
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 O**

United States Department of Energy Leach Fields 1

Prepared for:

**The Boeing Company
and
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DRAFT IN PROGRESS

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Acronyms and Abbreviations

µg/dl	micrograms per deciliter
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/Lv	micrograms per liter vapor
µs/cm	micro siemens per centimeter
3-D	three dimensional
AI	Atomics International
AOC	Area of Concern
AST	aboveground storage tank
bgs	below ground surface
BMP	best management practice
Boeing	The Boeing Company
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
COEC	chemical of ecological concern
COPC	chemical of potential concern
CPEC	chemical of potential ecological concern
CSM	conceptual site model
CTE	central tendency exposure
CUA	Chemical Use Area
DCA	dichloroethane
DCE	dichloroethene
DOE	United States Department of Energy
DQO	data quality objective
DTSC	Department of Toxic Substances Control
ECL	Engineering Chemistry Laboratory

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ACRONYMS AND ABBREVIATIONS

EEL	Environmental Effects Laboratory
ELCR	estimated lifetime cancer risk
ELV	Expendable Launch Vehicle
EPC	exposure point concentration
ERA	ecological risk assessment
ESL	ecological screening level
ETEC	Energy Technology Engineering Center
gpd	gallons per day
GRC	Groundwater Resource Consultants, Inc.
H&A	Haley and Aldrich
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
KEWB	kinetics experiment water boiler
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 ($\mu\text{g}/\text{kg}$ or $\mu\text{g}/\text{L}$)
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
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RIHL	Rockwell International Hot Laboratory
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
TCDD-TEQ	2,3,7,8-tetrachlorodibenzodioxin toxicity equivalency quotient

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ACRONYMS AND ABBREVIATIONS

TCE	trichloroethene
TDS	total dissolved solids
TEQ	toxicity equivalency quotient
TIC	tentatively identified compound
TPH	total petroleum hydrocarbons
TRV	toxicity reference value
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WBNS	water boiler neutron source
WPA	RFI Work Plan Addendum
WPAA	RFI Work Plan Addendum Amendments

Appendix O

O.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 United States Department of Energy (DOE) Leach Fields 1 (DOE LF1) Site of the Santa Susana Field Laboratory (SSFL). The DOE LF1 Site contains two Areas of Concern (AOCs) – Building 4030 Leach Field and Building 4093 Leach Field. The DOE LF1 Site, located within Area IV of the SSFL, was used in support of 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 DOE LF1 Site is 1 of 17 RFI sites included in the Group 5 RFI Report. The location of the DOE LF1 Site within the SSFL and Group 5 Reporting Area is shown in Figure O.1-1. An RFI Site is an area that includes at least one solid waste management unit (SWMU) and/or an AOC, and some adjacent land for the purpose of characterization. The other 16 Group 5 RFI sites are:

- Boeing Area IV Leach Fields (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)
- Building 100 Trench (SWMU 7.5)
- 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 DOE LF1 Site is located in the northern end of the Group 5 Reporting Area, south and west of the Group 6 Reporting Area, west and southeast of the Group 7 Reporting Area, and north of undeveloped Group 5 open areas (Figure O.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 to

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 DOE LF1 Site characterization presented in this appendix comprises data for the SMOU in addition to summaries of the CFOU groundwater data. The SMOU includes soil, sediment, surface water, air, biota, and near-surface groundwater (NSGW) at the SSFL. NSGW is defined as groundwater occurring within alluvium or weathered bedrock of the Chatsworth Formation. The CFOU includes Chatsworth Formation bedrock and deeper groundwater that occurs within the unweathered bedrock of the Chatsworth Formation.

0.1.1 Report Organization

This DOE LF1 Site Report provides detailed sampling data and evaluation pertaining to the DOE LF1 Site, including a summary of the site history, a summary of the RFI sampling and analyses, risk assessment results, and site action recommendations. This information is presented in sections organized as follows:

- **Section O.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 O.3 – Nature and Extent of Chemical Impacts.** Presents a summary of SMOU and CFOU characterization information for the DOE LF1 Site.
- **Section O.4 – Summary of Risk Assessment Findings.** Presents the results of the human health risk assessment (HRA) and ecological risk assessment (ERA) for DOE LF1 Site; the complete risk assessment is included in Appendix A of the Group 5 RFI Report.
- **Section O.5 – DOE LF1 Site Action Recommendations.** Presents a summary of DOE LF1 Site areas recommended for either (1) NFA, or (2) further evaluation in the CMS. CMS Areas recommended for interim measures to prevent contaminant migration are also identified, if any.
- **Section O.6 – References.** Includes a list of cited references.

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

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

Information regarding characterization for the DOE LF1 Site is provided in the following figures and tables:

- **Figure O.1-1:** Presents the location of the DOE LF1 Site within the SSFL and the Group 5 Reporting Area.

- Figure O.2-1: Presents a plan view of DOE LF1 Site, showing known and potential chemical use areas. Tables O.2-1 through O.2-4 present summaries of buildings, tanks, transformers, and other site features at the DOE LF1 Site.
- Figure O.2-2: Presents a plan view of the DOE LF1 Site, showing soil and soil vapor sampling locations, and nearby monitoring wells.
- Figures O.2-3A and O.2-3B: Presents geologic cross-sections across the DOE LF1 Site.
- Figures O.3-1 through O.3-9: Summarize soil and soil vapor sampling at the DOE LF1 Site. Soil and soil vapor sampling results are shown on the maps and correlate with appropriate sections of Table O.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 appendixes. Pertinent appendixes 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 DOE LF1 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.

O.1.2 Historical Reference Documents

A searchable database of historical document for the Group 5 Reporting Area is being submitted to DTSC along with this Group 5 RFI Report (Boeing, 2008b). Included are facility records, maps and drawings, correspondence, and reports relevant to the RFI for each of the Group 5 RFI sites. Documents pertaining to the entire SSFL are included if they are relevant to Group 5. The Group 5 document database includes documents relevant to the DOE LF1 Site. It is worth noting that information presented in this DOE LF1 Site report is supplemented by background documents that contain information about site and facility background, SMOU Program background, and methodologies or 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 near-surface groundwater 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 CFOU groundwater.
- Annual and quarterly groundwater monitoring reports, including:
 - Annual Groundwater Monitoring Report (Haley & Aldrich, Inc. [H&A], 2008a).
 - Second Quarter 2007 Groundwater Monitoring Report (H&A, 2007a).
 - Third Quarter 2007 Groundwater Monitoring Report (H&A, 2007b).
 - Fourth Quarter 2007 Groundwater Monitoring Report (H&A, 2008b).
 - First Quarter 2008 Groundwater Monitoring Report (H&A, 2008c).
- Historical Site Assessment (Sapere, 2005). This report contains:
 - Facility descriptions and historical operational information for buildings used for radiological research and development in Area IV.
 - Information regarding radiological demolition activities, surveys, releases, and removal actions conducted for radiological areas within Area IV.
- Debris Area Survey and Sampling Methodology (CH2M HILL, document in progress). This standard operating procedure (SOP) provides general guidelines for performing the following activities:
 - Visual inspections of the SSFL for surficial evidence of solid waste disposal (referred to herein as debris areas).
 - Sampling for chemical analytes at debris areas.
- Quality Assurance Project Plan (QAPP) (MECx, 2008). This QAPP provides general guidelines, which include:
 - Quality assurance/quality control (QA/QC) procedures to ensure that field and laboratory data quality and project work meet the data quality objectives (DQOs).
 - Ensuring that the project work performed is in accordance with professional standards and regulatory guidelines.
- Building Feature Evaluation and Sampling (MWH, 2008). This SOP presents the procedures for evaluating environmental conditions associated with existing buildings, concrete pads, and supporting infrastructure under the following scenarios:
 - Environmental assessment prior to building demolition.
 - Environmental assessment during/after building demolition.
 - Environmental assessment for buildings not planned for demolition

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

The DOE LF1 Site is approximately 10.7 acres in the north-central portion of Area IV at the SSFL. The site location within the SSFL is shown in Figure O.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 O.2-1. The sampling locations across the site are shown in Figure O.2-2.

During the RFA, various SWMUs and AOCs within the SSFL were identified. The Buildings 4030 and 4093 Leach Fields were identified as AOCs in the RFA (SAIC, 1991 and 1994). No other SWMUs or AOCs were identified in the RFA within the boundary of the DOE LF1 Site as it is defined in this report (Figure O.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 DOE LF1 Site boundary was defined to include operations associated with the Buildings 4030 and 4093 Leach Fields. In addition, facilities or features near these AOCs were included for assessment in the RFI. These include former Buildings 4023, 4030, 4035, 4046, 4073, 4074, 4083, 4093, 4103, 4123, 4453, 4633, 4636, 4641, 4643, 4793, 4836, and 4893, two aboveground storage tanks (ASTs), two underground storage tanks (USTs), one transformer pole, and one electrical substation. The identified chemical use areas at the DOE LF1 Site are shown in Figure O.2-1 and described in Tables O.2-1 through O.2-4. A spill record is included in Table O.2-5.

The following sections describe AOCs, site history and operations, chemicals used, and current conditions at the DOE LF1 Site.

O.2.1 SWMUs and/or AOCs at the DOE LF1 Site

The DOE LF1 Site contains two AOCs – the Buildings 4030 and 4093 Leach Fields (SAIC, 1994). A brief description of the AOCs that are included in this RFI Site Report is presented below.

O.2.1.1 Building 4030 Leach Field (AOC)

The Building 4030 Leach Field, located southwest of Building 4030, comprised 90 linear feet and received flow from a 1,000-gallon septic tank associated with Building 4030. While the location of the leach field is shown in facility drawings, the location of the leach field has not been confirmed through geophysical surveys or through exploratory trenching. The use of the leach fields and septic tanks was discontinued in 1961 when a sanitary sewer system came online at the site. Additional information regarding the Building 4030 Leach Field is in Tables O.2-4 and O.2-6.

O.2.1.2 Building 4093 Leach Field (AOC)

The Building 4093 Leach Field, located southwest of Building 4093, received flow from a 750-gallon septic tank associated with Building 4093. The leach field is suspected to consist of 4-inch-diameter terra cotta clay piping surrounded by gravel, buried at depths ranging from 2 to 6 feet below ground surface (bgs). The leach field had three leach lines, for a total length of 234 linear feet. The use of the leach fields and septic tanks was discontinued in 1961 when a sanitary sewer system came online at the site. The leach field was removed in

1999. Additional information regarding the Building 4093 Leach Field is in Tables O.2-4, O.2-6, and O.2-7.tr

O.2.2 DOE LF1 Site History

A summary of the site chronology, including descriptions of site operations and investigation activities for the DOE LF1 Site, is presented below. Facility correspondence, investigation reports, waste disposal records, facility maps, drawings, photographs, and personnel interview records were reviewed and evaluated to compile the site history information presented below. Primary sources of information are summarized in Section O.1.2.

O.2.2.1 Site Chronology

A summary of key historical investigation and remediation activities is presented in Tables O.2-6 and O.2-7. A more detailed description of the DOE LF1 Site is presented below.

O.2.2.1.1 1956 through 1980

The DOE LF1 Site contained the Kinetics Experiment Water Boiler (KEWB) reactors, the Water Boiler Neutron Source (WBNS) reactor (also known as the AE-6 reactor or the L-85 reactor), and support buildings. The support buildings include the following former buildings and respective uses.

4046	Material Office Annex
4074	Storage and X-ray film processing
4103	Reactor Kinetics Lab and storage
4123	Temporary storage of radiological waste material
4453	Neutron radiography and reactor fuel (uranyl sulfate) handling
4633	Reactor cooling water pad
4636	Guard shack
4643	Ventilation for KEWB reactor building
4793	Heating and air conditioning for the KEWB reactor building
4836	Time clock for personnel working within SNAP Facility
4893	Reactor pad

The KEWB reactors operated from 1956 to 1966. The KEWB reactors were housed in Building 4073. The WBNS reactor operated from 1958 to 1980. Both reactors used uranyl sulfate as fuel sources. The WBNS reactor was housed in Building 4093. Building 4083 served as the reactor control room.

O.2.2.1.2 1958 through 1966

Building 4030/4035, constructed in 1958, was used as a counting room and work shop and included the use of Van de Gaff accelerator with tritium targets in support of SNAP from 1960 to 1964. The accelerator was removed in 1966.

O.2.2.1.3 1962 to Late 1970s

Building 4023 was used as the Liquid Metals and Analytical Chemistry Laboratory to support SNAP reactor operations.

O.2.2.1.4 1964 through 1985

Building 4641 was used as the transfer point for all SSFL incoming and outgoing shipments, including radioactive materials. Radioactive materials were not stored inside the building. Radioactive shipments were not handled at Building 4641 after 1985. The parking lot located north of Building 4641 supported operations at Building 4641.

O.2.2.1.5 1968 through 1976

The KEWB reactor operations building, Building 4073, was decontaminated from 1968 to 1975. In 1975, Building 4073 was demolished, and in 1976 the area was released for unrestricted use.

O.2.2.1.6 1993

A soil vapor investigation was conducted at the Buildings 4030 and 4093 Leach Fields to determine potential impacts to soil. Volatile organic compounds (VOCs) in soil vapor were not detected.

O.2.2.1.7 1999 through 2002

The Building 4093 Leach Field was removed in 1999. Additional investigation for metals was performed in the soil near the former leach field in 2000. In 2000 and 2002, geophysical surveys were conducted in the suspected vicinity of the Building 4030 Leach Field to identify the locations of the leach field and septic tank. No indications of the leach field or septic tank were identified during the surveys. Building 4030 was demolished in 1999.

O.2.2.2 Site Inventories

Inventories of buildings, tanks, transformers, and chemicals used at the DOE LF1 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 O.2-1. The inventories are included as the following tables:

- Building inventory – Table O.2-1
- Storage tank inventory – Table O.2-2
- Transformer inventory – Table O.2-3
- Inventory of other site features – Table O.2-4
- Spill inventory – Table O.2-5

O.2.3 DOE LF1 Site 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, 14 chemical use areas were identified within the DOE LF1 Site boundary. Chemicals that were potentially used or stored in these Chemical Use Areas were unknown in many locations. In the known locations, chemical uses include VOCs, total

petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCB s), inorganics, and metals. Chemical Use Areas at the DOE LF1 Site are shown in Figure O.2-1 and described in detail in Table O.2-8.

O.2.4 Site Conditions

This section provides summaries of site conditions near the DOE LF1 Site, including topography, geology, soil, groundwater, surface water, and biology.

O.2.4.1 General Conditions and Topography

The DOE LF1 Site is located within the north-central portion of Area IV. The site is currently inactive, with no remaining structures. Topography in the central portion of the site slopes to the south. The gently sloping area is bounded by northeast-trending bedrock outcrops to the north and west. Current surface elevations at the DOE LF1 Site range from a low of approximately 1830 feet above mean sea level (msl) in the southwest portion of the site to an elevation of approximately 1920 feet msl in the northern portion of the site. A summary site conceptual model is presented in Table O.2-9. Figure O.2-3B presents a cross-section developed for the DOE LF1 Site (Surficial Cross Section W-W'), detailing topography, locations and depths of alluvium, and the most recent available groundwater elevations. The location of the cross-section is shown in Figure O.2-3A.

O.2.4.2 Geology

The DOE LF1 Site is located north of the Coca Fault, near the Upper Burro Flats and ELV Members of the Upper Chatsworth Formation to the north of the fault (Dibblee, 1992; MWH, 2002 and 2007C).

Beds of the Upper Burro Flats and ELV Members 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 consists of interbedded shale, siltstone, and sandstone in which shale and siltstone make up much more than 50 percent of the total thickness of the member. Figure 2-5 of the Group 5 RFI Report (Volume I) shows the geologic units represented within the RFI site. The location of the Coca Fault is shown in 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.

O.2.4.3 Soil

Throughout most of the DOE LF1 Site, soil is generally thin, typically ranging from less than 1 foot to 10 feet thick. 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 in the undisturbed areas of the site consist of weathered Chatsworth formation materials, which are primarily fine-grained silty sands, clayey sands, and sandy lean clay. Soil boring logs are included as Attachment O-2 to this appendix.

O.2.4.4 Groundwater

The groundwater system and monitoring network in RFI Group 5 is discussed in detail in Appendix B of the Group 5 RFI Report. In that appendix, Figure B-1 shows wells and

piezometers that are used to monitor groundwater at and near the DOE LF1 Site. Figure O.2-2 shows locations of wells in and around the DOE LF1 Site.

A cross-sectional diagram of NSGW and CFOU Groundwater occurrence is shown in Figure B-6 of Appendix B of the Group 5 RFI Report. NSGW has not been observed recently at the DOE LF1 Site. During the first quarter of 2005, NSGW was reported at depths of 11 to 22 feet bgs in piezometer PZ-112 at the southeastern corner of the site. One well (RD-17) was installed to monitor groundwater conditions in the unweathered bedrock (that is in CFOU Groundwater). Construction details for this piezometer and well are shown in Tables B-2 and B-3 in Appendix B of the Group 5 RFI Report, and their locations are shown in Figure O.2-2.

NSGW at the DOE LF1 Site flows south to southwest at a hydraulic gradient of approximately 0.04 foot/foot. The occurrence of NSGW in the DOE LF1 area is shown in plan view in Figure B-7 in Appendix B of the Group 5 RFI Report.

CFOU groundwater at the DOE LF1 Site is encountered at depths ranging from 26 feet bgs (1810 feet msl) to 29 feet bgs (1807 feet msl) in well RD-17. 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. Groundwater in the CFOU at the DOE LF1 Site flows to southeast at a hydraulic gradient of approximately 0.05 foot per foot. The occurrence of CFOU Groundwater in the DOE LF1 area is shown in plan view in Figure B-8 in Appendix B of the Group 5 RFI Report.

0.2.4.5 Surface Water

Surface water flow at the DOE LF1 Site is shown in Figure 2-7 of the Group 5 RFI Report (Volume I). Surface water may exist intermittently at the DOE LF1 Site as the result of seasonal precipitation events. While there are no perennial bodies of surface water at the site, rainwater flows generally south, southeast, and southwest from the site.

One monitoring location, National Pollutant Discharge Elimination System (NPDES) Outfall 018, is located downgradient of the site at the discharge of the R-2 Ponds (shown in 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.

0.2.4.6 Biology

In April 2008, a reconnaissance-level biological survey was conducted at the Group 5 RFI Sites. Biological conditions at the DOE LF1 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..

O.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 DOE LF1 Site. The presentation includes sampling objectives, scope, key decision points related to characterization activities, and findings.

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

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

O.3.1 Sampling Objectives

Several soil and soil vapor samples were collected as part of the previous RFA, CCR, and preliminary RFI sample collection events. Based on the review of historical documents summarized in Section O.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 established in the Group 5 DQOs as summarized in the Group 5 RFI Report, Section 4.0 (Volume I).

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

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

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

O.3.2 Sampling Scope

A total of 54 soil matrix samples and 10 soil vapor samples was collected between August 1993 and May 2008 to assess potential impacts associated with the Chemical Use Areas at the DOE LF1 Site. 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 O.3-1A and O.3-1B. Sample locations are shown in Figure O.2-2.

Both CFOU groundwater and NSGW have been sampled and analyzed according to agency-approved work plans (GRC, 1995a and 1995b; Ogden, 2000b). At the DOE LF1 Site, one piezometer (PZ-112) was used to characterize NSGW, and one monitoring well (RD-17) was used to characterize CFOU groundwater. Groundwater characterization data for the DOE LF1 Site are presented with the entire Group 5 groundwater data set in Appendix B of the Group 5 RFI Report.

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

Based on a QA review conducted on soil, soil vapor, sediment, and piezometer sampling results, data have been deemed usable and in compliance 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 data sets. Historical samples (collected prior to the beginning of the RFI in 1996) were typically not validated for the subsequent RFI but are deemed useable for the RFI since they were collected and reviewed according to the QA protocols for those programs and used by agencies to make decisions for the DOE LF1 Site cleanup actions. Overall data quality is described in the RFI Program Report (MWH, 2004). Site-specific data quality summaries for the DOE LF1 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 DOE LF1 Site, including results for the following media:

- Soil vapor
- Soil matrix
- Groundwater
- Surface water

O.3.3 Key Decision Points

DTSC has been an integral part of the decision-making process during the SSFL RFI Program. The DOE LF1 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 either assumptions upon which sampling was based, or decisions made during step-out sampling or data evaluation. Programmatic decision points (those common to all RFI sites) are described and included in the RFI Program Report (MWH, 2004).

O.3.4 Soil Matrix and Soil Vapor Findings

All soil and soil vapor sampling results and characterization findings are summarized in Tables O.3-2A and O.3-2B. 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. Indicate that soil and soil vapor volumes for areas recommended for CMS evaluation 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 and soil vapor 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 DOE LF1 Site are provided in Tables O.3-3A and O.3-3B.

O.3.4.1 Soil and Soil Vapor Data Presentation

The soil data results organized by chemical group are summarized in Figures O.3-1 through O.3-8. Relevant site information, sampling rationale, analytical results, and evaluation of results are presented in Table O.3-2A. This table discusses the sampling approach for each

Chemical Use Area and a brief summary of the sampling results by chemical group, including:

- Column 1 –Chemical Use Area number.
- Column 2 – Chemical Use Area name.
- Column 3 – Chemical group sampled in a particular Chemical Use Area.
- Column 4 – Sampling scope and rationale for each chemical group in a particular Chemical Use Area.
- Column 5 – Abbreviated summary of sampling results for soil and soil vapor each chemical group in a particular Chemical Use Area. (A more detailed site-wide summary is presented in Section O.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 O.3-3A and O.3-3B.
- Column 6 – Assessment of 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).

