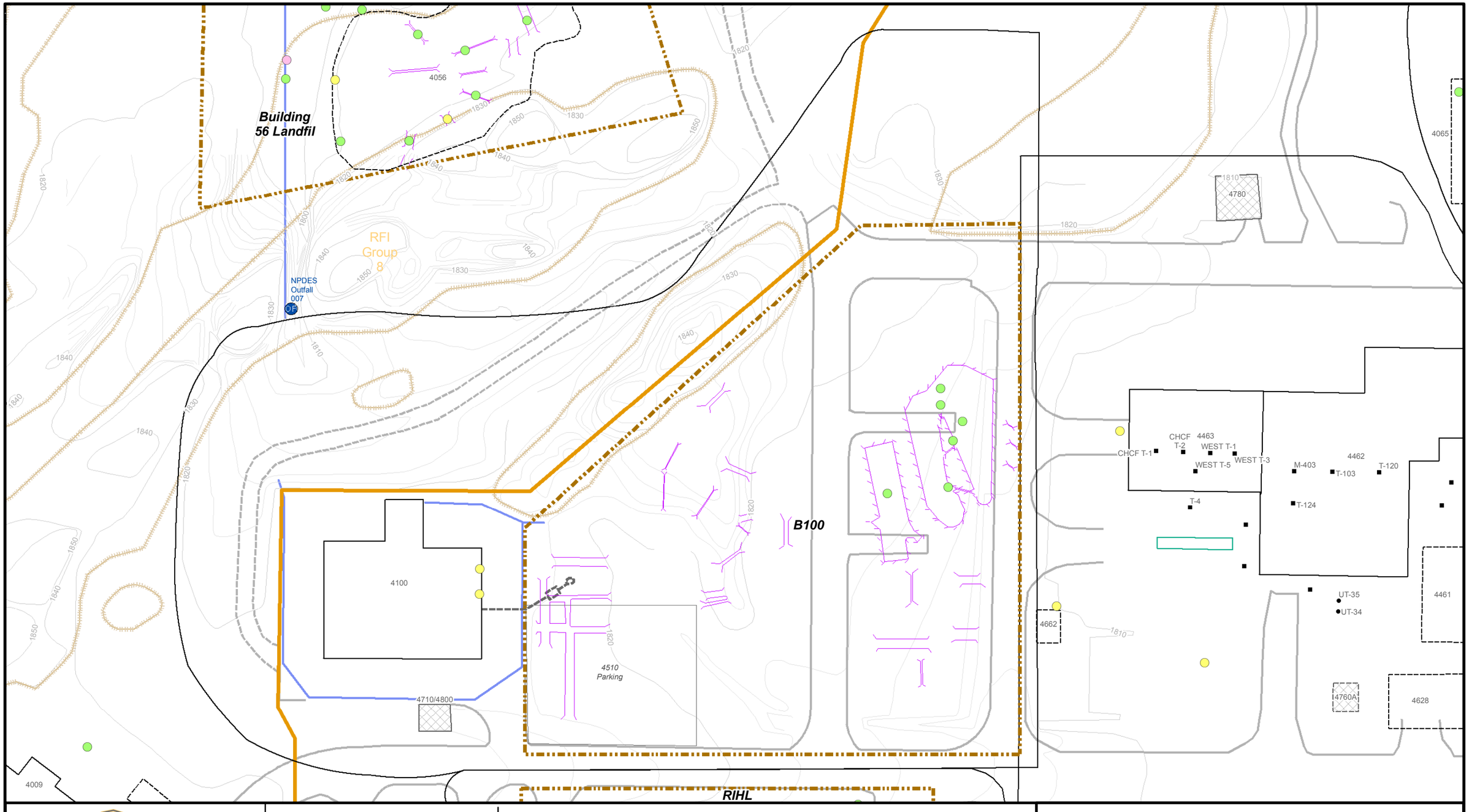
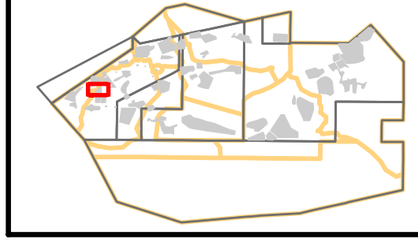
WORKING DRAFT

FIGURE N.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
- 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

VOCs in Soil
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

October 31, 2008

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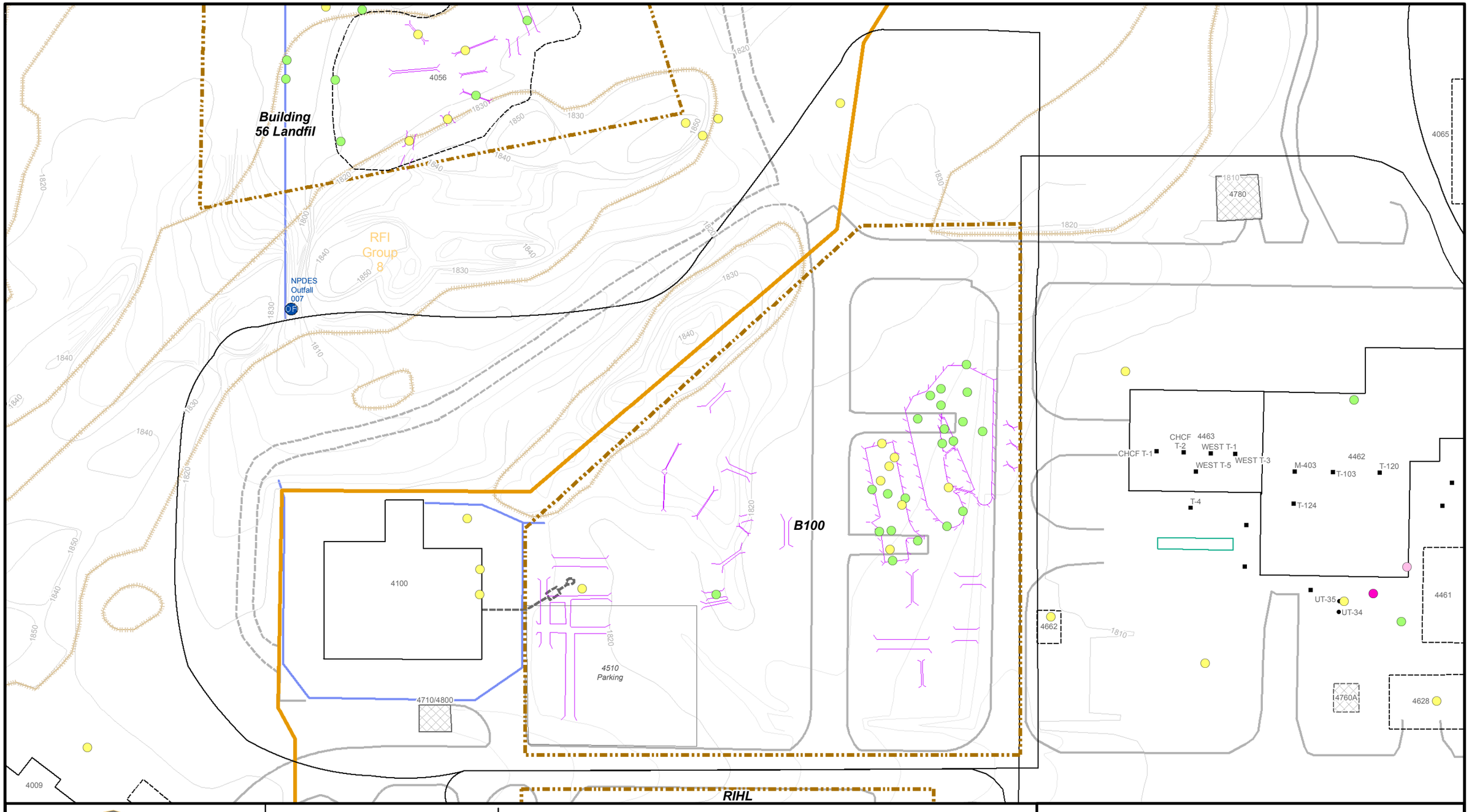
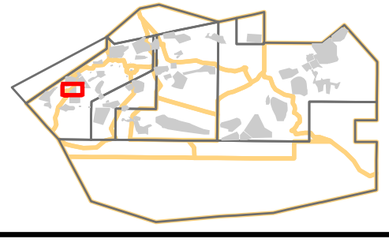
WORKING DRAFT

FIGURE N.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
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

