Report

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

Volume IX – RFI Site Reports Appendix T

Systems for Nuclear Auxiliary Power

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Acronyms and Abbreviations

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

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

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

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

Appendix T

T.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 Systems for Nuclear Auxiliary Power (SNAP) RFI Site of the Santa Susana Field Laboratory (SSFL). The SNAP Site is contains one Area of Concern (AOC): Building 4059. The SNAP Site, located within Area IV of the SSFL, was used in support of United States Department of Energy (DOE) operations. The RCRA Corrective Action Program at the SSFL is being conducted under the oversight of the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC).

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

- Boeing Area IV Leach 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 1 (DOE LF1) (AOC)
- Department of Energy Leach Field 2 (DOE LF2) (AOC)
- Department of Energy Leach Field 3 (DOE LF3) (AOC)
- Hazardous Material Storage Area (HMSA) (AOC)
- Rockwell International Hot Laboratory (RIHL) (SWMU 7.7)

The SNAP Site is located in the northwestern portion of the Group 5 Reporting Area, north of the Building 65 RFI Site, west of the HMSA RFI Site, and southeast of the Group 7 Reporting Area (Figure T.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 (that is, the ecosystem), 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) groundwater. The SNAP Site characterization presented in this appendix comprises data for both the SMOU and the CFOU groundwater. The SMOU includes soil, sediment, surface water, air, biota, and near-surface groundwater (NSGW) at the SSFL. NSGW is defined as groundwater occurring within alluvium or weathered bedrock of the Chatsworth Formation. The CFOU groundwater includes Chatsworth Formation bedrock and deeper groundwater that occurs within the unweathered bedrock of the Chatsworth Formation.

T.1.1 Report Organization

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

- **Section T.2 – Site History, Chemical Use, and Current Conditions.** Presents the site history, chemicals used, and the current conditions including geology and groundwater conditions. Changes in site conditions and soil disturbance areas are also described.
- **Section T.3 – Nature and Extent of Chemical Impacts.** Presents a summary of SMOU, NSGW, and CFOU groundwater characterization information for the SNAP Site.
- **Section T.4 – Summary of Risk Assessment Findings**. Presents the results of the human health risk assessment (HRA) and ecological risk assessment (ERA) for the SNAP Site. The complete risk assessment is included in Appendix A of the Group 5 RFI Report.
- **Section T.5 – Site Actions Recommendations**. Presents a summary of the SNAP Site areas recommended for either (1) no further action (NFA), or (2) further evaluation in the CMS. CMS areas recommended for interim measures to prevent contaminant migration are also identified, if any.
- **Section T.6 – References.** Includes a list of cited references.

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

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

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

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

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

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 SNAP 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.

T.1.2 Historical Reference Documents

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

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

- Current Conditions Report (CCR) (ICF Kaiser Engineers [ICF], 1993). This report contains:
  - A general description of the SSFL facility, including an operational history, physical setting information, and regulatory programs and oversight during the late 1980s and early 1990s.
  - Description of SWMUs and AOCs, including presentation of results from environmental sampling performed to assess current conditions.
  - A draft work plan for further investigation during the RFI for selected SWMUs and AOCs.
- RFI Work Plan Addendum (WPA) (Ogden Environmental and Energy Services Company, Inc. [Ogden], 1996), RFI Work Plan Addendum Amendments (WPAA) (Ogden, 2000a and 2000b). These reports contain:
  - Sampling procedures and rationale.
  - RFI site descriptions and operational history.
  - Shallow groundwater characterization sampling and analysis plan for the SSFL.
- RFI Program Report (Montgomery Watson Harza [MWH], 2004). This report contains:
  - A general description of the SSFL facility, including an operational history, physical setting information, and regulatory programs and oversight.
  - A summary of the RCRA Corrective Action Program being conducted at the SSFL and a description of the OUs.
  - A comprehensive description of the SMOU field sampling program, including work plans followed, overall sampling scope performed, sampling methods and subcontractors used, and protocol followed.
  - Details of the analytical program for the SMOU RFI, including laboratories used, data validation findings, and Data Quality Assessment findings.
  - Programmatic key decision points or significant issues that influenced sampling, laboratory procedures, methodologies, or step-out requirements.
- Standardized Risk Assessment Methodology (SRAM) Work Plan, Revision 2 (MWH, 2005). This report contains:
  - Procedures for completing HRAs and ERAs.
  - Background soil concentrations and groundwater comparison concentrations.
  - A biological conditions report for the SSFL.
- Near-Surface Groundwater Characterization Report (MWH, 2003b). This report contains:
  - Nature and extent of 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, 2000; MWH, 2002 and 2003a). These reports contain:
  - Geologic framework at the SSFL and hydrogeologic conditions of both NSGW and CFOU groundwater.
  - Transport and fate of TCE, and the occurrence and transport of other chemicals of concern in the CFOU groundwater.
- Annual and quarterly groundwater monitoring reports, including:
  - Annual 2007 Groundwater Monitoring Report (Haley & Aldrich, Inc. [H&A], 2008a).
  - Second Quarter 2007 Groundwater Monitoring Report (H&A, 2007a).
  - Third Quarter 2007 Groundwater Monitoring Report (H&A, 2007b).
  - Fourth Quarter 2007 Groundwater Monitoring Report (H&A, 2008b).
  - First Quarter 2008 Groundwater Monitoring Report (H&A, 2008c).
- Historical Site Assessment (Sapere, 2005). This report contains:
  - Facility descriptions and historical operational information for buildings used for radiological research and development in Area IV.
  - Information regarding radiological demolition activities, surveys, releases, and removal actions conducted for radiological areas within Area IV.
- Debris Area Survey and Sampling Methodology (CH2M HILL document in progress). This standard operating procedure (SOP) provides general guidelines for performing the following activities:
  - Visual inspections of the SSFL for surficial evidence of solid waste disposal (referred to herein as debris areas).
  - Sampling for chemical analytes at debris areas.
- Quality Assurance Project Plan (QAPP) (MECx, 2008). This QAPP provides general guidelines, which include:
  - Quality assurance/quality control (QA/QC) procedures to ensure that field and laboratory data quality and project work meet the data quality objectives (DQO).
  - 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

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

The SNAP Site is approximately 3.6 acres located in the western portion of Area IV at the SSFL. The site location within the SSFL is shown in Figure T.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 T.2-1. The sampling locations across the site are shown in Figure T.2-2.

During the RFA, various SMWUs and AOCs within the SSFL were identified. Building 4059 was identified as an AOC in the RFA (SAIC, 1994). No other SWMUs or AOCs were identified in the RFA within the boundary of the SNAP Site as it is defined in this report (Figure T.1-1).

Based on site inspections, reviews of historical aerial photographs, drawings, and facility maps and on interviews with site personnel conducted during the RFI, the SNAP Site boundary was defined to include operations associated with Building 4059. In addition, facilities or features near this AOC were included for assessment in the RFI. These include Buildings 4019, 4039, 4057, 4358, 4360, 4459, and 4626, aboveground storage tanks (ASTs), underground storage tanks (USTs), three electrical substations, and the Building 4059 French Drain system. The identified Chemical Use Areas at the SNAP Site are shown in Figure T.2-1 and described in Tables T.2-1 through T.2-4.

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

T.2.1 SWMUs and/or AOCs at the SNAP

The SNAP Site contains one AOC, Building 4059 (SAIC, 1994). A brief description of the AOC for this RFI Site Report follows.

T.2.1.1 Building 4059 (AOC)

Building 4059 was constructed from 1961 to 1963, and a vacuum system was added from 1963 to 1965 to test SNAP reactors under vacuum conditions. The SNAP reactors were designed as small compact reactors for use in space, underwater, and terrestrial applications. In this case, the SNAP reactors were for outer space operations. Building 4059 was designated as the SNAP Ground Prototype Test Facility. Actual testing was conducted until 1969 when the program was terminated. The building was later converted for the Large Leak Test Rig Sodium Test Program in 1973. Partial decontamination and decommissioning began in 1978 and was completed in 2004. The area in and around Building 4059 (including associated USTs) was excavated to remove aboveground structures and basement vaults. Additional information is provided in Tables T.2-1 through T.2-4.

T.2.2 SNAP Site History

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

T.2.2.1 Site Chronology

A summary of key historic investigation and remediation activities is presented in Tables T.2-6 and T.2-7. A more detailed description of the SNAP Site is presented below.

T.2.2.1.1 1961 through 1969

The SNAP Site was built and operated to test SNAP reactors. The reactor was shut down in 1964 for facility modifications to allow for testing under vacuum conditions. The reactor was restarted in 1968 and ran until the end of 1969. A leak in the reactor core was detected in 1969, and a panel of experts was assembled to determine cause for the failure.

T.2.2.1.2 1973 through 1978

The SNAP Site was used for the Large Leak Test Rig Sodium Test Program.

T.2.2.1.3 1983

During a building inspection, groundwater was found to have infiltrated into the below-grade vault of the south test cell in Building 4059. Testing of the water in the building indicated contamination by soluble radioactive isotopes while the groundwater outside the building indicated no radioactive contamination. The water was pumped, and all leaks were sealed in the building.

T.2.2.1.4 1986 through 1992

A French Drain system was installed to control groundwater elevations in the vicinity of the Building 4059. The French Drain system was found to contain tetrachloroethene (PCE), tritium, TCE, and their degradation products. The source of the volatile organic compounds (VOCs) was unknown. A monitoring and extraction program was established to prevent migration of chemicals of potential concern (COPCs).

T.2.2.1.5 1987

A 3,000-gallon underground diesel fuel tank, UT-36-54 (historically identified as UT-36 or UT-54), was removed under the oversight of Ventura County Environmental Health Department (VCEHD). Based on the excavation inspection and sampling results, VCEHD required additional investigation in October 1994.

T.2.2.1.6 2003 through 2004

The area in and around Building 4059 (including the French Drain and storage tanks) was excavated to remove aboveground structures and basement vaults. The main excavation area measured approximately 160 feet by 175 feet; an approximate 20- to 40-foot-wide portion of the excavation also extended approximately 140 feet to the south (refer to Figure T.1-1). The excavation extended to a maximum depth of approximately 57 feet near its center. The excavation was filled in with soil obtained from the Area IV Borrow Pit. Approximately 5,000 to 8,000 cubic yards of backfill were required.

T.2.2.2 Site Inventories

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

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

T.2.3 SNAP Chemical Use Areas

Chemical Use Areas are locations where chemicals were documented to have been (or potentially have been) used, stored, spilled, discharged, and/or disposed of. Based on the review historical document, 13 chemical use areas were identified within the SNAP Site boundary. Chemicals that were potentially used or stored in these Chemical Use Areas include VOCs, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), and metals. Chemical Use Areas at the SNAP Site are shown in Figure T.2-1 and listed in Table T.2-8.

T.2.4 Site Conditions

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

T.2.4.1 General Conditions and Topography

The SNAP Site is located within the western portion of Area IV. The site is currently inactive and has two remaining structures and two remaining electrical substations. Topography in the central portion of the site slopes to the east. The gently sloping area is bounded by northeast-trending bedrock outcrops to the west and southwest. Current surface elevations at the SNAP Site range from a low of approximately 1800 feet above mean sea level (msl) in the eastern portion of the site to a high of approximately 1810 feet msl in the western portions of the site. A summary site conceptual model is presented in Table T.2-9. The locations of cross-sections for the SNAP Site are shown in Figure T.2-3A. Figures T.2-3B and T.2-3C (Surficial Cross Sections H-H' and M-M') present cross-sections developed for the SNAP Site that detail surface topography, locations and depths of alluvium, and the most recent available groundwater elevations.

One cleanup action has been conducted at the SNAP Site that has altered the surface topography through extensive excavation, backfilling, and grading. The areal extent of the excavation is shown in Figure T.2-4.

T.2.4.2 Geology

The SNAP Site is located north of the Coca Fault, near the Upper and Lower Burro Flats and the Expendable Launch Vehicle Site (ELV) Members of the Upper Chatsworth Formation to the north of the fault (Dibblee, 1992; MWH, 2002 and 2007c). The Western and Eastern Former Sodium Disposal Facility (FSDF) Structures are located to the west of the SNAP Site. The structures are defined by two parallel aerial photo lineaments formed by drainages. There are no exposures of the structures along the lineaments. The lineaments are interpreted to be created by faults or deformation bands on the basis of an apparent left lateral displacement of stratigraphic units observed across the Eastern FSDF structure (MWH, 2007b).

Beds of the Upper Burro Flats, Lower Burro Flats, and ELV Members generally strike N70°E and dip 25°NW. The Upper Burro Flats Member is predominantly composed of medium- and fine-grained sandstone with minor interbeds of siltstone and shale. The Lower Burro Flats Member consists primarily of medium- to fine-grained sandstone with some shale and siltstone. 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 formation. Figure 2-5 of the Group 5 RFI Report (Volume I) shows the geologic units represented within the RFI site. The locations of the Coca Fault and the FSDF structures are 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.

T.2.4.3 Soil

Throughout most of the SNAP Site, soil depths vary significantly, typically ranging from less than 1 foot to 12 feet thick. The maximum depth of backfill in the SNAP Site is about 57 feet below current grade based on topographic surveys performed following the excavation. A map depicting the distribution of alluvial soil within the Group 5 Reporting Area is provided as Figure 2-4 in the Group 5 RFI Report (Volume I). Soil within the excavation areas consists of DTSC-approved soil from an onsite borrow area. The fill soil is primarily composed of fine-grained silty sands, sandy silts, and lean clay. Soil in the undisturbed areas of the site consist of weathered Chatsworth Formation materials, which are primarily fine-grained silty sands, sandy lean clays, well-graded sand with clay, sandy silts, lean clay, poorly graded sands, and clayey sands. Soil boring logs are included as Attachment T-2 to this appendix.

T.2.4.4 Groundwater

The groundwater system and monitoring network in RFI Group 5 is discussed in detail in Appendix B of the Group 5 RFI Report. In that appendix, Figure B-4 shows the locations of wells and piezometers that are used to monitor groundwater within and near the SNAP Site. Figure T.2-2 shows well locations in and around the SNAP Site.

At the SNAP Site, one piezometer (PZ-109) and no shallow wells were installed to monitor groundwater conditions in alluvium and weathered bedrock (that is, in NSGW), while three wells (RD-24, RD-25, and RD-28) were installed to monitor groundwater conditions in the unweathered bedrock (that is, in the CFOU Groundwater). Wells RD-25 and RD-28 were abandoned in 2004. Construction details for these wells/piezometers are discussed in Tables B-2 and B-3 of Appendix B in the Group 5 RFI Report, and their locations are shown in Figure T.2-2.

NSGW is vertically continuous with the CFOU Groundwater in the SNAP Site area. A cross-sectional diagram of near-surface and Chatsworth Formation groundwater occurrence is shown in Figure B-6 in Appendix B of the Group 5 RFI Report. NSGW is encountered at average depths ranging from 15 feet below ground surface (bgs) (1795 feet msl) to 22 feet bgs (1792 feet msl) at piezometer PZ-109. The NSGW in the SNAP Site area is laterally discontinuous and has limited areal extent. The occurrence of NSGW in the SNAP Site area is shown in the plan view of Figure B-7 in Appendix B of the Group 5 RFI Report.

CFOU groundwater at the SNAP Site is estimated to occur at depths ranging from 30 feet bgs (1772 feet msl) at well RD-24 to 40 feet bgs (1770 feet msl) at well RD-25. CFOU groundwater at the SNAP Site has a hydraulic gradient of approximately 0.08 ft/ft to the northwest. The occurrence of CFOU Groundwater in the SNAP Site area is shown in the plan view of Figure B-8 in Appendix B of the Group 5 RFI Report.

Depths to CFOU groundwater are quite variable at this site due to groundwater extractions. During the construction of Building 4059 in the early 1960s, groundwater was below the excavation foundation. The S-2 sump was installed during building construction to receive input from the Building 4059 French Drain system and maintain water levels in the sump within 3 feet of the bottom of the sump. Since the S-2 sump was installed, groundwater was found in the basement of the building; therefore, pumping of the sump was initiated to remove the groundwater. During periods of high seasonal precipitation, the sump could pump as much as 300 gallons per day (gpd).

A water management control program was implemented to maintain a positive hydraulic head outside the building to prevent any outward migration of contaminants. An onsite carbon treatment system was installed to treat extracted sump water prior to discharge to drainages leading to Outfall 002. Starting in 1995, in addition to the S-2 sump, pumping was initiated at well RD-24 at a limited rate of 1.5 gpm to maintain the well level between 115 and 136 feet bgs. During plans for the removal of Building 4059 in February 1998, a more robust sump pump was installed in the S-2 sump, and more aggressive pumping was initiated to eliminate potential recharge of the excavation pit. Additionally, the extracted groundwater from well RD-24 was rerouted to the treatment unit that the sump discharge used. Starting in July 1999, wells RD-25 and RD-28 were added to the extraction system allowing about 2,200 gpd to be removed. Both wells could extract up to 1 gpm, and discharges were routed through the onsite treatment unit. In April 2004, wells RD-25 and RD-28 were abandoned. Extraction ceased in March 2005 when the Building 4059 foundation was removed. While pumping varied from year to year due to seasonal precipitation, up to 560,000 gallons a year were extracted between 1995 and 2004 (GRC, 1999).

T.2.4.5 Surface Water

Surface water flow at the SNAP Site is shown in Figure 2-7b of the Group 5 RFI Report (Volume I). Surface water exists intermittently in the SNAP Site as the result of seasonal precipitation events. While there are no perennial bodies of surface water at the SNAP Site, in general, surface water flows east from the SNAP Site toward the Hazardous Materials Storage Area (HMSA) Site.

Surface water runoff at the site is regularly monitored as part of the National Pollutant Discharge Elimination System (NPDES) monitoring program under the oversight of the Los Angeles Regional Water Quality Control Board (RWQCB). One monitoring location, Outfall 018, is located downgradient of the SNAP Site (and all of the Group 5 Reporting Area) at the discharge of the R-2 Ponds (Figure 2-7 in 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.

T.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 LF3 RFI Site, including habitat/vegetation types, are shown in 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, of the Group 5 RFI Report.

T.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 SNAP 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 and subsurface soil to soil vapor, and soil vapor to indoor and ambient air
- Group 5 RFI Report (Volume III), Appendix B, Groundwater Characterization – Potential migration from soil to groundwater, and groundwater migration

T.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 (Ogden, 2000a). Based on the review of historical documents summarized in Section T.1.2, additional soil and soil vapor samples were collected to further characterize the site based on the RFI data quality objectives (DQOs). The process of selecting sampling locations, depths, and analytical methods considered objectives established in the Group 5 DQOs, as summarized in the Group 5 RFI Report, Section 4.0 (Volume I).

To achieve these objectives, recent soil sampling was conducted as described in Tables T.3-1A and T.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 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.

Both CFOU groundwater and NSGW at SSFL have been sampled and analyzed according to agency-approved work plans (GRC, 1995a and 1995b; Ogden, 2000b). At the SNAP Site, one piezometer (PZ-109) was installed to monitor groundwater conditions in alluvium and weathered bedrock (that is, in NSGW), while three wells (RD-24, RD-25, and RD-28) were installed to monitor groundwater conditions in the unweathered bedrock (that is, in the CFOU groundwater).

T.3.2 Sampling Scope

A total of 58 soil matrix samples and 15 soil vapor samples were collected between August 2000 and May 2008 to assess potential impacts associated with the Chemical Use Areas at the SNAP Site, not including samples from areas that have since been excavated. Sampling locations and analytical suites were based on 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 T.3-1A and T.3-1B. Sample locations are shown in Figure T.2-2.

Both Chatsworth Formation groundwater and NSGW have been sampled and analyzed according to agency-approved work plans (GRC, 1995a and 1995b; Ogden, 2000b). One piezometer (PZ-109) was used to characterize NSGW, and three Chatsworth Formation wells (RD-24, RD-25, and RD-28) were used to characterize CFOU groundwater specifically at the SNAP Site. Groundwater characterization data for the SNAP 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 quality assurance (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 and soil vapor sampling results, data have been deemed usable and in compliance with RFI program requirements as defined by Quality Assurance Project Plans (QAPP) in Appendix V of the Group 5 RFI Report. The RFI QA program included individual sample data validation, assessment of each laboratory's performance, and a qualitative review of the precision, accuracy, representativeness, reliability, and completeness parameters for the data sets collected for this RFI. A summary of the site-specific data quality evaluation is presented in Attachment T-3 of this report. An evaluation of the historical samples (collected prior to the beginning of the RFI in 1996) data quality is discussed in the RFI Program Report (MWH, 2004). Site-specific data quality summaries for the SNAP Site are described by media in the sections below.