O.3.4.2 Soil and Soil Vapor Data Summary

As detailed in Tables O.2-8 and O.3-2A, 14 individual confirmed and potential Chemical Use Areas were investigated at the DOE LF1 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.

O.3.4.2.1 Volatile Organic Compounds

A total of 11 soil vapor samples was collected from seven locations and analyzed for VOCs. Of the 11 samples, one had detectable levels of VOCs, and results are shown in Figures O.3-1A and O.3-6.

- Toluene and xylenes were detected at concentrations that did not exceed their respective RBSLs.

Soil vapor sampling was also attempted at four additional locations (Figure O.3-1A). However, no vapor samples could be collected at these locations due to the presence of

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.

shallow bedrock (i.e., less than 5 feet bgs) or insufficient flow from the vapor wells to allow sample collection.

A total of 15 soil samples collected from eight locations was analyzed for VOCs. Of the 15 samples, 6 samples had detectable levels of VOCs, and results are shown in Figures O.3-1B and O.3-6.

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

Further characterization for VOCs in soil or soil vapor is not recommended.

O.3.4.2.2 Semivolatile Organic Compounds

A total of 26 soil samples was collected from 15 locations and analyzed for SVOCs. Of the 26 samples, 12 samples had detectable levels of SVOCs and results are shown in Figures O.3-2 and O.3-7.

- Bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, diethyl phthalate, di-n-butyl phthalate, and di-n-octyl phthalate were detected at concentrations that did not exceed their respective RBSLs.
- Various PAHs were detected in nine samples. None of the detected concentrations exceeded their respective RBSLs.

Further characterization of SVOCs in soil is not recommended.

O.3.4.2.3 Total Petroleum Hydrocarbons

A total of 23 soil samples was collected from 15 locations and analyzed for TPH. Of the 23 samples, 9 samples had detectable levels of TPH and results are shown in Figures O.3-3 and O.3-7.

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

Further characterization of TPH in soil is not recommended.

O.3.4.2.4 Polychlorinated Biphenyls

A total of nine soil samples was collected from six locations and analyzed for PCBs. Of the nine samples, three samples had detectable levels of PCBs and results are presented in Figures O.3-4 and O.3-7.

- Aroclor 1248, Aroclor 1254, and Aroclor 1260 were detected at concentrations that did not exceed their respective RBSLs.

Further characterization for PCBs in soil is not recommended.

O.3.4.2.5 Metals/Inorganic Compounds

A total of 36 soil samples was collected from 22 locations and analyzed for metals. At least one or more metals were detected in all sampling locations, and results are shown in Figures O.3-5 and O.3-8.

- Aluminum, mercury, and selenium concentrations were detected above their respective background concentrations and Ecological RBSLs.
 - Aluminum (background concentration of 20,000 milligrams per kilogram [mg/kg], Ecological RBSL of 12 mg/kg) was detected at concentrations ranging from 7,050 mg/kg to 20,200 mg/kg. Aluminum was detected above its background concentration and Ecological RBSL in one sample collected from U5BS1055 at a depth of 5 to 5.5 feet bgs (20,200 mg/kg). The elevated concentrations of aluminum may be consistent with naturally occurring concentrations in the soil derived from the Santa Susana Formation. Additionally, this sample is sufficiently bounded by samples below the background concentration for aluminum at locations to the south and rock outcroppings to the north.
 - Mercury (background concentration of 0.09 mg/kg, Ecological RBSL of 0.1 mg/kg) was detected at concentrations ranging from 0.003 J mg/kg to 0.107 J mg/kg. Mercury was detected above its background concentration and Ecological RBSL in one sample collected from U5BS1056 at a depth of 0 to 1 foot bgs (0.107 J mg/kg). This sample contains mercury at an estimated concentration that is slightly above its background concentration.
 - Selenium (background concentration of 0.655 mg/kg, Ecological RBSL of 0.17 mg/kg) was detected at concentrations ranging from 0.352 J mg/kg to 1 J mg/kg. Selenium was detected above its background concentration and Ecological RBSL in one sample collected from U5BS1054 at a depth of 0 to 1 foot bgs (1 J mg/kg). That sample is sufficiently bounded by samples below the background concentration for selenium at locations to the north, west, and south and by rock outcroppings to the east.
- Metals detected above background concentrations (but below their respective RBSLs) include beryllium and sodium. Background concentrations for metals are included in Table O.3-3A. Sodium was detected at concentrations ranging from 74.2 mg/kg to 189 mg/kg. RBSLs for sodium have not been established.
- Hexavalent chromium was detected in five samples at concentrations ranging from 0.0486 J mg/kg to 0.27 mg/kg. Hexavalent chromium was detected at a concentration that exceeded its Ecological RBSL of 0.2 mg/kg in one sample collected from L3BS1001 at a depth of 4 to 5 feet bgs (0.27 mg/kg).
- Perchlorate was not identified as having been previously used at the DOE LF1 Site during the historical document review. Consequently, perchlorate was not analyzed in samples collected from the DOE LF1 Site.

0.3.4.2.6 Dioxins

Dioxins were not identified as COPCs for the DOE LF1 Site. Therefore, no soil samples were analyzed for dioxins.

0.3.4.2.7 Energetics

One soil screening sample was collected at a debris pile location and analyzed for energetics. Energetics were not detected in the sample.

Further characterization of energetics in soil is not recommended.

0.3.5 Groundwater Findings

Groundwater occurrence and impacts at the DOE LF1 Site are described below.

0.3.5.1 Groundwater Data Presentation

Groundwater sampling results and characterization findings are summarized in Table O.3-2B and Appendix B of the Group 5 RFI Report. 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 O.3-2A, Table O.3-2B describes groundwater data by chemical group (metals, VOCs, or SVOCs, for example). Table O.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.

0.3.5.2 Groundwater Data Summary

Groundwater conditions at the DOE LF1 Site are characterized by one NSGW piezometer (PZ-112) and by one CFOU groundwater well (RD-17). Groundwater findings from these wells are presented in Table O.3-2B and in Appendix B of the Group 5 RFI Report.

0.3.5.2.1 NSGW Data Summary

As described in Appendix B of the Group 5 RFI Report, samples collected from the NSGW well at the site (PZ-112) were analyzed for VOCs.

- Acetone and methylene chloride were detected in a sample collected on April 4, 2002. Detected concentrations did not exceed their respective screening levels.

Further characterization of VOCs in NSGW is not recommended.

0.3.5.2.2 CFOU Groundwater Data Summary

As described in Appendix B of the Group 5 RFI Report, samples collected from the CFOU groundwater monitoring well at the site (RD-17) were analyzed for VOCs, SVOCs, metals, inorganics, and energetics.

- TCE was detected in nearly all samples collected from RD-17. Detected concentrations ranged from 0.79 micrograms per liter ($\mu\text{g}/\text{L}$) to 2.9 $\mu\text{g}/\text{L}$. Detected concentrations did not exceed the groundwater screening level. Carbon disulfide and toluene were also detected, but at concentrations that do not exceed their respective groundwater screening levels.
- SVOCs were not detected in any of the samples collected.
- Concentrations of dissolved metals (calcium, magnesium, potassium, silica, sodium, strontium, and zinc) were below screening levels.
- Concentrations for detected inorganic compounds (bicarbonate, chloride, fluoride, sulfate, and nitrate- NO_3) were below screening levels for all groundwater samples collected from RD-17.
- Energetics were not detected in any of the samples collected.

Past operations at the DOE LF1 Site are not expected to be the source of the low levels of TCE, metals, and inorganic compounds detected in CFOU groundwater at RD-17. CFOU Groundwater will be discussed further in Appendix B and in the CFOU RFI Report.

0.3.6 Surface Water Findings

It is not likely that near-surface soil at the DOE LF1 Site has been impacted by soil from upgradient sites since there is a surface water divide immediately north (upstream) of the site. Near-surface soil within the DOE LF1 Site has been impacted by metals (selenium and mercury). It is possible that these metals could have been mobilized during storm events and subsequently deposited at downstream sites, including the PDU Site.

0.4 Risk Assessment Findings

The objective of this risk assessment (RA) is to determine whether the DOE LF1 Site 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 DOE LF1 Site. Details regarding how the HRA and ERA were conducted are presented in the SRAM (MWH, 2005) and in Appendix A of the Group 5 RFI Report. Details regarding how the site-specific HRA and ERA is presented in Appendix A, Attachment A8, of the Group 5 RFI Report.

0.4.1 Key Decision Points

Site-specific key decision points for the HRA and ERA are listed below and described more fully in Appendix A and Attachment A8 of the Group 5 RFI Report. These decisions were made for the risk assessments based on site-specific conditions, chemical characteristics, and assessment findings. Programmatic decision points are described and included in the RFI Program Report (MWH, 2004). Site-specific key decision points include the following:

1. Both direct (drinking water) and indirect (soil vapor) exposures to groundwater COPCs were evaluated in the risk assessment (Appendix A).
2. Exposure point concentration (EPC) calculations were based on collected characterization data, as follows:
 - All CFOU Groundwater EPCs were based on maximum levels detected in a single highest-concentration well within Group 5, HAR-18, for both indirect and direct exposure. All NSGW EPCs were based on the maximum levels detected in all NSGW wells within the DOE LF1 Site for both indirect and direct exposure.
 - A review of time-series plots for chemical constituents, groundwater gradients, and source areas indicates maximum concentrations detected during the last consecutive 3 years conservatively represent potential future conditions for the purpose of estimating future risks.
 - Soil EPCs were calculated using ProUCL 4.0 following methods specified in the SRAM (MWH 2005). Two EPCs were used, the central tendency exposure (CTE) and the reasonable maximum exposure (RME). The CTE was the arithmetic mean of the data, and the RME was the 95 percent upper confidence limit (95UCL) as calculated by ProUCL 4.0. In cases where the 95UCL exceeded the maximum detected concentration, the RME defaulted to the maximum detected concentration. In some cases, the CTE also exceeded either the RME or the maximum detected concentration due to differences in assumptions regarding distribution (the arithmetic mean assumes a normal distribution, whereas the method for calculating the 95UCL is based on data distribution) and handling of nondetected values in ProUCL 4.0. In these cases, the value selected as the RME EPC was also used for the CTE EPC.
3. Large home-range receptors were assumed to live only in source areas within the DOE LF1 Site. Risks for these receptors using home-range adjusted exposures were calculated

for the purpose of evaluating RFI-Site-related risks. Large home-range receptor cumulative risk across the SSFL will be presented later in a sitewide summary report of large home-range receptor risk assessment..

0.4.2 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 DOE LF1 Site. A conceptual site model diagram for human health risk assessment is presented in Figure O.4-1 and a summary of COPCs and risk estimates for human health are presented in Table O.4-1 and Table O.4-2 respectively. Results of the risk characterization indicated the following:

- Soil – No COCs were identified for direct contact with soil or 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.
- NSGW – No COCs were identified for domestic use of shallow groundwater by future residents.
- CFOU Groundwater – COCs will be identified and addressed as part of the CFOU.

The uncertainties associated with the Group 5 RFI Sites in general were discussed in Appendix A. Uncertainties specific to the DOE LF 1 Site are summarized in Table O.4-3.

0.4.3 Ecological Risk Assessment Findings

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

- Soil: PCB-toxicity equivalency quotient (TEQ)_Mammal was retained as a chemical of ecological concern (COEC). Estimated risks (hazard quotients [HQs]) exceeded the level of 1 for deer mouse (low toxicity reference value [TRV]) and fall in the medium-low risk category. However, exposure was based on extrapolated concentrations creating uncertainty in the risk estimate. Hexachlorobenzene was not retained as a COEC. That chemical was never detected, and estimated risks for other SVOCs were less than 1.
- 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 TRVs.

The uncertainties associated with the Group 5 RFI Sites in general were discussed in Appendix A. Uncertainties specific to the DOE LF 1 Site are summarized in Table O.4-6.

0.4.4 Risk Assessment Conclusions for DOE LF1 Site

This section presents the overall conclusions for the DOE LF1 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.

Based on the risk evaluation, there are no potential sources of contamination at the DOE LF1 Site that constitute a significant risk to human health or the environment.

Potential risks associated with direct contamination of soil and soil vapor were assessed in this RA. Soil and soil vapor samples were collected and analyzed for VOCs, SVOCs, TPH, metals/inorganics, PCBs and energetics. Data were considered adequate to evaluate potential risks. No COCs were identified in soil and soil vapor for human health. PCB-toxicity equivalency quotient (TEQ) Mammal was identified as a COEC in soil. No COEC was identified in soil vapor for ecological receptors.

Near-surface groundwater was analyzed for VOCs. No COCs were identified in near-surface groundwater for future residents. Chatsworth groundwater will be addressed as part of the CFOU RFI Report.

No locations within the DOE LF1 Site require further action to address human health or ecological risks.

O.5 DOE LF1 Site Action Recommendations

This section presents a summary of RFI reporting requirements as applicable to the DOE LF1 Site. Section O.5.1 describes the RFI reporting requirements, particularly with respect to the identification of areas recommended for additional work, or “site action” recommendations. The process and criteria used for making site action recommendations are described in Section O.5.2. Site action recommendations for the DOE LF1 Site are summarized in Sections O.5.3, O.5.4, and O.5.5.

O.5.1 RFI Reporting Requirements

As described in regulatory guidance documents for the SSFL RCRA Corrective Action Program (see Section 1.2.3 of Volume I 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 DOE LF1 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 O.3-2A and O.3 2B). Section O.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 DOE LF1 Site (Section O.4 and Appendix A).
4. Identifying the DOE LF1 Site areas requiring further work (this section).

O.5.2 Basis for Site Action Recommendations

In summary, site action recommendations included in the DOE LF1 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 in more detail below.

O.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 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 could 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 O.5-1.

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.

0.5.2.2 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) soil
- Proximity of surficial impacts to an active surface water drainage pathway
- Moderate to steep topography
- Absence of containment features (such as 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, 2006a).

0.5.3 CMS Site Action Recommendations

Based on the findings presented in this RFI report, the entire DOE LF1 Site is recommended for an NFA designation. Corrective measures studies are not recommended for this site.

0.5.4 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, and the results of human health and ecological risk assessments performed for the site, the entire DOE LF1 Site is appropriate for an NFA designation. The sections below summarize the historical uses, the sampling data collected, and the results of the HRA and ERA for the site.

0.5.4.1 Historical Uses

CH2M HILL performed a detailed review of all available historic 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 DOE LF1 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. The Chemical Use Areas were subject to site investigation,

sample collection, and analysis. Consequently, all suspect areas of the DOE LF1 Site were investigated and the findings presented and considered herein.

The area recommended for NFA includes the entire DOE LF1 Site, including the following Chemical Use Areas:

- Chemical Use Area 1 – Building 4093 Leach Field
- Chemical Use Area 2 – Building 4030 Leach Field
- Chemical Use Area 3 – Building 4074 (X-ray film processing)
- Chemical Use Area 4 – Building 4023 (Chemistry Lab)
- Chemical Use Area 5 – Building 4030/4035 (Workshop)
- Chemical Use Area 6 – Electrical Substation (north of Building 4641)
- Chemical Use Area 7 – Transformer Pole
- Chemical Use Area 8 – Building 4641 (Shipping and Receiving)
- Chemical Use Area 9 – Building 4073 (reactor testing)
- Chemical Use Area 10 – Building 4083 (reactor control building)
- Chemical Use Area 11 – Buildings 4093 and 4893 (reactor building)
- Chemical Use Area 12 – Building 4103 (reactor kinetics)
- Chemical Use Area 13 – Building 4123 (radiological waste storage)
- Chemical Use Area 14 – Building 4453 (neutron radiography)

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. Sampling data are summarized in the following section.

O.5.4.2 Sampling and Analysis Results

As presented in Section O.3, the DOE LF1 Site, including the additional buildings and features identified within the site, were investigated during this RFI. Soil and soil vapor samples were collected and analyzed for VOCs. Soil samples were also analyzed for SVOCs, petroleum hydrocarbons, metals, inorganics, PCBs, and energetics. Of these, three metals (aluminum, mercury, and selenium) were detected at concentrations that exceeded their respective background concentrations and their respective Ecological or Residential RBSLs. As shown in Figure O.3-7, these exceedances are not significantly elevated above their background concentrations. Also, these metal exceedances occurred in only 1 sample out of the 29 soil samples analyzed for metals at the DOE LF1 Site. The relatively low magnitude of exceedance and the low frequency of exceedance for samples collected throughout the DOE LF1 Site are not indicative of a contamination release. In addition, these metals have not been detected in groundwater samples collected from the nearest CFOU Groundwater

monitoring well, indicating that groundwater has not been impacted by past activities at the DOE LF1 Site.

Hexavalent chromium was also detected at a concentration (0.27 mg/kg) that slightly exceeded its Ecological RBSL (0.2 mg/kg) (a background concentration for hexavalent chromium has not been established) in one sample. The sample might be associated with a release of Turco 3878, which contains sodium chromate, in the Chemical Storage Yard east of Building 4035 in 1987. This exceedance appears to be isolated because hexavalent chromium was not detected at concentrations above the Ecological RBSL in the other samples analyzed for hexavalent chromium at the site.

None of the other compounds analyzed in soil or soil vapor samples collected from the DOE LF1 Site were detected above their respective screening levels. Therefore, although there is documentation of chemicals being used and/or stored in the buildings and process areas throughout the DOE LF1 Site, there are no indications of significant impacts from previous site activities.

0.5.4.3 Risk Assessment

Finally, as presented in Section O.4, the maximum cumulative risk for the site is 3×10^{-7} for a hypothetical future residential exposure and 6×10^{-8} for a hypothetical future recreational exposure. These cumulative human health cancer risks are below the low end of the risk management range (1×10^{-6}). In addition, the hazard indices for human health non-cancer risks are well below 1 for both exposure scenarios, indicating that the site does not pose a significant threat to future potential human receptors.

PCB-TEQs (Mammals) were retained as COEC in the ERA. Estimated risks (hazard quotients [HQs]) exceeded the level of 1 for deer mouse (low TRV) and fall in the medium-low risk category. PCB-TEQs were extrapolated using Aroclor 1260 and Aroclor 1254 data for the site. Because of the uncertainty inherent in this extrapolation, the fact that PCB-TEQs did not exceed the high TRV, and the fact that Aroclor 1254 and Aroclor 1260 were detected at concentrations significantly below their respective Ecological RBSLs (Section O.3.4.2.4), a CMS is not recommended to address the elevated HQs calculated for PCB-TEQs. The site does not pose a significant threat to ecological receptors.

Based on these results, an NFA designation is appropriate for the entire DOE LF1 Site.

0.5.5 Source Area Stabilization Site Action Recommendations

No source area stabilization is required for the DOE LF1 Site because cumulative risks for the site are below 10^{-6} and the site is recommended for NFA.

O.6 References

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Tables

Table O.2-1
Building Inventory
DOE Leach Fields 1 RFI Site

Building Number	Start (Year)	End (Year)	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
4023	1962	1999	Liquid Metals and Analytical Chemistry Lab. Used to support the SNAP reactor until the late 1970s. Small sodium loop to conduct studies of radioactive contamination transport (Mn-54 and Co-60). Program to remove and separate radioactive isotopes from used nuclear fuel was conducted in 1988. Also served as a storage and setup room. Two incidents of possible release of sodium containing Mn-54 on 12/18/80 and 4/28/81. In addition, 0.1 gallons of mercury was released in 1997. Chemicals used included lithium chloride, potassium chloride, and cadmium.	4		Unknown, 1995; Rocketdyne, 1999; Rockwell, 1980; Boeing, 1999b; Rockwell, 1981; Boeing, 2000; Unknown, Unknown Date (HDMSE00187729).
4030 / 4035	1958	1999	Used as a counting room and work shop. Use of Van de Gaff accelerator with tritium targets in support of SNAP (1960-1964). (The accelerator was removed in 1966.) Managed regulated radiological material. Also used as a purchasing office, for traffic and warehousing (beginning in 1972), and for shipping and receiving. Less than 10 gallons of diesel fuel was spilled on November 6, 1991. Approximately 1 pint of Turco 3878 (containing sodium chromate) and 1,000 pounds of nickel chloride flake were released from the Chemical Storage Yard at Building 4035 (adjacent to Building 4030) in 1987.	5		MWH, 2003; Rockwell, 1987.
4046	1977	1981	Material Office Annex.	NA	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4073	early 1950s	1966	KEWB reactor test building. Used uranyl sulfate as fuel. Decontamination in 1968. Removed in 1975.	9		Sapere, 2005.
4074	1958	1980	Storage and X-ray film processing. Demolished in 1995.	3		Sapere, 2005.
4083	1958	1980	Reactor kinetics control building.	10		Sapere, 2005
4093	1958	1995	Used as a reactor building for the L-85 Reactor, also known as the AE-6 Reactor, also known as the Water Boiler Neutron Source Reactor. Used as a neutron source and for reactor operator training. Reactor fuel consisted of a highly enriched uranyl sulfate dissolved in water, and contained in a spherical graphite-reflected stainless steel vessel. Reactor operated from 1958 to 1980, and was decommissioned (all fuel removed) in 1985. Used for storage after reactor decommissioning. Three incidents of possible release in 3/25/59 (fission gas release to air), 7/30/82 (U-235 contaminated rinse water released to floor and concrete shield block), and 5/24/95 (radioactive HEPA filter found in pile of debris). NRC released the site for unrestricted uses on March 19, 1987.	11		MWH, 2003; Sapere, 2005; Rockwell, 1985.
4103	early 1970s	1980	Reactor Kinetics Lab and Storage	12		Sapere, 2005.
4123	early 1950s	1975	Temporary storage of radiological waste material.	13		Sapere, 2005.
4453	1958	1980	Neutron Radiography. Reactor fuel (uranyl sulfate) handling.	14		Sapere, 2005.
4633	1962	late 1980s	Reactor Cooling water pad.	NA	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4636	Unknown, but uses likely started around the time of Building 4536 (<1962)	Standing, along with 4536 (2005)	Guard Shack	NA	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4641	1964	2004	Shipping and Receiving, including radiological materials through 1985. Parking lot located north of Building 4641 supported operations in the building, and was used for storage of materials and equipment. Very small quantities of mercury (0.1 gallons) were released in 1996 and 1997.	8		Unknown, Date Unknown (HDMSE00187729); Sapere, 2005; Rockwell International, 1993; Unknown, 1969.
4643	early 1950s	1975	Provided ventilation for KEWB reactor building.	NA	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4793	early 1950s	1975	Heating and air conditioning for the KEWB reactor building.	NA	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4836	1962	Unknown	Time Clock for personnel working within SNAP Facility	NA	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4893	Unknown	Unknown	Reactor Pad	11		Sapere, 2005.