Feet

60 120

November 04, 2008

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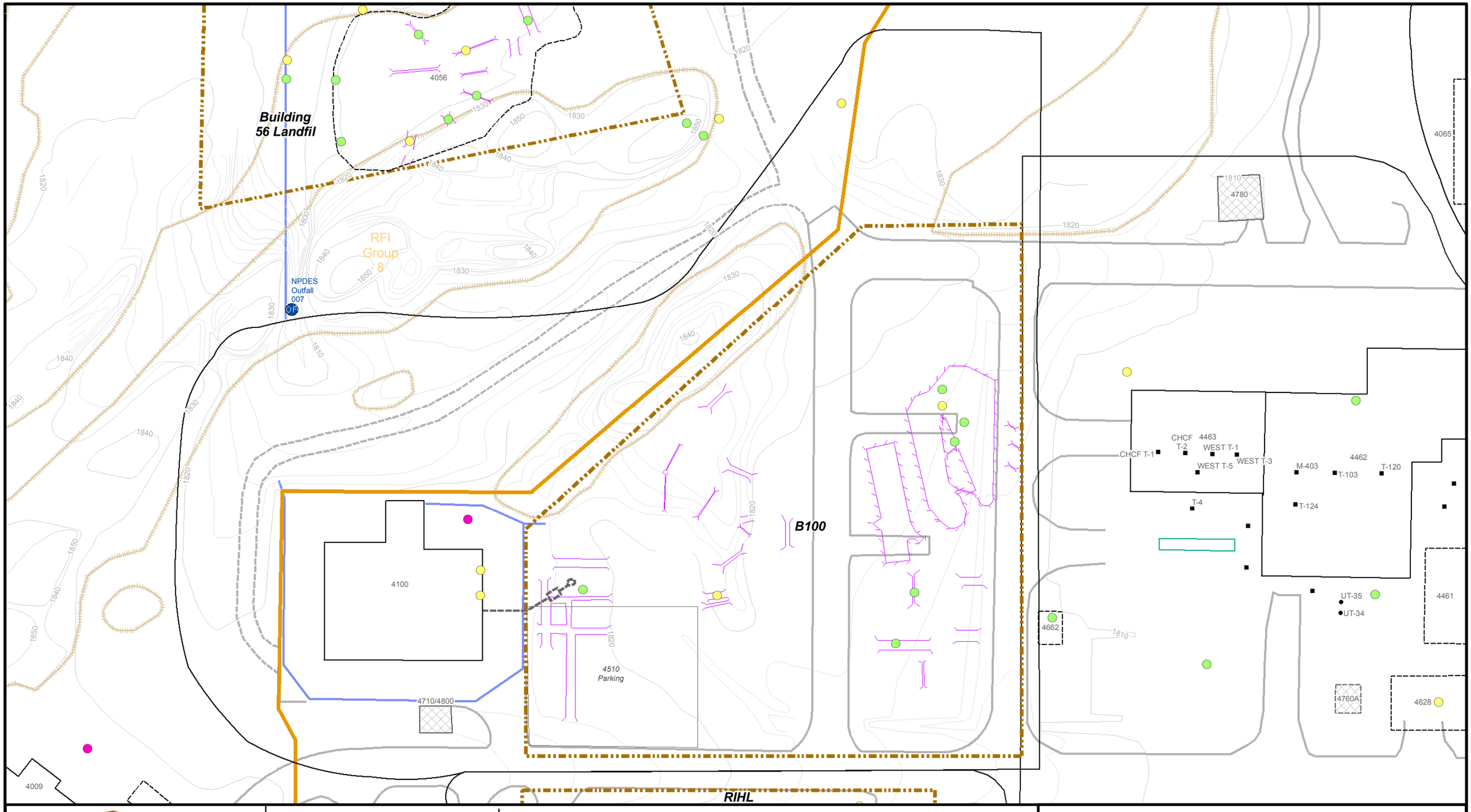
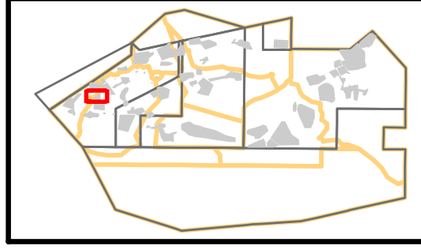
WORKING DRAFT

FIGURE N.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
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

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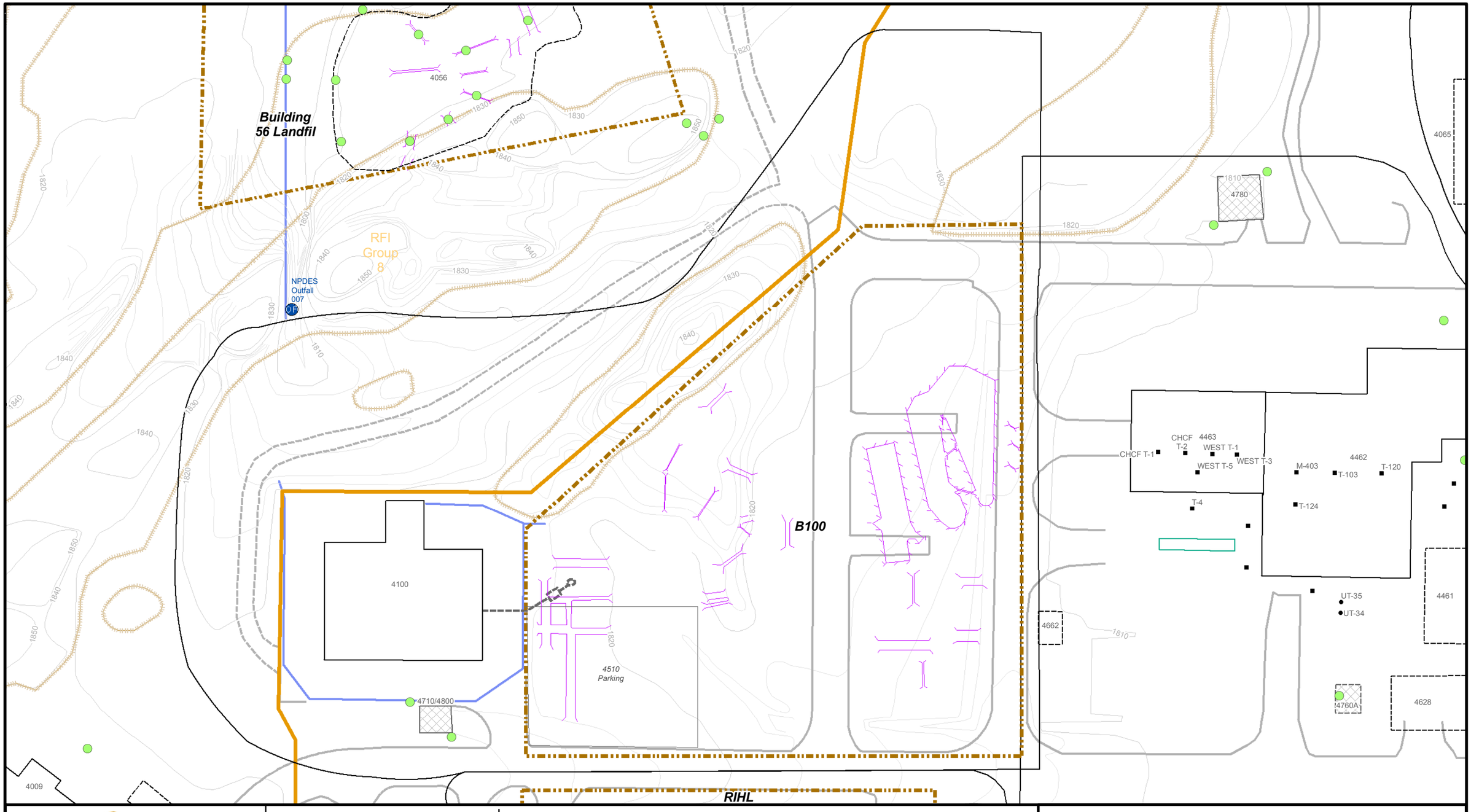
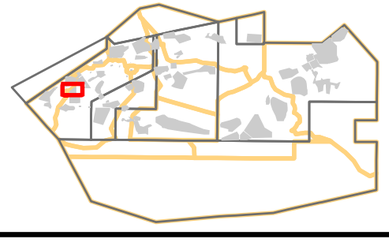
WORKING DRAFT

FIGURE N.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
- 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