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

- Soil vapor
- Soil matrix
- Groundwater
- Surface water

T.3.3 Key Decision Points

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

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

T.3.4 Soil Matrix and Soil Vapor Findings

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

1. Present summaries of sampling results, including nature and extent of impacts.
2. Evaluate the soil characterization and assess whether further sampling is warranted.
3. Indicate that soil volumes for areas recommended for CMS can be estimated within a factor of 10 for comparison of remedial alternatives.

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

The evaluation of site characterization data for the SNAP Site is provided in Tables T.3-3A and T.3-3B.

T.3.4.1 Soil and Soil Vapor Data Presentation

The results by chemical group are summarized in Figures T.3-1 through T.3-9. Relevant site information, sampling rationale, analytical results, and evaluation of results are presented in Table T.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 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 for each chemical group in a particular Chemical Use Area. (A more detailed site-wide summary is presented in Section T.3.4.2 below.) As appropriate, sample results are compared to established SSFL background concentrations (metals and dioxins only) and/or SSFL RBSLs[1]. The screening levels are also displayed on Tables T.3-3A and T.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).

T.3.4.2 Soil and Soil Vapor Data Summary

As detailed in Table T.2-8, 13 individual confirmed and potential Chemical Use Areas were investigated at the SNAP 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.

T.3.4.2.1 Volatile Organic Compounds

A total of 15 soil vapor samples was collected at nine locations and analyzed for VOCs. Of the 15 samples collected, 10 had detectable levels of VOCs, and results are shown in Figures T.3-1A and T.3-6. Soil vapor sampling was also attempted at five additional locations (refer to Figure T.3-1A). However, no vapor samples could be collected at these locations due to the presence of shallow bedrock (i.e., less than 5 feet bgs) or insufficient flow from the vapor wells to allow sample collection.

- PCE concentrations were detected above the Residential RBSL of 0.452 micrograms per liter (µg/L) in the following samples:
  - SASV1005 at a depth of 4 to 5 feet bgs (0.5 µg/L)
  - U5SV1205 at a depth of 4 to 5 feet bgs (8.8 µg/L)
- A benzene concentration was detected above the Residential RBSL of 0.095 µg/L in a sample from SASV1006 at a depth of 9 to 10 feet bgs (0.1 J µg/L). In two step-out sampling locations adjacent to SASV1006, no elevated benzene concentrations were detected.
- Toluene concentrations were detected above the Ecological RBSL of 0.084 µg/L in the following six samples:

[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 conservation concentrations that pose a low level of risk. See Appendix A of the Group 5 RFI Report.

- SASV1006 at a depth of 4 to 5 feet bgs (0.15 µg/L) and 9 to 10 feet bgs (0.58 µg/L)
- SASV1007 at a depth of 4 to 5 feet bgs (0.16 µg/L) and 9 to 10 feet bgs (0.28 µg/L)
- SASV1002 at a depth of 4 to 5 feet bgs (0.25 µg/L)
- U5SV1210 at a depth of 8 to 9 feet bgs (0.28 µg/L)

- Cis-1,2-Dichloroethene, ethylbenzene, o,m,p- and total-xylenes, and TCE concentrations were detected at concentrations that did not exceed their respective RBSLs.

A total of 23 soil samples collected at 13 locations were analyzed for VOCs. Of the 23 samples, 20 samples had detectable levels of VOCs, and results are shown in Figures T.3-1B and T.3-6.

- PCE concentrations were detected above the Residential RBSL of 4.3 micrograms per kilogram (µg/kg) in the following five samples:

  - U5BS1208 at a depth of 5 to 6 feet bgs (0.66 µg/kg)
  - SABS1004 at a depth of 0 to 1 foot bgs (1.6 µg/kg) and 5 to 6 feet bgs (4.0 µg/kg)
  - U5BS1402 at a depth of 5 to 6 feet bgs (9.1 µg/kg) and 9 to 10 feet bgs (37 µg/kg).

- 1,1-Dichloroethene, acetone, methyl ethyl ketone, methylene chloride, and styrene concentrations were detected at concentrations that did not exceed their respective RBSLs.

The RBSL exceedances for PCE in soil and soil vapor in the southern portion of the SNAP Site warrant further evaluation. Further characterization of other VOCs is not recommended.

T.3.4.2.2 Semivolatile Organic Compounds

A total of 20 soil samples was collected at 12 locations and analyzed for SVOCs. Of the 20 samples, 10 samples had detectable levels of SVOCs, and results are shown in Figures T.3-2 and T.3-7.

- Di-n-butyl-phthalate and butyl benzyl phthalate were detected at concentrations that did not exceed their respective RBSLs, and further characterization of SVOCs in soil is not required at the SNAP Site.

- Various polynuclear aromatic hydrocarbons (PAHs) were detected in all of the samples analyzed for PAHs. No PAH concentrations exceeded their respective RBSLs. No further characterization of PAHs is required at the SNAP Site.

T.3.4.2.3 Total Petroleum Hydrocarbons

A total of 26 soil samples was collected at 15 locations and analyzed for TPH. Of the 26 samples, 24 samples had detectable levels of TPH and results are shown in Figures T.3-3 and T.3-7.

- Gasoline-range hydrocarbons (C8-C11) concentrations were detected above the Residential RBSL of 1.1 milligrams per kilogram (mg/kg) in the following three samples:

  - SABS1001 at a depth of 0 to 1 foot bgs (1.5 mg/kg)
  - SABS1002 at a depth of 0 to 1 foot bgs (1.3 mg/kg)

  - NSTS02S01 at a depth of 3 to 3.5 feet bgs (2.8 mg/kg).

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

No further characterization of the low-level RBSL exceedances for gasoline-range hydrocarbons is recommended.

T.3.4.2.4 Polychlorinated Biphenyls

A total of 11 soil samples was collected at nine locations and analyzed for PCBs. Of the 11 samples, 2 samples had detectable levels of PCBs, and results are presented in Figures T.3-4 and T.3-7.

- Aroclor 1248 was detected at concentrations ranging from 0.003J mg/kg to 0.061 mg/kg. Aroclor 1248 was detected above the Ecological RBSL of 0.011 mg/kg in a sample collected from U5BS1208 at a depth of 0 to 1 foot bgs (0.061 mg/kg). In the deeper sample at U5BS1208 (4 to 5 feet bgs), the Aroclor 1248 concentration (0.003J mg/kg) did not exceed the Ecological RBSL. In addition, U5BS1208 is laterally bounded by three sample locations where no PCBs were detected in soil.

Based on the limited areal extent of PCBs at U5BS1208, no further characterization of PCBs is recommended.

T.3.4.2.5 Metals/Inorganic Compounds

A total of 38 soil samples was collected at 25 locations and analyzed for metals. At least one or more metals were detected in all sampling locations, and results are shown in Figures T.3-5 and T.3-8.

- Aluminum, barium, cobalt, selenium, silver, vanadium, and/or zinc concentrations were detected above their respective background concentrations, Ecological RBSLs, and/or Residential RBSLs.
  - Aluminum (background of 20,000 mg/kg, Ecological RBSL of 12 mg/kg) was detected at concentrations ranging from 7,790J mg/kg to 42,000 mg/kg. Aluminum was detected above background and Ecological RBSLs in a sample from SABS1001 at a depth of 5 to 6 feet bgs (42,000 mg/kg).
  - Barium (background of 140 mg/kg, Ecological RBSL of 15 mg/kg) was detected at concentrations ranging from 41 mg/kg to 320 mg/kg. Barium was detected above background and Ecological RBSLs in a sample from SABS1001 at a depth of 5 to 6 feet bgs (320 mg/kg).
  - Cobalt (background of 12.1 mg/kg, Ecological RBSL of 8.9 mg/kg) was detected at concentrations ranging from 3.2J mg/kg to 25 mg/kg. Cobalt was detected above Ecological RBSLs and background in a sample from SABS1001 at a depth of 5 to 6 feet bgs (25 mg/kg).
  - Selenium (background of 0.655 mg/kg, Ecological RBSL of 0.17 mg/kg) was detected at concentrations ranging from 0.24J mg/kg to 1.5J mg/kg. Selenium was

detected above background and Ecological RBSLs in the following two samples: from SATS01S01 at 70 feet bgs 0.88J mg/kg, and from SABS1001 at a depth of 5 to 6 feet bgs (1.5J mg/kg).

- Silver (background of 0.79 mg/kg, Ecological RBSL of 0.54 mg/kg) was detected at concentrations ranging from 0.024J mg/kg to 4.5J mg/kg. Silver was detected above background and Ecological RBSLs in the following two samples: from NSTS02S03 at a depth of 4.5 to 5 feet bgs (3.5J mg/kg) and from NSTS02S02 at a depth of 2.5 to 3 feet bgs (4.5J mg/kg).
- Vanadium (background of 62 mg/kg, Ecological RBSL of 1.5 mg/kg, Residential RBSL of 76 mg/kg) was detected at concentrations ranging from 18.4 mg/kg to 130 mg/kg. Vanadium was detected above background, Ecological RBSLs, and Residential RBSLs in a sample from SABS1001 at a depth of 5 to 6 feet bgs (130 mg/kg).
- Zinc (background of 110 mg/kg, Ecological RBSL of 21 mg/kg) was detected at concentrations ranging from 34 mg/kg to 130 mg/kg. Zinc was detected above background and Ecological RBSL in a sample from SABS1001 at a depth of 5 to 6 feet bgs (130 mg/kg).

- Metals detected above their respective background concentrations (but below their respective RBSLs) include beryllium, chromium, lithium, sodium, and thallium. Background concentrations for metals are included in Table T.3-3A. Sodium was detected at concentrations ranging from 68.9J mg/kg to 1200 mg/kg. RBSLs for sodium have not been established.
- A total of seven samples was collected at six locations and analyzed for perchlorates. Perchlorates were not detected in any of the samples collected, and further characterization may not be required at the SNAP Site.

T.3.4.2.6 Dioxins

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

T.3.4.2.7 Energetics

Energetics were not found to have been previously used at the SNAP Site and were not included for analysis at any sampling locations.

T.3.5 Groundwater Findings

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

T.3.5.1 Groundwater Data Presentation

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

- Summarize soil impacts as they potentially relate to groundwater impacts.

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

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

T.3.5.2 Groundwater Data Summary

Groundwater conditions at the SNAP Site are characterized by one piezometer (PZ-109) to characterize NSGW, and three Chatsworth Formation wells (RD-24, RD-25, and RD-28) to characterize CFOU groundwater. Groundwater findings from these wells are presented in Tables T.3-2B and in Appendix B of the Group 5 RFI Report. Concentrations denoted with a "J" flag indicate the results are estimated below the method reporting limits.

T.3.5.2.1 NSGW Data Summary

As described in Appendix B of the Group 5 RFI Report, samples from the NSGW well at the site (PZ-109) were analyzed for VOCs, SVOCs (naphthalene), metals, and inorganics.

- PCE was detected at a concentration of 273J µg/L in a sample from PZ-109 collected on April 11, 2002. This concentration exceeds its groundwater screening level of 5 µg/L.

  Cis-1,2-dichloroethene and TCE were detected at concentrations below their respective screening levels.

- SVOCs were not detected in any of the NSGW samples collected.
- Concentrations for dissolved metals detected (arsenic, barium, boron, lead, magnesium, manganese, nickel, strontium, vanadium, and zinc) were below their respective groundwater screening levels, except the following metals.
  - Copper at a concentration of 8.8 µg/L was detected in a sample from PZ-109 collected on February 19, 2008, exceeding its groundwater screening level of 4.7 µg/L.
  - Molybdenum at a concentration of 90 µg/L was detected in a sample from PZ-109 collected on February 19, 2008, exceeding its groundwater screening level of 2.2 µg/L.
  - Selenium at a concentration of 2.4 µg/L at RD-28 detected in a sample from PZ-109 collected on February 19, 2008, exceeded its groundwater screening level of 1.6 µg/L.
- Concentrations for inorganic compounds detected (bromide, chloride, sulfate, and nitrate-NO_3) were below screening levels. Fluoride was detected at a concentration of 1,100 µg/L in two samples from PZ-109, exceeding its groundwater screening level of 800 µg/L on February 19, 2008, and on May 14, 2008.

The SNAP Site may be a source of the PCE observed in NSGW. As discussed in Section T.4.3.2, PCE was detected in soil and soil vapor samples collected in the southern portion of the SNAP Site. The source of the metals and fluoride detections in NSGW described above is indeterminate and does not appear to be related to impacts due to operations at the SNAP Site.

T.3.5.2.2 CFOU Groundwater Data Summary

As described in Appendix B of the Group 5 RFI Report, samples from the CFOU groundwater monitoring wells (RD-24, RD-25, and RD-28) at the SNAP Site were analyzed for VOCs, SVOCs, inorganics, metals, and energetics.

- The VOC concentrations for acetone, cis-1,2-dichloroethene, 1,1,2,2-tetrachloroethane, 1,1-dichloroethane, methyl ethyl ketone, methylene chloride, TCE, and toluene detected in groundwater samples collected from wells installed in the CFOU groundwater were below their respective screening levels with the exception of PCE. This compound was detected at concentrations ranging from 0.1J µg/L to 42 µg/L. PCE was detected above the groundwater screening level of 5.0 µg/L in 27 samples collected from RD-25.
- SVOCs were not detected in any of the CFOU groundwater samples collected.
- Concentrations for dissolved metals detected (boron, calcium, magnesium, manganese, potassium, silica, sodium, strontium, and zinc) in the CFOU groundwater wells were below their respective groundwater screening levels.

- Concentrations for inorganic compounds detected (fluoride, bicarbonate, chloride, sulfate, and nitrate-NO_3) were below screening levels in all groundwater samples collected from the CFOU groundwater wells.
- Energetics were not detected in any of the Chatsworth Formation groundwater samples collected.

Concentrations of PCE in Chatsworth Formation groundwater may be attributable to past operations at the SNAP Site. PCE has also been detected in soil and NSGW at the SNAP site. CFOU groundwater will be discussed further in Appendix B of the Group 5 RFI Report and in the CFOU RFI Report. The Site-wide Groundwater RFI and subsequent CMS will address groundwater at the SNAP Site.

T.3.6 Surface Water Findings

Surface water may exist intermittently at the SNAP Site primarily as the result of seasonal precipitation events. RFI and NPDES surface water sampling was conducted at the site as described in Table T.3-1C. For the RFI, one surface water sample was collected and the sample was analyzed for VOCs, SVOCs (1,4-dioxane and naphthalene), TPH, inorganics (perchlorate), and metals. Data quality and risk assessment evaluation summaries for surface water sampling are provided in Table T.3-3C.

- VOCs were not detected in the surface water sample
- SVOCs (1,4-dioxane and naphthalene) were not detected in the surface water sample.
- TPH was not detected in the surface water sample.
- Concentrations for metals detected (arsenic, aluminum, antimony, barium, cadmium, chromium, cobalt, molybdenum, nickel, selenium, thallium, vanadium, and zinc) were below their respective groundwater screening levels, except the following metals:
  - Beryllium at a concentration of 1.4 µg/L exceeded its Ecological RBSL of 0.5 µg/L
  - Copper at a concentration of 17 µg/L exceeded its Ecological RBSL of 9 µg/L
  - Lead at a concentration of 14 µg/L exceeded its Ecological RBSL of 2.5 µg/L
  - Silver at a concentration of 0.14J µg/L exceeded its Ecological RBSL of 0.10 µg/L
- Inorganic compounds (perchlorate) were not detected in the surface water sample.

The SNAP Site is located near a surface water divide. It is unlikely that the SNAP Site has been impacted from upgradient sites via surface water transport. Surface water flows southeast from the SNAP Site towards the HMSA and PDU Sites, along 20th Street, eventually flowing towards the R-2 Ponds. No further characterization of metals is recommended since surface water concentrations are most likely due to underlying soil concentrations mobilized during runoff.

T.4 Risk Assessment Findings

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

T.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. 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 of the Group 5 RFI Report).
2. Exposure Point Concentration (EPC) calculations were based on collected characterization data, as follows:
    - All groundwater EPCs were based on maximum levels detected in a single highest-concentration well (PZ-109) at the SNAP 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 non-detected 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 SNAP 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 large home-range receptor risk assessment report.

T.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 SNAP Site. A conceptual site model diagram for human health risk assessment is presented in Figure T.4-1 and summaries of COPCs and risk estimates for human health are presented in Table T.4-1 and Table T.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 – Tetrachloroethene was identified as a COC for inhalation of indoor air by future residents. No COCs were identified as COCs for inhalation of ambient air by future residents or future recreators.
- Near-surface Groundwater – Tetrachloroethene and trichloroethene were identified as COCs for domestic use of shallow groundwater by future residents.
- Chatsworth Groundwater – COCs will be identified and addressed as part of the CFOU RFI Report.

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

T.4.3 Summary of Ecological Risk Assessment Findings

Potential risks were estimated for terrestrial plants, soil invertebrates, and terrestrial birds and mammals, and for aquatic organisms. A conceptual site model diagram for ecological risk assessment is presented in Figure T.4-2 and a summary of COECs and ecological risk estimates is presented in Table T.4-4, Table T.4-5, and Table T.4-6. Results of the Risk Characterization indicated the following:

- Soil – Aroclor 1248, and PCB_TEQs (birds and mammals) were retained as COECs. Estimated risks were limited to the Low TRV; however, the Aroclor and dioxin/furan HIs also exceeded one. Estimated risks are in the Low range for Aroclor 1248 and Medium-Low for PCB_TEQs. Barium was not retained as a COEC. Background concentrations accounted for most of the estimated risks to the thrush, and estimated risks to the deer mouse were driven by a single high detect at 5 to 6 ft bgs.
- 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 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.
- Surface Water – No COECs. Aluminum, barium, beryllium, cadmium, copper, lead, and vanadium exceeded TRVs (chronic AWQC), but surface water is present at the SNAP site only during storm runoff events and background comparisons were not conducted for surface water. Surface water concentrations may be due to the underlying soil concentrations.

The uncertainties associated with the Group 5 RFI Sites in general and those specific to the SNAP site are summarized in Table T.4-7.

T.4.4 Risk Assessment Conclusions for the SNAP Site

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

The potential sources of contamination to the SNAP Site include the former SNAP Building 4059 and the Building 4059 excavation area; Buildings 4019 and 4057; former Buildings 4039, 4459, 4358, 4360, and 4626; the former tank areas; and substations 4719, 4757, and 4759.

Potential risks associated with direct contamination of soil, soil vapor, surface water, and near-surface groundwater were assessed in this RA. Soil vapor samples were collected and analyzed for VOCs, and soil samples were collected and analyzed for VOCs, SVOCs, TPH, metals/inorganics, and PCBs. Data were considered adequate to evaluate potential risks. No COCs were identified in soil for human health. Tetrachloroethene was identified as a COC in soil vapor for inhalation of indoor air by hypothetical future residents. Aroclor 1248 and PCB_TEQs (birds and mammals) were identified as COECs in soil. No COECs were identified in soil vapor for ecological receptors.

Surface water was analyzed for VOCs, SVOCs (1,4-dioxane and naphthalene), TPH, inorganics (perchlorate), and metals and evaluated for ecological risk. No COECs were identified in surface water for ecological receptors.

Near-surface groundwater was analyzed for VOCs, SVOCs (naphthalene), metals, and inorganics. Tetrachloroethene and trichloroethene were identified as COCs in near-surface groundwater for future residents. Chatsworth Groundwater will be addressed as part of the Chatsworth Formation OU.

The location within the SNAP Site that will require further action to address human health and ecological risk consists of an area in the southern portion of the site that encompasses portions of former Building 4626 and existing Building 4057. In this area, PCE in soil vapor and PCBs in surface soil are risk drivers for the SNAP Site.

T.5 SNAP Site Action Recommendations

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

T.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 SNAP Site Report accomplishes these requirements by:

- 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 T.3-2A and T.3-2B). Section T.3 summarizes the overall characterization of contamination nature and extent, potential source areas, and an assessment of investigation completeness.
- 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.
- Identifying potential receptors and estimating potential risks at the SNAP Site (Section T.4 in this appendix and in Appendix A of the Group 5 RFI Report).
- Identifying SNAP Site areas requiring further work (this section).

T.5.2 Basis for Site Action Recommendations

In summary, site action recommendations included in the SNAP 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 and NFA Area recommendations are based on an integrated evaluation of characterization and risk assessment results. Stabilization Area recommendations rely on characterization evaluations, including transport- and fate-analysis, and comparison to risk-based levels. Each process is described further below.

T.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 hazard index (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 (such as 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 T.5-1. CMS Areas are also depicted graphically in Figure T.5-1 to illustrate locations and approximate areal extents, and are summarized in Table T.5-2.