Table O.2-2
 Tank Inventory
 DOE Leach Fields 1 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										
AT-1	Building 4641	550	Diesel	Unknown	Unknown	Regulated under Corrective Action	Fuel Pumps associated with tanks	8		Unknown, 1991; Rockwell International, 1992a.
AT-2	Building 4641	550	Diesel	Unknown	Unknown	Regulated under Corrective Action	Fuel Pumps associated with tanks	8		Unknown, 1991; Rockwell International, 1992a.
T-23	Building 4023	Unknown	Radioactive Water	Unknown	Unknown	Regulated under Corrective Action	Listed as a vaulted tank on Sisal's Area IV Tank Inventory	4		Rockwell International, 1992b.
T-23-1	Building 4023	Unknown	Radioactive Water	Unknown	Unknown	Regulated under Corrective Action	Listed as a vaulted tank on Sisal's Area IV Tank Inventory	4		Rockwell International, 1992b.
Underground Tanks										
UT-17	Building 4023	220	Radioactive Water	1976 to 1993	Removed	Regulated under Corrective Action	Stainless Steel Vaulted	N/A	No chemical uses based on available information on tank contents.	Unknown, 1994; Unknown, 1989.

Table O.2-3
Transformer Inventory
DOE Leach Fields 1 RFI Site

Transformer/ Substation Number	Location	Use Period	Use Status	Description	Chemical Use Area Number	Comments	Reference
4XXX	North of Building 4641	Unknown	Not in Use		6	The number of this substation is unknown.	Sapere, 2005.
4XXX	Near intersection of G and 11th Streets	Unknown	Unknown	Transformer Pole	7	The number of this transformer pole is unknown.	

**Table O.2-4
Inventory of Other Site Features
DOE Leach Fields 1 RFI Site**

Feature ID	Location	Use Period	Use Status	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
Building 4093 Leach Field	Southwest of Building 4093	1958 - 1961	Not in Use.	Received sanitary wastes from a 750-gallon septic tank. Likely consisted of 4-inch diameter terra cotta clay piping surrounded by gravel, buried at depths ranging from 2 to 6 feet bgs. Comprised of 3 leach lines, for a total length of 234 linear feet. Removed in 1999.	1		MWH, 2003.
Building 4030 Leach Field	Southwest of Building 4030	1958 - 1961	Not in Use.	Comprised 90 linear feet, receiving flow from a 1,000 gallon septic tank. This leach field has not been located through geophysical means.	2		MWH, 2003.
Debris Pile 2004	On the west end of the site just north of the road to the HMDF	Unknown	Unknown	The debris pile appears to be road repair of road removal debris. The pile is largely asphalt with soil underneath.	N/A		CH2M HILL (In progress) and MWH, 2004
Debris Area 3010	On the east end of the site just north of G St, between 10th St and 11th St.	Unknown	Unknown	One approximately 250-ml glass bottle containing gel residue.	N/A		CH2M HILL (In progress) and MWH, 2004
Debris Area 3011	On the northeast end of the site just south of the 4513 parking area	Unknown	Unknown	Soil pile intermixed with asphalt and concrete pushed up against rocky outcrop. Potentially from old foundation. Partially located in RFI Group 6.	N/A		CH2M HILL (In progress) and MWH, 2004

Table O.2-5
Spill Inventory
DOE Leach Fields 1 RFI Site

Date	Building/ Feature	Chemical Spilled	Amount (gallons)	Comments	References
7/30/1982	4093	Uranyl Sulfate (radioactive)	Unknown	In 1982, a 5mL of uranyl sulfate was spilled on the floor and concrete shielding block. Most of the contamination was cleaned up, but the areas where it had been absorbed into the concrete were painted to fix the contamination in place.	Rockwell International. 1983. Sapere, 2005.
12/3/80	4023	Radioactive Contamination	Unknown	On December 3, 1980. water reacted with non-neutralized sodium and surged out of the sodium loop. The water leaked, which resulted in contamination of the ceiling, walls and floor with maximum contamination levels of 1,000 dpm/100 cm ² of Mn-54.	Sapere, 2005.
9/16/92	4641	Hydraulic Oil	Unknown	On September 16, 1991, a site employee noticed a truck was leaking hydraulic oil. The leaked was stopped. The drivers route was covered to see if the roads were safe to travel. The only spills evident were near Buildings 4641 and 4206. This release is addressed with Chemical Use Area 8.	Rockwell International. 1992b.
11/6/91	4030	Diesel Fuel	<10	Less than 10 gallons of diesel fuel spilled at the cross light near Building 4030. This release is addressed with Chemical Use Area 5.	Lafflam, S.R., 1986

Table O.2-6
Site History - Investigations
DOE Leach Fields 1 RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	Purpose	COPCs Analyzed	COPCs Reported	Comments	Reference
2	Building 4030 Leach Field	8/24/1993	Soil Vapor: CCR Sampling in all leach fields.	VOCs in soil vapor	ND for VOCs		MWH, 2003.
2	Building 4030 Leach Field	8/9/2000	Geophysical Survey: Leach field was not found.	N/A	N/A		MWH, 2003.
2	Building 4030 Leach Field	4/23/2002	Geophysical Survey: No indications of septic tank or piping extending from Building 4030 were observed.	N/A	N/A	DOE LF RFI Report concluded that no further action is required to address constituents in soil, soil vapor, and groundwater at this site.	MWH, 2003.
3	Building 4093 Leach Field	8/24/1993	Soil Vapor: CCR Sampling in all leach fields.	VOCs in soil vapor	ND for VOCs		MWH, 2003.
3	Building 4093 Leach Field	3/2/2000-4/13/2000	Soil: Characterization of metals.	Metals	None. All metals detected below background concentrations.	DOE LF RFI Report concluded that no further action is required to address constituents in soil, soil vapor, and groundwater at this site.	MWH, 2003.

Table O.2-7
Site History - Soil Disturbance
DOE Leach Fields 1 RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	COPCs Targeted	Media	Key Activities	Status	Reference
2	Building 4093 Leach Field	1999	N/A	N/A	Removal of leach field. No staining noted during removal.	Not closed	MWH, 2003; Lenox, 2000

Table O.2-9
 Conceptual Site Model
 DOE Leach Fields 1 RFI Site

Chemical Use Area Name (or Site if appropriate)	Ground Surface Elevation (Feet MSL)	Alluvium Thickness (Feet)	Elevation Unweathered Chatsworth Formation (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
DOE Leach Fields 1	1830 to 1920	1 to 10	1795 to 1880	11 to 22	0.04/south to southwest	26 to 29	0.05/southeast	No	While there are no perennial surface water bodies at the site, surface water runoff flows south/southeast/southwest from the site.	Near-surface groundwater has not been observed recently at the site, but was reported at depths of 11 to 22 feet in piezometer PZ-112 during the first quarter of 2005. The site is located in a zone of potential recharge bounded by a surface water divide to the north and the ELV Member shale unit to the south.	MWH, 2003.

MSL = above mean sea level

Table O.3-1A
 Sampling Summary for Soil
 DOE Leach Fields 1 RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	Energetics	Hydrocarbons	Inorganics	Metals	PCBs	SVOC	VOC
OCTS02	Trench	RS871	5/7/1999	3.5	3.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil		X	X				
L9BS01	Soil Boring	RX036	3/2/2000	8	8	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil			X	X			
L9BS01	Soil Boring	RX044	4/13/2000	12	12	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil			X	X			
L9BS02	Soil Boring	RX045	4/13/2000	4	4	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil			X	X			
L9BS03	Soil Boring	RX046	4/13/2000	5	5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil			X	X			
XFBS30	Soil Boring	WD199	9/22/2005	0	0.5	Composite Sample	In Place		Soil			X		X		
U5BS1041	Soil Boring	U5BS1041S01	4/1/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1041	Soil Boring	U5BS1041S02	4/1/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1016	Soil Boring	U5BS1016D01	4/1/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1016	Soil Boring	U5BS1016S02	4/1/2008	4.5	5.5	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1056	Soil Boring	U5BS1056S01	4/9/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X		X	
U5BS1056	Soil Boring	U5BS1056X01	4/9/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X					
U5BS1056	Soil Boring	U5BS1056S02	4/9/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X		X	
U5BS1007	Soil Boring	U5BS1007S01	4/9/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1007	Soil Boring	U5BS1007S02	4/9/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
L9BS1001	Soil Boring		4/9/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
L9BS1001	Soil Boring	L9BS1001D01	4/9/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X			X	
L9BS1001	Soil Boring	L9BS1001X01	4/9/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X					
L9BS1001	Soil Boring		4/9/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
L9BS1001	Soil Boring	L9BS1001S02	4/9/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X			X	
L9BS1001	Soil Boring		4/9/2008	7.5	8.5	Primary Sample	In Place	CH2M HILL	Soil							X
L9BS1001	Soil Boring	L9BS1001S03	4/9/2008	7.5	8.5	Primary Sample	In Place	CH2M HILL	Soil			X				
L3BS1001	Soil Boring	L3BS1001S01	4/9/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X		X	
L3BS1001	Soil Boring	L3BS1001S02	4/9/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil			X	X		X	
L3BS1000	Soil Boring	L3BS1000S01	4/9/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
L3TS1000	Trench	L3TS1000S01	4/11/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
L3TS1000	Trench	L3TS1000S02	4/11/2008	4.5	5.5	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1061	Soil Boring	U5BS1061S01	4/14/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1061	Soil Boring	U5BS1061S02	4/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1061	Soil Boring	U5BS1061S03	4/14/2008	7	8	Primary Sample	In Place	CH2M HILL	Soil				X			
U5BX1002	Soil Boring	U5BX1002C01	4/16/2008	0	0.5	Composite Sample	In Place	CH2M HILL	Soil			X		X		
U5BX1001	Soil Boring	U5BX1001C01	4/16/2008	0	0.5	Composite Sample	In Place	CH2M HILL	Soil			X		X		
U5BS1054	Soil Boring	U5BS1054S01	4/24/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1015	Soil Boring	U5BS1015S01	5/1/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1055	Soil Boring	U5BS1055S01	5/1/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1055	Soil Boring	U5BS1055S02	5/1/2008	5	5.5	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1008	Soil Boring	U5BS1008S01	5/1/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X	X	X	
U5BS1008	Soil Boring	U5BS1008S02	5/1/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X	X	X	
L9BS1000	Soil Boring	L9BS1000D01	5/1/2008	0	0.5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X		X	
U5TS1503	Trench		5/14/2008	1	2	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
U5TS1503	Trench	U5TS1503D01	5/14/2008	1	2	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X	X	X	X		X	
U5BS1008A	Soil Boring		5/20/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1008A	Soil Boring	U5BS1008AS01	5/20/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1008A	Soil Boring		5/20/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1008A	Soil Boring	U5BS1008AS02	5/20/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X				
L9BS1000A	Soil Boring		5/20/2008	0.5	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
L9BS1000A	Soil Boring	L9BS1000AS01	5/20/2008	0.5	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
L9BS1000A	Soil Boring		5/20/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
L9BS1000A	Soil Boring	L9BS1000AS02	5/20/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1055A	Soil Boring		5/20/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1055A	Soil Boring	U5BS1055AS01	5/20/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1055A	Soil Boring		5/20/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1055A	Soil Boring	U5BS1055AS02	5/20/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1041A	Soil Boring		5/27/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1041A	Soil Boring	U5BS1041AS01	5/27/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1041A	Soil Boring		5/27/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1041A	Soil Boring	U5BS1041AS02	5/27/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1054A	Soil Boring		5/27/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X

Table O.3-1A
 Sampling Summary for Soil
 DOE Leach Fields 1 RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	Energetics	Hydrocarbons	Inorganics	Metals	PCBs	SVOC	VOC
U5BS1054A	Soil Boring	U5BS1054AS01	5/27/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1435	Soil Boring	U5BS1435D01	5/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X			
U5BS1435	Soil Boring	U5BS1435S01	5/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
U5BS1435	Soil Boring	U5BS1435S02	5/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1436	Soil Boring	U5BS1436S01	5/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
U5BS1436	Soil Boring	U5BS1436X01	5/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X			
U5BS1434	Soil Boring	U5BS1434S01	5/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1601	Soil Boring	U5BS1601D01	5/29/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X	X	X	
U5BS1601	Soil Boring	U5BS1601S02	5/29/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X	X	X	
U5BS1018	Soil Boring		5/29/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
U5BS1018	Soil Boring	U5BS1018S01	5/29/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
U5BS1018	Soil Boring		5/29/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1018	Soil Boring	U5BS1018S02	5/29/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1602	Soil Boring	U5BS1602S01	5/29/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X	X	X	
U5BS1602	Soil Boring	U5BS1602S02	5/29/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X	X	X	

Table O.3-1B
Sampling Summary for Soil Vapor
DOE Leach Fields 1 RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	VOC
SV-LF030-1	Soil Vapor Sample	SVLF0301	8/24/1993	10	10	Primary Sample	In Place	ICF Kaiser Engineers	Soil Vapor	X
SV-LF093-1	Soil Vapor Sample	SVLF0931	8/24/1993	3	3	Primary Sample	In Place	ICF Kaiser Engineers	Soil Vapor	X
U5SV1018	Soil Vapor Sample		4/10/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1020	Soil Vapor Sample		4/17/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
U5SV1020	Soil Vapor Sample		4/17/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1020	Soil Vapor Sample	U5SV1020D01	4/17/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
U5SV1021	Soil Vapor Sample		4/17/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1021	Soil Vapor Sample		4/17/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1022	Soil Vapor Sample		4/17/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1031	Soil Vapor Sample		4/17/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1031	Soil Vapor Sample		4/17/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X

Table O.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Field 1 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 O.2-2 for sampling locations)	Sampling Results Chemical Concentrations detected greater than background and/or risk screening levels?	Chemical Use Area sufficiently evaluated for risk assessment?	Is delineation sufficient to estimate soil volume in CMS? (see Figure O.5-1 for CMS area)
1	Building 4093 Leach Field	VOCs	Screen for potential VOCs at Building 4093 Leach Field. <u>Soil Vapor</u> : Samples collected at one (1) location. <u>Soil Matrix</u> : Samples were collected at one (1) location.	<u>Soil Vapor</u> : No VOCs were detected. <u>Soil Matrix</u> : VOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.1 and Figures O.3-1A, O.3-1B, O.3-6, and O.3-7.	Yes. The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		SVOCs	Screen for potential SVOCs at Building 4093 Leach Field. Soil samples were collected at one (1) location.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.2 and Figures O.3-2 and O.3-8.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Screen for potential TPH at Building 4093 Leach Field. Soil samples were collected at one (1) location.	No TPH was detected in any soil samples.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Screen for potential metals at Building 4093 Leach Field. Soil samples were collected at three (3) locations.	Metals were detected but did not exceed their respective RBSLs or background. Discussion of results is presented in Section O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
2	Building 4030 Leach Field	VOCs	Chemical uses included VOCs. Screen for potential VOCs at Building 4030 Leach Field. <u>Soil Vapor</u> : Samples collected at one (1) location. <u>Soil Matrix</u> : No samples were collected.	No VOCs were detected in soil vapor.	Yes. The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		SVOCs	Chemical uses included SVOCs. Screen for potential SVOCs at Building 4030 Leach Field. Soil samples were collected at one (1) location.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.2 and Figures O.3-2 and O.3-8.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Chemical uses included TPH. Screen for potential TPH in areas at Building 4030 Leach Field. Soil samples were collected at one (1) location.	TPH was not detected in any soil samples.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Chemical uses included metals. Screen for potential metals at Building 4030 Leach Field. Soil samples were collected at one (1) location.	Metals were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A

Table O.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Field 1 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 O.2-2 for sampling locations)	Sampling Results Chemical Concentrations detected greater than background and/or risk screening levels?	Chemical Use Area sufficiently evaluated for risk assessment?	Is delineation sufficient to estimate soil volume in CMS? (see Figure O.5-1 for CMS area)
3	Building 4074	Metals	Chemical used included metals. Screen for potential metals at Building 4074. Soil samples were collected at one (1) location.	Metals were detected but did not exceed their respective RBSLs or background. Discussion of results is presented in Section O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
4	Building 4023	VOCs	Screen for potential VOCs at Building 4023. <u>Soil Vapor</u> : Samples were collected at one (1) location. <u>Soil Matrix</u> : Samples were collected at one (1) location.	<u>Soil Vapor</u> : No VOCs were detected in any sample. <u>Soil Matrix</u> : VOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.1 and Figures O.3-1A, O.3-1B, and O.3-7.	Yes. The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		SVOCs	Screen for potential SVOCs at Building 4023. Samples were collected at two (2) locations.	No SVOCs were detected in any soil samples.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Screen for potential TPH at Building 4023. Samples were collected at two (2) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.3 and Figures O.3-3 and O.3-8.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Chemicals uses include metals. Screen for potential metals at Building 4023. Samples were collected at two (2) locations.	Metals were detected but did not exceed their respective RBSLs or background. Discussion of results is presented in Section O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
5	Building 4030/4035	SVOCs	Chemical uses included SVOCs. Screen for potential SVOCs at Building 4030. Soil samples were collected at two (2) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.2 and Figures O.3-2 and O.3-8.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Chemical uses included TPH. Screen for potential TPH at Building 4030. Soil samples were collected at one (1) location.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.3 and Figures O.3-3 and O.3-8.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A

Table O.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Field 1 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 O.2-2 for sampling locations)	Sampling Results Chemical Concentrations detected greater than background and/or risk screening levels?	Chemical Use Area sufficiently evaluated for risk assessment?	Is delineation sufficient to estimate soil volume in CMS? (see Figure O.5-1 for CMS area)
		Metals	Chemical uses included metals. Screen for potential metals at Building 4030. Soil samples were collected at two (2) locations.	Hexavalent chromium were detected above Ecological RBSLs in one sample. No background concentration has been established. L3BS1001 at 4-5 ft bgs Discussion of result is presented in O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of hexavalent chromium impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
6	Electrical Substation located north of Building 4641	PCBs	Chemical uses include PCBs. Screen for potential PCBs in substation area. Soil sample was collected at one (1) location.	No PCBs were detected in any soil samples.	Yes. The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
7	Transformer Pole	PCBs	Chemical used included PCBs. Screen for potential PCBs in transformer pole area. Soil samples were collected at two (2) locations.	No PCBs were detected in any soil samples.	Yes. The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Screen for potential TPH in transformer pole area. Soil samples were collected at one (1) location.	No TPH was detected in any soil samples.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
8	Building 4641	VOCs	Chemical uses included VOCs. Screen for potential VOCs at Building 4641. <u>Soil Vapor</u> : Soil vapor samples were collected at three (3) locations. <u>Soil Matrix</u> : Soil samples were collected at one (1) locations.	<u>Soil Vapor</u> : VOCs were detected but did not exceed their respective RBSLs. <u>Soil Matrix</u> : No VOCs were detected in any soil sample. Discussion of results is presented in Section O.3.4.2.1 and Figures O.3-1A, O.3-1B, and O.3-7.	Yes. The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		SVOCs	Chemical uses included SVOCs. Screen for potential SVOCs at Building 4641. Soil samples were collected at two (2) locations.	No SVOCs were detected in any soil samples.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Chemical uses included TPH. Screen for potential TPH at Building 4641. Soil samples were collected at two (2) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.3 and Figures O.3-3 and O.3-8.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A