PCBs in Soil
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 04, 2008

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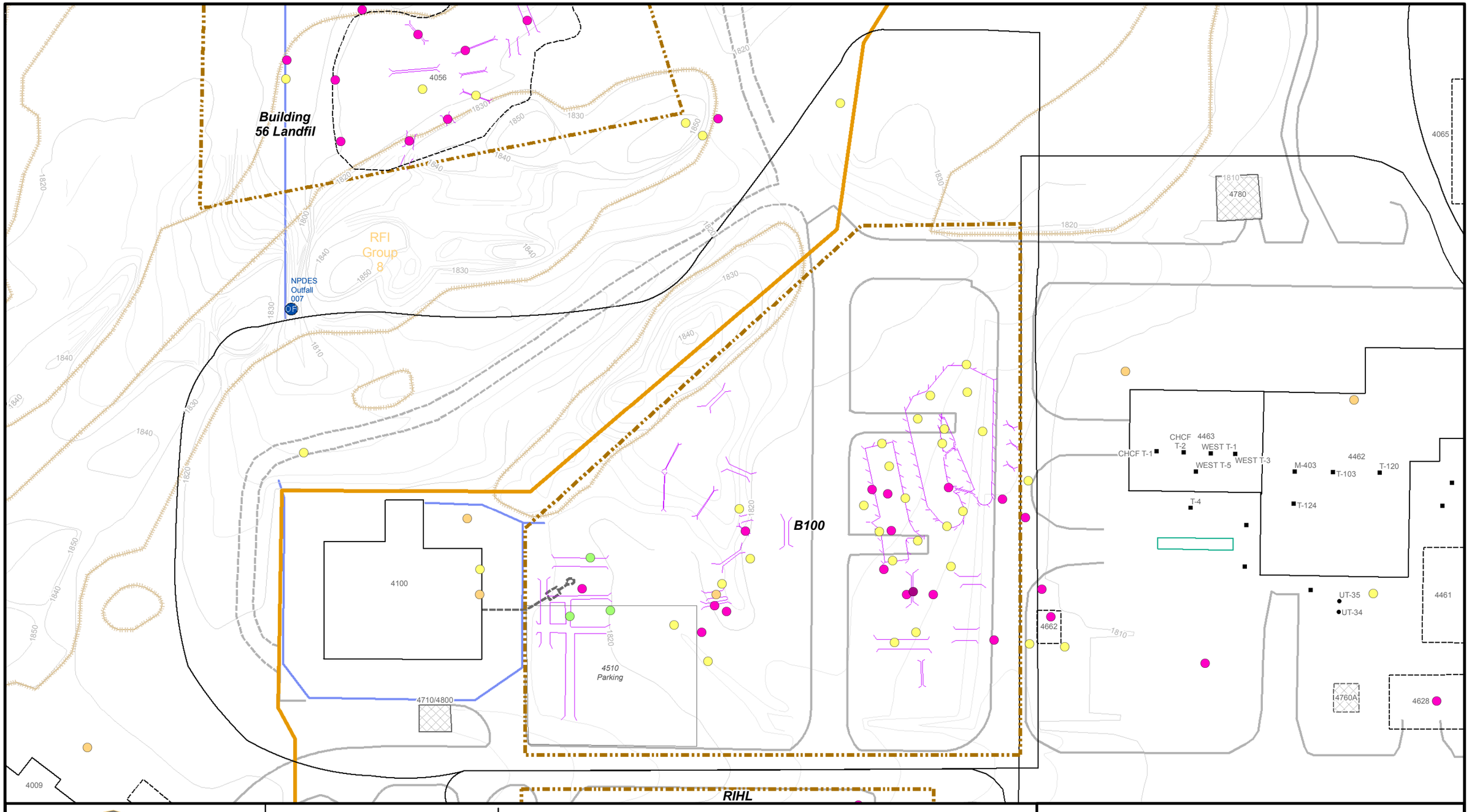
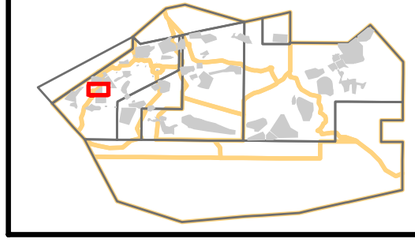
WORKING DRAFT

FIGURE N.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
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 04, 2008

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WORKING DRAFT

FIGURE N.3-5

Building 56 Landfil

RFI Group 8

NPDES Outfall 007

NORTHERN HUMMOCKY AREA

WESTERN HUMMOCKY AREA

BUILDING 100 TRENCHES

B100

4510 Parking

SUSPECTED FORMER LEACH FIELD LOCATION (REMOVED)

RIHL

F ST

G ST

24 ST

23 ST

4056 4065 4100 4710/4800 4780 4009 4662 4760A 4628 4461

CHCF T-1 CHCF T-2 4463 WEST T-1 WEST T-3 WEST T-5 M-403 4462 T-120 T-103 T-4 T-124 UT-35 UT-34

1810 1820 1830 1840 1850

Dioxins in Soil

- Exceeds Background + Residential RBSL + Eco RBSL
- Exceeds Background + Eco RBSL
- Exceeds Background + Residential RBSL
- Exceeds Background
- Detect, 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

Dioxins in Soil
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 04, 2008

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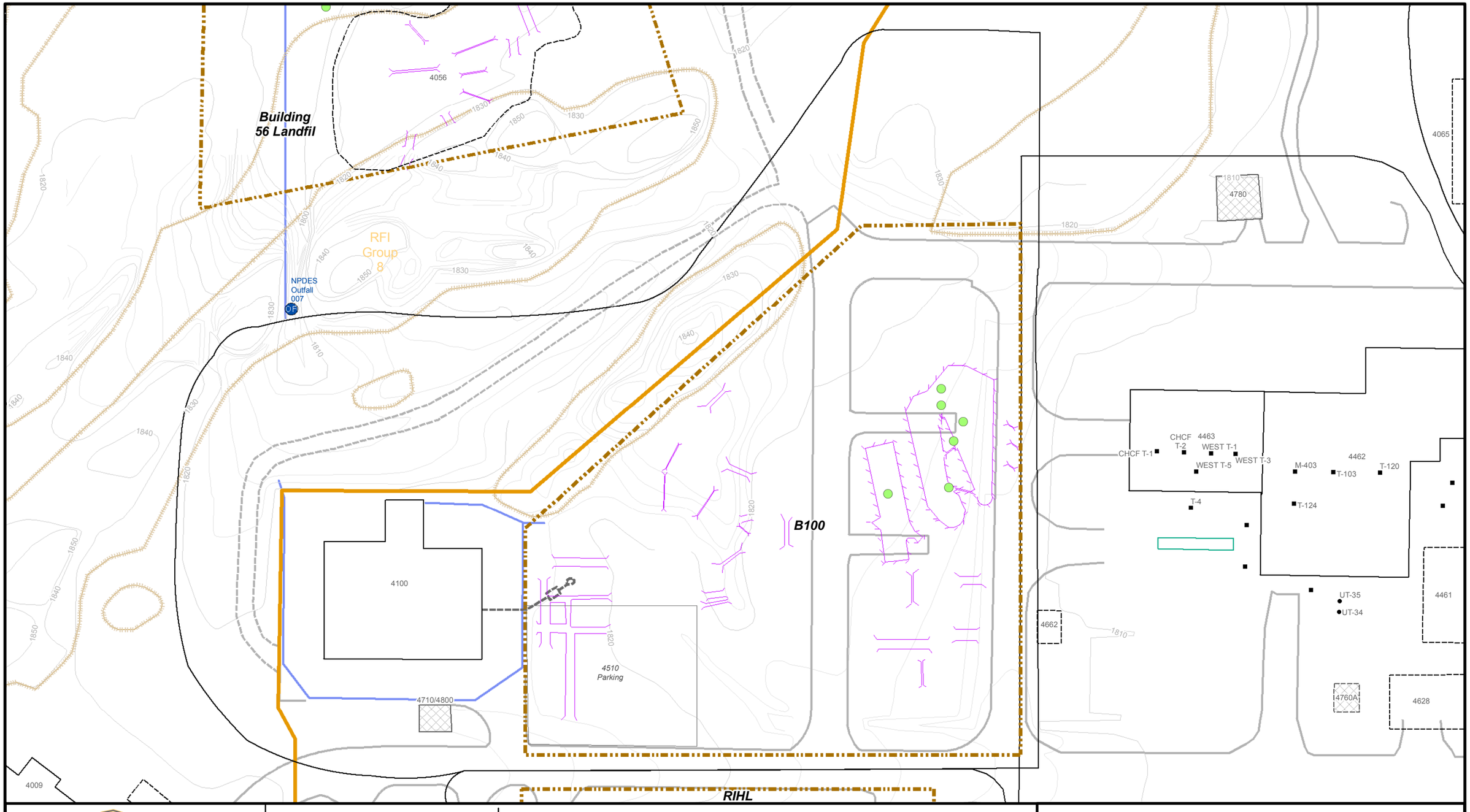
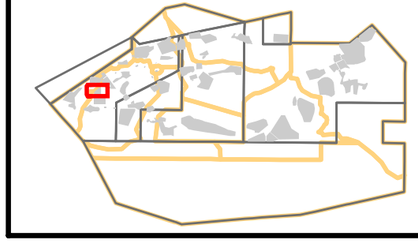
FIGURE N.3-6





Energetics in Soil

- 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

Energetics in Soil
Building 100 Trench RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 04, 2008

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WORKING DRAFT

FIGURE N.3-7

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
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

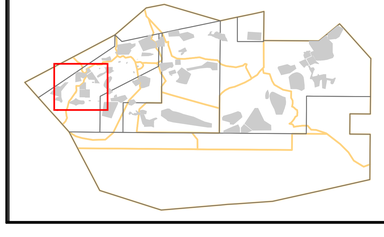
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area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