Two additional aspects of RFI reporting will serve to confirm and/or finalize the areas recommended in Group RFI Reports for evaluation in the CMS. The first is an ecological evaluation for large home-range receptors (for example, 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.

T.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).

T.5.3 CMS Site Action Recommendations

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

As presented in Table T.4-2, the maximum cumulative human health risk for the SNAP Site is $2x10^{-3}$ under a hypothetical future residential exposure scenario, and the maximum hazard index is 10. For the hypothetical future recreational scenario, the risk and hazard index values are less than $1x10^{-6}$ and 1, respectively. The potential human health risks at the SNAP RFI Site exceed the low end of the risk management range ($1 X 10^{-6}$) (excess lifetime cancer risk [ELCR]) and also exceed a hazard index of 1 (noncancer risks). Consequently, a CMS is recommended. As shown in Table T.5-1, the primary risk drivers for the hypothetical future residential scenario are PCE (cancer risk), and PCE, TCE, fluoride, and molybdenum (noncancer effects) in NSGW. In addition, PCE in soil vapor is a risk driver for indoor air risk for a hypothetical future residential structure. PCE in soil vapor in the southern portion of the SNAP Site is recommended for further evaluation in CMS.

As presented in Table T.4-4, Ecological HI values are greater than 1 for the hermit thrush and deer mouse due to a single PCB detection in surface soil near former Building 4626 (southern portion of SNAP Site). Because the hazard quotient values exceed 1, a CMS is recommended to address ecological risks.

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

- **SNAP-1** – An area encompassing portions of current Building 4057 and former Building 4626 with human health and ecological risk drivers, as described below.
  - Building 4057. The chemical risk drivers are PCE in soil vapor (human health).
  - Former Building 4626. The chemical risk drivers are PCE in soil vapor (human health) and a PCB (Aroclor 1248) in surface soil (ecological effects).

The locations of this CMS area is presented in Figure T.5-1 and described further in Table T.5-2.

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

T.5.4 NFA Site Action Recommendations

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

The NFA recommendation for the SNAP Site will be reevaluated, and if appropriate revised, in the future after the existing structures are demolished. Four structures remain at the SNAP Site (4019, 4057, 4719, and 4757). As part of the planned demolition of these buildings, soil sampling will be performed, as needed, according to the process specified in SOP: Building Feature Evaluation and Sampling (MWH and CH2M HILL, 2008) to assess the potential for chemical impacts beneath the buildings. The NFA recommendation for the ECL RFI Site will be confirmed based on the data collected following building demolition.

T.5.4.1 Historical Uses

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

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

- Chemical Use Area 1 – Building 4059 (AOC)
- Chemical Use Area 2 – Bldg 4059 French Drain System
- Chemical Use Area 4 – Building 4358
- Chemical Use Area 5 - Building 4360
- Chemical Use Area 6 - Building 4459
- Chemical Use Area 7 – UST UT-36
- Chemical Use Area 8 - Building 4757 Transformer
- Chemical Use Area 9 - Building 4759 Transformer
- Chemical Use Area 10 - Building 4719 Transformer
- Chemical Use Areas 11 and 12 - Acid and Sodium Hydroxide ASTs

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

T.5.4.2 Sampling and Analysis Results

As presented in Section T.3, several soil and soil vapor samples were collected in the area recommended for NFA. Soil and soil vapor samples were collected and analyzed for VOCs. Soil samples were also analyzed for SVOCs, petroleum hydrocarbons, metals, inorganics, PCBs, and energetics. Although several compounds were detected above their respective background concentrations (metals) and Ecological RBSLs, the exceedances appear to be isolated in nature, and not indicative of significant releases. In all cases, the exceedances have either deeper sample or lateral sample results that do not exceed either respective background or Ecological RBSLs. Therefore, based on the seemingly random distribution of exceedances for a few compounds, no further action appears warranted.

T.5.4.3 Risk Assessment

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

T.5.5 Source Area Stabilization Site Action Recommendations

Due to the nature of contamination at the SNAP Site (VOCs in soil and soil vapor), it is unlikely that the constituents would be mobilized in storm event, and therefore no stabilization measures are required.

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Tables

Table T.2-1
Building Inventory
SNAP RFI Site

Bldg Number	Start (Year)	End (Year)	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
4019	1962	Currently inactive	Housed 3 SNAP FS reactors from 1964 to 1965. Each reactor used vacuum pumps, which contained oil. Performed criticality acceptance tests of SNAP reactors prior to launch of space power systems, used as a store room since early 1970s. In 1965, all nuclear materials removed from building 4019, reassigned for non-nuclear use in the 1970s and 1980s. DHS released the building for unrestricted use in February 2005.	NA	No chemical uses based on available information on operations at this building.	Sapere, 2005; Atomics International, 1965.
4039	1964	2003	Building 4039 functioned as an office building until 2000, at which time it became a health physics counting laboratory.	NA	No chemical uses based on available information on	Sapere, 2005.
4057	1961	Current	Building 4057 was used as the Liquid Metals Engineering Center (LMEC) Laboratory. Housed 2 sodium test rigs, each rig can achieve 1,300 degrees F and had a capacity of 42 gallons. Decommissioned for laboratory use in 1998 and then became a records room (Sapere, 2005). A flammable storage cabinet under a canopy was located outside north wall of building. Contained: alcohol, paint, trichloroethane, oil, and a 55-gal drum of Dowanol (ethylene glycol monoethyl ether).	3		Sapere, 2005; Unknown, Date Unknown (HDMSp001925809).
4059 (AOC)	1962	1978	Bldg 4059 was built in 1963 to test SNAP reactors under vacuum conditions; it was later converted for the Large Leak Test Rig Sodium Test Program in 1973. NaK, freon, kerosene, mercury, and several metals were used for the SNAP 8 Development Reactor (S8DR) Program. Partial Decon & Decom began in 1978; completed in 2004 (Sapere, HSA). Approx. 5000-8000 cubic yards of the backfill came from the Area IV Borrow Pit. The area at and around Bldg 4059 (including associated underground storage tanks) was excavated to removed above ground structures and basement vaults (max excavation length=300 feet; max. depth=70 feet bgs). Excavation bottom confirmation soil samples collected for metals and propellants. The excavation was filled in with soil obtained from the Area IV Borrow Pit. During a 1983 inspection, discovered that groundwater had leaked into below grade vault; groundwater in building was found to have been contaminated with Co-60. The leak in the basement was subsequently repaired. In November 1981, a 75-gallon Dowanol (diethylene glycol monoethyl ether) spill occurred. No information provided on location.	1	As of 2005, DOE had not yet released the site for unrestricted use. During the Bldg 65 Landfill RFI (Group 8), a shale bed was found during excavation activities that could act as a conduit for groundwater to migrate from this area to the SNAP area.	Sapere, 2005; ICF, 1993; Ogden, 2000; Boeing, 2005; Rockwell International, 1983; Rockwell International, 1992; Atomics International, 1968; Atomics International, 1969; Atomics International, 1961; ETEC, 1990b; Boeing, 2007; Rocketdyne, 1976-1990.
4038	1962	During/after 2005	SNAP, LMEC, and ETEC Administration and Office Building. Release of acetone (unknown quantity) in 1989. A small quantity (2 gallons) of hydraulic oil was released to an open trench in 2000.	NA		Unknown, Date Unknown (HDMSE00407395); Unknown, Date Unknown (HDMSE00187729)
4358	1966	1978	Building 4358 was initially used as a Chemical Storage Building and part of the SCTL support area. The function of the SCTL was to test components and instruments in a sodium environment. When SCTL was eliminated, Building 4358 became a storage building for SCTI and Kalina. The primary purpose of the SCTI was to test sodium-heated steam generators and sodium-to-sodium intermediate heat exchangers (IHX) under simulated sodium-cooled nuclear power plant operating conditions. The building was moved over time. It was present in the SNAP RFI Site area (northwest of Bldg 4656) from 1966 through 1978. It was then moved to a location directly south of 4026 (PDU RFI Site). The buildling was demolished in 2003. The building was a 1,120-square-foot structure with the frame, siding and roof constructed of steel.	4	Unspecified types of chemical storage.	Sapere, 2005.
4360	1987	1999	Building 4360 was used as Chemical Storage for SCTI. Chemicals include acids, bases, and combustible liquids.	5		Sapere, 2005; DOE, 1991.
4459	1963	2003	From 1963 to 1992, Building 4459 was used as a Uninterruptable Power Supply (UPS) and contained a large diesel generator. From 1992 to 2003, Building 4459 was used for non-radiological storage, stored flammables. Also stored R/A (Radioactive) Waste Containers during Bldg 4059 demolition activities.	6	Unspecified types of flammable chemical storage.	Sapere, 2005; Rockwell International, 1989; ETEC, 1990a.
4626	1963	2004?	Equipment Storage (non-chemical). A storage yard to the west of 4626 was used to store barrels of radioactive sand.	NA	No chemical uses based on available information on operations at this building.	Sapere, 2005.

Table T.2-2
Tank Inventory
SNAP 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										
S-2 Holding Tank	Associated with Bldg 59 French Drain System	Unknown	Temporarily stored water collected from French drain	Post 1983 to 2004 (assumed removed when Bldg 4059 demolished)	Removed	Removed as part of the demolition of Bldg 4059	Collected water drained from Bldg 4059 basement. Screened for radioactivity and then passed through carbon before discharge to storm drain; water monitored in NPDES program.	2		RFI Workplan Addendum Amendment, Ogden 2000 and CCR 1993, ICF; HDMSP001823369; HDMSP001834849.
Unknown	North of Bldg 4358	Unknown	Acid	Unknown	Unknown	Regulated under Corrective Action	Tanks were part of SCTI Water and Demineralizer Systems.	11		Demineralizer Systems (HDMSp00019701); CH2M HILL GIS map.
Unknown	North of Bldg 4358	Unknown	NaOH	Unknown	Unknown	Regulated under Corrective Action	Tanks were part of SCTI Water and Demineralizer Systems.	11		Demineralizer Systems (HDMSp00019701); CH2M HILL GIS map.
Unknown	North of Bldg 4358	Unknown	Deionized Water	Unknown	Unknown	Regulated under Corrective Action	Tanks were part of SCTI Water and Demineralizer Systems.	NA		Demineralizer Systems (HDMSp00019701); CH2M HILL GIS map.
Unknown	West of Bldg 4358	Unknown	Unknown (Demineralizer Day Tanks)	Unknown	Unknown	Regulated under Corrective Action	Tanks were part of SCTI Water and Demineralizer Systems.	NA		Demineralizer Systems (HDMSp00019701); CH2M HILL GIS map.
Unknown	Northwest of Bldg 4057	1000	Liquid Nitrogen	1960- before 1992	Inactive	Regulated under Corrective Action		NA	Property Number ZO172844	Rockwell, Storage Tanks at DOE Facilities, 1992b; CH2M HILL GIS map.
Unknown	Perimeter of Bldg 4059, exact location unknown	1000	Liquid Nitrogen	1964- before 1992	Inactive	Regulated under Corrective Action		NA		Rockwell, Storage Tanks at DOE Facilities, 1992b.
Unknown	Perimeter of Bldg 4059, exact location unknown	1000	Argon	1964- before 1992	Inactive	Regulated under Corrective Action		NA		Rockwell, Storage Tanks at DOE Facilities, 1992b.
Unknown	Perimeter of Bldg 4059, exact location unknown	10000	Sodium	1974-Unknown	Active as of 1992	Regulated under Corrective Action		NA		Rockwell, Storage Tanks at DOE Facilities, 1992b.
Unknown	Perimeter of Bldg 4059, exact location unknown	3000	Alcohol	1961- before 1992	Inactive	Regulated under Corrective Action		NA		Rockwell, Storage Tanks at DOE Facilities, 1992b.
Unknown	Perimeter of Bldg 4059, exact location unknown	Unknown	Unknown	Unknown	Unknown	Regulated under Corrective Action		NA		
Unknown	Perimeter of Bldg 4059, exact location unknown	Unknown	Unknown	Unknown	Unknown	Regulated under Corrective Action		NA		
Unknown	North of Bldg 4019	300	Deionized Water	Unknown	Unknown	Regulated under Corrective Action		NA		Rockwell International, 1992c.

Table T.2-2
Tank Inventory
SNAP RFI Site

Tank ID	Location	Size (Gallons)	Contents	Use Period	Use Status	Regulatory Closure Status	Additional Information	Chemical Use Area Number	Comments	Reference
Unknown	North of Bldg 4626	5000	Liquid Nitrogen	1966-?	Inactive	Regulated under Corrective Action		NA		Rockwell International, 1992c.
Underground Tanks										
UT-24	Building 4059	12,000	Sodium	1961 to 1998	Removed	DOE has oversight	12,000-gallon Na salts UST. Reactions product tank. Scheduled for removal in 1994/1995.	NA		Unknown, 1994; Unknown, 1989
UT-25	Building 4059	550	Radioactive Water	1962 to 1998	Removed	DOE and either NRC or DHS	Reportedly contained radioactive water.	NA	The tank reportedly contained radioactive water; no reports of other chemicals.	Unknown, 1994; Unknown, 1989
UT-26	Building 4059	1,100 cubic feet	Radioactive Exhaust	1961 to before 1978	Removed	DOE and either NRC or DHS	Reportedly contained radioactive exhaust.	NA	The tank reportedly contained radioactive exhaust; no reports of other chemicals.	Unknown, 1994; Unknown, 1989
UT-36 (UT-54)	East of Building 4059	3,000	Fuel Oil/Diesel	Unknown to 1987	Removed	Tank removed in August 1987 under VCEHD permit #703. Site not closed.	Diesel tank used to refuel a generator located inside Bldg 4059. UT-36 appears to be the same tank as UT-54 as reported on 10/20/93 historical review.	7	No sample data in EDMS.	Ogden, 2000; Unknown, 1994
Unknown Tanks										
Reaction Products Tank (RPT)	Unknown	Unknown	Sodium	Unknown	Unknown	Regulated under Corrective Action	Unknown	2		Boeing, 1997

Table T.2-3
Transformer Inventory
SNAP RFI Site

Transformer/ Substation Number	Location	Use Period	Use Status	Description	Chemical Use Area Number	Comments	Reference
4719	Northwest of Bldg 4019	Unknown	Unknown	Electrical substation for Bldg 4019	10	Sampling needed to assess whether soil impacted by PCBs.	Sapere, 2005.
4757	Between Bldgs 4059 and 4057	Unknown	Unknown	Electrical substation for Bldg 059 and 057 (Sapere). During 2000 transformer inspection, no visible staining, concrete pad, locked fence. During 2003 visual inspection, transformer oil was observed leaking from a valve onto the transformer pad (east side). Inspection performed during Bldg 4059 removal excavation activities and, therefore, site may have been inaccessible at time.	8	Sampling needed to assess whether soil impacted by PCBs.	Sapere, 2005; Transformer Inspection Table, 2000.
4759	Adjacent to the north side of Bldg 4459	Unknown	Removed	Electrical substation for Bldg 4459	9	Sampling performed; no PCBs detected (see investigations table)	Sapere, 2005.

Table T.2-4
Inventory of Other Site Features
SNAP RFI Site

Chemical Use Area Name	Location	Start (Year)	End (Year)	Chemical Use Area Number	Process/Chemical Use	Comments	Reference
Bldg 4059 French Drain System	French drain located around the perimeter of Bldg 4059, Sump S-2 excavated into rock six feet below French drain on southwest side of Building 4059	1962	2004 (assumed removed when Bldg 4059 demolished)	2	Installed to prevent the intrusion of groundwater into the below grade portions of Bldg 4059. Water collected in the French drain's collection sump stored into holding tank (unknown number). The water was screened for radioactivity and VOCs. Routine sampling showed consistent detections of VOCs (PCE, TCE, cis/trans-1,2-DCE). Water containing VOCs (and no radioactivity) was transported to the Delta Air Stripping Tower in Area II for treatment before discharge to storm drain; water monitored in NPDES program.	WPAA also mentions CF wells RD-24, -25, and -28 used for dewatering, but no details on extraction.	Ogden, 2000; ICF, 1993.

Table T.2-5
Spill Inventory
SNAP RFI Site

Date	Building/ Feature	Chemical Spilled	Amount (gallons)	Comments	References
1983	4059	Cobalt 60	Unknown	During a 1983 inspection, discovered that groundwater had leaked into below grade vault; groundwater in building was found to have been contaminated with Co-60. The leak in the basement was subsequently repaired.	Rockwell International, 1983. ICF, 1993.
11/4/81	4059	Dowanol (Diethylene glycol monoethyl ether)	75	In November 1981, a 75-gallon Dowanol (diethylene glycol monoethyl ether) spill occurred. No information provided on location.	Reported Releases, 1975-1990.
1/19/89	4059	Oil	Unknown	Oil spill from a leaky transformer.	Reported Releases, 1975-1990.
June 1993	4059	Diesel Fuel	2	An estimated two gallons of diesel fuel leaked from a generator at B/059.	Rockwell International, 1993.
10/16/89	4059	Tritium	Unknown	Possible release of tritiated water from Building 4059 to an NPDES permitted pond.	Rockwell International, 1989a.
9/21/61	4059	Radiological Contaminated Water	Unknown	On September 21, 1961, a spill of an unspecified amount of water and 93% enriched U-Zr fines and sludge occurred at SNAP Room 1256.	Incident Report Vol. 1.
5/1/62	4059	Radiological	Unknown	On May 1, 1962, a spill occurred that involved 2.8 kg of U-235 in SNAP lab 1252.	Incident Report Vol. 1.

Table T.2-6
Site History - Investigations
SNAP RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	Purpose	COPCs Analyzed	COPCs Reported	Comments	Reference
1	Bldg 4059	1983	Groundwater: Groundwater found to have leaked into the below grade vault in the building in 1983. A water management program was implemented to maintain the inward flow gradient and the leaks in the basement were sealed.	Radiochemistry	Radiochemistry		Ogden, 2000.
2	Bldg 4059 French Drain System	1986 to 1992	Groundwater: Beginning in 1986, CF groundwater samples were collected from the French drain system for VOC analysis as part of SSFL ground water monitoring program.	VOCs	VOCs (PCE, TCE, cis-1,2-DCE)		Ogden, 2000.
9	Bldg 4759 Transformer	Sep-03	Transformer soil investigation.	PCBs	Non-detect for PCBs		MWH, 2004.
NA	None Area between Bldgs 4626 and 4757)	2000	Purpose of trenching and sampling unknown.	1 sample: TPH, SVOCs, inorganics Both samples: Metals	TPH<100 mg/kg SVOCs-ND Metals > background and Eco RBSL	Trenching and soil sampling conducted in Aug and Sept 2000 by Ogden at the northeast corner of Bldg 4626. Two soil samples collected (2.5 and 3 feet bgs). No additional information available.	MWH, 2004.

Table T.2-7
Site History - Soil Disturbance
SNAP RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	COPCs Targeted	Media	Key Activities	Status	Reference
1 and 2	Building 4059 Building 4059 French Drain System	2003 to 2004	Metals and Propellants	Soil	The area at and around Building 4059 (including the French drain and tanks storage tanks) was excavated to removed above ground structures and basement vaults. The main excavation area measured approximately 160 feet by 175 feet; an approximate 20- to 40-foot wide portion of the excavation also extended approximately 140 feet to the south; the excavation extended to a maximum depth of 57 feet near the center. The excavation was backfiled with soil obtained from the Area IV Borrow Pit. Excavation bottom confirmation soil samples collected for metals and propellants. No propellants were detected. Metals concentrations exceeded background and the Eco RBSL in an excavation bottom sample collected at 70 feet bgs (no ecological exposures would be expected at this depth).	Facility demolition activities completed	MWH, 2004; Geomatrix, 2005.
7	UT-36	Aug 1987 Oct 1994	TPH, VOCs	Soil	During removal action activities in 1987, a "dime-size" hole was present in the bottom of the tank. Five (5) soil samples were collected. No VOCs were detected; the maximum TPH concentration was 20 mg/kg. WPAA (Ogden, 2000) reports that, in 1994, VCEHD required further investigation of site based on inspection of the excavation (presumably noted observations from the 1987 tank removal excavation) and results of samples collected from the excavation. No information additional information found in historic records indicating whether follow-up sampling was performed.	Tank removed in August 1987 under VCEHD permit #703.	Ogden, 2000; Rocketdyne, Date Unknown.