Table O.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Field 1 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 O.2-2 for sampling locations)	Sampling Results Chemical Concentrations detected greater than background and/or risk screening levels?	Chemical Use Area sufficiently evaluated for risk assessment?	Is delineation sufficient to estimate soil volume in CMS? (see Figure O.5-1 for CMS area)
		PCBs	Screen for potential PCBs at Building 4641. Soil samples were collected at three (3) locations.	PCBs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.4 and Figures O.3-4 and O.3-8.	Yes. The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Screen for potential metals Building 4641. Soil samples were collected at three (3) locations.	Metals were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
9	Building 4073	VOCs	Screen for potential VOCs at Building 4073. <u>Soil Vapor</u> : Samples collected at one (1) location.	No VOCs were detected in any soil vapor sample.	Yes. The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		SVOCs	Screen for SVOCs at Building 4073. Soil samples were collected at one (1) location.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.2 and Figures O.3-2 and O.3-8.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Screen for potential TPH at Building 4073. Soil samples were collected at one (1) location.	No TPH was detected in any soil samples.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Screen for potential metals at Building 4073. Soil samples were collected at one (1) location.	Metals were detected but did not exceed their respective RBSLs or background. Discussion of results is presented in Section O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
10	Building 4083	VOCs	Screen for potential VOCs at Building 4083. <u>Soil Matrix</u> : Samples were collected at two (2) locations.	VOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.1 and Figures O.3-1A, O.3-1B, and O.3-7.	Yes. The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		SVOCs	Screen for potential SVOCs at Building 4083. Soil samples were collected at two (2) locations.	No SVOCs were detected in any soil samples.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A

Table O.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Field 1 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 O.2-2 for sampling locations)	Sampling Results Chemical Concentrations detected greater than background and/or risk screening levels?	Chemical Use Area sufficiently evaluated for risk assessment?	Is delineation sufficient to estimate soil volume in CMS? (see Figure O.5-1 for CMS area)
		TPH	Screen for potential TPH at Building 4083. Soil samples were collected at two (2) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.3 and Figures O.3-3 and O.3-8.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		PCBs	Screen for potential PCBs at Building 4083. Soil samples were collected at one (1) location.	No PCBs were detected in any soil samples.	Yes. The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Screen for potential metals at Building 4083. Soil samples were collected at two (2) locations.	Aluminum were detected above background and Ecological RBSLs in one sample. U5BS1055 at 5-5.5 ft bgs Discussion of result is presented in O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of aluminum impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
11	Building 4093	VOCs	Screen for potential VOCs at Building 4093. <u>Soil Matrix:</u> Samples collected at one (1) location.	No VOCs were detected in any soil sample.	Yes. The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		SVOCs	Screen for potential SVOCs at Building 4093. Soil samples were collected at one (1) location.	No SVOCs were detected in soil samples.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Screen for potential TPH at Building 4093. Soil samples were collected at one (1) location.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.3 and Figures O.3-3 and O.3-8.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Screen for potential metals at Building 4093. Soil samples were collected at one (1) location.	Metals were detected but did not exceed their respective RBSLs or background. Discussion of results is presented in Section O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
12	Building 4103	VOCs	Screen for potential VOCs at Building 4103. <u>Soil Matrix:</u> Soil samples were collected at one (1) location.	VOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.1 and Figures O.3-1A, O.3-1B, and O.3-7.	Yes. The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A

Table O.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Field 1 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 O.2-2 for sampling locations)	Sampling Results Chemical Concentrations detected greater than background and/or risk screening levels?	Chemical Use Area sufficiently evaluated for risk assessment?	Is delineation sufficient to estimate soil volume in CMS? (see Figure O.5-1 for CMS area)
		SVOCs	Screen for potential SVOCs at Building 4103. Soil samples were collected at one (1) location.	No SVOCs were detected in any soil samples.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Screen for potential TPH at Building 4103. Soil samples were collected at one (1) location.	No TPH was detected in any soil samples.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Screen for potential metals at Building 4103. Soil samples were collected one (1) location.	Aluminum were detected above background and Ecological RBSLs in one sample. U5BS1055 at 5-5.5 ft bgs Discussion of result is presented in O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of aluminum impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
13	Building 4123	SVOCs	Screen for potential SVOCs at Building 4123. Soil samples were collected at one (1) location.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.2 and Figures O.3-2 and O.3-8.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Screen for potential TPH at Building 4123. Soil samples were collected at one (1) location.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.3 and Figures O.3-3 and O.3-8.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Screen for potential metals at Building 4123. Soil samples were collected at one (1) location.	Mercury was detected above background and Ecological RBSLs in one sample. U5BS1056 at 0-1 ft. bgs Discussion of result is presented in O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of mercury impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
14	Building 4453	VOCs	Screen for potential VOCs at Building 4453. <u>Soil Matrix</u> : Soil samples collected at one (1) location.	VOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.1 and Figures O.3-1A, O.3-1B, and O.3-7.	Yes. The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		SVOCs	Screen for potential SVOCs at Building 4453. Soil samples collected at one (1) location.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.2 and Figures O.3-2 and O.3-8.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A

Table O.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Field 1 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 O.2-2 for sampling locations)	Sampling Results Chemical Concentrations detected greater than background and/or risk screening levels?	Chemical Use Area sufficiently evaluated for risk assessment?	Is delineation sufficient to estimate soil volume in CMS? (see Figure O.5-1 for CMS area)
		TPH	Screen for potential TPH at Building 4453. Soil samples were collected at one (1) location.	No TPH was detected in any soil samples.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Screen for potential metals at Building 4453. Soil samples collected at three (3) locations.	Selenium was detected above background and Ecological RBSLs in one sample. U5BS1054 at 0-1 ft. bgs Discussion of result is presented in O.3.4.2.5 and Figures O.3-5 and O.3-9.	Yes. The extent of selenium impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
N/A	Debris Pile 2004	VOCs	Screen for potential presence of VOCs at debris pile consisting of asphalt and soils. <u>Soil Matrix:</u> Soil samples collected at one (1) location.	No VOCs were detected in any soil samples.	Yes. The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		SVOCs	Screen for potential presence of SVOCs at debris pile consisting of asphalt and soils. Soil samples collected at one (1) location.	No SVOCs were detected in any soil samples.	Yes. The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		TPH	Screen for potential presence of TPH at debris pile consisting of asphalt and soils. Soil samples were collected at one (1) location.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section O.3.4.2.3 and Figures O.3-3 and O.3-8.	Yes. The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Metals	Screen for potential presence of metals at debris pile consisting of asphalt and soils. Soil samples collected at one (1) location.	Metals were detected but did not exceed their respective RBSLs or background. Discussion of results is presented in Section O.3.4.2.5 and Figures O.3-5, and O.3-9.	Yes. The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A
		Energetics	Screen for potential presence of energetics at debris pile consisting of asphalt and soils. Sample was collected at one (1) location.	No energetics were detected in any soil samples.	Yes. The extent of energetics impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	N/A

Table O.3-2B
Evaluation of Groundwater Sampling Results
DOE Leach Field 1 RFI Site

Analytical Group	Site Soil Impacts (Summary of relevant impacts)	Monitored in Groundwater?	Constituent detected in groundwater? (Above screening criteria?)	Site related?	Groundwater characterized sufficiently for risk assessment?
VOCs	VOCs were detected below screening levels in soil and soil vapor.	Yes. Monitored at PZ-112 in NSGW and RD-17 in CFOU Groundwater.	Yes. TCE was detected in CFOU Groundwater but below screening levels. All other detectable VOCs were below screening levels.	No. TCE and TCE breakdown products were not detected in site soils above screening levels. Additionally, TCE is a regional groundwater concern in the CFOU Groundwater.	NSGW - Yes. CFOU Groundwater¹
SVOCs	SVOCs were detected below RBSLs in soil.	Yes. Monitored at RD-17 in CFOU Groundwater.	No.	No. SVOCs were not detected in GW.	NSGW - Yes.² CFOU Groundwater¹
TPH	TPH was detected below RBSLs in soil.	No.	N/A	N/A	NSGW - Yes.² CFOU Groundwater¹
PCBs	PCBs were detected below screening levels in soils.	No.	N/A	N/A	NSGW - Yes.² CFOU Groundwater¹
Metals	Aluminum, mercury, and selenium were detected above RBSLs and background in soil samples. Hexavalent chromium was detected above Ecological RBSLs. See Section O.3.4.2.5 for further information.	Yes. Monitored at RD-17 in CFOU Groundwater.	Yes. Calcium, magnesium, potassium, sodium, strontium, and zinc were detected but below groundwater screening levels.	No. Detections in CFOU Groundwater are not consistent with the metals detected above RBSLs in surface soil.	NSGW - Yes.² CFOU Groundwater¹
Energetics	Energetics were not detected in soils.	Yes. Monitored at RD-17 in CFOU Groundwater.	No.	No. Energetics were not detected in GW.	NSGW - Yes.² CFOU Groundwater¹

Notes:

1. Chatsworth Formation Groundwater (CFOU Groundwater) is discussed further in Appendix B and will be evaluated for risk assessment purposes in the CFOU RFI Report.
2. Although SVOCs, petroleum hydrocarbons, PCBs, metals, and energetics were not analyzed in NSGW, these chemical groups were detected in soil at concentrations below or only slightly above screening levels, indicating that significant releases of these chemical groups have not occurred at the DOE LF1 Site. Therefore, impacts to NSGW are not expected.
3. NSGW - Near Surface Groundwater

Table O.3-3A
Data Screening and Statistical Summary for Soil
DOE Leach Fields 1 RFI Site

Constituent	Units	Screening Levels			Detect Data Summary						
		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
Energetics											
2,4-Dinitrotoluene	mg/kg		0.43		1						
2,6-Dinitrotoluene	mg/kg		1.71		1						
Nitrobenzene	mg/kg	29	2		1						
Hydrocarbons											
Diesel Range Organics (C14-C20)	mg/kg	1,400			1						
Diesel Range Organics (C15-C20)	mg/kg	1,400			19	2	1.9	2.905			
Gasoline Range Hydrocarbons (C8-C11)	mg/kg	1.1			19						
Gasoline Range Hydrocarbons (C8-C11)	mg/kg	1.1			1						
Kerosene Range Hydrocarbons (C11-C14)	mg/kg	1,400			1						
Kerosene Range Hydrocarbons (C12-C14)	mg/kg	1,400			19						
Lubricating Oil Range Hydrocarbons (C20-C30)	mg/kg	1,400			1						
Lubricating Oil Range Hydrocarbons (C21-C30)	mg/kg	1,400			22	9	1.31	57			
Total Petroleum Hydrocarbons	mg/kg				2	1	57	57			
Inorganics											
% Solids	%				3	3	94.5	96.2			
Bromide	mg/kg				7						
Chloride	mg/kg				7	6	2.6	48.2			
Fluoride	mg/kg	4,600		6.7	7	4	0.908	1.48			
Moisture	%				36	36	3.48	16.8			
Nitrate-N	mg/kg	120,000			7	5	0.33	1.3			
Nitrite-N	mg/kg				7						
Orthophosphate as P	mg/kg				3	2	1.5	3.7			
pH	pH Units				15	15	6.56	8.6			
Phosphate	mg/kg				4	2	1.26	3.52			
Sulfate	mg/kg				7	7	10	48.8			
Total Solids	%				20	20	87	98			
Metals											
Aluminum	mg/kg	75,000	12	20,000	29	29	7050	20200		29	1
Antimony	mg/kg	30	0.095	8.7	29	1	1.425	1.425		1	
Arsenic	mg/kg	0.095	1.9	15	31	31	1.9	12	31	30	
Barium	mg/kg	15,000	15	140	29	29	48	118		29	
Beryllium	mg/kg	150	5	1.1	29	28	0.33	1.2			1
Boron	mg/kg	15,000	6.76	9.7	29	10	0.8	2			
Cadmium	mg/kg	39	0.0045	1	29	26	0.0975	0.29		26	
Chromium	mg/kg	3,400	930	36.8	29	29	10.05	31.2			
Cobalt	mg/kg	1,500	8.9	21	29	29	3.5	7.8			
Copper	mg/kg	3,000	1.1	29	29	29	4.6	18.2		29	
Hexavalent Chromium	mg/kg	110	0.2		5	5	0.0486	0.27		1	
Lead	mg/kg	150	0.013	34	29	29	2.8	13.7		29	
Lithium	mg/kg	1,522		37	28	28	14	34.2			
Mercury	mg/kg	23	0.1	0.09	29	22	0.003	0.1065		1	1
Molybdenum	mg/kg	380	0.11	5.3	29	25	0.13	1.6		25	
Nickel	mg/kg	1500	0.1	29	29	29	5.5	16.8		29	
Potassium	mg/kg			6400	28	28	1430	3690			
Selenium	mg/kg	380	0.17	0.655	33	14	0.35225	1		14	1
Silver	mg/kg	380	0.54	0.79	29	12	0.029	0.249			
Sodium	mg/kg			110	28	5	74.2	189			2
Thallium	mg/kg	6.1	2.9	0.46	29	25	0.14	0.38			
Vanadium	mg/kg	76	1.5	62	29	29	18.25	53.4		29	
Zinc	mg/kg	23000	21	110	29	29	37	110		29	
Zirconium	mg/kg			8.6	28	28	1.2	2.9			

Table O.3-3A
Data Screening and Statistical Summary for Soil
DOE Leach Fields 1 RFI Site

Constituent	Units	Screening Levels			Detect Data Summary						
		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
PCBs											
Aroclor 1016	mg/kg	3.9	1.6		9						
Aroclor 1221	mg/kg	0.35	1.6		9						
Aroclor 1232	mg/kg	0.35	0.077		9						
Aroclor 1242	mg/kg	0.35	0.079		9						
Aroclor 1248	mg/kg	0.35	0.0114		9	1	0.003	0.003			
Aroclor 1254	mg/kg	0.35	0.077		9	1	0.0043	0.0043			
Aroclor 1260	mg/kg	0.35	0.077		9	1	0.0014	0.0014			
SVOC											
1,2-Diphenylhydrazine	mg/kg		8.5		1						
1-Methyl naphthalene	mg/kg	230			26						
2,4,5-Trichlorophenol	mg/kg	5700	9		1						
2,4,6-Trichlorophenol	mg/kg	10	10		1						
2,4-Dichlorophenol	mg/kg	170	1.3		1						
2,4-Dimethylphenol	mg/kg	1100	110		1						
2,4-Dinitrophenol	mg/kg	110	0.59		1						
2-Chloronaphthalene	mg/kg		530		1						
2-Chlorophenol	mg/kg	290	21		1						
2-Methylnaphthalene	mg/kg	230	210		26						
2-Nitroaniline	mg/kg		11		1						
2-Nitrophenol	mg/kg		11		1						
3,3'-Dichlorobenzidine	mg/kg		1.3		1						
3-Nitroaniline	mg/kg		5.9		1						
4,6-Dinitro-o-cresol	mg/kg	5.7	11		1						
4-Bromophenyl phenyl ether	mg/kg		4.3		1						
4-Chlorophenylphenyl ether	mg/kg		1.3		1						
4-Nitrophenol	mg/kg		7		1						
Acenaphthene	mg/kg	3400	2.46		26						
Acenaphthylene	mg/kg	1700	370		26						
Aniline	mg/kg	130	11		1						
Anthracene	mg/kg	17000	2.4		26	3	0.00014	0.00017			
Benzo(a)anthracene	mg/kg	0.6	5.6		26	4	0.00023	0.001773333			
Benzo(a)pyrene	mg/kg	0.06	5.6		26	6	0.00024	0.0075			
Benzo(b)fluoranthene	mg/kg	0.6	5.6		25	6	0.00024	0.04175			
Benzo(ghi)perylene	mg/kg		6.4		26	6	0.0003	0.0053			
Benzo(k)fluoranthene	mg/kg	0.6	5.8		23	2	0.00027	0.0067			
Benzoic acid	mg/kg	230000	4.4		1						
Benzyl alcohol	mg/kg	17000	4.4		1						
bis(2-Chloroethoxy)methane	mg/kg		150		1						
bis(2-Chloroethyl) ether	mg/kg	0.29	150		1						
bis(2-Chloroisopropyl) ether	mg/kg	2300	150		1						
bis(2-Ethylhexyl) phthalate	mg/kg	250	4.9		19	2	0.031	0.047			
Butyl benzyl phthalate	mg/kg	11000	340		22	2	0.017	0.037			
Chrysene	mg/kg	6	2.4		26	6	0.00021	0.008			
Dibenzo(a,h)anthracene	mg/kg	0.17	5.6		26	2	0.00042	0.0017			
Dibenzofuran	mg/kg	110	62		1						
Diethyl phthalate	mg/kg	46000	6940		21	2	0.00057	0.00058			
Dimethyl phthalate	mg/kg	570000	4.4		26						
Di-n-butyl phthalate	mg/kg	5700	0.49		22	3	0.0012	0.0059			
Di-n-octyl phthalate	mg/kg	2300	39		26	2	0.0046	0.039			
Diphenylamine	mg/kg				1						
Fluoranthene	mg/kg	2300	38		26	8	0.00028	0.003566667			

Table O.3-3A
Data Screening and Statistical Summary for Soil
DOE Leach Fields 1 RFI Site

Constituent	Units	Screening Levels			Detect Data Summary						
		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
Fluorene	mg/kg	2300	1.6		26	1	0.00047	0.00047			
Hexachlorobenzene	mg/kg	0.4	0.34		1						
Hexachlorocyclopentadiene	mg/kg	340	13		1						
Hexachloroethane	mg/kg	18	2.1		1						
Indeno(1,2,3-cd)pyrene	mg/kg	0.6	5.8		26	3	0.001075	0.0021			
Isophorone	mg/kg	750	320		1						
Naphthalene	mg/kg	6	210		25						
n-Nitrosodimethylamine	mg/kg	0.045	20		26						
n-Nitrosodi-n-propylamine	mg/kg	0.1	28		1						
o-Cresol	mg/kg	2867.0661	110		1						
p-Chloroaniline	mg/kg		4.4		1						
p-Chloro-m-cresol	mg/kg		21		1						
p-Cresol	mg/kg	290	4.3		1						
Pentachlorophenol	mg/kg	8.8	6		1						
Phenanthrene	mg/kg	1700	1.3		26	3	0.00042	0.000923333			
Phenol	mg/kg	18000	5		1						
p-Nitroaniline	mg/kg		3.3		1						
Pyrene	mg/kg	1700	18		26	8	0.00022	0.0061			
VOC											
1,1,1,2-Tetrachloroethane	mg/kg	0.00025	76		15						
1,1,1-Trichloroethane	mg/kg	0.49	4300		15						
1,1,2,2-Tetrachloroethane	mg/kg	0.0014	6		15						
1,1,2-Trichloro-1,2,2-trifluoroethane	mg/kg	16	583		15						
1,1,2-Trichloroethane	mg/kg	0.0012	8.3		15						
1,1-Dichloroethane	mg/kg	0.0016	210		15						
1,1-Dichloroethene	mg/kg	0.023	10.7		15						
1,1-Dichloropropene	mg/kg		22		15						
1,2,3-Trichlorobenzene	mg/kg	0.124604521	20		15						
1,2,3-Trichloropropane	mg/kg	0.000051	12		15						
1,2,4-Trichlorobenzene	mg/kg	0.124604521	20		15						
1,2,4-Trimethylbenzene	mg/kg	0.035	64		15						
1,2-Dibromo-3-chloropropane	mg/kg	0.029	22		15						
1,2-Dibromoethane	mg/kg		25		15						
1,2-Dichlorobenzene	mg/kg	1.8	370		15						
1,2-Dichloroethane	mg/kg	0.0005	76		15						
1,2-Dichloropropane	mg/kg		250		15						
1,3,5-Trimethylbenzene	mg/kg	0.036	64		15						
1,3-Dichlorobenzene	mg/kg	1.7	160		15						
1,3-Dichloropropane	mg/kg		22		15						
1,4-Dichlorobenzene	mg/kg	0.01	20		15						
2-Chloro-1,1,1-trifluoroethane	mg/kg				3						
2-Chloroethylvinyl ether	mg/kg	9.56905E-06	0.73		14						
2-Hexanone	mg/kg		1220		15						
Acetone	mg/kg	51	43		14	1	0.1	0.1			
Benzene	mg/kg	0.00013	110		15						
Bromobenzene	mg/kg		110		15						
Bromochloromethane	mg/kg		25		15						
Bromodichloromethane	mg/kg	0.00031	15		15						
Bromoform	mg/kg		38		15						
Bromomethane	mg/kg		25		15						
Carbon Tetrachloride	mg/kg	0.000042	1.5		15						
Chlorobenzene	mg/kg	0.097	40		15						

Table O.3-3A
Data Screening and Statistical Summary for Soil
DOE Leach Fields 1 RFI Site

Constituent	Units	Screening Levels			Detect Data Summary						
		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
Chloroethane	mg/kg		190		15						
Chloroform	mg/kg	0.00077	11		15						
Chloromethane	mg/kg		25		15						
Chlorotrifluoroethylene	mg/kg		10.7		3						
cis-1,2-Dichloroethene	mg/kg	0.014	68		15						
cis-1,3-Dichloropropene	mg/kg		22		15						
Cumene	mg/kg	0.382558451	210		15						
Dibromochloromethane	mg/kg		46		15						
Dibromomethane	mg/kg		25		15						
Dichlorodifluoromethane	mg/kg	0.015	64		15						
Ethylbenzene	mg/kg	1.2	210		15						
Hexachlorobutadiene	mg/kg	9.2	0.85		15						
Methyl ethyl ketone	mg/kg	62	2540		15	1	0.005	0.005			
Methyl isobutyl ketone (MIBK)	mg/kg	19.63756975	2540		15						
Methyl tert-butyl ether	mg/kg		120		15						
Methylene chloride	mg/kg	0.004	25		15	1	0.00266	0.00266			
m-Xylene & p-Xylene	mg/kg	0.15	64		15						
n-Butylbenzene	mg/kg		210		15						
n-Propylbenzene	mg/kg	0.203267508	210		15						
o-Chlorotoluene	mg/kg	1222.098214	160		15						
o-Xylene	mg/kg	0.19	64		15						
p-Chlorotoluene	mg/kg	1222.098214	160		15						
p-Cymene	mg/kg		64		15						
sec-Butylbenzene	mg/kg	76.76404578	210		15						
sec-Dichloropropane	mg/kg		22		15						
Styrene	mg/kg	7.2	427		15	4	0.000231	0.000316			
tert-Butylbenzene	mg/kg		210		15						
Tetrachloroethene	mg/kg	0.00043	6		15						
Toluene	mg/kg	0.3	3.4		15						
trans-1,2-Dichloroethene	mg/kg	0.016	970		15						
trans-1,3-Dichloropropene	mg/kg		4.4		15						
Trichloroethene	mg/kg	0.0022	3		15						
Trichlorofluoromethane	mg/kg	0.11	300		15						
Vinyl chloride	mg/kg	0.0000096	0.73		15						
Xylenes, Total	mg/kg	0.15	64		15						