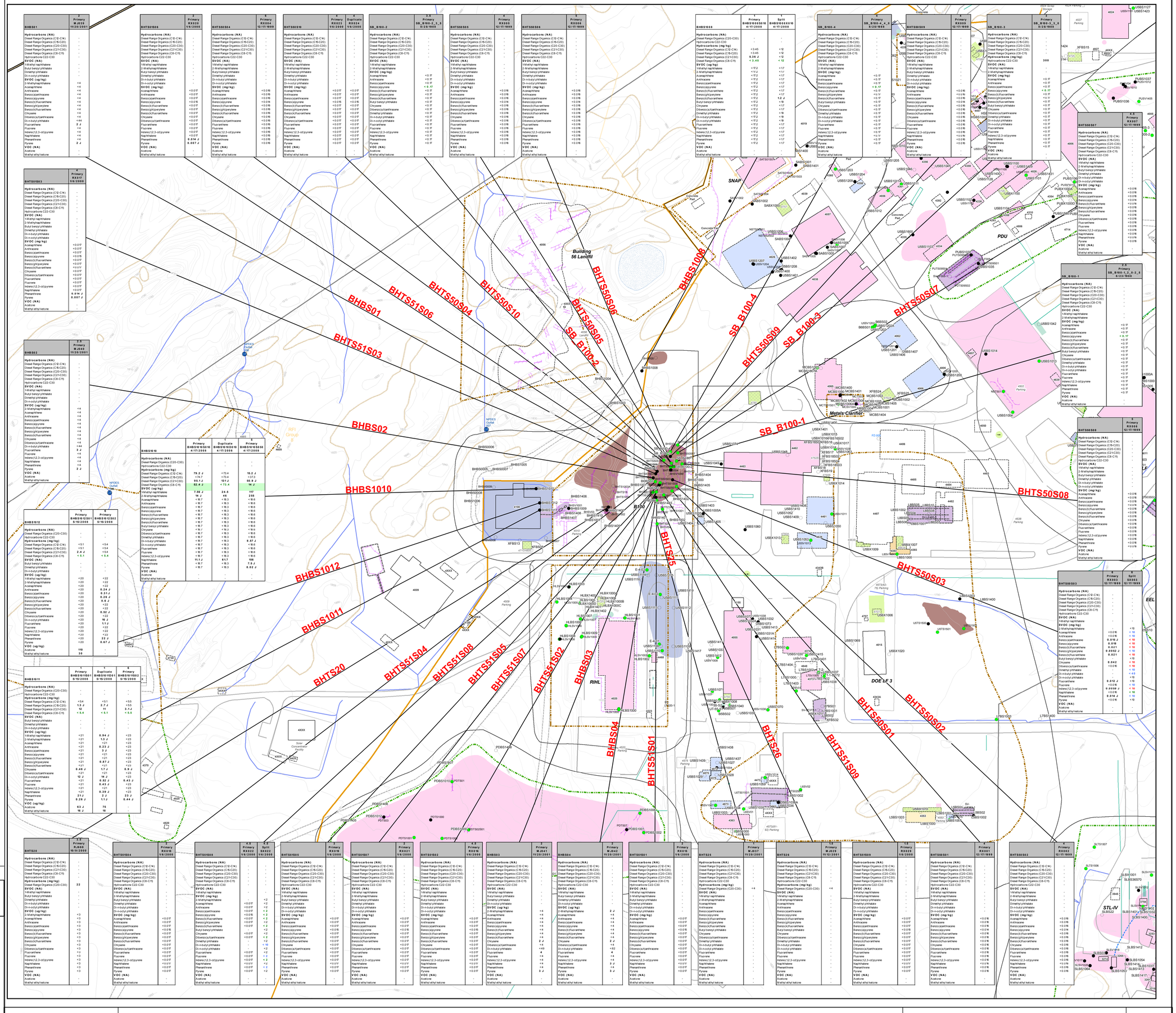
\\MapFiles\RFI_05\RFI_Report\SpiderDiagram\RFIGrp5_SpiderDiagram_EL.mxd

0 75 150

1 inch equals 75 feet

Feet





SANTA SUSANA FIELD LABORATORY

CH2MHILL

VOCs, SVOCs, and TPH Data Results B 100 Trench RFI Site

FIGURE N.3-8

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

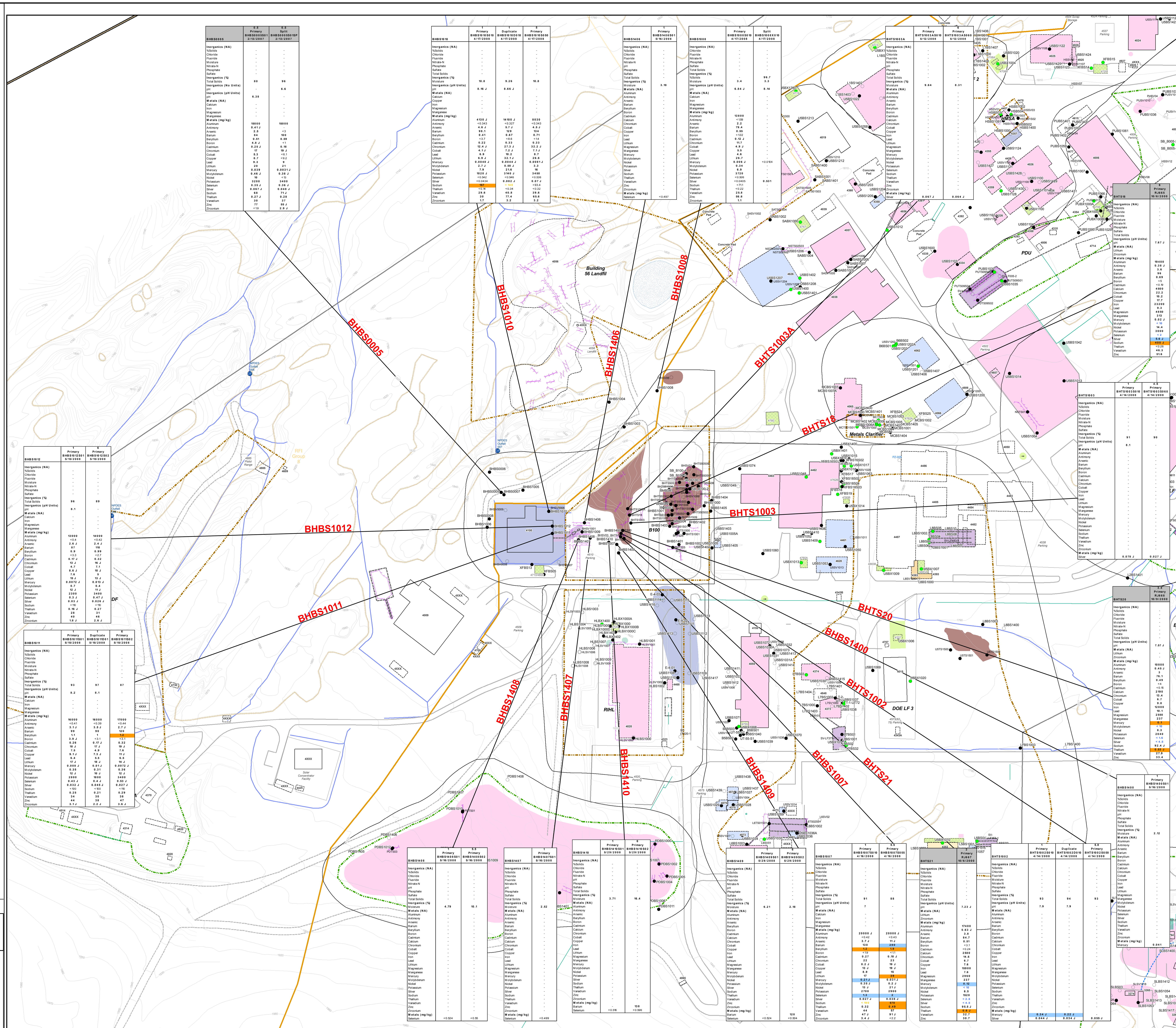
= Pre-2008 Data

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

1 inch equals 75 feet — 0 75 150 Feet



BHBS0005	0.5 Primary BHBS0005S01 2/13/2007	0.5 Split BHBS0005S01SP 2/13/2007
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Nitrate-N	-	-
Phosphate	-	-
Sulfate	-	-
Inorganics (%)		
Total Solids	80	96
Inorganics (No Units)		
pH	-	6.6
Inorganics (pH Units)		
pH	6.38	-
Metals (NA)		
Calcium	-	-
Iron	-	-
Magnesium	-	-
Manganese	-	-
Metals (mg/kg)		
Aluminum	15000	15000
Antimony	0.41 J	-
Arsenic	2.5	<3
Barium	84	100
Beryllium	0.51	0.59
Boron	4.8 J	<1
Cadmium	0.25 J	0.18
Chromium	17	19 J
Cobalt	5.3	<6.1
Copper	8.7	<9.2
Lead	9.3	9
Lithium	20	21
Mercury	0.039	0.0031 J
Molybdenum	0.46 J	0.38 J
Nickel	10	<13
Potassium	3200	3400
Selenium	0.35 J	0.36 J
Silver	0.067 J	0.048 J
Sodium	68	71 J
Thallium	0.27 J	0.28
Vanadium	30	37
Zinc	77	55 J
Zirconium	<1.9	2.9 J

BHBS1010	1 Primary BHBS1010S010 4/17/2008	1 Duplicate BHBS1010D010 4/17/2008	5 Primary BHBS1010S050 4/17/2008
Inorganics (NA)			
%Solids	-	-	-
Chloride	-	-	-
Fluoride	-	-	-
Nitrate-N	-	-	-
Phosphate	-	-	-
Sulfate	-	-	-
Total Solids	-	-	-
Inorganics (%)			
Moisture	10.8	9.26	10.8
Inorganics (pH Units)			
pH	8.16 J	8.66 J	-
Metals (NA)			
Calcium	-	-	-
Copper	-	-	-
Iron	-	-	-
Magnesium	-	-	-
Manganese	-	-	-
Metals (mg/kg)			
Aluminum	4130 J	14100 J	8030
Antimony	<0.343	<0.327	<0.343
Arsenic	4.6 J	5.7 J	4.5 J
Barium	98.1	129	134
Beryllium	0.41	0.67	0.71
Boron	<3.7	<8.6	<14
Cadmium	0.22	0.33	0.33
Chromium	12.4 J	27.3 J	32.2 J
Cobalt	4.1 J	7.2 J	7.1 J
Lead	6.9	10.2	8.7
Lithium	6.9 J	32.1 J	26.6
Mercury	0.0048 J	0.0044 J	0.0081 J
Molybdenum	2.7 J	0.58 J	3.3
Nickel	7.9	21.6	16
Potassium	1020 J	3140 J	3450
Selenium	<0.542	<0.546	<0.536
Silver	<0.0434	0.082 J	0.07 J
Sodium	157	<140	<93.4
Thallium	<0.14	<0.34	<0.32
Vanadium	29.6	40.8	39.6
Zinc	30	77.4	65.6
Zirconium	1.7	3.2	3.2