Table T.2-8
Chemical Use Summary
SNAP RFI Site

			Chemical Use Area Types and Typical Target Analytical Suites														
			Solvents	Petroleum Fuels		Hydrazine-Related Compounds	Oil-Related Materials	Metal Wastes (exclusive of debris areas)	Debris Areas/ Fill	Energetic Constituents	Transformers	Leach Field	Non-metal Inorganic Compounds	Non-metal Inorganic Compounds		Acids/ Bases	
Chemical Use Area Number	Chemical Use Area Name	Potential Chemicals Used/Stored	VOCs	TPH, VOCs[1]	SVOCs	VOCs, SVOCs (Hydrazines, Formaldehyde, NDMA, UDMH, and MMH)	SVOCs, TPH, PCBs, Metals	Metals, pH	TPH, Metals, VOCs, SVOCs, PCBs, Dioxins[2]	Energetics, Metals	PCBs	Site-Specific	Fluoride, Chloride, Nitrate, Sulfate, Bromide	Perchlorate	Dioxins, Furans	pH	Asbestos
1	Building 4059 (AOC)	Mercury, platinum, freon, BTEX, acetone, kerosene, and Dowanol.	X	X				X									
2	Bldg 4059 French Drain System	VOCs	X														
3	Building 4057	Trichloroethane, paint, oil, and Dowanol	X		X		X	X									
4	Building 4358	Chemical storage (unspecified type)	X				X										
5	Building 4360	Metals, acids, bases, and combustible liquids		X				X								X	
6	Building 4459	Flammables (unspecified type)	X				X										
7	UT-36	Fuel oil, diesel		X													
8	Building 4757 Transformer	PCBs									X						
9	Building 4759 Transformer	PCBs									X						
10	Building 4719 Transformer	PCBs									X						
11+12	Acid and Sodium Hydroxide Aboveground Storage Tanks	Acids (unspecified type) and sodium hydroxide									X					X	
13	Building 4626	Unknown	X	X				X	X		X					X	

Notes:

1. VOCs were a COPC for gasoline range organics.

2. SVOCs and dioxins were evaluated at COPCs if burned materials were observed. PCBs were evaluated as COPCs if elevated concentrations of lubricant oil-range hydrocarbons were detected.

Table T.2-9
Conceptual Site Model
SNAP RFI Site

Chemical Use Area Name (or Site if appropriate)	Ground Surface Elevation (Feet MSL)	Alluvium Thickness (Feet)	Elevation of Unweathered Chatsworth (Feet MSL)	Depth to Near-Surface Groundwater (Feet)	Near-Surface Groundwater Horizontal Gradient/Flow Direction (foot/foot)	Depth to Chatsworth Formation Groundwater (Feet)	Chatsworth Formation Groundwater Horizontal Gradient/Flow Direction (foot/foot)	Surface Water Present? (Yes/No)	Surface Water Flow Information	Other Information?	Reference
SNAP	1800 to 1810	1 to 12	1760 to 1782	15 to 22	Only one shallow ground water well is located withing the SNAP buffer zone; therefore, localized information about gradient and flow cannot be ascertained. In general, shallow ground water flows to the north in this portion of Group 5.	30 to 40	0.08/northwest	No	While there are no perennial surface water bodies at the SNAP Site, surface water flows east from the SNAP Site towards the PDU Site.	Dewatering of Chatsworth Formation Wells RD-24 and RD-25 affects groundwater gradients beneath the SNAP site. NSGW has been indentified only at PZ-109 in the vicinity of Building 4057 in the southern portion of the SNAP buffer zone.	Ogden, 2000; MWH, 2004.

MSL = above mean sea level

Table T.3-1A
Sampling Summary for Soil
SNAP RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth	Base Depth	Sample Type	Remediation Status	Consultant	Matrix	Hydrocarbons	Inorganics	Metals	PCBs	SVOC	VOC
NSTS02S01	Grab Sample	RJ578	8/18/2000	3	3.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil	X	X	X		X	
NSTS02S02	Grab Sample	RJ594	9/11/2000	2.5	3	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil			X			
NSTS02S03	Grab Sample	RJ595	9/11/2000	4.5	5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil			X			
SABS01	Soil Boring	MT807	9/11/2003	0	0.5	Primary Sample	In Place	MWH	Soil		X		X		
SABS02	Soil Boring	MT808	9/11/2003	0	0.5	Primary Sample	In Place	MWH	Soil		X		X		
SALS01	Surface Soil Sample	WC028	11/23/2004	70	70	Primary Sample	In Place	MWH	Soil		X				
SALS01	Surface Soil Sample	WC029	11/23/2004	10	10	Primary Sample	In Place	MWH	Soil		X				
SATS01S01	Trench	WC023	11/23/2004	70	70	Primary Sample	In Place	MWH	Soil		X	X			
SATS01S02	Trench	WC024	11/23/2004	10	10	Primary Sample	In Place	MWH	Soil		X	X			
SATS01S03	Trench	WC025	11/23/2004	4	4	MULTIPLE SAMPLE TYPES	In Place	MWH	Soil		X	X			
SATS01S04	Trench	WC026	11/23/2004	1	1.5	MULTIPLE SAMPLE TYPES	In Place	MWH	Soil		X	X			
SATS01S05	Trench	WC027	11/23/2004	8	8	MULTIPLE SAMPLE TYPES	In Place	MWH	Soil		X	X			
U5BS1207	Soil Boring	U5BS1207S010	3/26/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X	X	X	X	X	X
U5BS1207	Soil Boring	U5BS1207S060	3/26/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X	X	X	X
SABS1004	Soil Boring	SABS1004D010	3/26/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X	X	X		X	X
SABS1004	Soil Boring	SABS1004S060	3/26/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	X
SABS1004	Soil Boring	SABS1004S100	3/26/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil		X				
U5BS1203	Soil Boring	U5BS1203S010	3/26/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	X
SABS1002	Soil Boring	SABS1002D010	3/26/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X		X			X
SABS1002	Soil Boring	SABS1002S010	3/26/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				
SABS1002	Soil Boring	SABS1002S060	3/26/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X			X
SABS1001	Soil Boring	SABS1001S070	3/26/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X			X
SABS1001	Soil Boring	SABS1001S100	3/26/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil		X	X			
SABS1001	Soil Boring	SABS1001X010	3/26/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X	X	X			X
SABS1002	Soil Boring	SABS1002S100	3/26/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil		X				
SABS1003	Soil Boring	SABS1003S010	3/26/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	X
SABS1003	Soil Boring	SABS1003S060	3/26/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	X
SABS1003	Soil Boring	SABS1003S100	3/26/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil		X				X
SABX1000	Soil Boring	SABX1000C010	3/27/2008	0	1	Composite Sample	In Place	CH2M HILL	Soil		X		X		
U5BS1208	Soil Boring	U5BS1208S010	3/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X	X	X	X	X	X
U5BS1208	Soil Boring	U5BS1208S060	3/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X	X	X	X
SABS1005	Soil Boring	SABS1005S010	3/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	X
SABS1005	Soil Boring	SABS1005S050	3/28/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	X
U5BS1209	Soil Boring	U5BS1209S010	3/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	X
SABS1000	Soil Boring	SABS1000S010	3/28/2008	0	1	Primary Sample	In Place	MWH	Soil	X	X	X			X
SABS1000	Soil Boring	SABS1000S060	3/28/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X	X	X			X
U5BS1205	Soil Boring	U5BS1205S010	3/31/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X				
U5BS1205	Soil Boring	U5BS1205S060	3/31/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X				
U5BS1204	Soil Boring	U5BS1204S010	3/31/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				
U5BS1204	Soil Boring	U5BS1204S040	3/31/2008	3	4	Primary Sample	In Place	CH2M HILL	Soil		X				
U5BS1206	Soil Boring	U5BS1206S010	4/1/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X			
U5BS1206	Soil Boring	U5BS1206S060	4/1/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			
U5BX1200	Soil Boring	U5BX1200C010	4/14/2008	0	1	Composite Sample	In Place	CH2M HILL	Soil		X		X		
U5BS1401	Soil Boring	U5BS1401S01	5/2/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X		X		
U5BS1401	Soil Boring	U5BS1401S02	5/2/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X				X
U5BS1400	Soil Boring	U5BS1400S01	5/2/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X		X		
U5BS1400	Soil Boring	U5BS1400S02	5/2/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				X
U5BS1402	Soil Boring	U5BS1402D01	5/2/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X		
U5BS1402	Soil Boring	U5BS1402S01	5/2/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				
U5BS1402	Soil Boring	U5BS1402S02	5/2/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X				X
U5BS1402	Soil Boring	U5BS1402S03	5/2/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil						X

Table T.3-1A
Sampling Summary for Soil
SNAP RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth	Base Depth	Sample Type	Remediation Status	Consultant	Matrix	Hydrocarbons	Inorganics	Metals	PCBs	SVOC	VOC
U5BS1213	Soil Boring	U5BS1213S01	5/14/2008	0.5	1.5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X	X	X		X	
U5BS1212	Soil Boring	U5BS1212S01	5/14/2008	0.5	2.5	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	
U5BS1212	Soil Boring	U5BS1212S02	5/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	
SABS1401	Soil Boring	SABS1401S01	5/14/2008	6	7	Primary Sample	In Place	CH2M HILL	Soil		X	X			
SABS1400	Soil Boring	SABS1400D01	5/14/2008	6	7	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X			
SABS1400	Soil Boring	SABS1400S01	5/14/2008	6	7	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				
SABS1007	Soil Boring	SABS1007D01	5/14/2008	0.5	1.5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X	X	X		X	
SABS1007	Soil Boring	SABS1007S02	5/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	
SABS1006	Soil Boring	SABS1006S01	5/14/2008	0.5	1.5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X	X	X		X	
SABS1006	Soil Boring	SABS1006S02	5/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X	X	X		X	

Table T.3-1B
Sampling Summary for Soil Vapor
SNAP 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
SASV1000	Soil Vapor Sample		4/7/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
SASV1002	Soil Vapor Sample		3/28/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
SASV1002	Soil Vapor Sample		3/28/2008	8	9	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
SASV1002	Soil Vapor Sample		5/1/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
SASV1005	Soil Vapor Sample		4/7/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
SASV1005	Soil Vapor Sample	SASV1005D050	4/7/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
SASV1005	Soil Vapor Sample		4/29/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
SASV1006	Soil Vapor Sample		5/15/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
SASV1006	Soil Vapor Sample		5/15/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
SASV1006	Soil Vapor Sample	SASV1006D01	5/15/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
SASV1007	Soil Vapor Sample		5/15/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
SASV1007	Soil Vapor Sample		5/15/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1204	Soil Vapor Sample		4/7/2008	6	7	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1205	Soil Vapor Sample		4/7/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1210	Soil Vapor Sample		5/15/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1210	Soil Vapor Sample		5/15/2008	8	9	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1401	Soil Vapor Sample		4/29/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
U5SV1401	Soil Vapor Sample	U5SV1401D01	4/29/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X

Table T.3-1C
Sampling Summary for Surface Water
SNAP RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	Hydrocarbons	Inorganics	Metals	SVOC	VOC
SASW01	Surface Water Sample	WC021	10/27/2004	0	0.5	Primary Sample	In Place		Surface Water	X	X	X	X	X

Table T.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
SNAP 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 T.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 T.5-1 for CMS area)
1 and 2	Building 4059 (AOC), and Building 4059 French Drain System	VOCs	Screen for potential VOCs in and around building 4059. Soil Vapor: Soil vapor samples were collected at two (2) locations. Soil Matrix: Soil samples were collected at three (3) locations surrounding the previous SNAP excavation area.	Soil Vapor: VOCs were detected above Ecological RBSLs at one location. SASV1002 at 4-5 ft bgs (Toluene) Soil Matrix: VOCs were detected in soil samples but did not exceed their respective RBSLs. Discussion of results is presented in T.3.4.2.1 and Figures T.3-1A, T.3-1B and T.3-6.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		TPH	Screen potential for TPH in and around building 4059. Soil samples were collected at three (3) locations surrounding the previous excavation area.	Soil Matrix TPH were detected above Residential RBSLs in two samples. SABS1001 at 0-1 ft bgs (Gasoline Range Hydrocarbons, C8-C11) SABS1002 at 0-1 ft bgs (Gasoline Range Hydrocarbons, C8-C11) Discussion of results is presented in T.3.4.2.3 and Figures T.3-3 and T.3-7.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Screen for Metals to evaluate potential presence. Soil samples were collected at ten (10) locations surrounding the previous excavation area.	Metals were detected above Residential RBSLs, Ecological RBSLs and Background concentrations in the following samples SABS1001 at 5-6 ft bgs (Vanadium, Aluminum, Barium, Cobalt, Selenium, Zinc) SATS01S01 at 70 ft bgs (Selenium) Discussion of results is presented in T.3.4.2.5 and Figures T.3-5 and T.3-8.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
3	Building 4057	VOCs	Chemical uses at Building 4057 included VOCs. Screened for potential VOCs. Soil Vapor: Soil vapor samples were collected at four (4) locations. Soil Matrix: Soil samples were collected at two (2) locations.	Soil Vapor: VOCs were detected above RBSLs at three locations. SASV1005 at 4-5 ft bgs (Tetrachloroethene) SASV1006 at 4-5 ft bgs (Toluene) and 9-10 ft bgs (Benzene, Toluene) SASV1007 at 4-5 ft bgs (Toluene) and 9-10 ft bgs (Toluene) Soil Matrix: VOCs were detected above Residential RBSLs at one location. SABS1004 at 0-1 and 5-6 ft bgs (Tetrachloroethene) Discussion of results is presented in T.3.4.2.1 and Figures T.3-1A, T.3-1B and T.3-6.	**Yes.** Characterization is sufficient for risk assessment.	**No.** **CMS Area - SNAP-1:** PCE in soil and soil vapor in the vicinity of Building 4057 warrant further evaluation. This area is recommended for further characterization in CMS based on sampling and risk assessment results.
		SVOCs	Chemical uses at Building 4057 included SVOCs. Screened for SVOCs to evaluate potential presence. Soil samples were collected at four (4) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in T.3.4.2.2 and Figures T.3-2 and T.3-7	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table T.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
SNAP 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 T.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 T.5-1 for CMS area)
		TPH	Chemical uses at Building 4057 included TPH. Screened for TPH to evaluate potential presence. Soil samples were collected at four (4) locations.	TPH were detected above Residential RBSLs at one location. SABS1004 at 0-1 ft bgs and 5-6 ft bgs (Gasoline Range Hydrocarbons, C8-C11) Discussion of results is presented in T.3.4.2.3 and Figures T.3-3 and T.3-7	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemical uses at Building 4057 included metals. Screened for Metals to evaluate potential presence. Soil samples were collected at four (4) locations.	Metals were detected above Background concentrations but below RBSLs in three samples. Discussion of results is presented in T.3.4.2.5 and Figures T.3-5 and T.3-8.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
4	Building 4358	VOCs	Chemical uses at Building 4358 included VOCs. Screened for potential VOCs. Soil Vapor: No soil vapor samples were collected. Soil Matrix : Soil samples were collected at one (1) location.	Soil Matrix: VOCs were detected in one soil sample but did not exceed their respective RBSLs. Discussion of results is presented in Section T.3.4.2.1 and Figures T.3-1A, T.3-1B and T.3-6.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Chemical uses at Building 4358 included SVOCs. Screened for SVOCs to evaluate potential presence. Soil samples were collected at one (1) location.	No SVOCs were detected in any of the soil samples.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		TPH	Chemical uses at Building 4358 included TPH. No prior sampling had occurred and was screened for TPH to evaluate potential presence. Soil samples were collected at one (1) location.	TPH were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section T.3.4.2.3 and Figures T.3-3 and T.3-7	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemical uses at Building 4358 included metals. Screened for Metals to evaluate potential presence. Soil samples were collected at one (1) location.	Metals were detected above Background concentrations but below their respective RBSLs. Discussion of results is presented in Section T.3.4.2.5 and Figures T.3-5 and T.3-8.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
5	Building 4360	VOCs	Chemical uses at Building 4360 included VOCs. Screened for VOCs to evaluate potential presence. Soil Vapor: No soil vapor samples were collected. Soil Matrix: Soil samples were collected at one (1) location.	Soil Matrix: No VOCs were detected in any of the soil samples. Discussion of results is presented in Section T.3.4.2.1 and Figures T.3-1A, T.3-1B and T.3-6.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table T.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
SNAP 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 T.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 T.5-1 for CMS area)
		SVOCs	Screening for SVOCs to evaluate potential presence. 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 T.3.4.2.2 and Figures T.3-2 and T.3-7	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		TPH	Chemical uses at Building 4360 included TPH. Screened for TPH to evaluate potential presence. Soil samples were collected at one (1) location.	TPH were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section T.3.4.2.3 and Figures T.3-3 and T.3-7	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemical uses at Building 4360 included metals. Screened for Metals to evaluate potential presence. Soil samples were collected at one (1) location.	Metals were detected above Background concentrations but below RBSLs in one samples. Discussion of results is presented in Section T.3.4.2.5 and Figures T.3-5 and T.3-8.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
6	Building 4459	VOCs	Chemical uses at Building 4459 included VOCs. Screened for VOCs to evaluate potential presence. Soil Vapor: No soil vapor samples were collected. Soil Matrix: Soil samples were collected at one (1) location.	Soil Matrix VOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section T.3.4.2.1 and Figures T.3-1B and T.3-6.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Chemical uses at Building 4459 included SVOCs. Screened for SVOCs to evaluate potential presence. 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 T.3.4.2.2 and Figures T.3-2 and T.3-7	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		TPH	Chemical uses at Building 4459 included TPH. Screened for TPH to evaluate potential presence. Soil samples were collected at one (1) location.	TPH were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section T.3.4.2.3 and Figures T.3-3 and T.3-7	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemical uses at Building 4459 included metals. Screened for Metals to evaluate potential presence. Soil samples were collected at one (1) location.	Metals were detected above Background concentrations but did not exceed their respective RBSLs. Discussion of results is presented in Section T.3.4.2.5 and Figures T.3-5 and T.3-8	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
7	UT-36	**No sampling was required for this tank. A documentation data gap exists for final regulatory closure status of the tank. In addition, tank was located within the SNAP excavation area.**				