Table O.3-3B
Data Screening and Statistical Summary for Soil Vapor
DOE Leach Fields 1 RFI Site

Constituent	Units	Screening Levels		Detect Data Summary					
		Residential RBSL	Ecological RBSL	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL
VOC									
1,1,1,2-Tetrachloroethane	ug/L	0.048		8					
1,1,1-Trichloroethane	ug/L	640	38	8					
1,1,2,2-Tetrachloroethane	ug/L	0.048		8					
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/L	8800	91	8					
1,1,2-Trichloroethane	ug/L	0.17	0.057	8					
1,1-Dichloroethane	ug/L	1.7	36	8					
1,1-Dichloroethene	ug/L	58	0.6	8					
1,2-Dichloroethane	ug/L	0.13	42	8					
Benzene	ug/L	0.095	0.57	8					
Carbon Tetrachloride	ug/L	0.063	0.63	8					
Chloroethane	ug/L		992	8					
Chloroform	ug/L	0.5	0.24	8					
cis-1,2-Dichloroethene	ug/L	10	1.9	8					
Dichlorodifluoromethane	ug/L	58	91	8					
Ethylbenzene	ug/L	290	23	8					
Methylene chloride	ug/L	2.7	0.87	8					
m-Xylene & p-Xylene	ug/L		16	8	1	0.12	0.12		
o-Xylene	ug/L	29	16	8					
Tetrachloroethene	ug/L	0.45232	24	8					
Toluene	ug/L	110	0.084	8	1	0.08	0.08		
trans-1,2-Dichloroethene	ug/L	20	1.9	8					
Trichloroethene	ug/L	1.4	6.4	8					
Trichlorofluoromethane	ug/L	200	90.9	8					
Vinyl chloride	ug/L	0.035	0.56	8					
VOC in vapor screen (All ND)	ug/L			2					
Xylenes, Total	ug/L		16	8	1	0.12	0.12		

Table O.4-1
Chemicals of Potential Concern for Human Health
DOE Leach Fields 1 RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-2	Acetone		Y	
Soil	0-2	Aluminum	N	N	Below Background
Soil	0-2	Anthracene		Y	
Soil	0-2	Anthracene		Y	
Soil	0-2	Antimony	N	N	Below Background
Soil	0-2	Aroclor 1260		Y	
Soil	0-2	Arsenic	N	N	Below Background
Soil	0-2	Barium	N	N	Below Background
Soil	0-2	Benzo(a)anthracene		Y	
Soil	0-2	Benzo(a)pyrene		Y	
Soil	0-2	Benzo(b)fluoranthene		Y	
Soil	0-2	Benzo(ghi)perylene		Y	
Soil	0-2	Benzo(k)fluoranthene		Y	
Soil	0-2	Beryllium	N	N	Below Background
Soil	0-2	bis(2-Ethylhexyl) phthalate		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	Chloride		N	General Chemistry
Soil	0-2	Chromium	N	N	Below Background
Soil	0-2	Chrysene		Y	
Soil	0-2	Cobalt	N	N	Below Background
Soil	0-2	Copper	N	N	Below Background
Soil	0-2	Dibenzo(a,h)anthracene		Y	
Soil	0-2	Diesel Range Hydrocarbons (C15-C20)		N	See BTEX, PAHs
Soil	0-2	Lubricating Oil Range Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-2	Di-n-octyl phthalate		Y	
Soil	0-2	Fluoranthene		Y	
Soil	0-2	Fluorene		Y	
Soil	0-2	Hexavalent Chromium	N	N	Below Background
Soil	0-2	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-2	Lead	N	N	Below Background
Soil	0-2	Lithium	N	N	Below Background
Soil	0-2	Mercury	N	N	Below Background
Soil	0-2	Methyl ethyl ketone		Y	
Soil	0-2	Methylene chloride		Y	
Soil	0-2	Molybdenum	N	N	Below Background
Soil	0-2	Nickel	N	N	Below Background
Soil	0-2	Nitrate-N		Y	
Soil	0-2	Orthophosphate as P		N	General Chemistry
Soil	0-2	Phenanthrene		Y	
Soil	0-2	Phosphate		N	General Chemistry
Soil	0-2	Pyrene		Y	
Soil	0-2	Selenium	N	N	Below Background
Soil	0-2	Silver	N	N	Below Background
Soil	0-2	Styrene		Y	
Soil	0-2	Sulfate		N	General Chemistry
Soil	0-2	Thallium	N	N	Below Background
Soil	0-2	Total Petroleum Hydrocarbons		N	See BTEX, PAHs
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	Acetone		Y	
Soil	0-10	Aluminum	N	N	Below Background
Soil	0-10	Anthracene		Y	

Table O.4-1
Chemicals of Potential Concern for Human Health
DOE Leach Fields 1 RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-10	Antimony	N	N	Below Background
Soil	0-10	Aroclor 1248		Y	
Soil	0-10	Aroclor 1254		Y	
Soil	0-10	Aroclor 1260		Y	
Soil	0-10	Arsenic	N	N	Below Background
Soil	0-10	Barium	N	N	Below Background
Soil	0-10	Benzo(a)anthracene		Y	
Soil	0-10	Benzo(a)pyrene		Y	
Soil	0-10	Benzo(b)fluoranthene		Y	
Soil	0-10	Benzo(ghi)perylene		Y	
Soil	0-10	Benzo(k)fluoranthene		Y	
Soil	0-10	Beryllium	Y	Y	
Soil	0-10	bis(2-Ethylhexyl) phthalate		Y	
Soil	0-10	Boron	N	N	Below Background
Soil	0-10	Butyl benzyl phthalate		Y	
Soil	0-10	Cadmium	N	N	Below Background
Soil	0-10	Chloride		N	General Chemistry
Soil	0-10	Chromium	N	N	Below Background
Soil	0-10	Chrysene		Y	
Soil	0-10	Cobalt	N	N	Below Background
Soil	0-10	Copper	N	N	Below Background
Soil	0-10	Dibenzo(a,h)anthracene		Y	
Soil	0-10	Diesel Range Hydrocarbons (C15-C20)		N	See BTEX, PAHs
Soil	0-10	Lubricating Oil Range Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-10	Diethyl phthalate		Y	
Soil	0-10	Di-n-butyl phthalate		Y	
Soil	0-10	Di-n-octyl phthalate		Y	
Soil	0-10	Fluoranthene		Y	
Soil	0-10	Fluorene		Y	
Soil	0-10	Fluoride		Y	
Soil	0-10	Hexavalent Chromium	N	N	Below Background
Soil	0-10	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-10	Lead	N	N	Below Background
Soil	0-10	Lithium	N	N	Below Background
Soil	0-10	Mercury	N	N	Below Background
Soil	0-10	Methyl ethyl ketone		Y	
Soil	0-10	Methylene chloride		Y	
Soil	0-10	Molybdenum	N	N	Below Background
Soil	0-10	Nickel	N	N	Below Background
Soil	0-10	Nitrate-N		Y	
Soil	0-10	Orthophosphate as P		N	General Chemistry
Soil	0-10	Phenanthrene		Y	
Soil	0-10	Phosphate		N	General Chemistry
Soil	0-10	Pyrene		Y	
Soil	0-10	Selenium	N	N	Below Background
Soil	0-10	Silver	N	N	Below Background
Soil	0-10	Styrene		Y	
Soil	0-10	Sulfate		N	General Chemistry
Soil	0-10	Thallium	N	N	Below Background
Soil	0-10	Total Petroleum Hydrocarbons		N	See BTEX, PAHs
Soil	0-10	Vanadium	N	N	Below Background
Soil	0-10	Zinc	N	N	Below Background
Soil	0-10	Zirconium	N	N	Below Background

Table O.4-1
Chemicals of Potential Concern for Human Health
DOE Leach Fields 1 RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil Vapor	0-10	m-Xylene & p-Xylene		N	See Xylenes, Total
Soil Vapor	0-10	Toluene		Y	
Soil Vapor	0-10	Xylenes, Total		Y	
Groundwater	-	Acetone		Y	
Groundwater	-	Methylene chloride		Y	

Table O.4-2
Human Health Risk Estimates¹
DOE Leach Fields 1 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	0.000002	-	0.00002		7E-10	-	6E-08		NA	-	NA		<0.01	-	<0.01		7E-10	-	6E-08					
Future Child Recreator	0.00008	-	0.0002		1E-08	-	5E-08		NA	-	NA		<0.01	-	<0.01		1E-08	-	5E-08					
Future Adult Resident	0.0004	-	0.001		1E-08	-	8E-08		0.0005	-	0.0008		5E-08	-	2E-07		0.001	-	0.003		6E-08	-	3E-07	
Future Child Resident	0.004	-	0.009		7E-08	-	2E-07		0.002	-	0.003		1E-07	-	2E-07		0.008	-	0.01		2E-07	-	3E-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 O.4-3
Human Health Risk Assessment Uncertainty Analysis
DOE Leach Fields 1 RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
COPC Selection	Beryllium was selected as a COPC since it could not be demonstrated to be consistent with background concentrations through the Wilcoxon Rank Sum test. For site data sets that are small, uncertainty is introduced into the comparisons.	Moderate	Conservative
	Toluene and total xylenes were selected as soil vapor COPCs since they were directly detected in soil vapor. Acetone, methyl ethyl ketone, methylene chloride, and styrene were also selected as soil vapor COPCs because they were detected in soil but not analyzed for in soil vapor.	Moderate	Conservative
	Petroleum hydrocarbons were not selected as COPCs since TPH-related constituents (BTEX and PAHs) were analyzed for.	Low	Realistic
Exposure Pathways	Risks associated with drinking of groundwater are not realistic because the groundwater beneath the SSF is not currently used as a drinking water source and the presence of the contamination will likely require a restriction on its future use as well.	High	Conservative
	Future land use of the site is currently undecided but may be recreational, which has lower risks than for urban residential. If land use is assumed agricultural, risk estimates may be higher.	Moderate	Uncertain
	Risk estimates for fruit and vegetable consumption are based on conservative models that are based on associations with physical-chemical properties, such as Koc.	Moderate	Conservative
EPC Calculations	EPCs are based on some data that are over 10 years old. In these cases available analytical data may not accurately reflect current site conditions. Source concentrations assumed constant over time. Chemical concentrations may decline as a result of migration or degradation.	Low	Conservative
	Use of upper confidence limits and maximum detected concentrations will likely overestimate site risks.	Low	Conservative
	Soil vapor exposure point concentration for acetone, methyl ethyl ketone, methylene chloride, and styrene 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
	The extrapolation of soil Aroclor 1254 and Aroclor 1260 concentrations to individual PCB congener concentrations introduces some uncertainty into the EPC estimates for the PCB congeners.	Low	Conservative
	Vapor migration into indoor air has been estimated using a model which is being validated for the site. Migration estimates may be changed once the model validation is complete.	Moderate	Uncertain
Cancer Slope Factor	Extrapolation of dose-response data from laboratory animals to humans.	High	Conservative
	Assumes that all carcinogens do not have a threshold below which carcinogenic response occurs, and therefore, any dose, no matter how small, results in some potential risk.	Moderate	Conservative
	Not all slope factors represent the same degree of certainty. All are subject to change as new evidence becomes available. Some slope factors derived by OEHHA and considerably more conservative than 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 O.4-4
Chemicals of Ecological Concern - Soil
DOE Leach Fields 1 RFI Site

Preferred Analyte Name	Range of HQs - RME Exposure (Refined Calculations)							Identification of COECs	
	Terrestrial Plant	Soil Invertebrate	Hermit Thrush	Red-Tailed Hawk	Deer Mouse	Bobcat	Mule Deer	COEC	Rationale
Hexachlorobenzene	No TRV	No TRV	0.01 -- 0.02	0.00001 -- 0.00001	1.01 -- 3.7	0.0001 -- 0.0003	0.002 -- 0.006	No	-Estimated risks exceeded 1 for both the Low and High TRV for the deer mouse, but -Estimated risks were less than 1 for all other receptors. -Chemical was never detected. Retained on basis of SQL screen. -Actual chemical concentration, if present, is uncertain. -No other semi-volatile chemicals detected in soils showed estimated risks.
PCB_TEQ_Mammal	No TRV	0.000002	n/a -- n/a	n/a -- n/s	0.57 -- 5.7	0.000004 -- 0.000043	0.0001 -- 0.0007	Yes	-Estimated exposures exceed Low TRV for deer mouse. -Estimated exposures based on EPCs extrapolated from Aroclor concentrations. -Actual presence of dioxin-like PCBs is uncertain.

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

**Table O.4-5
Chemicals of Ecological Concern - Soil Vapor
DOE Leach Fields 1 RFI Site**

Preferred Analyte Name	Inhalation of Soil Vapor (Deer Mouse)	Identification of COECs	
		COEC	Rationale
1,1,2-Trichloroethane	1.8	No	-Analyte was not detected in 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 conc

Notes:

n/a - not applicable

HQs listed are based on Refined Screen

COEC - chemical of ecological concern

CTE - central tendency exposure

HQ - hazard quotient

RME - reasonable maximum exposure

Table O.4-6
Ecological Risk Assessment Uncertainty Analysis
DOE Leach Fields 1 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	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	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	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	Low	Over-estimation of exposure/risk
CPEC Selection	SQL Comparison. Chemicals that were never detected at the site were included as CPECs if they met the criteria in the SQL screening process: a) SQL > ESL b) at least 5 samples were collected c) at least 2 other chemicals in the same chemical class were detected.	Low	Over-estimation of exposure/risk
Exposure Pathway Analysis	Dermal and inhalation (for surface-dwelling animals) exposure pathways were not quantified.	Low	Under-estimation of exposure/risk
Analysis			
Wildlife Exposure Factors	Assumptions regarding exposure - likelihood, contact with contaminated media, concentrations at exposure points, and frequency/duration of contact are based on available information and assumptions of wildlife habits at the SSFL. Assumptions tend to simplify actual site conditions and may over- or under-estimate actual exposure.	Moderate	Over- or under-estimation of exposure/risk

Table O.4-6
Ecological Risk Assessment Uncertainty Analysis
DOE Leach Fields 1 RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Bioaccumulation Factors	Site-specific data on CPEC concentrations in wildlife foods were used to derive BAFs for a limited number of CPECs (SRAM 2005). For the remaining CPECs, literature-based BAFs and regression models were used to estimate bioaccumulation. The suitability of these bioaccumulation models to conditions at the site is unknown. Therefore, concentrations of CPECs in biota present at the site and, consequently, the dietary exposures of birds and mammals, may be either higher or lower than values estimated in the	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	Moderate	Over-estimation of exposure/risk
Exposure Point Concentrations	The extrapolation of soil Aroclor 1254 and Aroclor 1260 concentrations to individual dioxin-like PCB congener concentrations introduces some uncertainty into the EPC estimates for the PCB congeners.	Low	Over- or under-estimation of exposure/risk
Exposure Point Concentrations	Soil vapor concentrations extrapolated from soil concentrations were used to calculate soil vapor EPC.	Moderate	Over- or under-estimation of exposure/risk
Exposure Point Concentrations	Estimation of soil vapor concentrations overstates actual burrow concentrations: 1) Model is conservative. 2) Air flow in burrows is not accounted for. 3) Model does not account for attenuation between depth to soil and 0-6 ft bgs interval for burrows.	Moderate	Over- or under-estimation of exposure/risk
Toxicity Reference Values	Toxicity data were not available for all CPECs or media considered in the Group 5 ERAs. CPECs for which toxicity data were unavailable were not evaluated, or surrogate toxicity data were used. Risks may be overestimated or underestimated.	Moderate	Over- or under-estimation of exposure/risk

Table O.4-6
Ecological Risk Assessment Uncertainty Analysis
DOE Leach Fields 1 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	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 O.4-6
Ecological Risk Assessment Uncertainty Analysis
DOE Leach Fields 1 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	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 O.5-1
Surficial Media Site Action Recommendations
DOE Leach Fields 1 RFI Site**

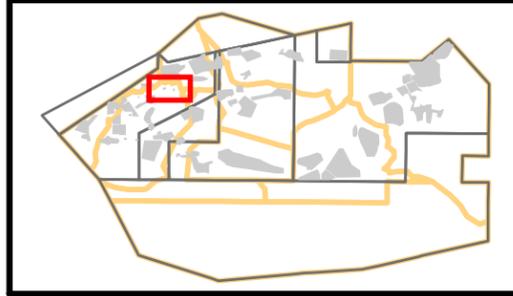
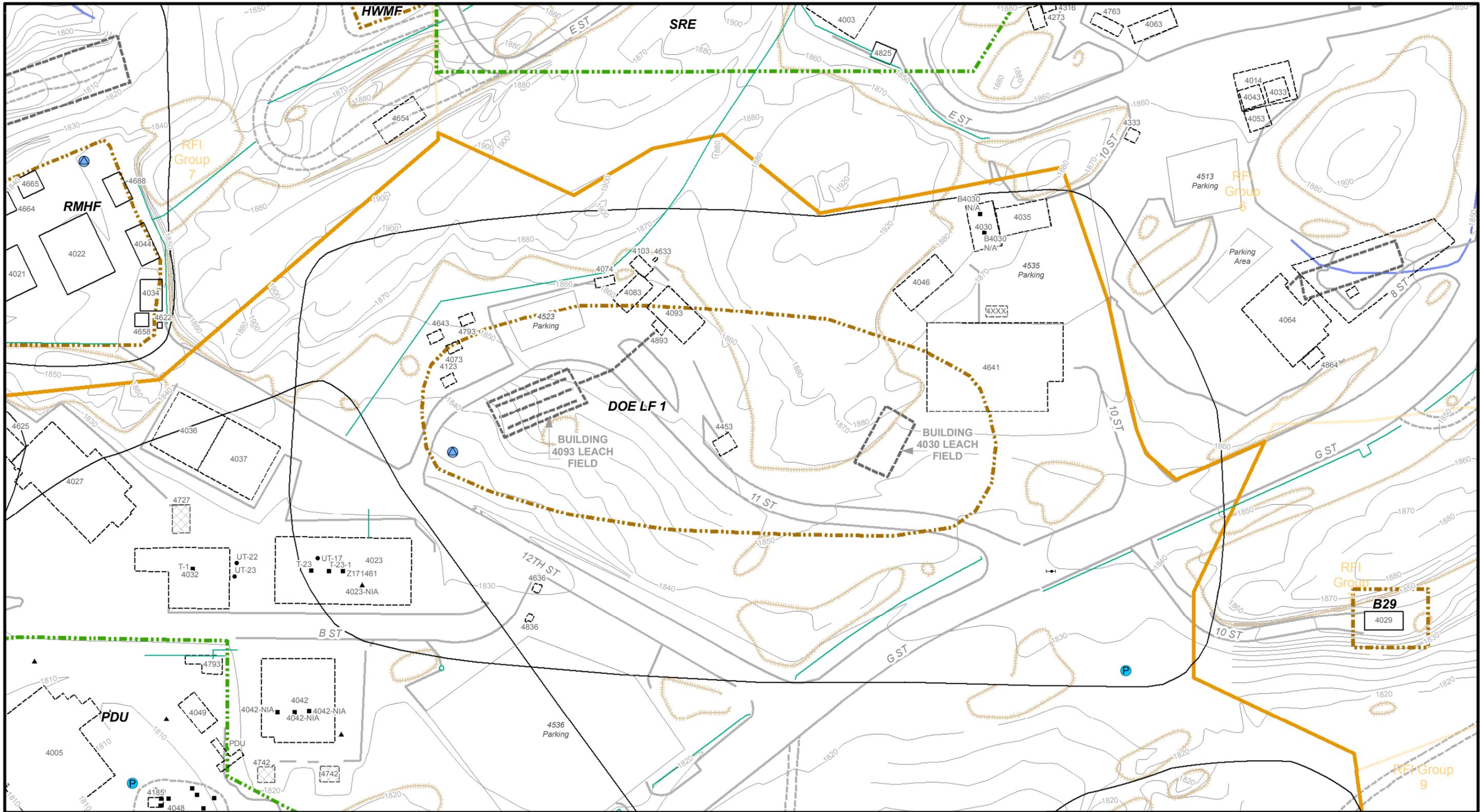
Area	Chemical Use Area Name	CMS Area ¹	Recommended for further consideration in CMS based on:													
			Residential Receptor ₂	Recreational Receptor ₂	Ecological Receptor ²											
1	Building 4093 Leach Field	NFA	No HRA COCs identified	No HRA COCs identified	Soil Results											
2	Building 4030 Leach Field	NFA			<table border="1"> <thead> <tr> <th>Any HQ>1</th> <th>COEC?</th> <th>Rationale</th> </tr> </thead> <tbody> <tr> <td>Hexachlorobenzene</td> <td>No</td> <td>ERA-1</td> </tr> <tr> <td>PCB_TEQ_Mammal</td> <td>Yes</td> <td>ERA-2</td> </tr> </tbody> </table>			Any HQ>1	COEC?	Rationale	Hexachlorobenzene	No	ERA-1	PCB_TEQ_Mammal	Yes	ERA-2
Any HQ>1	COEC?	Rationale														
Hexachlorobenzene	No	ERA-1														
PCB_TEQ_Mammal	Yes	ERA-2														
3	Building 4074	NFA														
4	Building 4023	NFA														
5	Building 4030/4035	NFA														
6	Electrical Substation located north of Building 4641	NFA														
7	Transformer Pole	NFA														
8	Building 4641	NFA														
9	Building 4073	NFA														
10	Building 4083	NFA														
11	Buildings 4093 and 4893	NFA														
12	Building 4103	NFA														
13	Building 4123	NFA														
14	Building 4453	NFA														
Soil Vapor Results																
<table border="1"> <thead> <tr> <th>Any HQ>1?</th> <th>COEC</th> <th>Rationale</th> </tr> </thead> <tbody> <tr> <td>1,1,2-Trichloroethane</td> <td>No</td> <td>ERA-1</td> </tr> </tbody> </table>						Any HQ>1?	COEC	Rationale	1,1,2-Trichloroethane	No	ERA-1					
Any HQ>1?	COEC	Rationale														
1,1,2-Trichloroethane	No	ERA-1														

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 Analyte was not detected in either soil or soil vapor. It was retained for risk calcs because SQL> ESL. Estimated risk is Low. Actual presence is uncertain.