BHBS1406	1 Primary BHBS1406S01 5/16/2008
Inorganics (NA)	
%Solids	-
Chloride	-
Fluoride	-
Nitrate-N	-
pH	-
Phosphate	-
Sulfate	-
Total Solids	-
Inorganics (%)	
Moisture	3.18
Metals (NA)	
Aluminum	-
Antimony	-
Arsenic	-
Barium	-
Beryllium	-
Boron	-
Cadmium	-
Calcium	-
Chromium	-
Cobalt	-
Copper	-
Iron	-
Lead	-
Lithium	-
Magnesium	-
Manganese	-
Mercury	-
Molybdenum	-
Nickel	-
Potassium	-
Silver	-
Sodium	-
Thallium	-
Vanadium	-
Zinc	-
Zirconium	-
Metals (mg/kg)	
Selenium	<0.497

BHBS1008	1 Primary BHBS1008S010 4/17/2008	1 Split BHBS1008X010 4/17/2008
Inorganics (NA)		
Chloride	-	-
Fluoride	-	-
Nitrate-N	-	-
Phosphate	-	-
Sulfate	-	-
Total Solids	-	-
Inorganics (%)		
%Solids	-	96.7
Moisture	3.4	3.3
Inorganics (pH Units)		
pH	6.84 J	8.14
Metals (NA)		
Calcium	-	-
Iron	-	-
Magnesium	-	-
Manganese	-	-
Metals (mg/kg)		
Aluminum	13800	-
Antimony	<1.59	-
Arsenic	2.2	-
Barium	79.4	-
Beryllium	0.55	-
Boron	<1.02	-
Cadmium	0.12 J	-
Chromium	11.7	-
Cobalt	4.9 J	-
Copper	5.5	-
Lead	4.6	-
Lithium	26.7	-
Mercury	0.006 J	<0.0104
Molybdenum	0.34	-
Nickel	6.9	-
Potassium	3720	-
Selenium	<0.506	-
Silver	<0.0405	0.531
Sodium	<71.1	-
Thallium	<0.22	-
Vanadium	25.8	-
Zinc	56.6	-
Zirconium	1.1	-

BHTS1003A	1 Primary BHTS1003AS010 5/12/2008	6 Primary BHTS1003AS060 5/12/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Nitrate-N	-	-
pH	-	-
Phosphate	-	-
Sulfate	-	-
Total Solids	-	-
Inorganics (%)		
Moisture	9.64	8.31
Metals (NA)		
Aluminum	-	-
Antimony	-	-
Arsenic	-	-
Barium	-	-
Beryllium	-	-
Boron	-	-
Cadmium	-	-
Calcium	-	-
Chromium	-	-
Cobalt	-	-
Copper	-	-
Iron	-	-
Lead	-	-
Lithium	-	-
Magnesium	-	-
Manganese	-	-
Mercury	-	-
Molybdenum	-	-
Nickel	-	-
Potassium	-	-
Selenium	-	-
Sodium	-	-
Thallium	-	-
Vanadium	-	-
Zinc	-	-
Zirconium	-	-
Metals (mg/kg)		
Silver	0.067 J	0.064 J

BHTS18	6 Primary RJ665 10/6/2000
Inorganics (NA)	
%Solids	-
Chloride	-
Fluoride	-
Moisture	-
Nitrate-N	-
Phosphate	-
Sulfate	-
Total Solids	-
Inorganics (pH Units)	
pH	7.67 J
Metals (NA)	
Lithium	-
Zirconium	-
Metals (mg/kg)	
Aluminum	19400
Antimony	0.38 J
Arsenic	3.6
Barium	96
Beryllium	0.69
Boron	<5
Cadmium	<0.19
Calcium	4500
Chromium	22.2
Cobalt	10.2
Copper	17.7
Iron	23200
Lead	9.3
Magnesium	4850
Manganese	313
Mercury	0.02 J
Molybdenum	< 10
Nickel	14.4
Potassium	3000
Selenium	< 2
Silver	5.6 J
Sodium	400 J
Thallium	<0.26
Vanadium	46.3
Zinc	51.6

BHTS1003	1 Primary BHTS1003S010 4/14/2008	4.5 Primary BHTS1003S060 4/14/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Nitrate-N	-	-
Phosphate	-	-
Sulfate	-	-
Inorganics (%)		
Total Solids	91	90
Inorganics (pH Units)		
pH	8.1	-
Metals (NA)		
Aluminum	-	-
Antimony	-	-
Arsenic	-	-
Barium	-	-
Beryllium	-	-
Boron	-	-
Cadmium	-	-
Calcium	-	-
Chromium	-	-
Cobalt	-	-
Copper	-	-
Iron	-	-
Lead	-	-
Lithium	-	-
Magnesium	-	-
Manganese	-	-
Mercury	-	-
Molybdenum	-	-
Nickel	-	-
Potassium	-	-
Selenium	-	-
Sodium	-	-
Thallium	-	-
Vanadium	-	-
Zinc	-	-
Zirconium	-	-
Metals (mg/kg)		
Silver	0.078 J	0.027 J

BHTS20	3.5 Primary RJ668 10/9/2000
Inorganics (NA)	
%Solids	-
Chloride	-
Fluoride	-
Moisture	-
Nitrate-N	-
Phosphate	-
Sulfate	-
Total Solids	-
Inorganics (pH Units)	
pH	7.57 J
Metals (NA)	
Lithium	-
Zirconium	-
Metals (mg/kg)	
Aluminum	10800
Antimony	0.45 J
Arsenic	3
Barium	76.1
Beryllium	0.49
Boron	<4
Cadmium	<0.15
Calcium	2190
Chromium	13.4
Cobalt	6.7
Copper	9.8
Iron	12800
Lead	10.1
Magnesium	2550
Manganese	237
Mercury	0.1
Molybdenum	< 10
Nickel	8.3
Potassium	2040
Selenium	< 1.6
Silver	< 4.5
Sodium	92.4 J
Thallium	0.53 J
Vanadium	27.9
Zinc	33.4

BHBS1400	1 Primary BHBS1400S01 5/16/2008
Inorganics (NA)	
%Solids	-
Chloride	-
Fluoride	-
Nitrate-N	-
pH	-
Phosphate	-
Sulfate	-
Total Solids	-
Inorganics (%)	
Moisture	2.12
Metals (NA)	
Aluminum	-
Antimony	-
Arsenic	-
Barium	-
Beryllium	-
Boron	-
Cadmium	-
Calcium	-
Chromium	-
Cobalt	-
Copper	-
Iron	-
Lead	-
Lithium	-
Magnesium	-
Manganese	-
Molybdenum	-
Nickel	-
Potassium	-
Selenium	-
Silver	-
Sodium	-
Thallium	-
Vanadium	-
Zinc	-
Zirconium	-
Metals (mg/kg)	
Mercury	0.041

BHBS1012	1 Primary BHBS1012S01 5/15/2008	6 Primary BHBS1012S02 5/15/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Nitrate-N	-	-
Phosphate	-	-
Sulfate	-	-
Inorganics (%)		
Total Solids	96	89
Inorganics (pH Units)		
pH	8.1	-
Metals (NA)		
Calcium	-	-
Iron	-	-
Magnesium	-	-
Manganese	-	-
Metals (mg/kg)		
Aluminum	13000	14000
Antimony	<0.4	<0.42
Arsenic	2.6 J	2.4 J
Barium	87	110
Beryllium	0.9	0.99
Boron	<3.3	<2.7
Cadmium	0.17 J	0.32
Chromium	13 J	16 J
Cobalt	4.7	7.1
Copper	8.6 J	10 J
Lead	7.6	5
Lithium	15 J	13 J
Mercury	0.0072 J	0.013 J
Molybdenum	0.7	0.4
Nickel	12 J	11 J
Potassium	2300	3400
Selenium	0.3 J	0.47 J
Silver	0.03 J	0.026 J
Sodium	<110	<110
Thallium	0.16 J	0.27
Vanadium	28	31
Zinc	40	46
Zirconium	1.8 J	2.6 J

BHBS1011	1 Primary BHBS1011S01 5/15/2008	1 Duplicate BHBS1011D01 5/15/2008	6 Primary BHBS1011S02 5/15/2008
Inorganics (NA)			
%Solids	-	-	-
Chloride	-	-	-
Fluoride	-	-	-
Moisture	-	-	-
Nitrate-N	-	-	-
Phosphate	-	-	-
Sulfate	-	-	-
Inorganics (%)			
Total Solids	93	97	87
Inorganics (pH Units)			
pH	8.2	8.1	-
Metals (NA)			
Calcium	-	-	-
Iron	-	-	-
Magnesium	-	-	-
Manganese	-	-	-
Metals (mg/kg)			
Aluminum	16000	16000	17000
Antimony	<0.41	<0.39	<0.44
Arsenic	3.1 J	3.5 J	2.7 J
Barium	99	90	120
Beryllium	1.1	1	1.2
Boron	3.9 J	<3.1	<3.1
Cadmium	0.26	0.17 J	0.32
Chromium	18 J	17 J	19 J
Cobalt	7.5	4.9	7.6
Copper	9.1 J	7.3 J	11 J
Lead	6.4	5.5	6.5
Lithium	17 J	18 J	14 J
Mercury	0.008 J	0.01 J	0.0072 J
Molybdenum	0.35	0.31	0.36
Nickel	12 J	10 J	12 J
Potassium	2800	1800	3400
Selenium	0.43 J	0.4 J	0.53 J
Silver	0.032 J	0.045 J	0.027 J
Sodium	<100	<100	<110
Thallium	0.25	0.21	0.29
Vanadium	34	30	38
Zinc	44	38	47
Zirconium	3.1 J	2.2 J	3.6 J