Table T.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
SNAP 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 T.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 T.5-1 for CMS area)
8	Building 4757 Transformer	PCBs	The substation had not been investigated and was screened for PCBs to evaluate potential presence. A four point composite soil sample was collected from the area of the substation from 0 to 0.5 feet bgs.	No PCBs were detected in any of the soil samples.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
9	Building 4759 Transformer	PCBs	Soil sampling for PCBs has been performed at Substation 4759 and PCBs were not detected. No further sampling is necessary. Soil samples were collected from two (2) locations.	No PCBs were detected in any of the soil samples.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
10	Building 4719 Transformer	PCBs	The substation had not been investigated and was screened for PCBs to evaluate potential presence. A four point composite soil sample was collected from the area of the former substation from 0 to 0.5 feet bgs.	No PCBs were detected in any of the soil samples.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
11 and 12	Acid and Sodium Hydroxide Aboveground Storage Tanks	Acids/Bases	No previous sampling had occurred in the vicinity of these above ground tanks which stored acids and bases. Soil samples were collected from two (2) locations.	pH ranged from 4.3 to 9.2 in the four samples collected.	**Yes.** pH has been adequately defined by representative soil sampling locations.	**N/A**
13	Building 4626	VOCs	No previous sampling had occurred at this building. Screening samples were collected from locations in the centroid and at the downgradient corner of the former building. <u>Soil Vapor:</u> Soil vapor samples were collected at two (2) locations. <u>Soil Matrix:</u> Soil samples were collected at five (5) locations.	<u>Soil Vapor:</u> VOCs were detected above Residential RBSLs at one location. U5SV1205 at 4-5 ft bgs (Tetrachloroethene) <u>Soil Matrix:</u> VOCs were detected above Residential RBSLs at two locations. U5BS1208 at 5-6 ft bgs (Tetrachloroethene) U5BS1402 at 5-6 and 9-10 ft bgs (Tetrachloroethene) Discussion of results is presented in Section T.3.4.2.1 and Figures T.3-1B, T.3-1A and T.3-6.	**Yes.** Characterization is sufficient for risk assessment.	**No.** **CMS Area - SNAP-1:** PCE in soil and soil vapor may require further characterization. Area is recommended for further characterization in CMS based on sampling and risk assessment results.
		SVOCs	No previous sampling had occurred at this building. Soil samples were collected at three (3) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section T.3.4.2.2 and Figures T.3-2 and T.3-7	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table T.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
SNAP 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 T.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 T.5-1 for CMS area)
		TPH	No previous sampling had occurred at this building. Soil samples were collected at three (3) locations.	TPH were detected above Residential RBSLs at one location. NSTS02S01 at 3-3.5 ft bgs (Gasoline Range Hydrocarbons, C8-C11) Discussion of results is presented in Section T.3.4.2.3 and Figures T.3-3 and T.3-7	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		PCBs	No previous sampling had occurred at this building. Soil samples were collected at five (5) locations.	PCBs were detected above Ecological RBSLs at one location. U5BS1208 at 0-1 ft bgs (Aroclor 1248, and Aroclor 1260). Three (3) sample locations around U5BS1208 had no detections of PCBs. Discussion of results is presented in Section T.3.4.2.4 and Figures T.3-4 and T.3-7	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**Yes.** **CMS Area - SNAP-1:** The extent of Aroclor 1248 impacts is defined and the area does not appear to warrant further characterization. This area is included for further evaluation in CMS.
		Metals	No previous sampling ha occurred at this building. Soil samples were collected at five (5) locations.	Metals were detected above Background concentrations and Ecological RBSLs in two samples. NSTS02S02 at 2.5-3 ft bgs (Silver) NSTS02S03 at 4.5-5 ft bgs (Silver) Discussion of results is presented in Section T.3.4.2.5 and Figures T.3-5 and T.3-8	**Yes.** The extent of silver impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
N/A	Building 4019	VOCs	No previous sampling has occurred at this building and no historic chemical uses were found during the historic document review process. However, during DTSC Group 5 2008 SAP site walk, sampling was added to this building due to former building features. Screening samples were collected to evaluate potential impacts. Soil Vapor: Soil vapor samples were collected at one (1) location. Soil Matrix: No soil samples were collected.	Soil Vapor: VOCs were detected above Ecological RBSLs in one sample. U5SV1210 at 8-9 ft bgs (Toluene) Discussion of results is presented in Section T.3.4.2.1 and Figures T.3-1A and T.3-6.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	No previous sampling has occurred at this building. Screening samples were collected to evaluate potential impacts. Soil samples were collected at two (2) locations.	SVOCs were detected in two soil samples but did not exceed their respective RBSLs. Discussion of results is presented in Section T.3.4.2.2 and Figures T.3-2 and T.3-7	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table T.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
SNAP 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 T.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 T.5-1 for CMS area)
		TPH	No previous sampling has occurred at this building and no historic chemical uses were found during the historic document review process. However, during DTSC Group 5 2008 SAP site walk, sampling was added to this building due to former building features. Screening samples were collected to evaluate potential impacts. Soil samples were collected at two (2) locations.	TPH were detected in two soil samples but did not exceed their respective RBSLs. Discussion of results is presented in Section T.3.4.2.3 and Figures T.3-3 and T.3-7	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	No previous sampling has occurred at this building and no historic chemical uses were found during the historic document review process. However, during DTSC Group 5 2008 SAP site walk, sampling was added to this building due to former building features. Screening samples were collected to evaluate potential impacts. Soil samples were collected at two (2) locations.	Metals were detected below all screening levels. Discussion of results is presented in Section T.3.4.2.5 and Figures T.3-5 and T.3-8	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table T.3-2B
Evaluation of Groundwater Sampling Results
SNAP 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 above Ecological and Residential RBSLs in soil and soil vapor.	**Yes.** Monitored at PZ-109 in NSGW, and RD-24, RD-25, and RD-28 in CFOU Groundwater.	**Yes.** NSGW (PZ-109) - Low level detections of cis-1,2-DCE below screening levels PCE (273 µg/L) was detected above the groundwater screening level. CFOU Groundwater - Low level detections of Acetone, Methyl Ethyl Ketone, Methylene Chloride, and cis-1,2-Dichloroethene below their respective groundwater screening level. RD-24 - PCE was detected at concentrations ranging from 0.34 µg/L to 2.9 µg/L and exceeded the groundwater SL RD-25 - PCE was detected at concentrations ranging from 0.48 µg/L to 42 µg/L and exceeded the groundwater SL RD-28 - PCE was detected at concentrations ranging from 0.22 µg/L to 1.5 µg/L and exceeded the groundwater SL.	**Yes.** Low level detections of VOC compounds in soil include many of the compounds detected in NSGW (Tetrachloroethene) and CFOU Groundwater (Acetone, Methyl Ethyl Ketone, Methylene Chloride, Styrene, and Tetrachloroethene). PCE concentrations exceeded Groundwater screening levels and Ecological RBSLs in NSGW, and exceeded Groundwater Screening Levels in CFOU Groundwater.	**NSGW - Yes** **CFOU Groundwater [1]**
PCBs	PCBs were detected above Ecological RBSLs.	**No.**	**N/A**	**No.**	**NSGW - Yes. [2]** **CFOU Groundwater [1]**
SVOCs	SVOCs were detected but did not exceed RBSLs.	**Yes.** Monitored at PZ-109 in NSGW, and RD-24, RD-25, and RD-28 in CFOU Groundwater.	**No.** No SVOCs were detected in NSGW or CFOU Groundwater.	**No.** SVOC concentrations in soil were below RBSLs.	**NSGW - Yes** **CFOU Groundwater [1]**
Metals	Aluminum, barium, cobalt, selenium, silver, and zinc concentrations were detected above Background concentrations and the Ecological RBSL. Vanadium was detected above Background concentrations, its Ecological RBSL, and itse Residential RBSL. See Section T.3.4.2.5 for further information.	**Yes.** Monitored at PZ-109 in NSGW, and RD-24, RD-25, and RD-28 in CFOU Groundwater.	**Yes.** NSGW (PZ-109) - Low level detections of barium, boron, lead, manganese, nickel, strontium, vanadium, and zinc. Copper, Molybdenum, and Selenium concentrations were detected above their respective groundwater screening levels. CFOU Groundwater- Low level detections at RD-24, RD-25, and RD-28 (boron, calcium, magnesium, manganese, potassium, silica, sodium, strontium, and zinc).	**No.** Metals detected in soil above RBSLs were not consistent with metals detected in NSGW except Barium and Selenium. Metals detected in soil above RBSLs were not consistent with metals detected in CFOU Groundwater.	**NSGW - Yes** **CFOU Groundwater [1]**
TPH	TPH compounds were detected but did not exceed RBSLs.	**No.**	**N/A**	**No.** Although groundwater samples have not been analyzed for TPH, detected concentrations in soil were below RBSLs.	**NSGW - Yes. [2]** **CFOU Groundwater [1]**

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

Table T.3-2B
Evaluation of Groundwater Sampling Results
SNAP 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?

3. NSGW - Near Surface Groundwater

Table T.3-3A
Data Screening and Statistical Summary for Soil
SNAP RFI Site

		Screening Levels			Detect Data Summary						
Constituent	**Units**	**Residential RBSL**	**Ecological RBSL**	**Background**	**Number of Samples**	**Number of Detects**	**Minimum Detected Value**	**Maximum Detected Value**	**Number of Detects > Residential RBSL**	**Number of Detects > Ecological RBSL**	**Number of Detects > Background SL**
Hydrocarbons											
Diesel Range Hydrocarbons (C14-C20)	mg/kg	1400			1						
Diesel Range Hydrocarbons (C15-C20)	mg/kg	1400			25	11	1.10	7.6			
Gasoline Range Hydrocarbons (C8-C11)	mg/kg	1.1			25	4	1.10	1.5	2		
Gasoline Range Hydrocarbons (C8-C11)	mg/kg	1.1			1	1	2.80	2.8	1		
Kerosene Range Hydrocarbons (C11-C14)	mg/kg	1400			1						
Kerosene Range Hydrocarbons (C12-C14)	mg/kg	1400			25						
Lubricating Oil Range Hydrocarbons (C20-C30)	mg/kg	1400			1	1	21	21			
Lubricating Oil Range Hydrocarbons (C21-C30)	mg/kg	1400			25	21	2.28	417			
Inorganics											
% Solids	%				6	6	89.9	92.9			
Moisture	%				21	21	4.75	13.1			
Perchlorate	mg/kg	9.1	2.40E-05		7						
pH	pH Units				20	20	4.30	9.21			
Total Solids	%				29	29	14	97			
Metals											
Aluminum	mg/kg	75,000	12	20,000	34	34	7,790	42,000		34	1
Antimony	mg/kg	30	0.095	8.7	24	3	0.32	0.64		3	
Arsenic	mg/kg	0.095	1.9	15	34	34	1.70	9.1	34	30	
Barium	mg/kg	15,000	15	140	34	34	41	320		34	1
Beryllium	mg/kg	150	5	1.1	36	36	0.35	4			3
Boron	mg/kg	15000	6.76	9.7	34	10	0.85	5			
Cadmium	mg/kg	39	4.50E-03	1	34	33	0.02	0.56		33	
Calcium	mg/kg				1	1	1650	1650			
Chromium	mg/kg	3,400	930	36.8	34	34	9.3	65			1
Cobalt	mg/kg	1,500	8.9	21	33	33	3.2	25		2	1
Copper	mg/kg	3000	1.1	29	33	33	5	16		33	
Iron	mg/kg			28,000	1	1	13500	13500			
Lead	mg/kg	150	0.013	34	34	34	3.6	17		34	
Lithium	mg/kg	1,522		37	28	28	11	58			1
Magnesium	mg/kg				1	1	2450	2450			
Manganese	mg/kg	1,800	59	495	1	1	295	295		1	
Mercury	mg/kg	23	0.1	0.09	34	28	0.003	0.035			
Molybdenum	mg/kg	380	0.11	5.3	34	33	0.20	1.7		33	
Nickel	mg/kg	1500	0.1	29	34	34	4.8	29		34	
Potassium	mg/kg			6400	29	29	890	4700			
Selenium	mg/kg	380	0.17	0.655	36	13	0.24	1.5		13	2
Silver	mg/kg	380	0.54	0.79	38	21	0.024	4.5		2	2
Sodium	mg/kg			110	29	23	68.9	1200			12
Thallium	mg/kg	6.1	2.9	0.46	36	36	0.19	2.7			3
Vanadium	mg/kg	76	1.5	62	34	34	18.4	130	1	34	1
Zinc	mg/kg	23,000	21	110	34	34	34	130		34	1
Zirconium	mg/kg			8.6	28	28	1	7.8			
PCBs											
Aroclor 1016	mg/kg	3.9	1.6		11						
Aroclor 1221	mg/kg	0.35	1.6		11						
Aroclor 1232	mg/kg	0.35	0.077		11						
Aroclor 1242	mg/kg	0.35	0.079		11						
Aroclor 1248	mg/kg	0.35	0.011		11	2	0.003	0.061		1	
Aroclor 1254	mg/kg	0.35	0.077		11						
Aroclor 1260	mg/kg	0.35	0.077		11	1	0.009	0.009			

Table T.3-3A
Data Screening and Statistical Summary for Soil
SNAP RFI Site

		Screening Levels			Detect Data Summary						
Constituent	Units	Residential RBSL	Ecological RBSL	Background	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL	Number of Detects > Background SL
SVOC											
1-Methyl naphthalene	mg/kg	230			19						
2-Methylnaphthalene	mg/kg	230	210		20						
Acenaphthene	mg/kg	3400	2.46		20	2	3.80E-04	6.80E-04			
Acenaphthylene	mg/kg	1700	370		20						
Anthracene	mg/kg	17000	2.4		20	3	2.00E-04	5.00E-03			
Benzo(a)anthracene	mg/kg	0.6	5.6		20	1	8.30E-04	8.30E-04			
Benzo(a)pyrene	mg/kg	0.06	5.6		20	3	5.90E-04	4.70E-03			
Benzo(b)fluoranthene	mg/kg	0.6	5.6		20	8	2.30E-04	0.02			
Benzo(ghi)perylene	mg/kg		6.4		20	4	1.10E-03	6.40E-03			
Benzo(k)fluoranthene	mg/kg	0.6	5.8		17						
bis(2-Ethylhexyl) phthalate	mg/kg	250	4.9		13						
Butyl benzyl phthalate	mg/kg	11000	340		19	7	7.60E-04	7.60E-03			
Chrysene	mg/kg	6	2.4		20	7	3.60E-04	0.02			
Dibenzo(a,h)anthracene	mg/kg	0.17	5.6		20	3	3.80E-04	4.20E-03			
Diethyl phthalate	mg/kg	46000	6940		13						
Dimethyl phthalate	mg/kg	570000	4.4		19						
Di-n-butyl phthalate	mg/kg	5700	0.49		19	10	1.20E-03	7.89E-03			
Di-n-octyl phthalate	mg/kg	2300	39		19						
Fluoranthene	mg/kg	2300	38		20	6	3.40E-04	8.01E-03			
Fluorene	mg/kg	2300	1.6		20	1	3.60E-04	3.60E-04			
Indeno(1,2,3-cd)pyrene	mg/kg	0.6	5.8		20	2	3.10E-04	4.80E-04			
Naphthalene	mg/kg	6	210		20						
n-Nitrosodimethylamine	mg/kg	0.045	20		19						
Phenanthrene	mg/kg	1700	1.3		20	4	3.60E-04	0.03			
Pyrene	mg/kg	1700	18		20	8	2.20E-04	0.02			
VOC											
1,1,1,2-Tetrachloroethane	mg/kg	2.50E-04	76		23						
1,1,1-Trichloroethane	mg/kg	0.49	4300		23						
1,1,2,2-Tetrachloroethane	mg/kg	1.40E-03	6		23						
1,1,2-Trichloro-1,2,2-trifluoroethane	mg/kg	16	583		23						
1,1,2-Trichloroethane	mg/kg	1.20E-03	8.3		23						
1,1-Dichloroethane	mg/kg	1.60E-03	210		23						
1,1-Dichloroethene	mg/kg	0.023	10.7		23	2	8.30E-04	1.40E-03			
1,1-Dichloropropene	mg/kg		22		23						
1,2,3-Trichlorobenzene	mg/kg	0.12	20		23						
1,2,3-Trichloropropane	mg/kg	5.10E-05	12		23						
1,2,4-Trichlorobenzene	mg/kg	0.12	20		23						
1,2,4-Trimethylbenzene	mg/kg	0.035	64		23						
1,2-Dibromo-3-chloropropane	mg/kg	0.029	22		23						
1,2-Dibromoethane	mg/kg		25		23						
1,2-Dichlorobenzene	mg/kg	1.8	370		23						
1,2-Dichloroethane	mg/kg	5.00E-04	76		23						
1,2-Dichloropropane	mg/kg		250		23						
1,3,5-Trimethylbenzene	mg/kg	0.036	64		23						
1,3-Dichlorobenzene	mg/kg	1.7	160		23						
1,3-Dichloropropane	mg/kg		22		23						
1,4-Dichlorobenzene	mg/kg	0.01	20		23						
2-Chloro-1,1,1-trifluoroethane	mg/kg				17						
2-Chloroethylvinyl ether	mg/kg	9.57E-06	0.73		23						
2-Hexanone	mg/kg		1220		23						

Table T.3-3A
Data Screening and Statistical Summary for Soil
SNAP RFI Site

		Screening Levels			Detect Data Summary						
Constituent	Units	Residential RBSL	Ecological RBSL	Background	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL	Number of Detects > Background SL
Acetone	mg/kg	51	43		21	8	5.00E-03	0.13			
Benzene	mg/kg	1.30E-04	110		23						
Bromobenzene	mg/kg		110		23						
Bromochloromethane	mg/kg		25		23						
Bromodichloromethane	mg/kg	3.10E-04	15		23						
Bromoform	mg/kg		38		23						
Bromomethane	mg/kg		25		23						
Carbon Tetrachloride	mg/kg	4.20E-05	1.5		23						
Chlorobenzene	mg/kg	0.097	40		23						
Chloroethane	mg/kg		190		23						
Chloroform	mg/kg	7.70E-04	11		23						
Chloromethane	mg/kg		25		23						
Chlorotrifluoroethylene	mg/kg		10.7		17						
cis-1,2-Dichloroethene	mg/kg	0.014	68		23						
cis-1,3-Dichloropropene	mg/kg		22		23						
Cumene	mg/kg	0.38	210		23						
Dibromochloromethane	mg/kg		46		23						
Dibromomethane	mg/kg		25		23						
Dichlorodifluoromethane	mg/kg	0.015	64		23						
Ethylbenzene	mg/kg	1.2	210		23						
Hexachlorobutadiene	mg/kg	9.2	0.85		23						
Methyl ethyl ketone	mg/kg	62	2540		22	5	1.72E-03	0.03			
Methyl isobutyl ketone (MIBK)	mg/kg	1.96E+01	2540		23						
Methyl tert-butyl ether	mg/kg		120		23						
Methylene chloride	mg/kg	4.00E-03	25		23	4	1.20E-03	3.20E-03			
m-Xylene & p-Xylene	mg/kg	0.15	64		23						
n-Butylbenzene	mg/kg		210		23						
n-Propylbenzene	mg/kg	0.20	210		23						
o-Chlorotoluene	mg/kg	1222.10	160		23						
o-Xylene	mg/kg	0.19	64		23						
p-Chlorotoluene	mg/kg	1222.10	160		23						
p-Cymene	mg/kg		64		23						
sec-Butylbenzene	mg/kg	76.76	210		23						
sec-Dichloropropane	mg/kg		22		23						
Styrene	mg/kg	7.2	427		23	6	2.44E-04	3.35E-04			
tert-Butylbenzene	mg/kg		210		23						
Tetrachloroethene	mg/kg	4.30E-04	6		23	5	6.61E-04	0.04	5		
Toluene	mg/kg	0.3	3.4		23						
trans-1,2-Dichloroethene	mg/kg	0.016	970		23						
trans-1,3-Dichloropropene	mg/kg		4.4		23						
Trichloroethene	mg/kg	2.20E-03	3		23						
Trichlorofluoromethane	mg/kg	0.11	300		23						
Vinyl chloride	mg/kg	9.60E-06	0.73		23						
Xylenes, Total	mg/kg	0.15	64		23						

Table T.3-3B
Data Screening and Statistical Summary for Soil Vapor
SNAP RFI Site

		Screening Levels		Detect Data Summary					
Constituent	**Units**	**Residential RBSL**	**Ecological RBSL**	**Number of Samples**	**Number of Detects**	**Minimum Detected Value**	**Maximum Detected Value**	**Number of Detects > Residential RBSL**	**Number of Detects > Ecological RBSL**
VOC									
1,1,1,2-Tetrachloroethane	ug/L	0.048		15					
1,1,1-Trichloroethane	ug/L	640	38	15					
1,1,2,2-Tetrachloroethane	ug/L	0.048		15					
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/L	8800	91	15					
1,1,2-Trichloroethane	ug/L	0.17	0.057	15					
1,1-Dichloroethane	ug/L	1.7	36	15					
1,1-Dichloroethene	ug/L	58	0.6	15					
1,2-Dichloroethane	ug/L	0.13	42	15					
Benzene	ug/L	0.095	0.57	15	8	0.0395	0.1	1	
Carbon Tetrachloride	ug/L	0.063	0.63	15					
Chloroethane	ug/L		992	15					
Chloroform	ug/L	0.5	0.24	15					
cis-1,2-Dichloroethene	ug/L	10	1.9	15	2	0.095	0.11		
Dichlorodifluoromethane	ug/L	58	91	15					
Ethylbenzene	ug/L	290	23	15	5	0.05	0.11		
Methylene chloride	ug/L	2.7	0.87	15					
m-Xylene & p-Xylene	ug/L		16	15	7	0.1	0.5		
o-Xylene	ug/L	29	16	15	5	0.06	0.16		
Tetrachloroethene	ug/L	0.45232	24	15	5	0.05	8.8	3	
Toluene	ug/L	110	0.084	15	7	0.06	0.58		6
trans-1,2-Dichloroethene	ug/L	20	1.9	15					
Trichloroethene	ug/L	1.4	6.4	15	2	0.14	0.18		
Trichlorofluoromethane	ug/L	200	90.9	15					
Vinyl chloride	ug/L	0.035	0.56	15					
Xylenes, Total	ug/L		16	15	7	0.1	0.66		

Table T.3-3C
Data Screening and Statistical Summary for Surface Water
SNAP RFI Site