ERA-2 Estimated risks >1 for 1 or more receptors and chemical class hazard index>1. NOTE- eposure point concentrations were extrapolated from Aroclor 1254 and 1260 (not directly measured).



Basemap Legend

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

Site Location
DOE LF1 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 100 feet

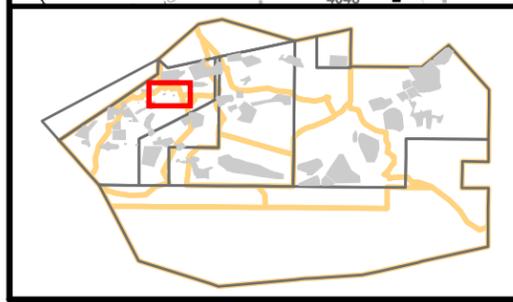
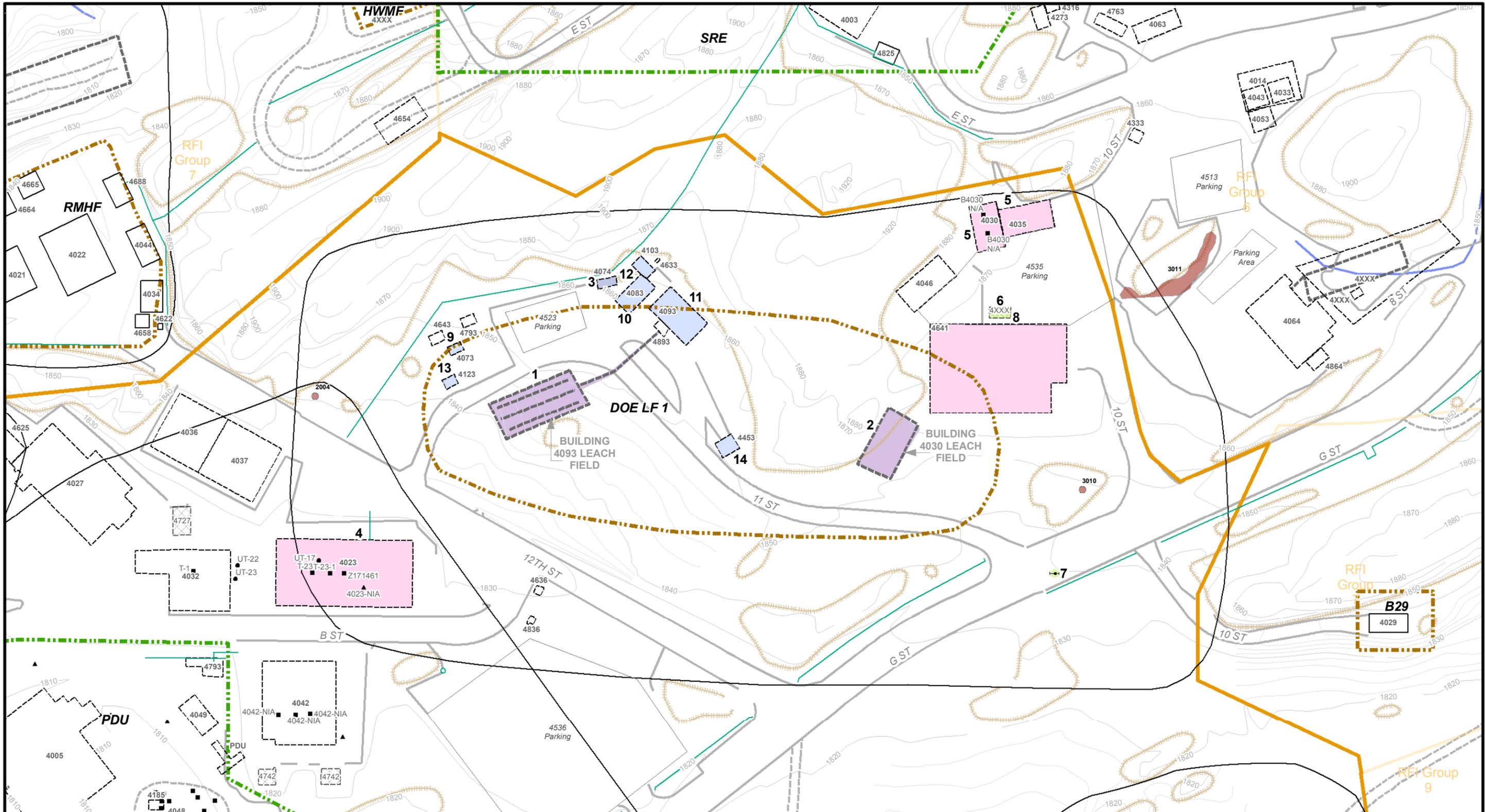
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November 03, 2008

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FIGURE 0.1-1



Chemical Use		Multiple Use Key		Basemap Legend	
Debris	Propellants	ACB - Acids and Bases	SLV - Solvents	RFI Site - Boeing	Surface Drainage Divide
Multiple Use	Leach Field	ASB - Asbestos	SVOC - SVOCs	RFI Site - DOE	Road - Asphalt
Solvent	Non-metal Inorganic Constituents	DEB - Debris		RFI Site - NASA	Roads - Dirt
Petroleum	Screening for Potential Impacts	DIOX - Dioxins and Furans		Investigation Boundary	Rocks
Oil/PCBs		ENC - Energetic Constituents		RFI Group Boundary	Streams
Metals		FRM - Formaldehyde		Administrative Area	Pond
Energetic Constituents		LCF - Leach Field		Property Boundary	Waste Debris Area
		MET - Metals			
		NMIC - Non-metal Inorganic Constituents			
		OPCB - Oil/PCBs			
		PET - Petroleum			
		PRP - Propellants			
				Transformer Poles	
				Tank - UST	
				Building - Existing	
				Tank - AST	
				Building - Removed	
				Building - Not Yet Determined	
				Tank - Not Yet Determined	
				Transformer - Existing	
				Transformer - Removed	
				Transformer - Not Yet Determined	
				Leachfield	
				Pipe	

Chemical Use Areas

DOE LF1 RFI Site

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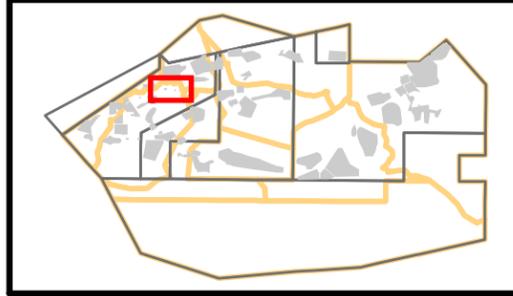
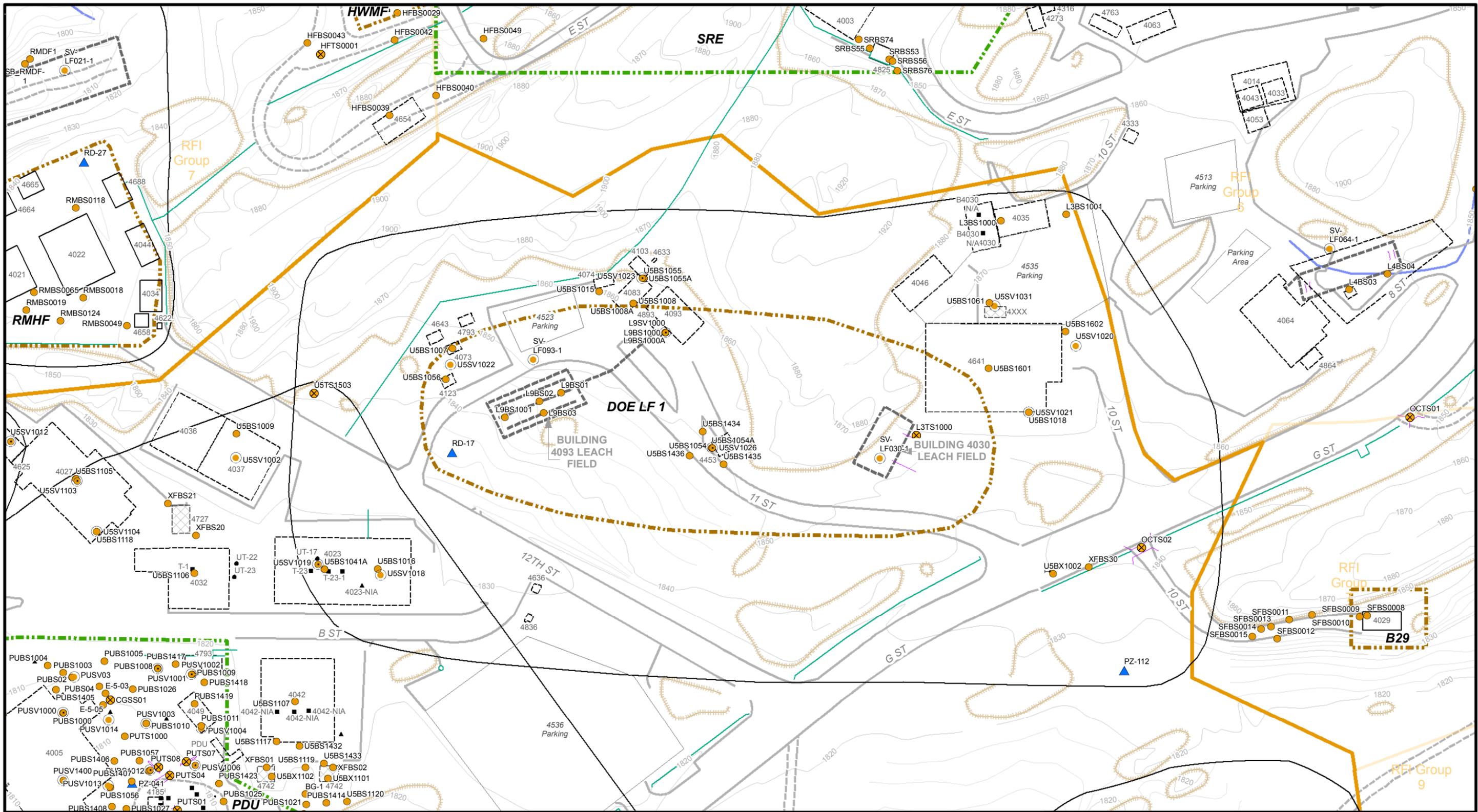
1 inch equals 100 feet

September 15, 2008

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FIGURE O.2-1

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Sample Type		Basemap Legend	
● Soil	○ Air	⚡ Transformer Poles	🏠 Building - Existing
■ Soil - Composite	▲ Groundwater	● Tank - UST	🗑️ Building - Removed
⊗ Soil - Sediment	▲ Groundwater - Lysimeter	■ Tank - AST	🏠 Building - Not Yet Determined
⊗ Soil - Surface	▲ Groundwater - Spring	▲ Tank - Not Yet Determined	🏠 Building - Existing
⊗ Air - Soil Vapor	💧 Water - Artificial	▲ Excavation	🗑️ Transformer - Removed
⊗ SV points that were not sampled due to refusal or poor air flow	💧 Water - Discharge	— Trench	🗑️ Transformer - Not Yet Determined
	💧 Water - Surface	— Leachfield	🏠 Property Boundary
		— Pipe	
			🏠 RFI Site - Boeing
			🏠 RFI Site - DOE
			🏠 RFI Site - NASA
			🏠 Investigation Boundary
			🏠 RFI Group Boundary
			🏠 Administrative Area
			🏠 Surface Drainage Divide
			🏠 Road - Asphalt
			🏠 Roads - Dirt
			🏠 Rocks
			🏠 Streams
			🏠 Pond
			🏠 Sump
			🏠 Other

Sample Locations DOE LF1 RFI Site

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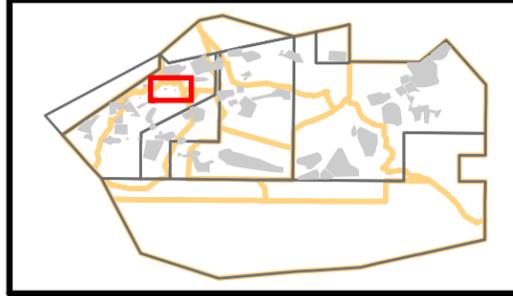
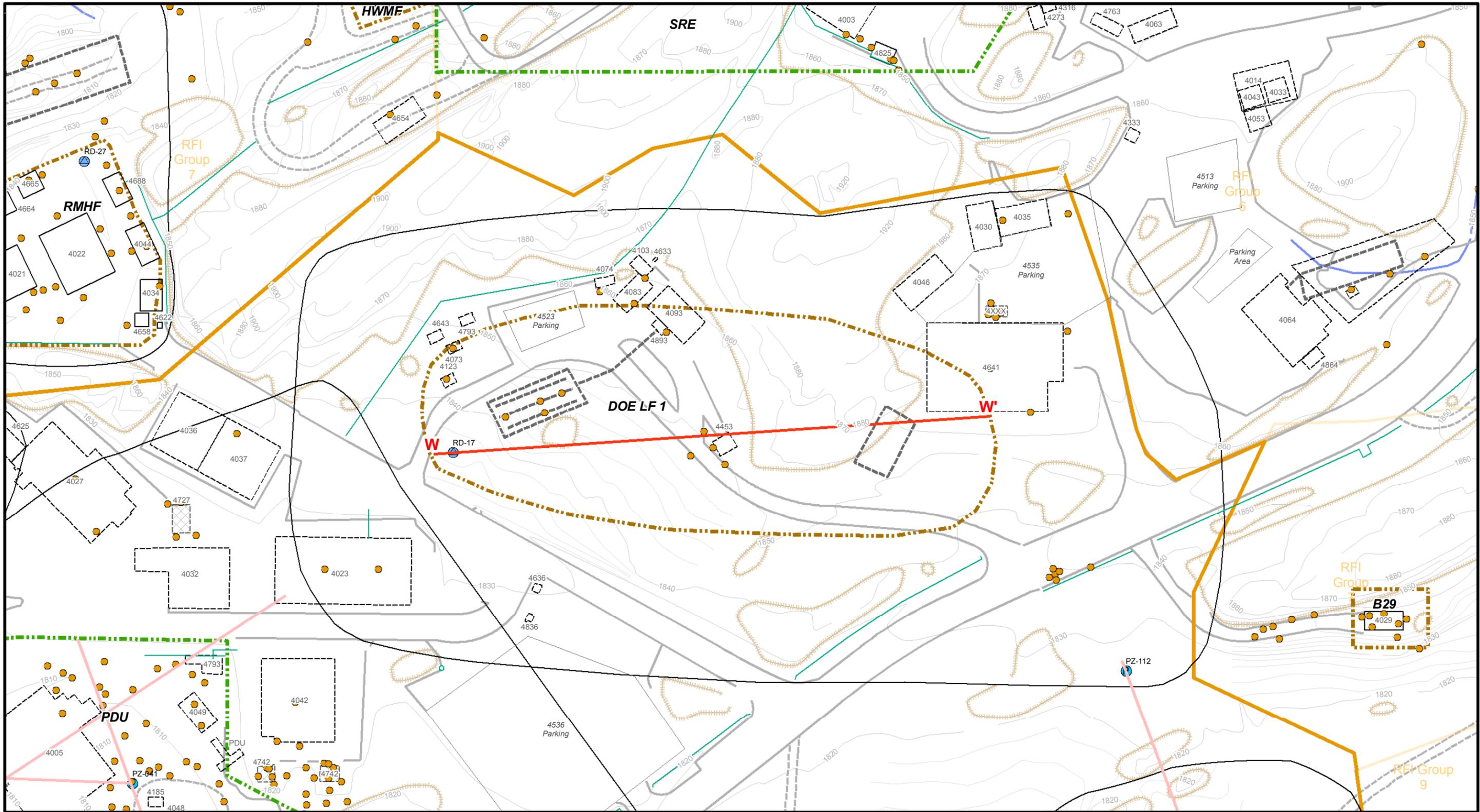
1 inch equals 100 feet

0 100 200 Feet

October 31, 2008

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FIGURE O.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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Drainage
- Road - Asphalt
- Roads - Dirt
- Leachfield
- Pipe
- Rocks
- Streams
- Pond

DOE LF1 Cross Section Location
W-W'