BHBS1408	1 Primary BHBS1408S01 5/16/2008	5.5 Primary BHBS1408S02 5/16/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Nitrate-N	-	-
pH	-	-
Phosphate	-	-
Sulfate	-	-
Total Solids	-	-
Inorganics (%)		
Moisture	4.79	10.1
Metals (NA)		
Aluminum	-	-
Antimony	-	-
Arsenic	-	-
Barium	-	-
Beryllium	-	-
Boron	-	-
Cadmium	-	-
Calcium	-	-
Chromium	-	-
Cobalt	-	-
Copper	-	-
Iron	-	-
Lead	-	-
Lithium	-	-
Magnesium	-	-
Manganese	-	-
Mercury	-	-
Molybdenum	-	-
Nickel	-	-
Potassium	-	-
Silver	-	-
Sodium	-	-
Thallium	-	-
Vanadium	-	-
Zinc	-	-
Zirconium	-	-
Metals (mg/kg)		
Selenium	<0.524	<0.55

BHBS1407	1 Primary BHBS1407S01 5/16/2008
Inorganics (NA)	
%Solids	-
Chloride	-
Fluoride	-
Nitrate-N	-
pH	-
Phosphate	-
Sulfate	-
Total Solids	-
Inorganics (%)	
Moisture	2.52
Metals (NA)	
Aluminum	-
Antimony	-
Arsenic	-
Barium	-
Beryllium	-
Boron	-
Cadmium	-
Calcium	-
Chromium	-
Cobalt	-
Copper	-
Iron	-
Lead	-
Lithium	-
Magnesium	-
Manganese	-
Mercury	-
Molybdenum	-
Nickel	-
Potassium	-
Silver	-
Sodium	-
Thallium	-
Vanadium	-
Zinc	-
Zirconium	-
Metals (mg/kg)	
Selenium	<0.499

BHBS1410	1 Primary BHBS1410S01 5/29/2008	6 Primary BHBS1410S02 5/29/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Nitrate-N	-	-
pH	-	-
Phosphate	-	-
Sulfate	-	-
Total Solids	-	-
Inorganics (%)		
Moisture	3.71	16.4
Metals (NA)		
Aluminum	-	-
Antimony	-	-
Arsenic	-	-
Beryllium	-	-
Boron	-	-
Cadmium	-	-
Calcium	-	-
Chromium	-	-
Cobalt	-	-
Copper	-	-
Iron	-	-
Lead	-	-
Lithium	-	-
Magnesium	-	-
Manganese	-	-
Mercury	-	-
Molybdenum	-	-
Nickel	-	-
Potassium	-	-
Silver	-	-
Sodium	-	-
Thallium	-	-
Vanadium	-	-
Zinc	-	-
Zirconium	-	-
Metals (mg/kg)		
Barium	-	138
Selenium	<0.516	<0.596

BHBS1409	1 Primary BHBS1409S01 5/29/2008	6 Primary BHBS1409S02 5/29/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Nitrate-N	-	-
pH	-	-
Phosphate	-	-
Sulfate	-	-
Total Solids	-	-
Inorganics (%)		
Moisture	6.21	2.18
Metals (NA)		
Aluminum	-	-
Antimony	-	-
Arsenic	-	-
Beryllium	-	-
Boron	-	-
Cadmium	-	-
Calcium	-	-
Chromium	-	-
Cobalt	-	-
Copper	-	-
Iron	-	-
Lead	-	-
Lithium	-	-
Magnesium	-	-
Manganese	-	-
Mercury	-	-
Molybdenum	-	-
Nickel	-	-
Potassium	-	-
Silver	-	-
Sodium	-	-
Thallium	-	-
Vanadium	-	-
Zinc	-	-
Zirconium	-	-
Metals (mg/kg)		
Barium	-	120
Selenium	<0.524	<0.504

BHBS1007	1 Primary BHBS1007S010 4/16/2008	5.5 Primary BHBS1007S055 4/16/2008
Inorganics (NA)		
%Solids	-	-
Chloride	-	-
Fluoride	-	-
Moisture	-	-
Nitrate-N	-	-
Phosphate	-	-
Sulfate	-	-
Inorganics (%)		
Total Solids	91	88
Inorganics (pH Units)		
pH	7	-
Metals (NA)		
Calcium	-	-
Iron	-	-
Magnesium	-	-
Manganese	-	-
Metals (mg/kg)		
Aluminum	20000 J	20000 J
Antimony	<0.42	<0.43
Arsenic	3.7 J	11 J
Barium	130	280
Beryllium	1.2	1.9
Boron	<1.9	<1.1
Cadmium	0.27	0.18 J
Chromium	22	23
Cobalt	8.2 J	19 J
Copper	13 J	19 J
Lead	8.9	15
Lithium	17	39
Mercury	0.21 J	0.031 J
Molybdenum	0.35 J	0.2 J
Nickel	13 J	21 J
Potassium	2700	2900
Selenium	1.3	2
Silver	0.027 J	0.038 J
Sodium	< 190	570
Thallium	0.32	0.49
Vanadium	44	57
Zinc	47 J	91 J
Zirconium	3.4 J	<2.2

BHTS21	2 Primary RJ667 10/6/2000
Inorganics (NA)	
%Solids	-
Chloride	-
Fluoride	-
Moisture	-
Nitrate-N	-
Phosphate	-
Sulfate	-
Total Solids	-
Inorganics (pH Units)	
pH	7.23 J
Metals (NA)	
Lithium	-
Zirconium	-
Metals (mg/kg)	
Aluminum	17400
Antimony	0.63 J
Arsenic	3.8
Barium	84.7
Beryllium	0.51
Boron	<3.1
Cadmium	<0.24
Calcium	2580
Chromium	14.6
Cobalt	6.7
Copper	7.6
Iron	15900
Lead	7.6
Magnesium	2960
Manganese	237
Mercury	0.12
Molybdenum	< 10
Nickel	6.5
Potassium	1520
Selenium	< 2.5
Silver	< 4.5
Sodium	95.5 J
Thallium	0.6 J
Vanadium	32.7
Zinc	30.7

BHTS1002	1 Primary BHTS1002S010 4/14/2008	1 Duplicate BHTS1002D010 4/14/2008	5.8 Primary BHTS1002S058 4/14/2008
Inorganics (NA)			
%Solids	-	-	-
Chloride	-	-	-
Fluoride	-	-	-
Moisture	-	-	-
Nitrate-N	-	-	-
Phosphate	-	-	-
Sulfate	-	-	-
Inorganics (%)			
Total Solids	93	94	93
Inorganics (pH Units)			
pH	7.9	7.9	-
Metals (NA)			
Aluminum	-	-	-
Antimony	-	-	-
Arsenic	-	-	-
Barium	-	-	-
Beryllium	-	-	-
Boron	-	-	-
Cadmium	-	-	-
Calcium	-	-	-
Chromium	-	-	-
Cobalt	-	-	-
Copper	-	-	-
Iron	-	-	-
Lead	-	-	-
Lithium	-	-	-
Magnesium	-	-	-
Manganese	-	-	-
Molybdenum	-	-	-
Nickel	-	-	-
Potassium	-	-	-
Selenium	-	-	-
Sodium	-	-	-
Thallium	-	-	-
Vanadium	-	-	-
Zinc	-	-	-
Zirconium	-	-	-
Metals (mg/kg)			
Mercury	0.34 J	0.22 J	-
Silver	0.044 J	0.034 J	0.055 J

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Metals and Inorganics Data Results
B 100 Trench RFI Site

FIGURE N.3-9A

Soil Sample Locations

- ● Soil Sample Location With Detected Metals and Inorganics Data
- ○ Soil Sample Location Not Analyzed for Metals and Inorganics Data
- ● (green) 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