		Screening Levels		Detect Data Summary					
Constituent	Units	Groundwater SL	Ecological RBSL	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Groundwater SL	Number of Detects > Ecological RBSL
Hydrocarbons									
Diesel Range Hydrocarbons (C13-C22)	ug/L			1					
Natural gasoline	ug/L			1					
TRPH	ug/L			1					
Inorganics									
Perchlorate	ug/L			1					
pH	pH Units			1	1	8.09	8.09		
Metals									
Aluminum	ug/L			1	1	32000	32000		
Antimony	ug/L		30	1	1	0.37	0.37		
Arsenic	ug/L		150	1	1	4.8	4.8		
Barium	ug/L			1	1	200	200		
Beryllium	ug/L		0.5	1	1	1.4	1.4		1
Cadmium	ug/L		1.1	1	1	0.27	0.27		
Chromium	ug/L			1	1	28	28		
Cobalt	ug/L			1	1	7.2	7.2		
Copper	ug/L		9	1	1	17	17		1
Lead	ug/L		2.5	1	1	14	14		1
Mercury	ug/L		0.012	1					
Molybdenum	ug/L			1	1	2.7	2.7		
Nickel	ug/L		52	1	1	15	15		
Selenium	ug/L		5	1	1	1.3	1.3		
Silver	ug/L		0.1	1	1	0.14	0.14		1
Thallium	ug/L		4	1	1	0.6	0.6		
Vanadium	ug/L			1	1	60	60		
Zinc	ug/L		110	1	1	91	91		
Radiochemistry									
Gross alpha	pCi/L			1	1	9.4	9.4		
Gross beta	pCi/L			1	1	8	8		
Tritium	pCi/L			1					
SVOC									
1,4-Dioxane	ug/L			1					
Naphthalene	ug/L		62	1					
VOC									
1,1,1-Trichloroethane	ug/L			1					
1,1,2,2-Tetrachloroethane	ug/L		240	1					
1,1,2-Trichloroethane	ug/L		940	1					
1,1-Dichloroethane	ug/L			1					
1,1-Dichloroethene	ug/L			1					
1,2,3-Trichloropropane	ug/L			1					
1,2-Dibromoethane	ug/L		2000	1					

Table T.3-3C
Data Screening and Statistical Summary for Surface Water
SNAP RFI Site

		Screening Levels		Detect Data Summary					
Constituent	Units	Groundwater SL	Ecological RBSL	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Groundwater SL	Number of Detects > Ecological RBSL
1,2-Dichloroethane	ug/L			1					
1,2-Dichloropropane	ug/L			1					
Benzene	ug/L			1					
Bromodichloromethane	ug/L			1					
Bromoform	ug/L			1					
Bromomethane	ug/L			1					
Carbon Tetrachloride	ug/L			1					
Chlorobenzene	ug/L		5	1					
Chloroethane	ug/L			1					
Chloroform	ug/L		124	1					
Chloromethane	ug/L			1					
cis-1,3-Dichloropropene	ug/L			1					
Dibromochloromethane	ug/L			1					
Diisopropyl ether	ug/L			1					
Ethylbenzene	ug/L			1					
Methyl tert-butyl ether	ug/L			1					
Methylene chloride	ug/L			1					
tert-Butyl alcohol	ug/L			1					
Tetrachloroethene	ug/L		84	1					
Toluene	ug/L			1					
trans-1,2-Dichloroethene	ug/L			1					
trans-1,3-Dichloropropene	ug/L			1					
Trichloroethene	ug/L		2190	1					
Vinyl chloride	ug/L			1					
Carbon Tetrachloride	ug/L	0.5		1					
Chlorobenzene	ug/L	70	5	1					
Chloroethane	ug/L			1					
Chloroform	ug/L	6	124	1					
Chloromethane	ug/L			1					
Chlorotrifluoroethylene	ug/L			1					
cis-1,2-Dichloroethene	ug/L	6		1	1	5.67	5.67		
cis-1,3-Dichloropropene	ug/L			1					
Cumene	ug/L	770		1					
Dibromochloromethane	ug/L			1					
Dibromomethane	ug/L			1					
Dichlorodifluoromethane	ug/L	1000		1					
Diisopropyl ether	ug/L			1					
Ethylbenzene	ug/L	300		1					
Hexachlorobutadiene	ug/L		0.93	1					
Methyl ethyl ketone	ug/L	8400		1					
Methyl isobutyl ketone (MIBK)	ug/L	120		1					

Table T.3-3C
Data Screening and Statistical Summary for Surface Water
SNAP RFI Site

		Screening Levels		Detect Data Summary					
Constituent	Units	Groundwater SL	Ecological RBSL	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Groundwater SL	Number of Detects > Ecological RBSL
Methyl tert-butyl ether	ug/L	5		1					
Methylene chloride	ug/L	5		1					
m-Xylene & p-Xylene	ug/L	1750		1					
n-Butylbenzene	ug/L	260		1					
n-Propylbenzene	ug/L	260		1					
o-Chlorotoluene	ug/L	140		1					
o-Xylene	ug/L	1750		1					
p-Chlorotoluene	ug/L	140		1					
p-Cymene	ug/L			1					
sec-Butylbenzene	ug/L	260		1					
sec-Dichloropropane	ug/L		570	1					
Styrene	ug/L	100		1					
tert-Amyl methyl ether	ug/L			1					
tert-Butyl alcohol	ug/L	12		1					
tert-Butyl ethyl ether	ug/L			1					
tert-Butylbenzene	ug/L	260		1					
Tetrachloroethene	ug/L	5	84	1	1	273.33	273.33	1	1
Toluene	ug/L	150		1					
trans-1,2-Dichloroethene	ug/L	10		1					
trans-1,3-Dichloropropene	ug/L			1					
Trichloroethene	ug/L	5	2190	1	1	4.53	4.53		
Trichlorofluoromethane	ug/L	150		1					
Trichlorotrifluorethane	ug/L			1					
Vinyl chloride	ug/L	0.5		1					
Xylenes, Total	ug/L	1750		1					

Table T.4-1
Chemicals of Potential Concern for Human Health
SNAP RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-2	1,1-Dichloroethene		Y	
Soil	0-2	Acenaphthene		Y	
Soil	0-2	Acetone		Y	
Soil	0-2	Aluminum	N	N	Below Background
Soil	0-2	Anthracene		Y	
Soil	0-2	Antimony	N	N	Below Background
Soil	0-2	Aroclor 1248		Y	
Soil	0-2	Aroclor 1260		Y	
Soil	0-2	Arsenic	N	N	Below Background
Soil	0-2	Barium	Y	Y	
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	Beryllium	N	N	Below Background
Soil	0-2	Boron	N	N	Below Background
Soil	0-2	Butyl benzyl phthalate		Y	
Soil	0-2	Cadmium	N	N	Below Background
Soil	0-2	Chromium	N	N	Below Background
Soil	0-2	Chrysene		Y	
Soil	0-2	Cobalt	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	Di-n-butyl phthalate		Y	
Soil	0-2	Fluoranthene		Y	
Soil	0-2	Gasoline Range Hydrocarbons (C8-C11)		N	See BTEX, PAHs
Soil	0-2	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-2	Lead	N	N	Below Background
Soil	0-2	Lithium	N	N	Below Background
Soil	0-2	Lubricating Oil Range Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-2	Mercury	N	N	Below Background
Soil	0-2	Methyl ethyl ketone		Y	
Soil	0-2	Molybdenum	N	N	Below Background
Soil	0-2	Nickel	N	N	Below Background
Soil	0-2	Phenanthrene		Y	
Soil	0-2	Pyrene		Y	
Soil	0-2	Selenium	N	N	Below Background
Soil	0-2	Silver	N	N	Below Background
Soil	0-2	Styrene		Y	
Soil	0-2	Tetrachloroethene		Y	
Soil	0-2	Thallium	N	N	Below Background
Soil	0-2	Vanadium	N	N	Below Background
Soil	0-2	Zinc	N	N	Below Background
Soil	0-2	Zirconium	N	N	Below Background
Soil	0-10	1,1-Dichloroethene		Y	
Soil	0-10	Acenaphthene		Y	
Soil	0-10	Acetone		Y	
Soil	0-10	Aluminum	N	N	Below Background
Soil	0-10	Anthracene		Y	
Soil	0-10	Antimony	N	N	Below Background
Soil	0-10	Aroclor 1248		Y	
Soil	0-10	Aroclor 1260		Y	
Soil	0-10	Arsenic	N	N	Below Background
Soil	0-10	Barium	Y	Y	
Soil	0-10	Benzo(a)anthracene		Y	

Table T.4-1
Chemicals of Potential Concern for Human Health
SNAP RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-10	Benzo(a)pyrene		Y	
Soil	0-10	Benzo(b)fluoranthene		Y	
Soil	0-10	Benzo(ghi)perylene		Y	
Soil	0-10	Beryllium	N	N	Below Background
Soil	0-10	Boron	N	N	Below Background
Soil	0-10	Butyl benzyl phthalate		Y	
Soil	0-10	Cadmium	N	N	Below Background
Soil	0-10	Chromium	N	N	Below Background
Soil	0-10	Chrysene		Y	
Soil	0-10	Cobalt	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	Di-n-butyl phthalate		Y	
Soil	0-10	Fluoranthene		Y	
Soil	0-10	Fluorene		Y	
Soil	0-10	Gasoline Range Hydrocarbons (C8-C11)		N	See BTEX, PAHs
Soil	0-10	Gasoline Range Hydrocarbons (C8-C11)		N	See BTEX, PAHs
Soil	0-10	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-10	Iron	N	N	Below Background
Soil	0-10	Lead	N	N	Below Background
Soil	0-10	Lithium	N	N	Below Background
Soil	0-10	Lubricating Oil Range Hydrocarbons (C20-C30)		N	See BTEX, PAHs
Soil	0-10	Lubricating Oil Range Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-10	Manganese	N	N	Below Background
Soil	0-10	Mercury	N	N	Below Background
Soil	0-10	Methyl ethyl ketone		Y	
Soil	0-10	Methylene chloride		Y	
Soil	0-10	Molybdenum	N	N	Below Background
Soil	0-10	Nickel	N	N	Below Background
Soil	0-10	Phenanthrene		Y	
Soil	0-10	Pyrene		Y	
Soil	0-10	Selenium	N	N	Below Background
Soil	0-10	Silver	N	N	Below Background
Soil	0-10	Styrene		Y	
Soil	0-10	Tetrachloroethene		Y	
Soil	0-10	Thallium	N	N	Below Background
Soil	0-10	Vanadium	N	N	Below Background
Soil	0-10	Zinc	N	N	Below Background
Soil	0-10	Zirconium	N	N	Below Background
Soil Vapor	0-10	Benzene		Y	
Soil Vapor	0-10	cis-1,2-Dichloroethene		Y	
Soil Vapor	0-10	Ethylbenzene		Y	
Soil Vapor	0-10	m-Xylene & p-Xylene		N	See total Xylenes
Soil Vapor	0-10	o-Xylene		N	See total Xylenes
Soil Vapor	0-10	Tetrachloroethene		Y	
Soil Vapor	0-10	Toluene		Y	
Soil Vapor	0-10	Trichloroethene		Y	
Soil Vapor	0-10	Xylenes, Total		Y	
Groundwater	-	Bromide		N	No toxicity factor
Groundwater	-	Fluoride	Y	Y	
Groundwater	-	Nitrate-NO3		Y	
Groundwater	-	Arsenic, Dissolved	N	N	Below Background
Groundwater	-	Barium, Dissolved	N	N	Below Background
Groundwater	-	Boron, Dissolved	N	N	Below Background

Table T.4-1
Chemicals of Potential Concern for Human Health
SNAP RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Groundwater	-	Copper, Dissolved	Y	Y	
Groundwater	-	Lead, Dissolved	N	N	Below Background
Groundwater	-	Manganese, Dissolved	N	N	Below Background
Groundwater	-	Molybdenum, Dissolved	Y	Y	
Groundwater	-	Nickel, Dissolved	N	N	Below Background
Groundwater	-	Selenium, Dissolved	Y	Y	
Groundwater	-	Strontium, Dissolved	N	N	Below Background
Groundwater	-	Vanadium, Dissolved	N	N	Below Background
Groundwater	-	Zinc, Dissolved	N	N	Below Background
Groundwater	-	cis-1,2-Dichloroethene		Y	
Groundwater	-	Tetrachloroethene		Y	
Groundwater	-	Trichloroethene		Y	

Table T.4-2
Human Health Risk Estimates[1]
SNAP 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	0.0000001 - 0.0000004		1E-09 - 1E-07		NA - NA		NA - NA		<0.01 - <0.01		2E-09 - 2E-07	
Future Child Recreator	0.000004 - 0.00001		1E-08 - 9E-08		NA - NA		NA - NA		<0.01 - <0.01		2E-08 - 1E-07	
Future Adult Resident	0.0003 - 0.0007		2E-08 - 2E-07		2 - 3	a	5E-04 - 2E-03	a	2 - 3	a	5E-04 - 2E-03	a
Future Child Resident	0.003 - 0.006		1E-07 - 5E-07		6 - 10	a, b, c	1E-03 - 2E-03	a	6 - 10	a, b, c	1E-03 - 2E-03	a

-

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

a = Tetrachloroethene (tetrachloroethene in NSGW comprises up to 2x10-3 of total site risk; tetrachloroethene in soil vapor [indoor air exposure pathway] comprises up 2x10-6 of total risk).
b = Trichloroethene
c = Fluoride

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

Table T.4-3
Human Health Risk Assessment Uncertainty Analysis
SNAP RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
COPC Selection	Barium was selected as a COPC since it could not be demonstrated to be consistent with background concentrations through the Wilcoxon Rank Sum test. The site data set was small, introducing uncertainty into the comparisons.	Low	Conservative
	Benzene, cis-1,2-DCE, ethylbenzene, toluene, total xylenes, PCE, and TCE were selected as soil vapor COPCs since they were directly detected in soil vapor. Acetone, methyl ethyl ketone, and styrene were also selected as soil vapor COPCs because they were detected in soil but not analyzed for in soil vapor.	Moderate	Conservative
	Diesel range organics were not selected as COPCs since TPH-related constituents (BTEX and PAHs) were analyzed for.	Low	Realistic
Exposure Pathways	Risks associated with drinking of groundwater are not realistic because the groundwater beneath the SSFL is not currently used as a drinking water source and the presence of the contamination will likely require a restriction on its future use as well.	High	Conservative
	Future land use of the site is currently undecided but may be recreational, which has lower risks than for urban residential. If land use is assumed agricultural, risk estimates may be higher.	Moderate	Uncertain
	Groundwater monitoring data and comparison concentrations (i.e., background) are filtered samples (i.e., dissolved concentrations) as per agency-approved groundwater monitoring work plan. Although dissolved concentrations represent the concentrations that may migrate, the total concentration in groundwater may be greater when there are significant amount of suspended solids present (i.e., total concentration).	Moderate	Realistic
	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 8 years old. In these cases available analytical data may not accurately reflect current site conditions. Source concentrations assumed constant over time. Chemical concentrations may decline as a result of migration or degradation.	Low	Conservative
	Use of upper confidence limits and maximum detected concentrations will likely overestimate site risks.	Low	Conservative
	Soil vapor exposure point concentrations for acetone, methyl ethyl ketone, 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 that corresponding factors derived by USEPA (e.g. arsenic, PCBs)	Moderate	Conservative
	Cancer slope factors derived from animal studies are the upper-bound maximum likelihood estimates based on a linear dose-response curve, and therefore, overstate carcinogenic potency.	Moderate	Conservative
Reference Dose	No dermal toxicity values are available, oral toxicity factors are used for the dermal route.	Moderate	Conservative
	High degree of uncertainty in extrapolation of dose-response data from laboratory animals to humans.	High	Conservative

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

Table T.4-4
Chemicals of Ecological Concern - Soil
SNAP RFI Site

	Range of HQs RME Exposure (Refined Calculations)														Identification of COECs	
Preferred Analyte Name	**Terrestrial Plant**	**Soil Invertebrate**	**Hermit Thrush**	**Red-Tailed Hawk**	**Deer Mouse**	**Bobcat**	**Mule Deer**	**Terrestrial Plants**	**Soil Invertebrates**	**Hermit Thrush**	**Red-Tailed Hawk**	**Deer Mouse**	**Bobcat**	**Mule Deer**	**COEC**	**Rationale**
Barium	0.2	0.27	0.99 -- **2.0**	0.00 -- 0.00	**1.9** -- **7.3**	0.00 -- 0.00	0.00 -- 0.02	<1	<1	<1 -- <1	<1 -- <1	<1 -- **3.1**	<1 -- <1	<1 -- <1	No	-Estimated risk driven by single high concentration (320 mg/kg) at 5-6 ft bgs. All other detected concentrations are below the maximum background concentration. -Deer mouse is only receptor with estimated risk at Low and High TRV. -No estimated incremental risks at High TRV.
Aroclor 1248	0.0011	0.0001	0.07 -- **1.01**	0.00001 -- 0.0002	0.4 -- **4.0**	0.00001 -- 0.0001	0.0002 -- 0.002	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	**Yes**	-Estimated risk exceeded 1 for 2 receptors (thrush and mouse) at the Low TRV (RME exposure). -The mouse HQ>1 for the Low TRV at the CTE exposure (not shown on this table). -Aroclor HI exceeded 1 for Low TRV.
PCB_TEQ_Bird	No TRV	0.0000	0.28 -- **2.8**	0.00002 -- 0.0002	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	**Yes**	-When dioxin-like PCB congeners are not analyzed on site, exposure point concentrations are modeled from Aroclor 1254 and 1260. At this site, Aroclor 1260 was detected, but not Aroclor 1254. -Extrapolated values have some degree of uncertainty and may over- or under-estimate actual concentrations. -HQs exceeded one only for 2 receptors (thrush and mouse), no other HQs exceeded one. -Exceedances were for the Low TRV only. Neither receptor exceeded at the High TRV indicating that potential risks are somewhere between a no effect and low effect. -HI exceeded one for dioxin/furan chemical class at the Low TRV only (based on the extrapolated values).
PCB_TEQ_Mammal	No TRV	0.0000	n/a -- n/a	n/a -- n/a	0.8 -- **8.5**	0.00001 -- 0.0001	0.0002 -- 0.002	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a		

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

Table T.4-5
Chemicals of Ecological Concern - Soil Vapor
SNAP 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. Retained for evaluation because SQL>ESL. -ESL and TRV are same value and have uncertainty regarding their derivation. -No other VOCs in soil vapor had HQs>1. -Not likely that the analyte is present at levels of ecological concern.