SANTA SUSANA FIELD LABORATORY

1 inch equals 100 feet

0 100 200 Feet

November 03, 2008

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FIGURE O.2-3A

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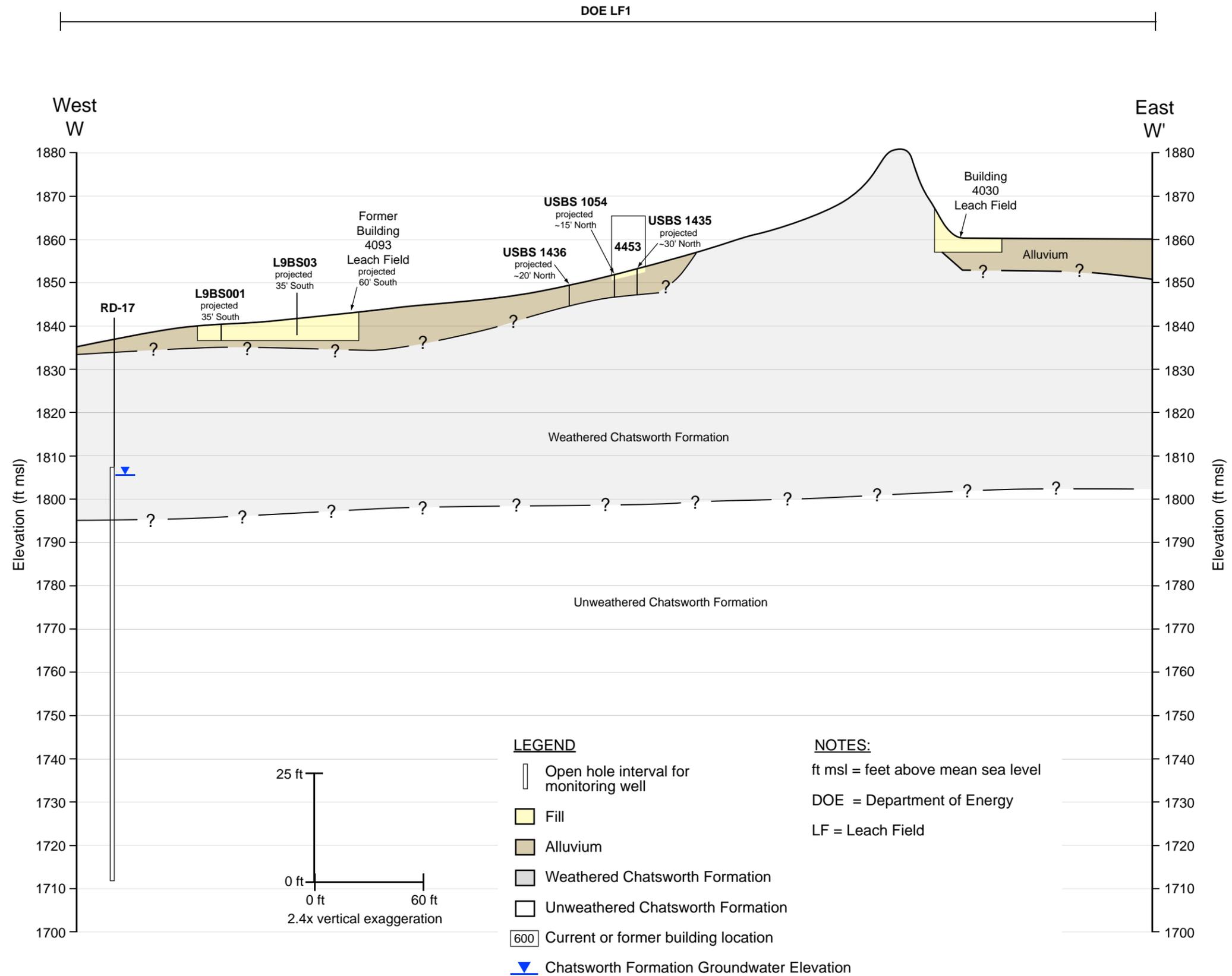
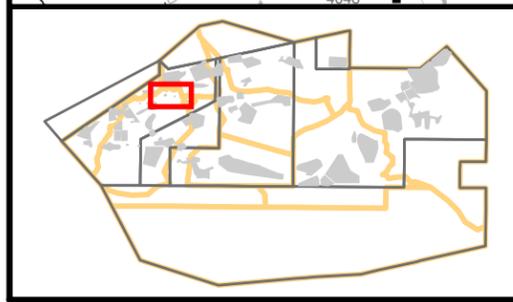
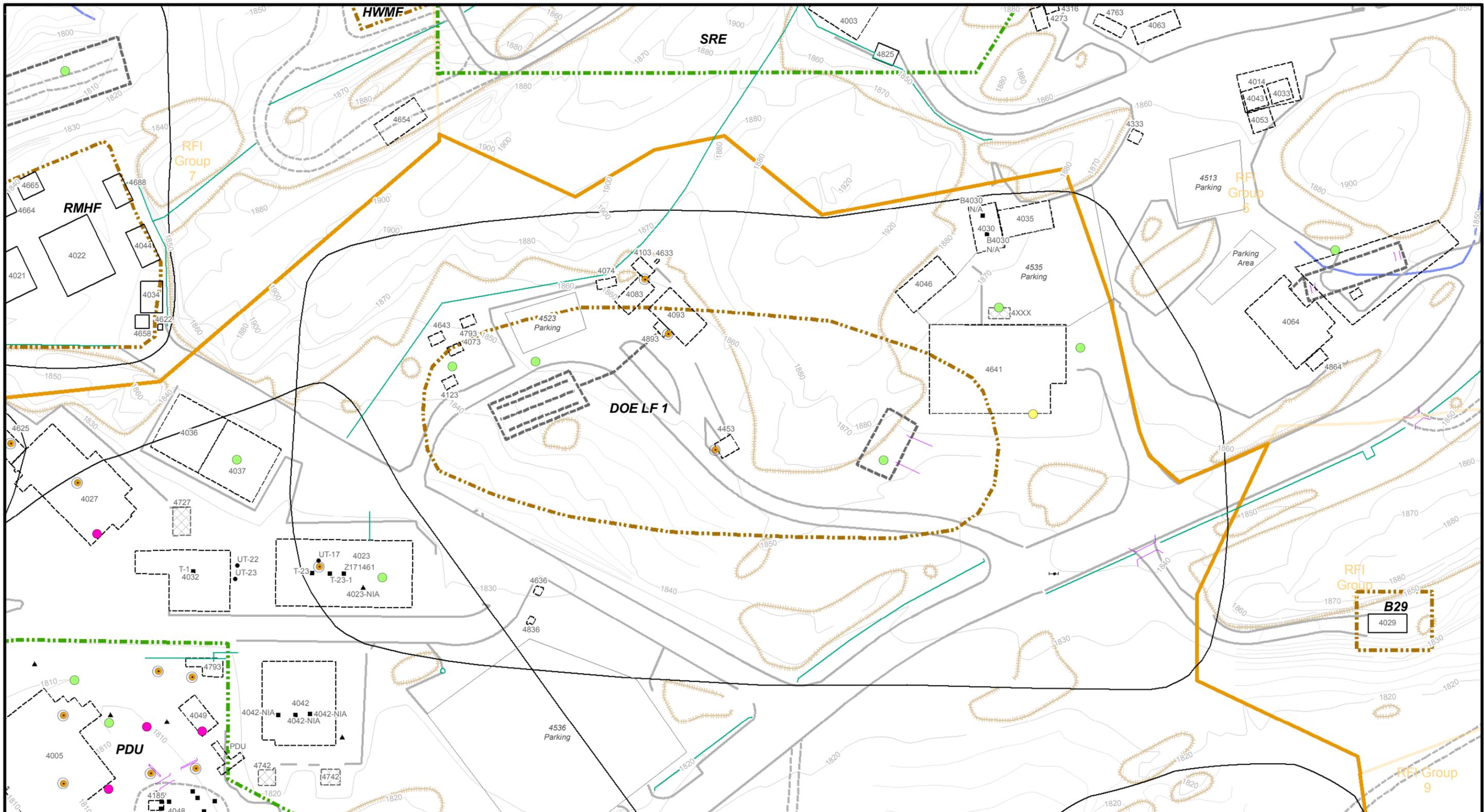


FIGURE O.2-3B
 Surficial Cross Section W-W'
 DOE LF1
 Santa Susana Field Laboratory
CH2MHILL



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	▭ Building - Existing
● Tank - UST	▭ Building - Removed
■ Tank - AST	▭ Building - Not Yet Determined
▲ Tank - Not Yet Determined	⊠ Transformer - Existing
⚡ Excavation	⊠ Transformer - Removed
▬ Leachfield	⊠ Transformer - Not Yet Determined
— Pipe	▭ Property Boundary

Basemap Legend

■ RFI Site - Boeing	— Drainage
■ RFI Site - DOE	— Road - Asphalt
■ RFI Site - NASA	— Roads - Dirt
▭ Investigation Boundary	▭ Rocks
▭ RFI Group Boundary	— Streams
▭ Administrative Area	▭ Pond
▭ Property Boundary	

**VOCs in Soil Vapor
DOE LF1 RFI Site**

SANTA SUSANA FIELD LABORATORY

1 inch equals 100 feet

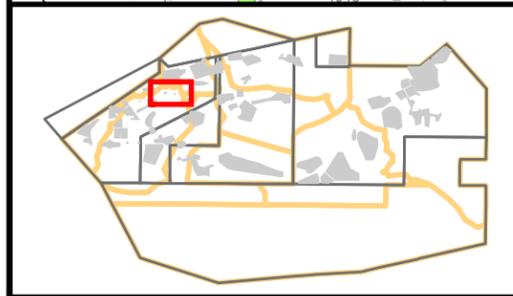
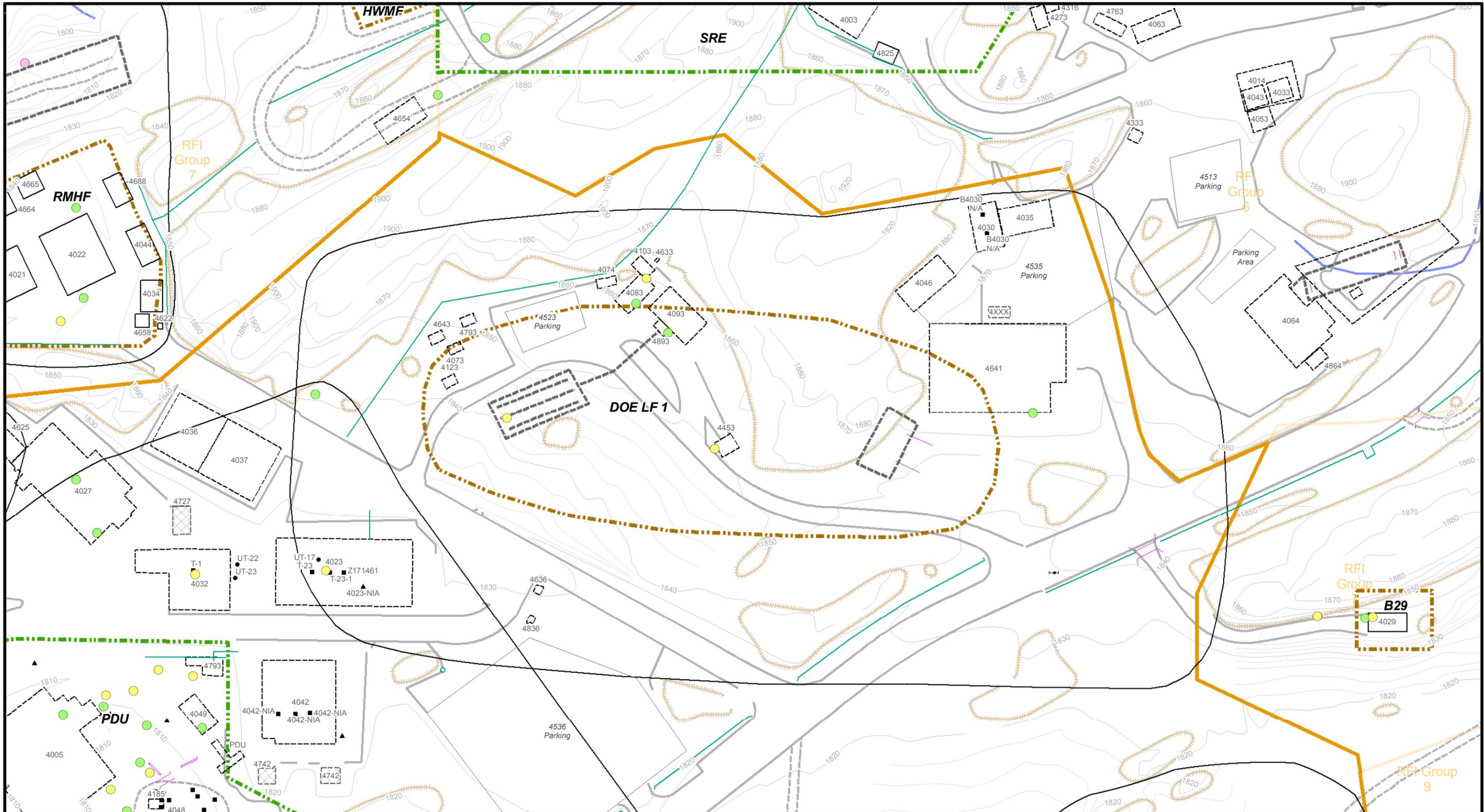
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November 03, 2008

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FIGURE O.3-1A

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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
- ▭ Investigation Boundary
- ▭ Administrative Area
- ▭ Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- ▭ Pond

Basemap Legend

- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- ▭ Investigation Boundary
- ▭ RFI Group Boundary
- ▭ Administrative Area
- ▭ Property Boundary

VOCs in Soil
DOE LF1 RFI Site
SANTA SUSANA FIELD LABORATORY

October 30, 2008

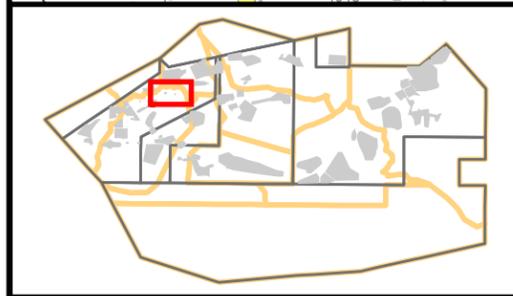
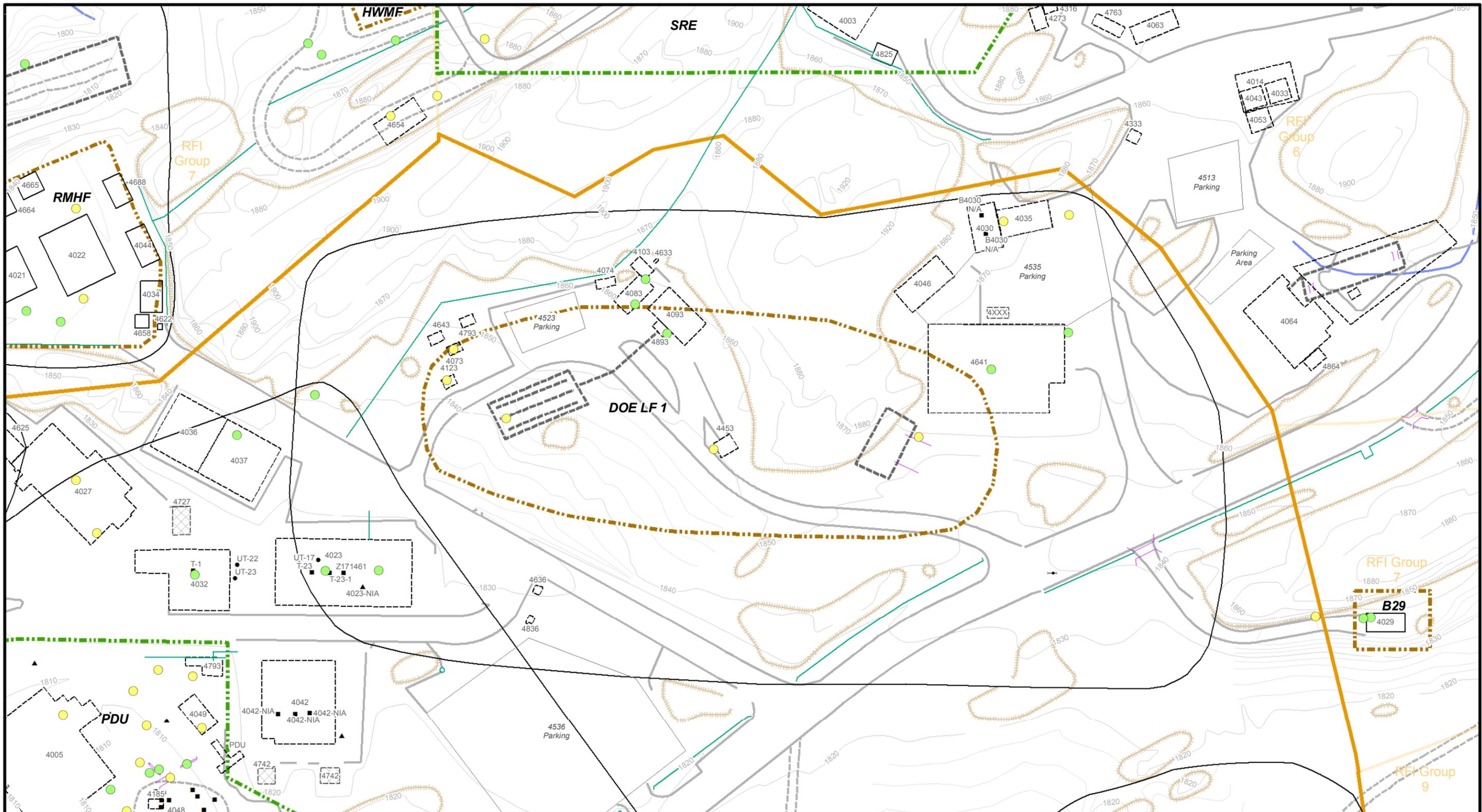
1 inch equals 100 feet

0 100 200 Feet

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WORKING DRAFT
FIGURE 0.3-1B

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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
- ▭ RFI Site Buffer
- ▭ RFI Group Boundary
- ▭ Administrative Area
- ▭ Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- ▭ Pond

SVOCs in Soil
DOE LF1 RFI Site
SANTA SUSANA FIELD LABORATORY

1 inch equals 100 feet

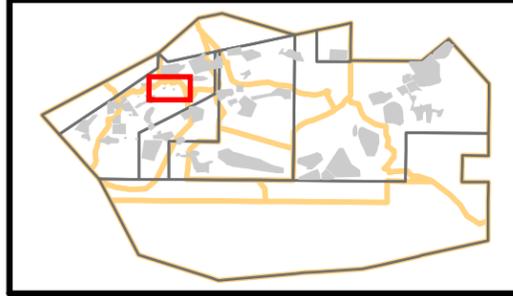
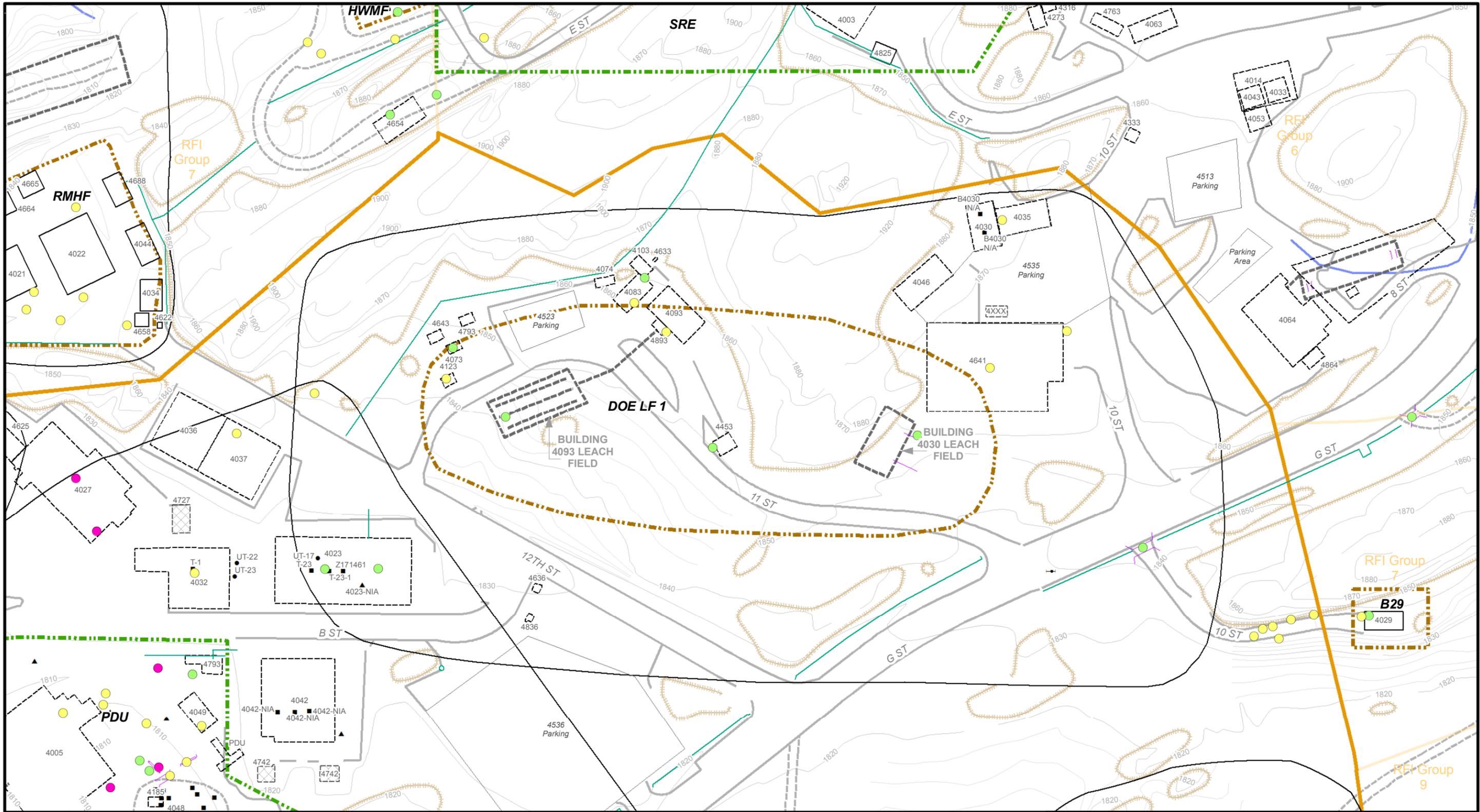
0 100 200 Feet

August 21, 2008

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WORKING DRAFT

FIGURE O.3-2



TPH in Soil

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

Basemap Legend

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

Basemap Legend

RFI Site - Boeing	Drainage
RFI Site - DOE	Road - Asphalt
RFI Site - NASA	Roads - Dirt
RFI Site Buffer	Rocks
RFI Group Boundary	Streams
Administrative Area	Pond
Property Boundary	