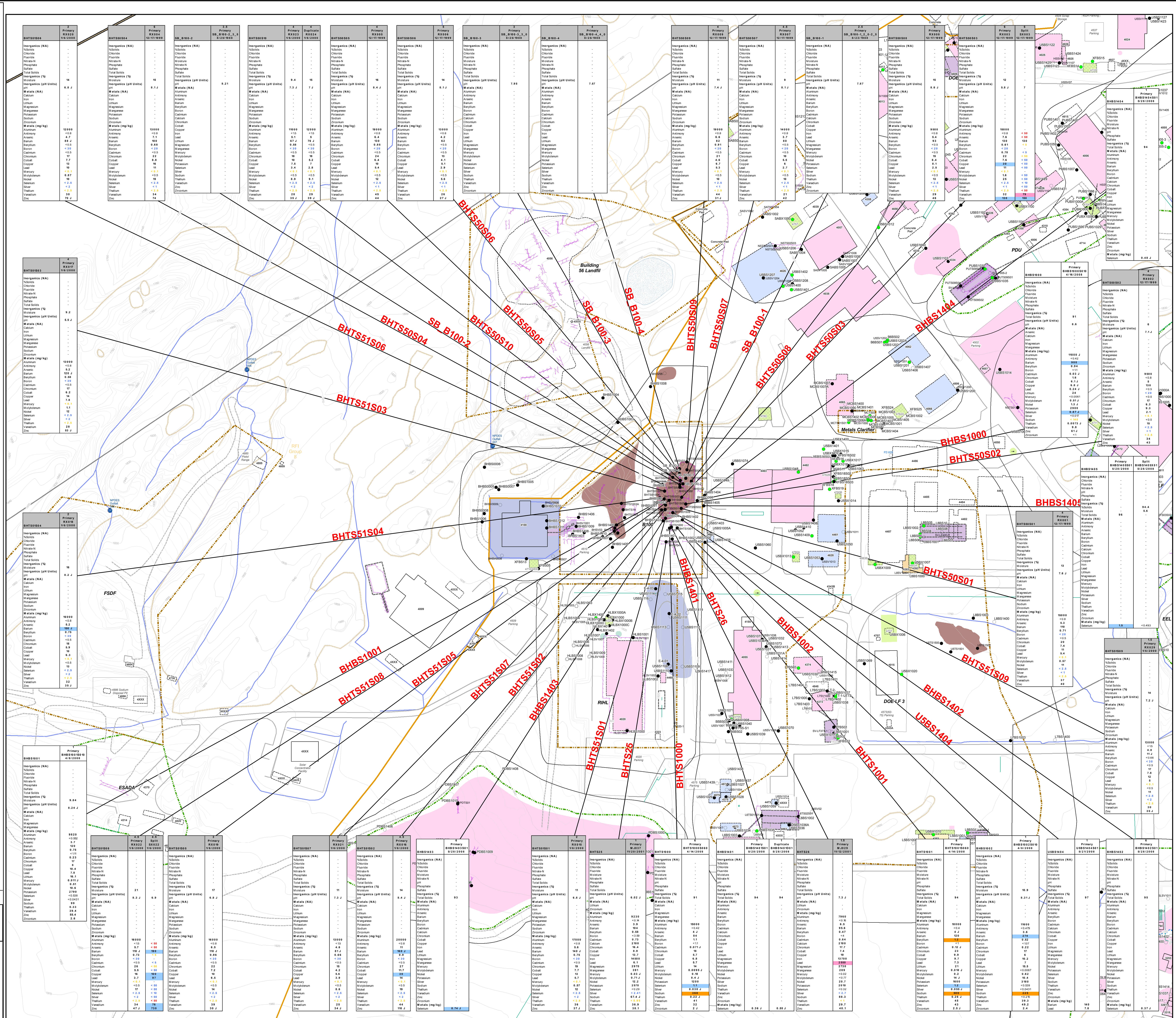
Basemap Legend

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 75 150 Feet — 1 inch equals 75 feet — N



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Metals and Inorganics Data Results B 100 Trench RFI Site

FIGURE N.3-9B

Soil Sample Locations

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

Data Box Information

Sample Location ID: B9B501

1.00	Depth in Feet
Primary	Sample Type
B9B501	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

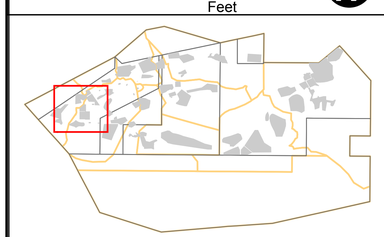
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Debris
- Multiple Use
- Solvent
- Petroleum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

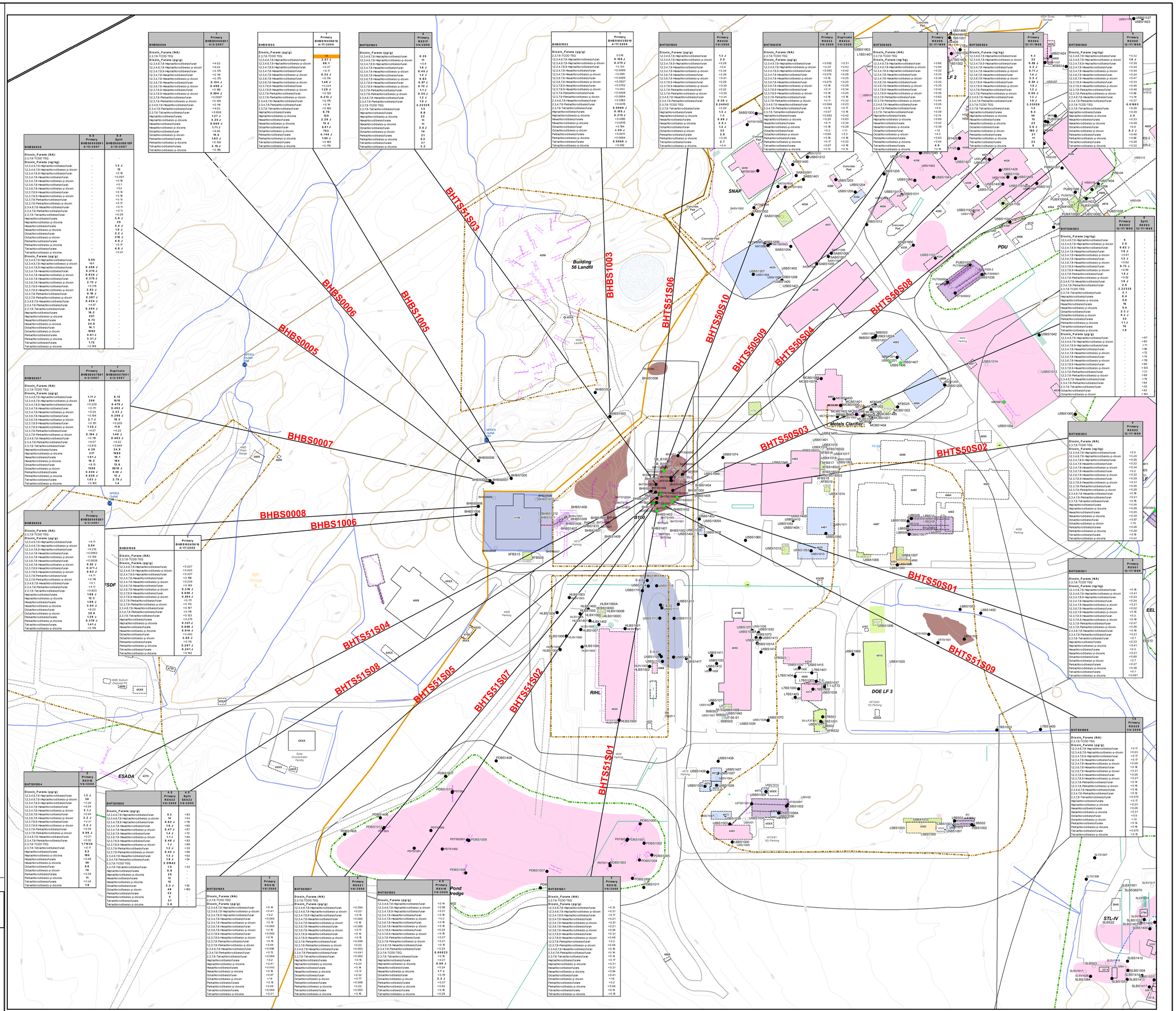
\\MapFiles\RFI_05\RFI_Report\SpiderDiagram\RFIGrp5_SpiderDiagram_EL.mxd

1 inch equals 75 feet

0 75 150

Feet





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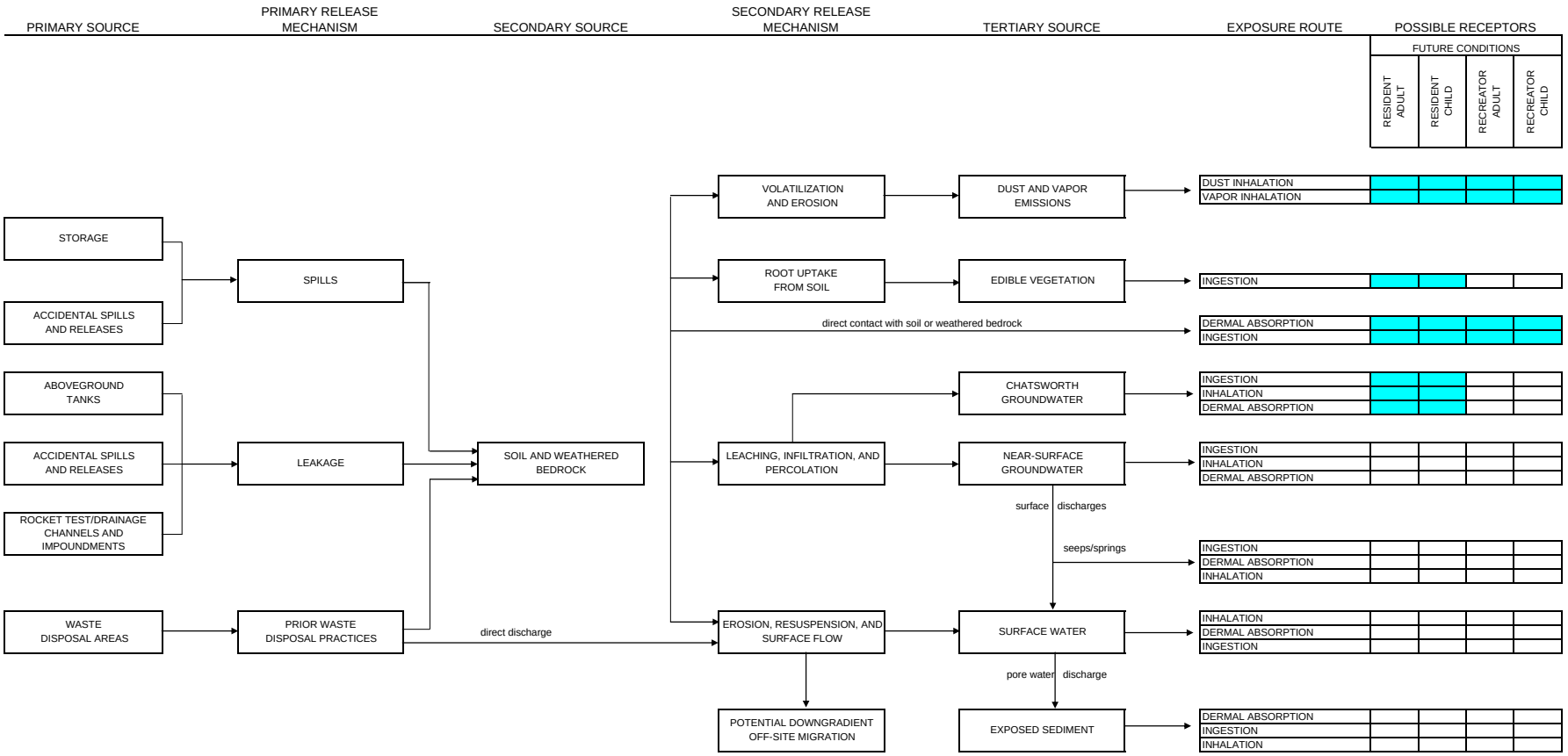
Dioxins Data Results
B 100 Trench RFI Site