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

Table T.4-6
Chemicals of Ecological Concern - Surface Water
SNAP RFI Site

Preferred Analyte Name	RME HQ	Identification of COECs	
		COEC	**Rationale**
Aluminum	368	No	-Surface water found on site only during storm runoff events. -Single sample collected. -No background data available for surface water. -Surface water concentrations most likely due to underlying soil concentrations mobilized during runoff.
Barium	50	No	
Beryllium	2.1	No	
Cadmium	1.1	No	
Copper	1.9	No	
Lead	5.6	No	
Vanadium	3.0	No	

Notes:
COEC - chemical of ecological concern
HQ - hazard quotient
RME - reasonable maximum exposure

Table T.4-7
Ecological Risk Assessment Uncertainty Analysis
SNAP RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Problem Formulation			
Fate and Transport	It is assumed that chemical concentrations will not change over time, and that concentrations are constant during the exposure duration. Natural attenuation and/or other degradation processes may be significant in some areas resulting in an over-estimation of exposure.	Moderate	Over-estimation of exposure/risk
Data Collection/Analysis	Variability in analyses, laboratories, representativeness of samples, sampling errors, and homogeneity of the sample matrix can influence quality and quantity of data used in the risk assessment. Data were validated, but historical sampling programs may not have had the same standards as more recent ones.	Unknown	Over- or under-estimation of exposure/risk
Data Collection/Analysis	Detection Limits. Historical data were noted to have overly high detection limits, especially in regard to metals. Recent sampling was designed to have detection limits meeting ESLs. However, as data are combined into the EPCs, high detection limits may influence the resulting mean and 95UCLs.	Moderate	Over-estimation of exposure/risk
Representative Species	Representative species were selected to reduce uncertainty; however, differences among species including physiology, reproductive biology, and/or foraging habits can result in different exposures and sensitivities for different receptors.	Low	Over- or under-estimation of exposure/risk
CPEC Selection	Background Comparison. Background evaluation was based on the WRS test. For some inorganics, the WRS test indicated that the site exceeded background, but site maximum, CTE, and RME concentrations were similar to or below background maximum, CTE, and/or RME concentrations.	Low	Over-estimation of exposure/risk
CPEC Selection	VOC Comparison. VOCs that were detected in soil but were not analyzed for in soil gas were retained as CPECs under the matrix "Modeled Soil Vapor". Concentrations were modeled from soil concentrations using SRAM Appendix G Equation 18.	Low	Over-estimation of exposure/risk
CPEC Selection	SQL Comparison. Chemicals that were never detected at the site were included as CPECs if they met the criteria in the SQL screening process: a) SQL>ESL b) at least 5 samples were collected c) at least 2 other chemicals in the same chemical class were detected.	Low	Over-estimation of exposure/risk
Exposure Pathway Analysis	Dermal and inhalation (for surface-dwelling animals) exposure pathways were not quantified.	Low	Under-estimation of exposure/risk
Analysis			
Wildlife Exposure Factors	Assumptions regarding exposure - likelihood, contact with contaminated media, concentrations at exposure points, and frequency/duration of contact are based on available information and assumptions of wildlife habits at the SSFL. Assumptions tend to simplify actual site conditions and may over- or under-estimate actual exposure.	Moderate	Over- or under-estimation of exposure/risk
Bioaccumulation Factors	Site-specific data on CPEC concentrations in wildlife foods were used to derive BAFs for a limited number of CPECs (SRAM 2005). For the remaining CPECs, literature-based BAFs and regression models were used to estimate bioaccumulation. The suitability of these bioaccumulation models to conditions at the site is unknown. Therefore, concentrations of CPECs in biota present at the site and, consequently, the dietary exposures of birds and mammals, may be either higher or lower than values estimated in the Group 5 ERAs.	Moderate	Over- or under-estimation of exposure/risk

Table T.4-7
Ecological Risk Assessment Uncertainty Analysis
SNAP RFI Site

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

Table T.4-7
Ecological Risk Assessment Uncertainty Analysis
SNAP RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Toxicity Reference Values	Sources of TRVs occasionally apply different uncertainty factors than those used in the SRAM to adjust a study to what they label a "Chronic NOAEL". When details of the study were available, SRAM-specified uncertainty factors were used. If the details of the study were not presented or were not sufficiently complete to make a determination, then the interpretations made by the source document were used.	Low	Over- or under-estimation of risks
Risk Characterization			
Risk Estimation	Potential ecological risks were quantified using the HQ approach. The magnitude of the HQ indicates potential for ecological risk, but is not an exact estimation of risk. For example, the actual risk from a chemical with an HQ of 70 could be less than that for a chemical with an HQ of 20 because of uncertainties involved in estimating exposure, selection of effects criteria (TRVs), or field conditions affecting exposure.	Moderate	Over- or under-estimation of risks
Risk Estimation	Data necessary to estimate potential risks from all pathways for all chemicals in the food-chain uptake model were not always available. For these chemicals and/or areas, the food-chain uptake model was completed using the available data.	Moderate	Under-estimation of exposure/risk
Risk Estimation	Risks estimated for exposure to some inorganics may represent a background risk, rather than a site-related risk. Although the WRS test sometimes indicated that the site exceeded background, the Maximum, CTE, and/or RME EPC concentrations, it was sometimes found that site values were less than or comparable to the background Maximum, CTE, and/or RME concentrations.	Moderate	Over- or under-estimation of exposure/risk
Risk Description	The soluble and toxic forms of aluminum are only present in soil under soil pH values of less than 5.5 (USEPA 2003), and the average pH for the soils at the Group 5 sites exceeds 5.5. Aluminum, while evaluated in the ERA as a CPEC and identified as a risk driver, most likely does not cause effects to the various ecological receptors due to the soil pH range.	Moderate	Over-estimation of exposure/risk

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

Table T.5-1
Surficial Media Site Action Recommendations
SNAP RFI Site

Chemical Use Area	Chemical Use Area Name	CMS Area [1]	Recommended for further consideration in CMS based on:				
			Residential Receptor [2]	**Recreational Receptor [2]**	**Ecological Receptor [2]**		
1	Building 4059 (AOC)	*NFA*	HRA COC:	No HRA COCs identified	***Soil Results***		
2	Bldg 4059 French Drain System	*NFA*			Any HQ>1	COEC	Rationale
3	Building 4057	**SNAP-1**	***Soil Vapor Results***		Barium	No	ERA-1
4	Building 4358	*NFA*	Tetrachloroethene		Aroclor 1248	Yes	ERA-4
5	Building 4360	*NFA*			PCB_TEQ_Bird	Yes	ERA-3
6	Building 4459	*NFA*	***Near Surface Groundwater Results***		PCB_TEQ_Mammal	Yes	ERA-3
7	UT-36	*NFA*					
8	Building 4757 Transformer	*NFA*	Tetrachloroethene				
9	Building 4759 Transformer	*NFA*	Trichloroethene				
10	Building 4719 Transformer	*NFA*			***Soil Vapor Results***		
11+12	Acid and Sodium Hydroxide Aboveground Storage Tanks	*NFA*			Any HQ>1?	COEC	Rationale
13	Building 4626	**SNAP-1**			1,1,2-Trichloroethane	No	ERA-2

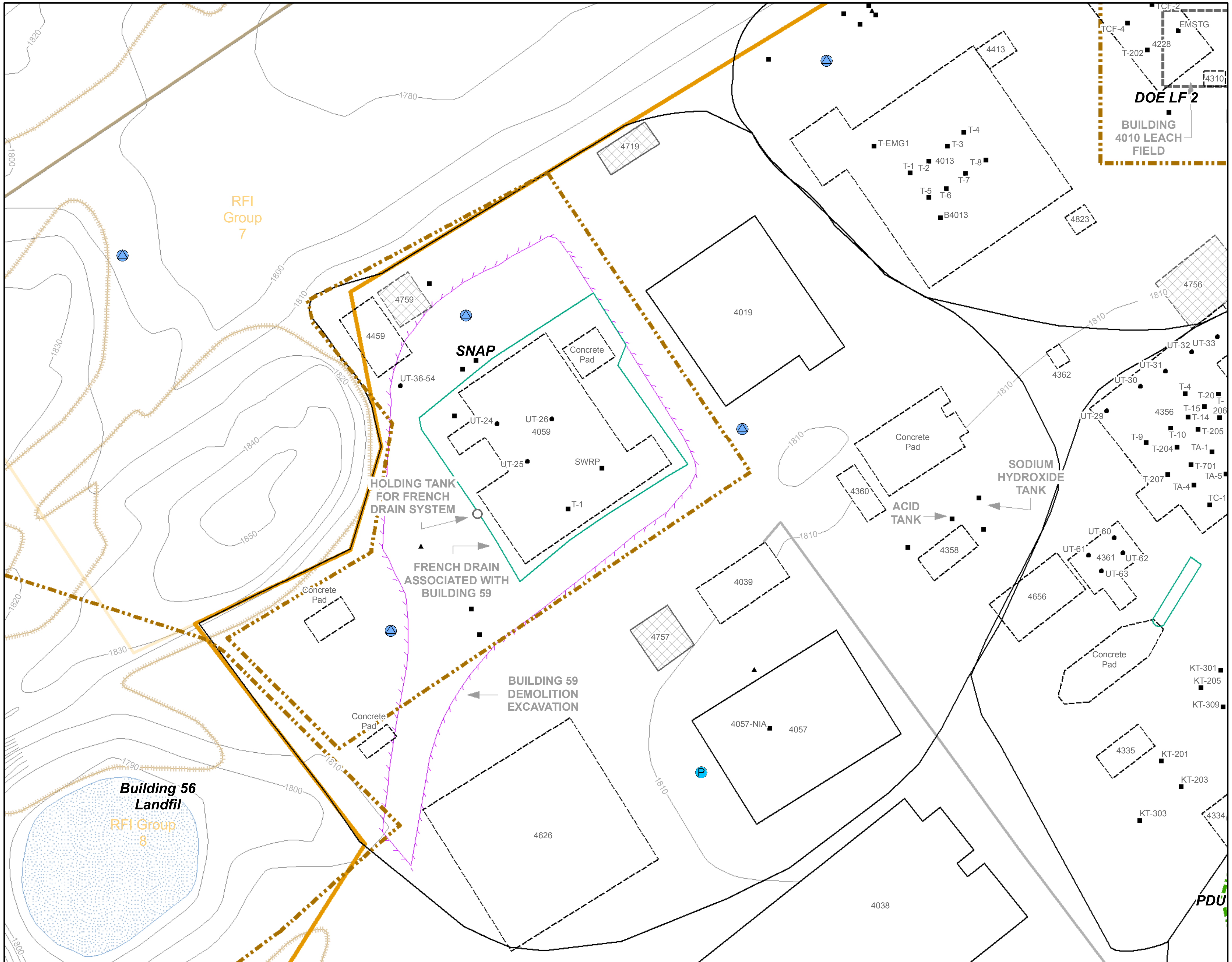
Notes:
1. NFA - Indicates area is recommended for No Further Action (NFA) for the CUA; not recommended for CMS evaluation.
2. CMS recommendations are based on compounds considered risk drivers (excess cancer risk > 1 x 10-6 or hazard index > 1) and/or significant risk contributors.

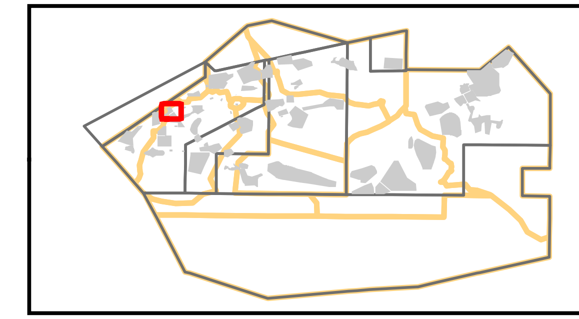
ERA-1 Site maximum concentration is below background maximum concentration. Site RME is similar to background RME.
ERA-2 Analyte was not detected in either soil or soil vapor. It was retained for risk calcs because SQL> ESL. Estimated risk is Low. Actual presence is uncertain.
ERA-3 Estimated risks >1 for 1 or more receptors and chemical class hazard index>1. NOTE- eposure point concentrations were extrapolated from Aroclor 1254 and 1260 (not directly measured).
ERA-4 Estimated risks >1 for 1 or more receptors. Chemical class Hazard Index >1.

Table T.5-2
Summary of Site Surficial Media CMS Recommendations
SNAP RFI Site

CMS Area	Description	Chemical Risk Drivers and Contributors	Rationale
SNAP - 1	Building 4057	PCE in soil vapor; PCE in NSGW	Cancer risk estimates exceed $1x10^{-6}$ for future residential scenario.
	Building 4626	Aroclor 1248 in soil	HQ>1 for thrush (HQ=1.01) and deer mouse (HQ=4.0). Risk is driven by one sample at 5-6 ft bgs located south of former Building 4626.

Figures





Basemap Legend

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

Site Location
SNAP RFI Site

Date: September 18, 2008 WORKING DRAFT

1 inch equals 60 feet

0 60 120 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure T.1-1

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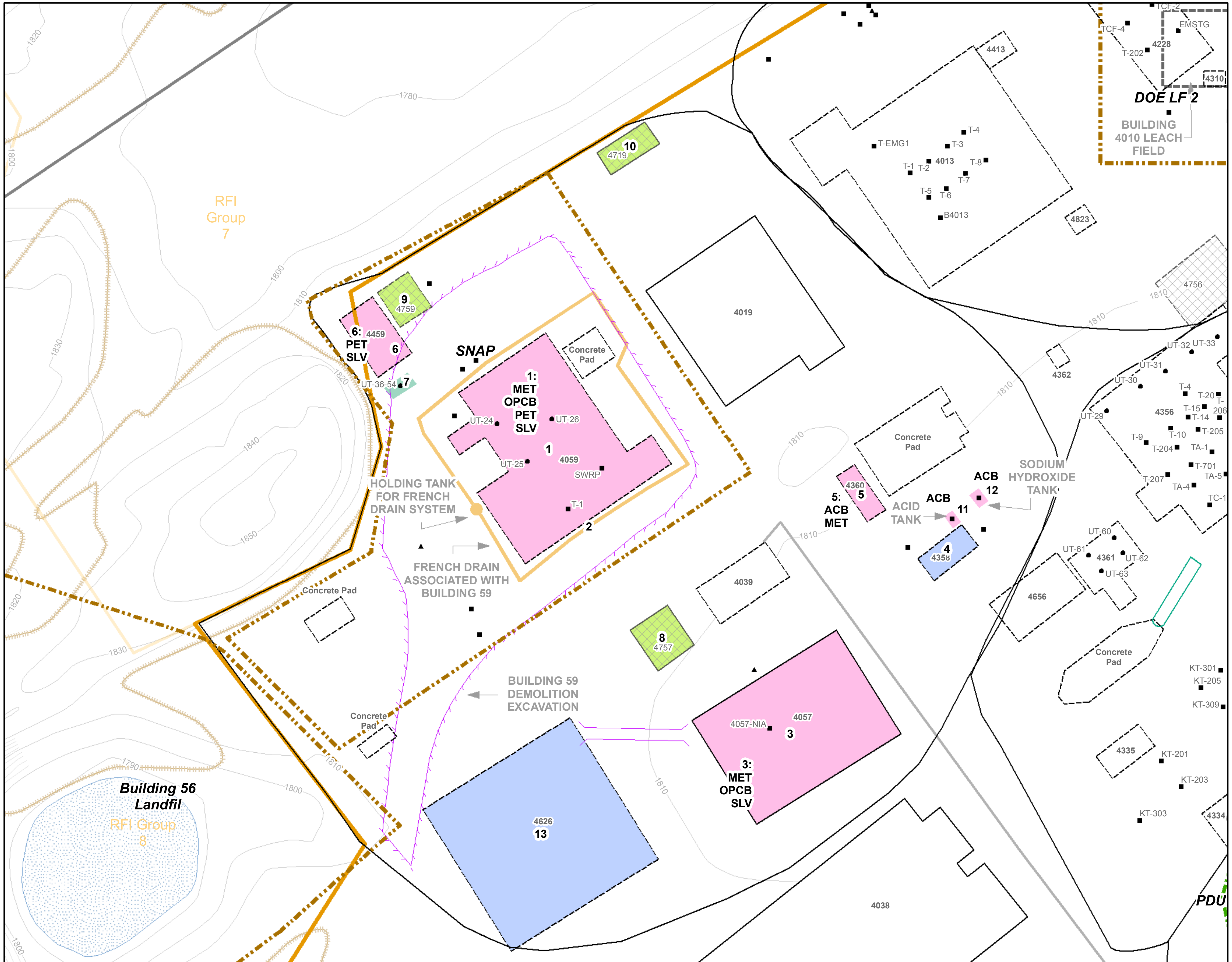

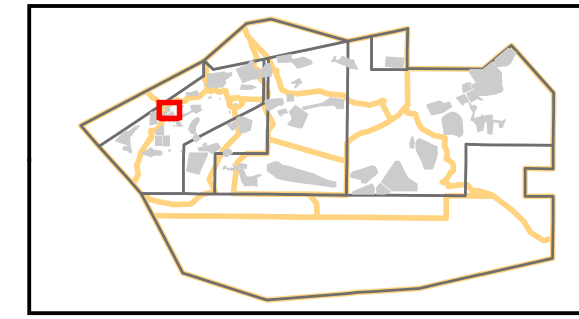

Chemical Use

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

Multiple Use Key

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

Basemap Legend

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

Chemical Use Areas SNAP RFI Site

Date: September 15, 2008 WORKING DRAFT

1 inch equals 60 feet

0 60 120 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure T.2-1

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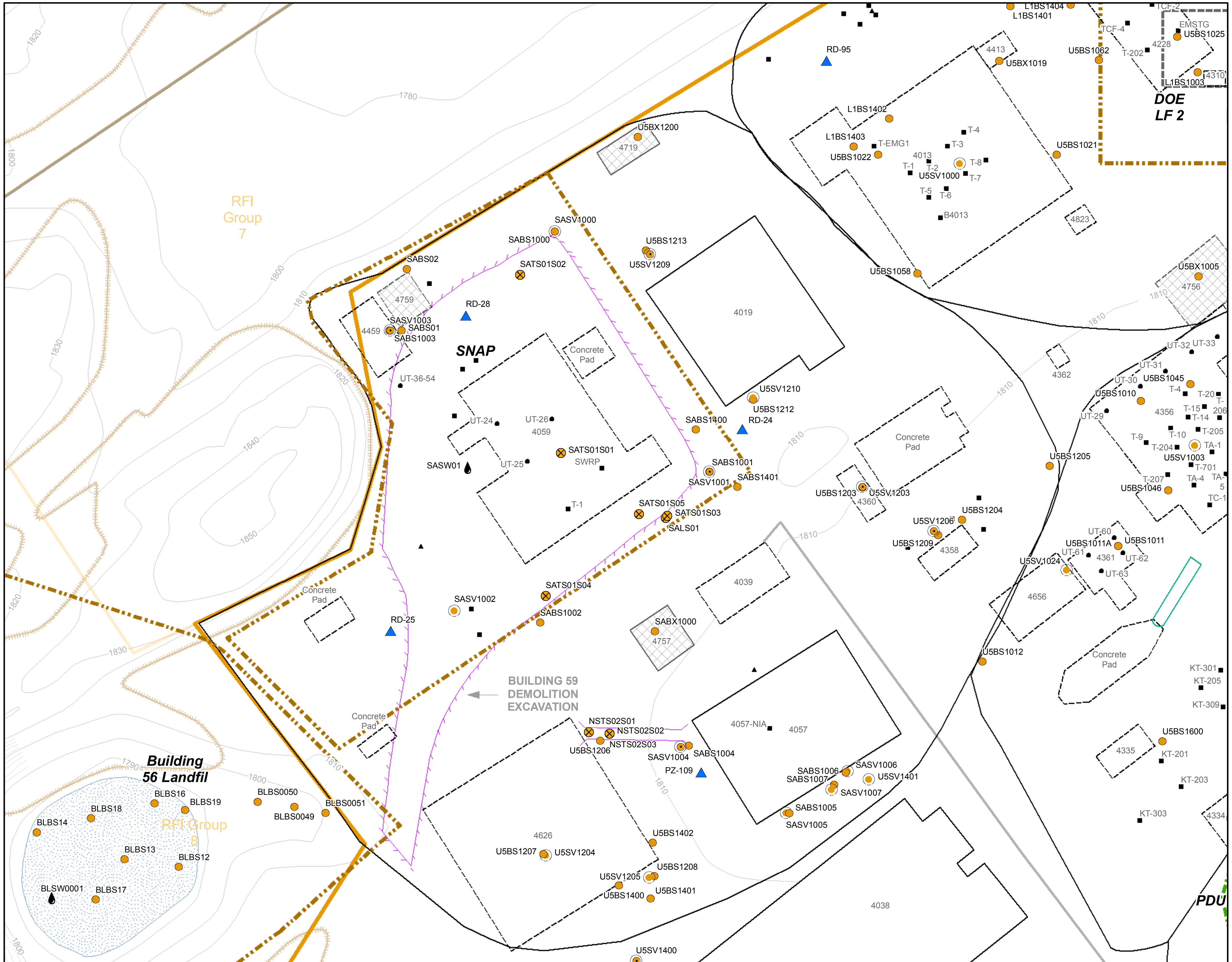
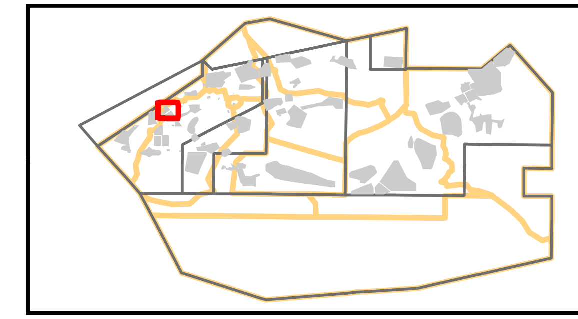