TPH in Soil
DOE LF1 RFI Site
SANTA SUSANA FIELD LABORATORY

1 inch equals 100 feet

0 100 200 Feet

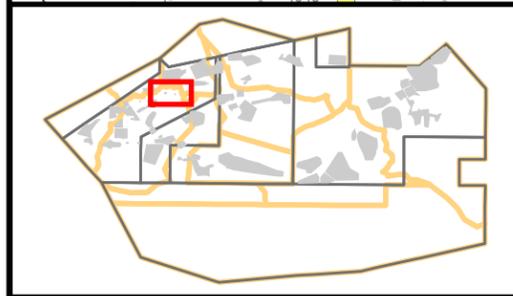
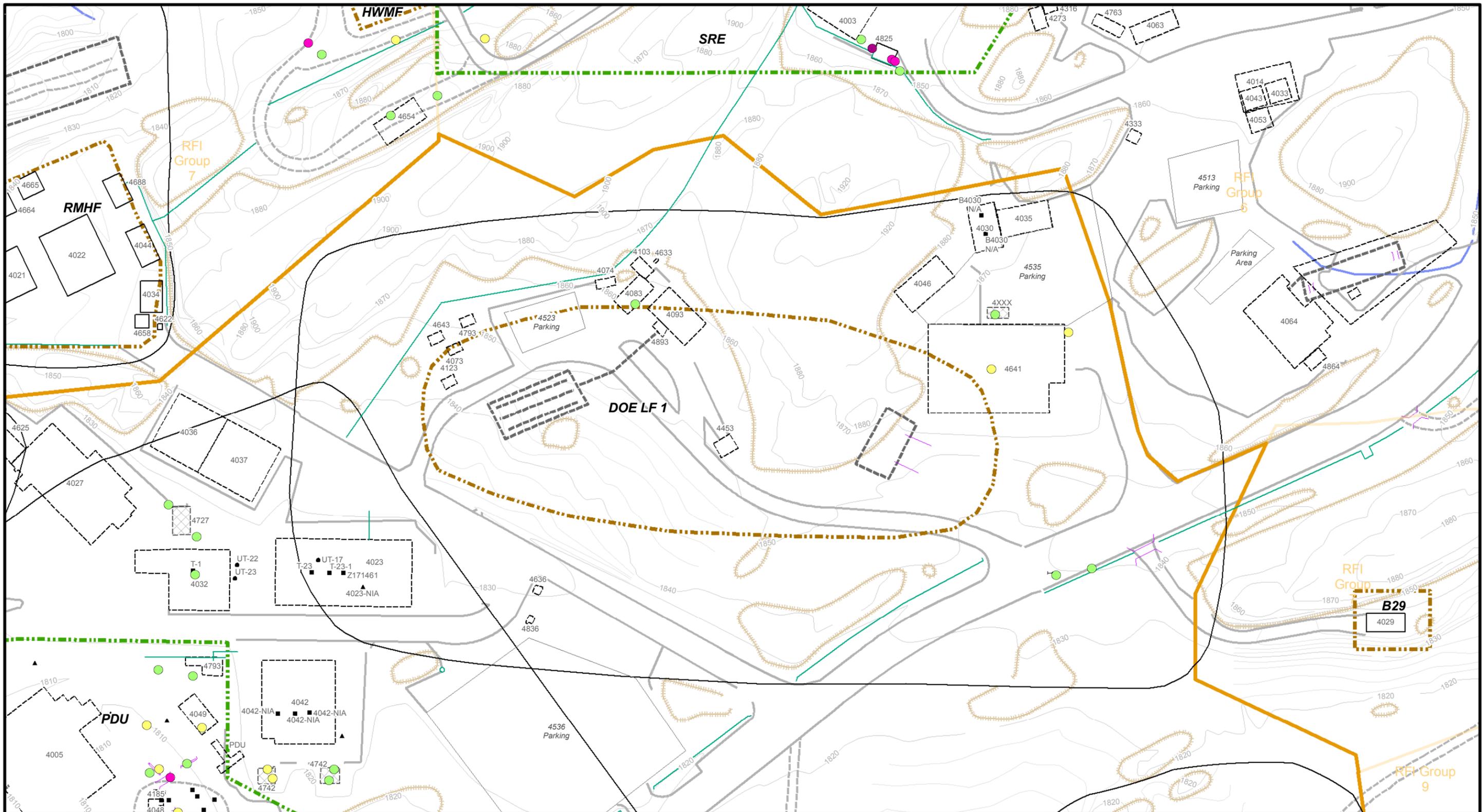
August 21, 2008

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WORKING DRAFT

FIGURE O.3-3

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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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond

Basemap Legend

- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary

PCBs in Soil
DOE LF1 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 100 feet

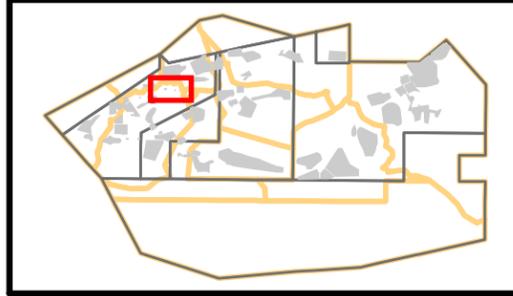
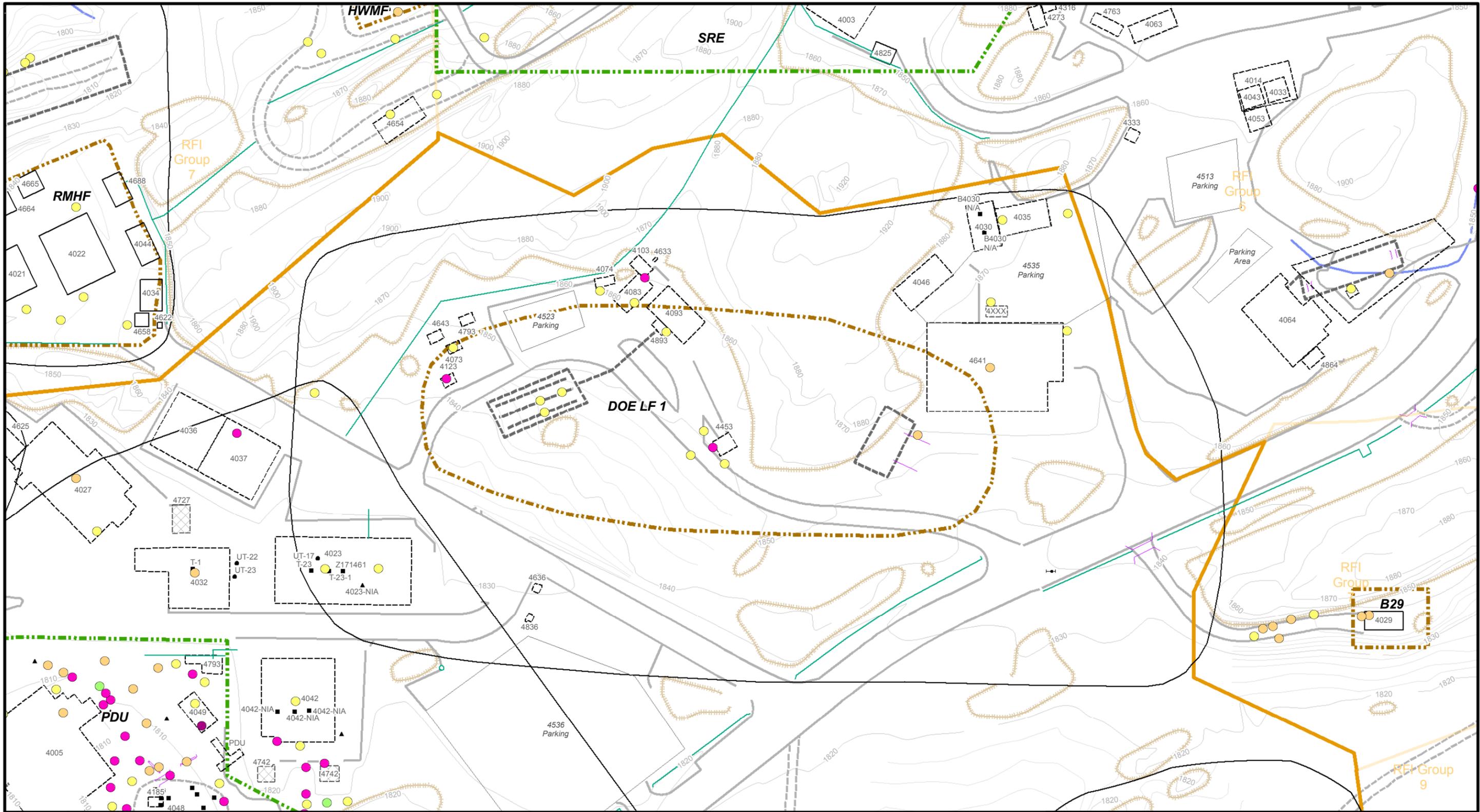
0 100 200 Feet

September 11, 2008

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WORKING DRAFT
FIGURE O.3-4

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Metals in Soil

- Exceeds Background + Residential RBSL + Eco RBSL
- Exceeds Background + Eco 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
- ▭ Investigation Boundary
- ▭ RFI Group Boundary
- ▭ Administrative Area
- ▭ Property Boundary

Basemap Legend

- 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
DOE LF1 RFI Site
SANTA SUSANA FIELD LABORATORY

1 inch equals 100 feet

0 60 120 Feet

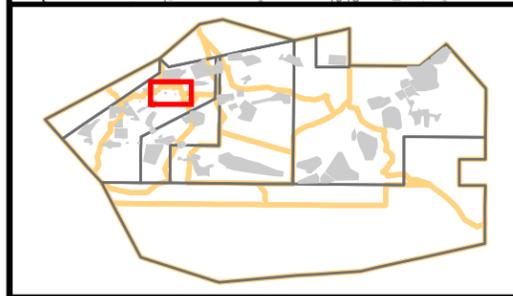
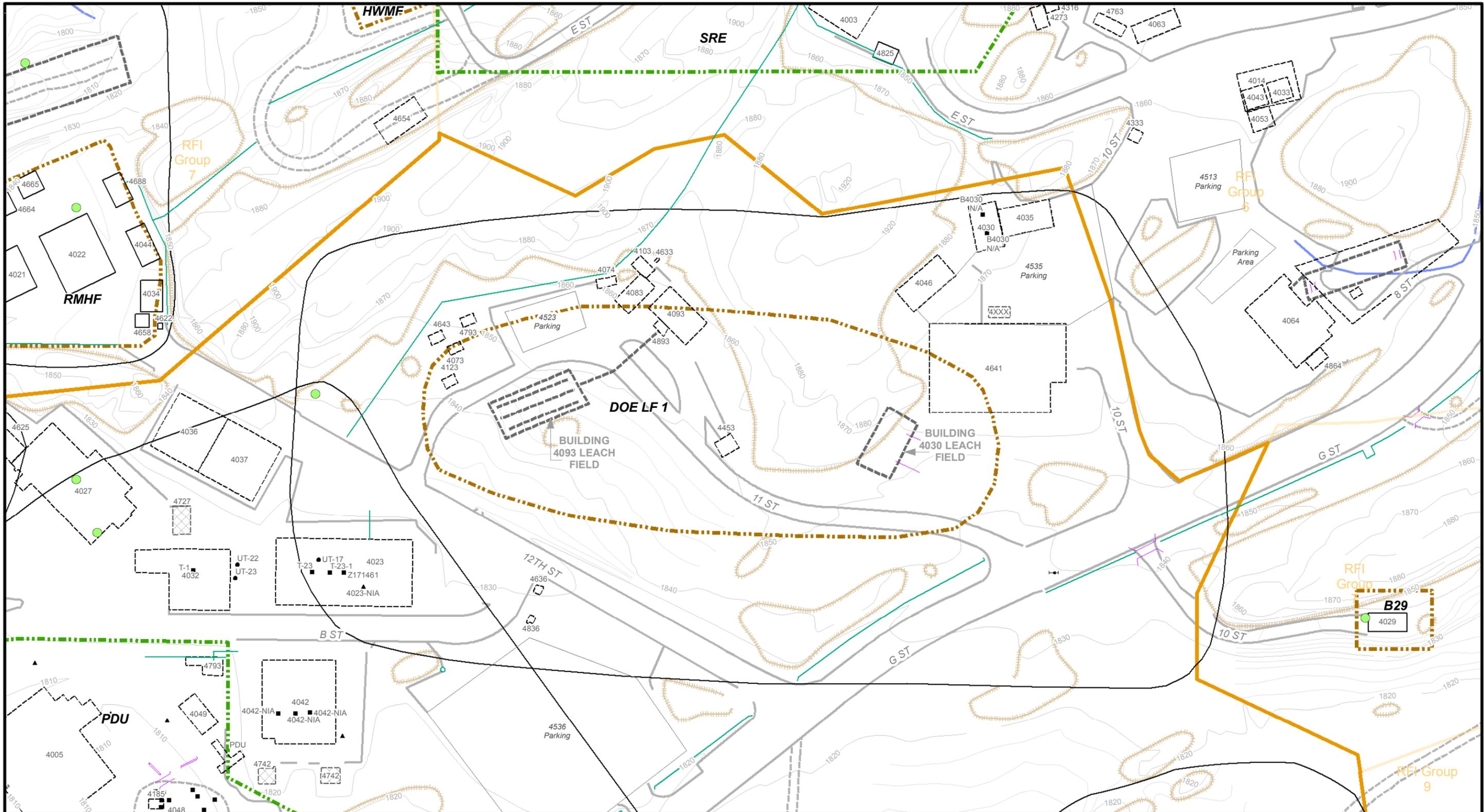
September 11, 2008

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WORKING DRAFT

FIGURE O.3-5

\\RFI\Grp05\RFISites\RFISites\Color\Dot_BLI\RFISites_CD\MisSoil_BLI_PLTS.mxd



Energetics in Soil

- Detect, Below All Screening Levels
- Non-detect; Soil, energetics, light green

Basemap Legend

● Transformer Poles	□ Building - Existing
● Tank - UST	□ Building - Removed
■ Tank - AST	□ Building - Not Yet Determined
▲ Tank - Not Yet Determined	□ Transformer - Existing
— Excavation	□ Transformer - Removed
— Leachfield	□ Transformer - Not Yet Determined
— Pipe	□ Property Boundary

Basemap Legend

■ RFI Site - Boeing	— Drainage
■ RFI Site - DOE	— Road - Asphalt
■ RFI Site - NASA	— Roads - Dirt
□ Investigation Boundary	— Rocks
□ RFI Group Boundary	— Streams
□ Administrative Area	□ Pond

**Energetics in Soil
DOE LF1 RFI Site**

SANTA SUSANA FIELD LABORATORY

1 inch equals 100 feet

0 100 200 Feet

September 15, 2008

CH2MHILL

WORKING DRAFT
FIGURE O.3-6

\\RFL05\RFI_Report\CDot_BL_PLT\RFISites_CDOEng\Soil_BL_PLT.mxd

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: **7/10/2005**

Unique Sample Identifier: **7/10/2005**

Date: **7/10/2005**

12.05 Detect with sample concentration shown. Non-Detect with lab detection limit shown.

< 0.06 Analyze 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 brackets.

Detect	Non-Detect	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)

[Light Gray Box]	= 2008 Data
[Dark Gray Box]	= Pre-2008 Data

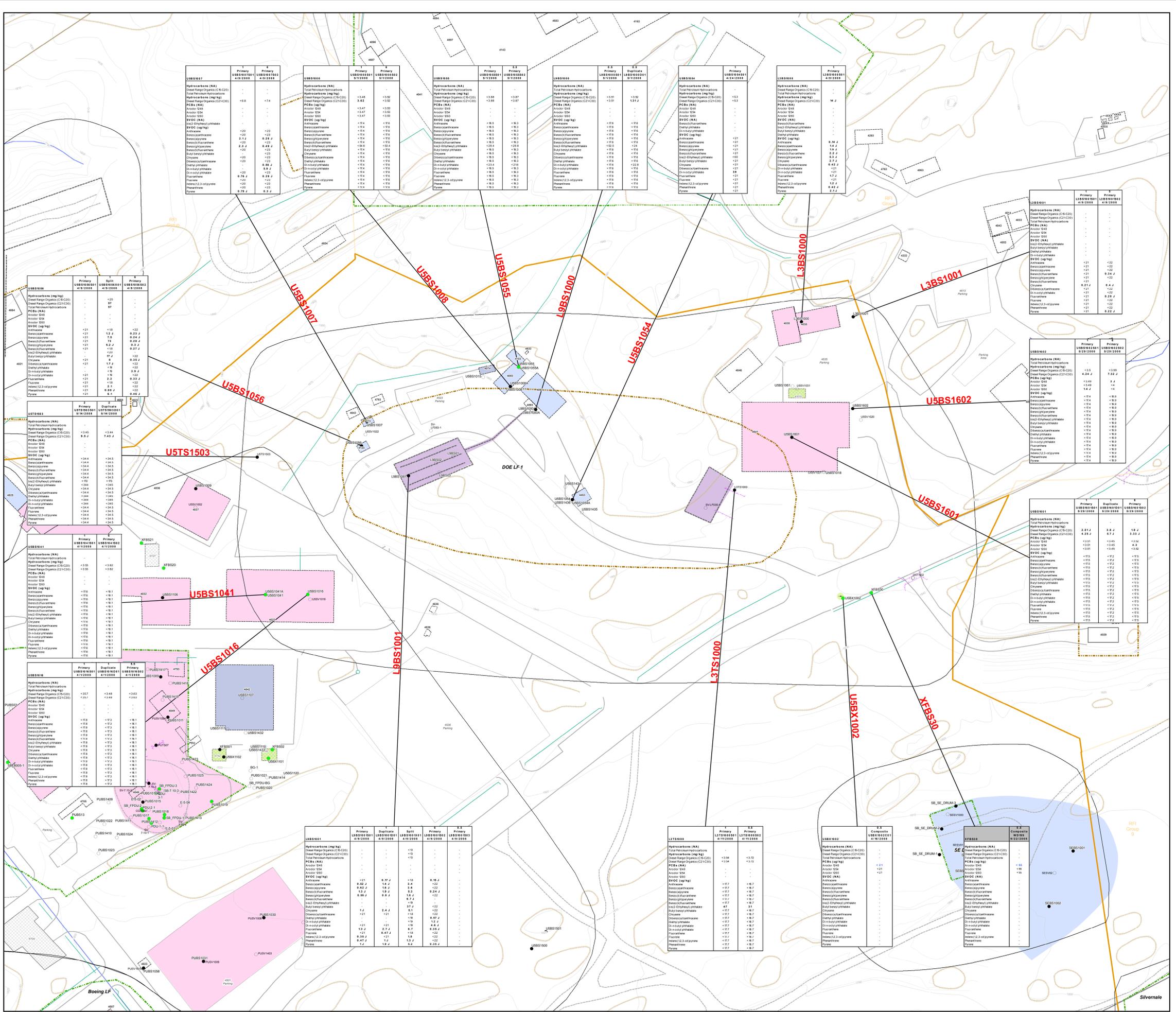
Basemap Legend

- 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

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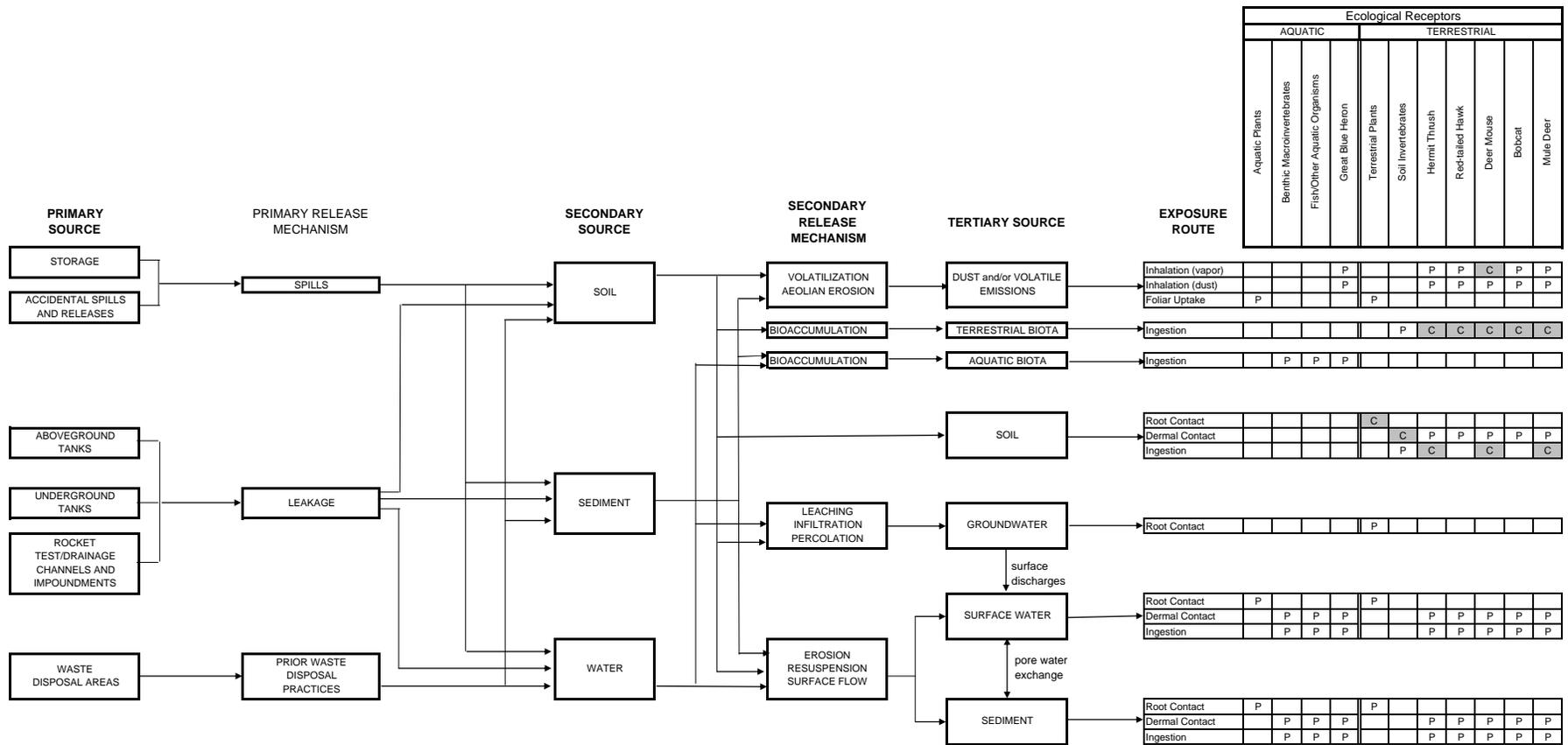
1 inch equals 45 feet

0 45 90 Feet



SANTA SUSANA FIELD LABORATORY

SVOCs, TPH, and PCBs Data Results
DOE LF1 RFI Site
FIGURE O.3-8



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 O.4-2
 Ecological Conceptual Site Model
 Group 5 RFI Report, Department of Energy Leach Field 1
 Santa Susana Field Laboratory

Attachments