FIGURE N.3-10

Figure N.4-1

Human Health Risk Assessment Conceptual Site Model

Building 100 Trench RFI Site

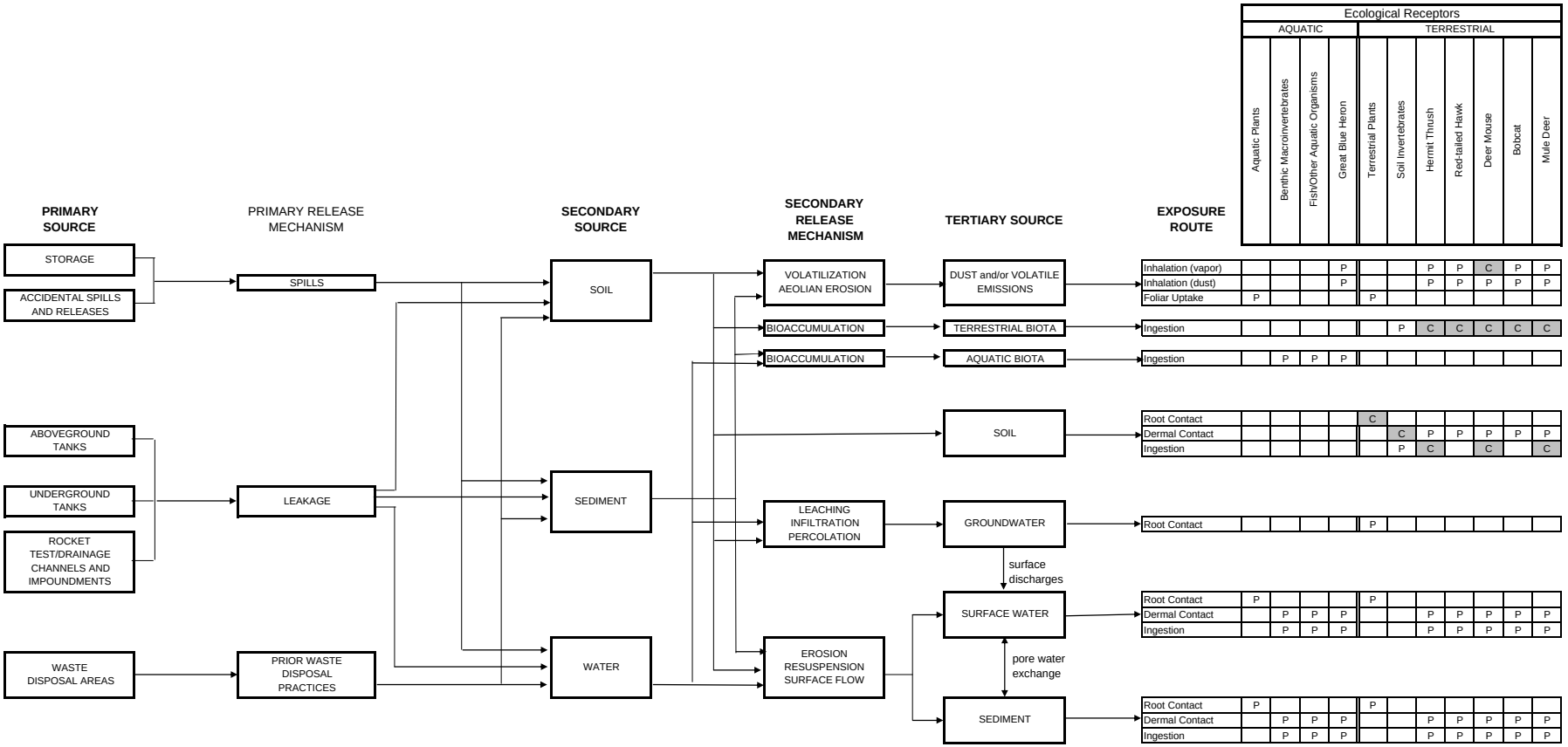


NOTES:

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



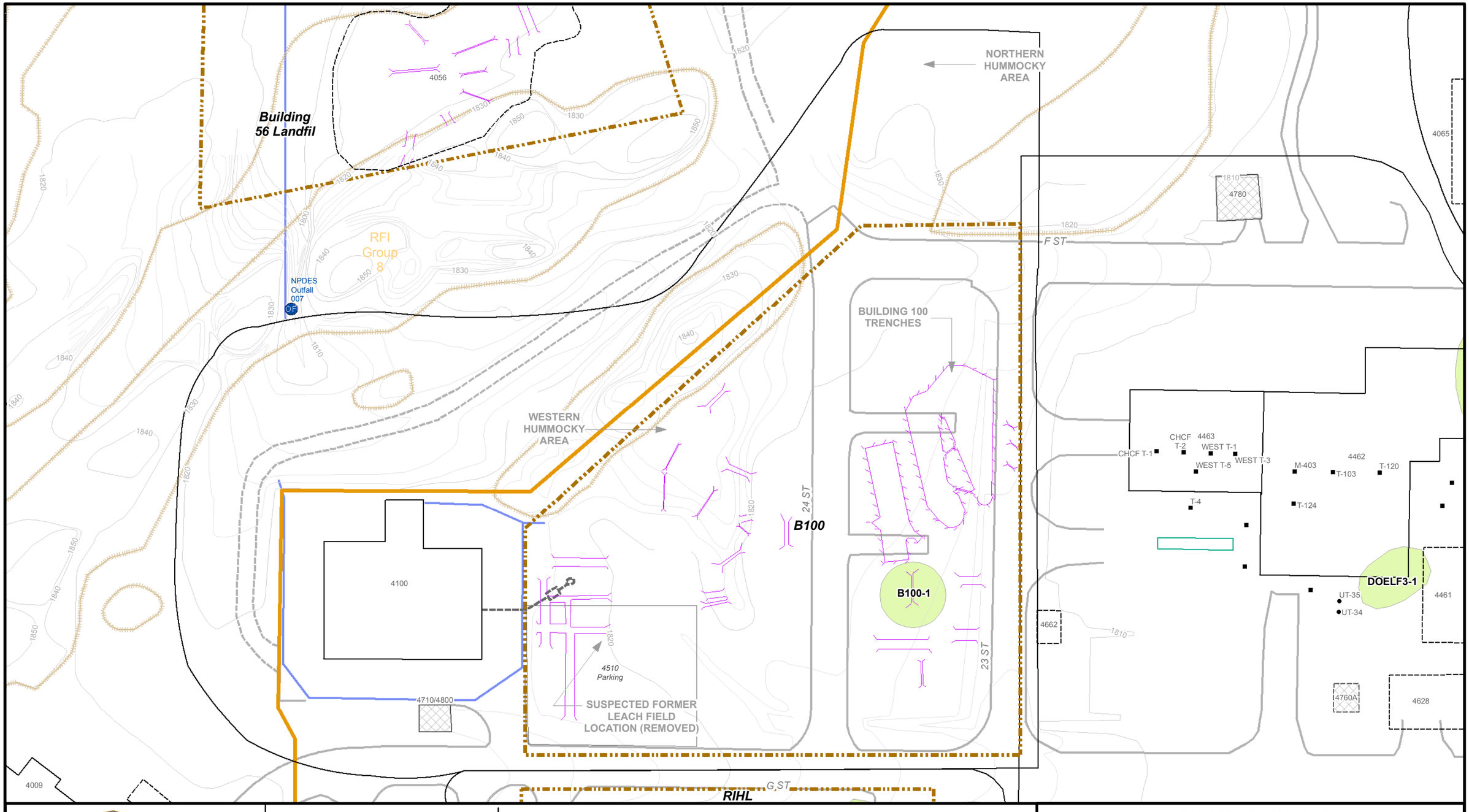
C - Pathway considered complete for purposes of ecological risk assessment

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 N.4-2
Ecological Conceptual Site Model
Group 5 RFI Report, Building 100 Trench
Santa Susana Field Laboratory



Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Trench
- 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
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Waste Debris Area
- CMS Area

Surficial Media Site Action Recommendations
Building 100 Trench RFI Site
SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

October 31, 2008

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WORKING DRAFT

FIGURE N.5-1

Attachments