Sample Type

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

Basemap Legend

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

Sample Locations
SNAP RFI Site

Date: October 30, 2008 WORKING DRAFT

1 inch equals 60 feet

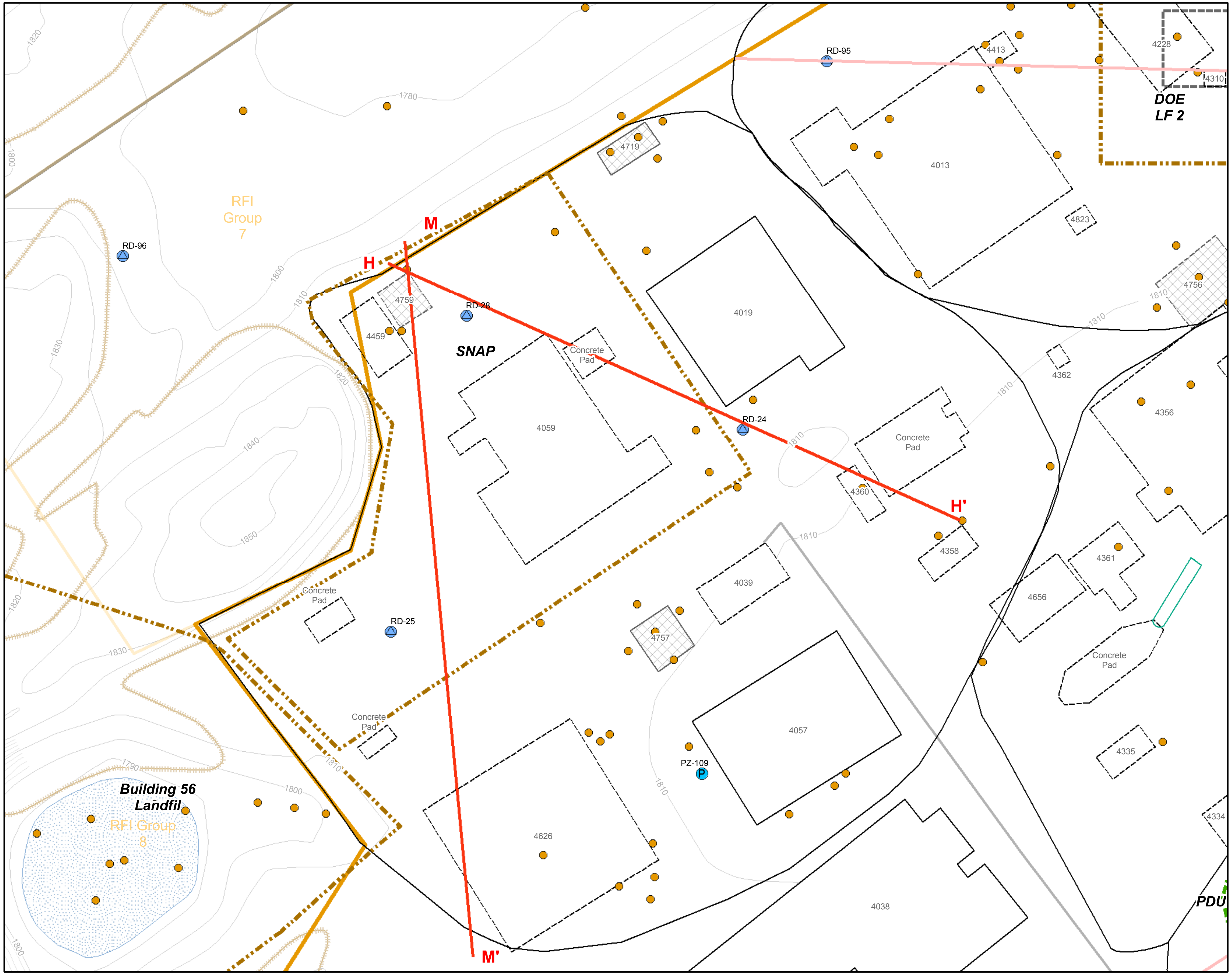
0 60 120 Feet

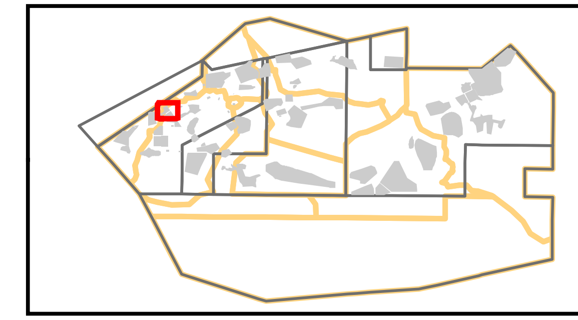
SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure T.2-2

\\..MapFiles\RFI_05\RFI_Report\RFISites_SampleLocs_BL_PLTS.mxd





Cross-section Line

Basemap Legend

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

SNAP Cross Section Locations

H-H' and M-M'

Date: September 11, 2008 WORKING DRAFT

\\..Mapfiles\RFI_05\RFI_Report\XSctns\Grp5RFIReport_CrossSct_BL_PLTS.mxd

1 inch equals 60 feet

0 60 120 Feet

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Figure T.2-3A

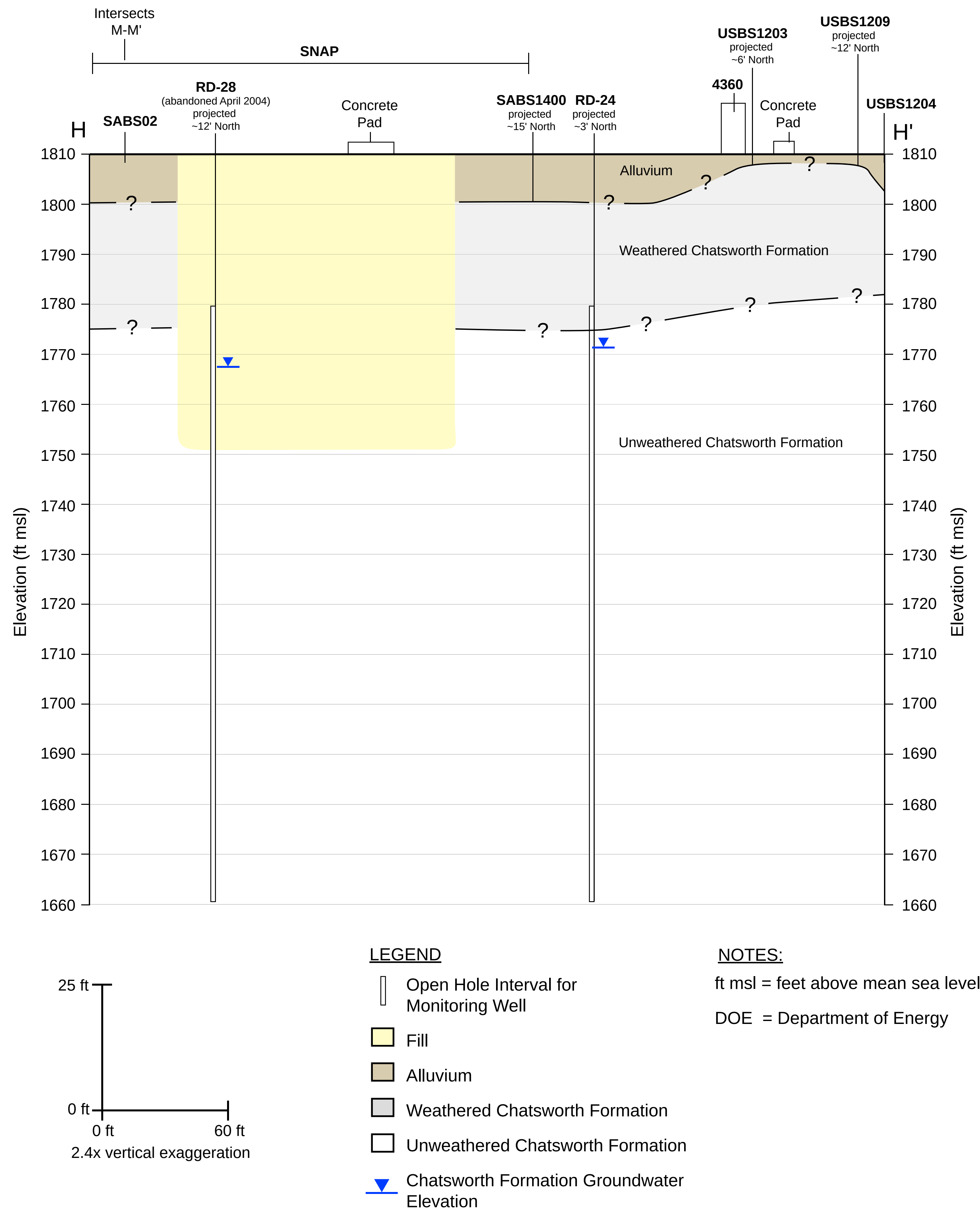
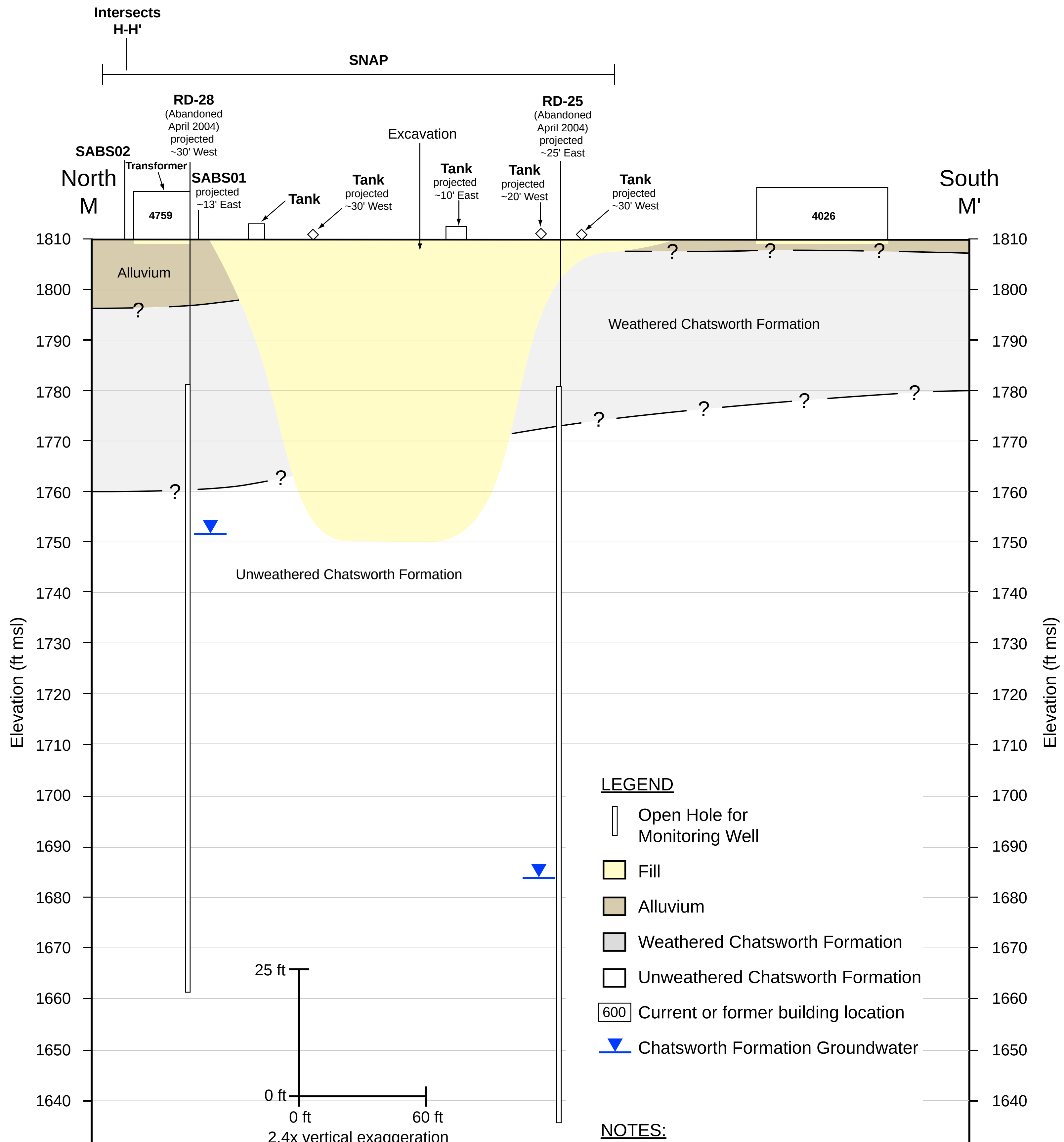


FIGURE T.2-3B
Surficial Cross Section H-H'
SNAP
Santa Susana Field Laboratory
CH2MHILL

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



NOTES:

ft msl = feet above mean sea level

SNAP = Systems for Nuclear Auxiliary Power

FIGURE T.2-3C
Surficial Cross Section M-M'
SNAP
Santa Susana Field Laboratory

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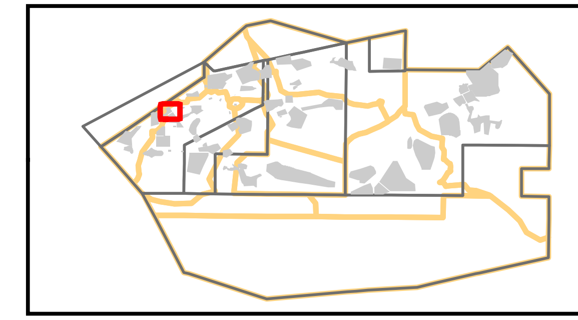
ES072007017SCO362070.FP.5A.05.BO CrossSect_MM.ai 9/08



Approximate Areas of Soil Disturbance

- Grading
- Excavation - Backfill

Basemap Legend

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

Soil Disturbance Area
SNAP RFI Site

Date: September 18, 2008 WORKING DRAFT

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1 inch equals 60 feet

0 60 120 Feet

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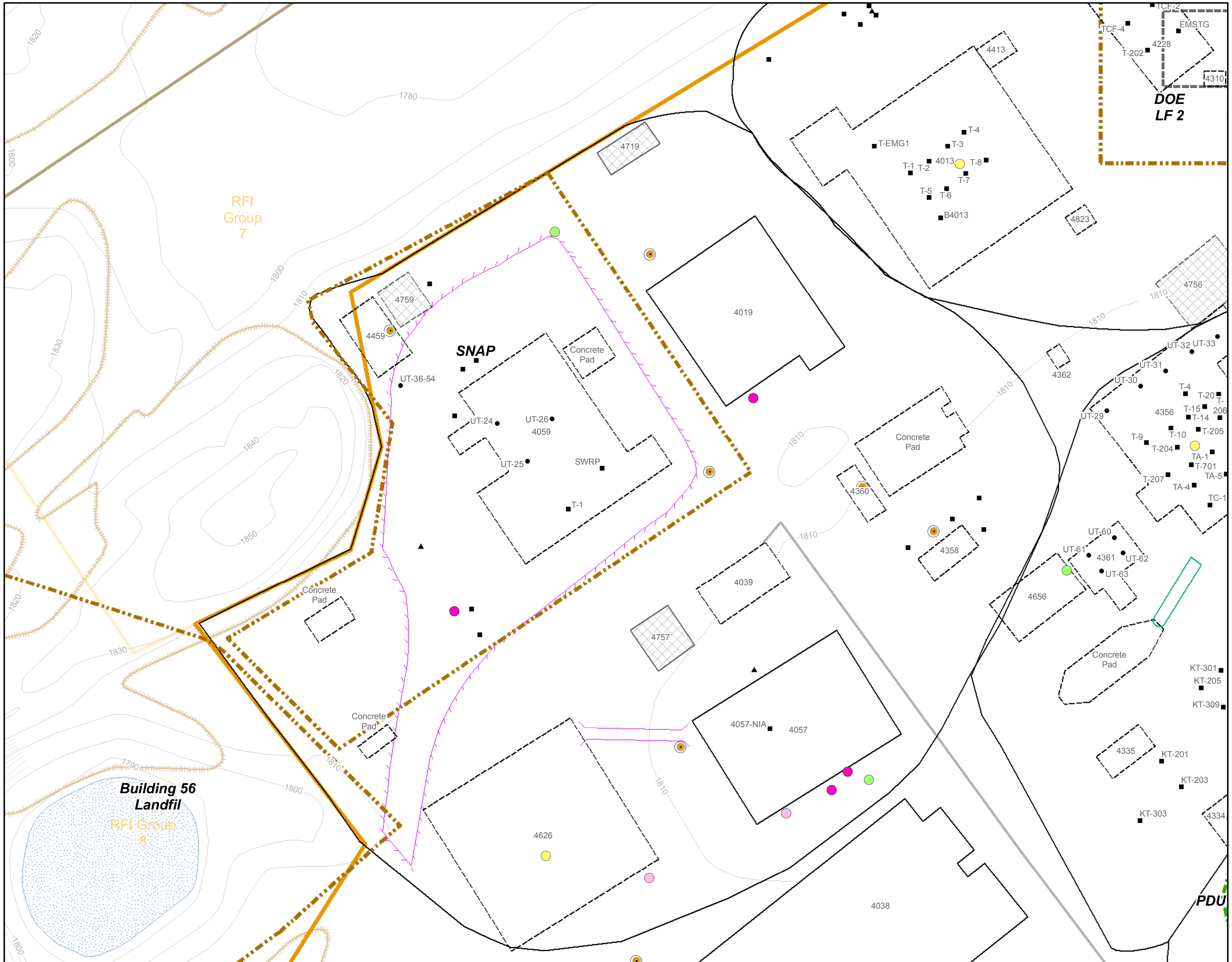
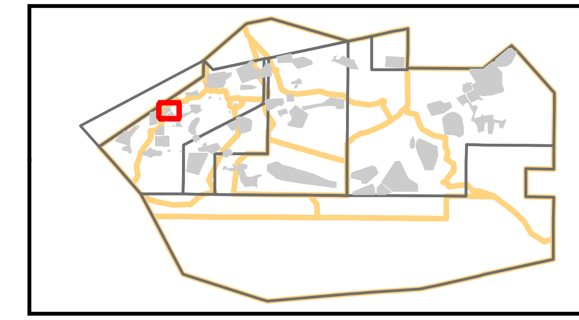
Figure T.2-4





VOCs in Soil Vapor

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

Basemap Legend

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

VOCs in Soil Vapor
SNAP RFI Site

Date: September 15, 2008 WORKING DRAFT

1 inch equals 60 feet

0 60 120 Feet

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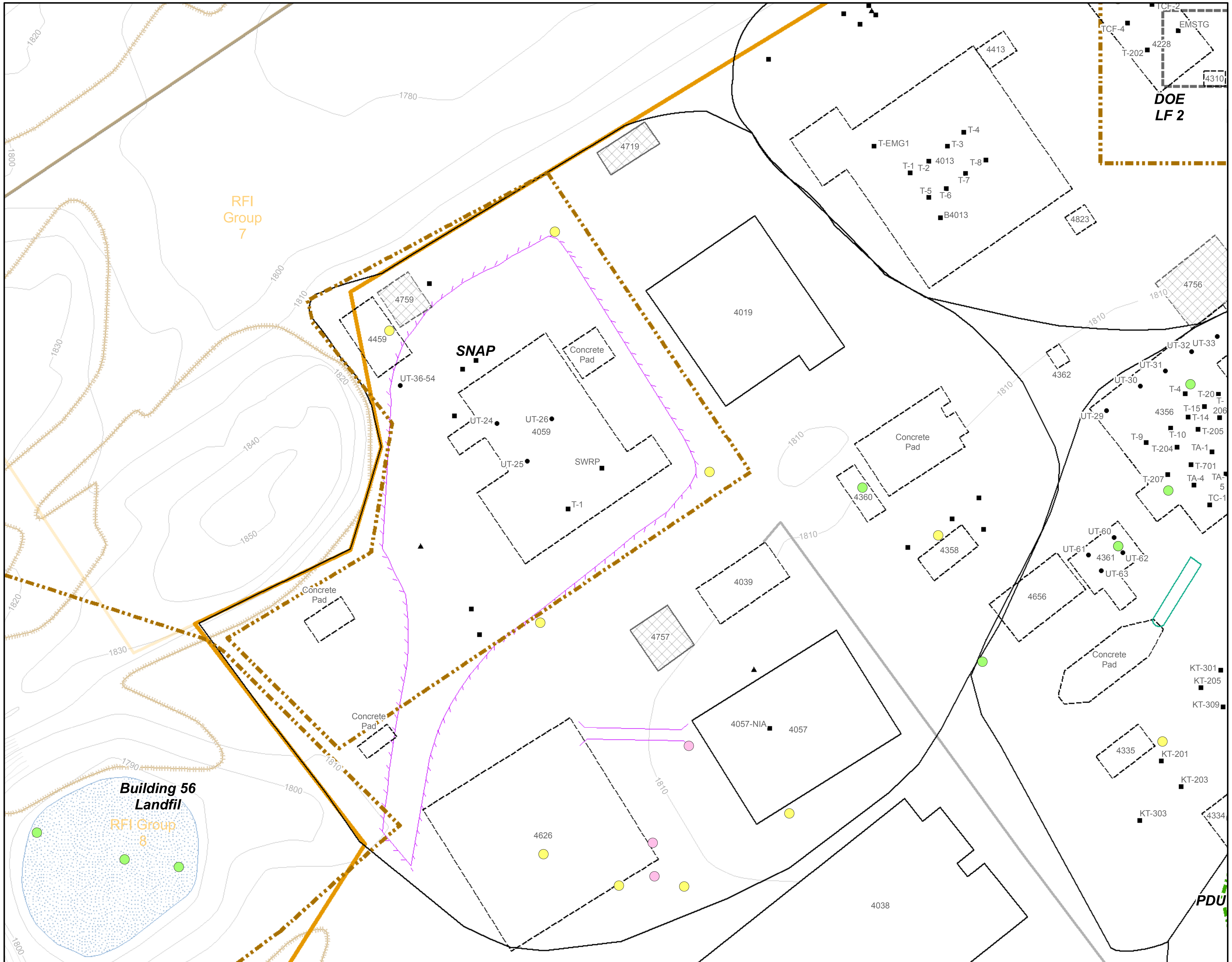
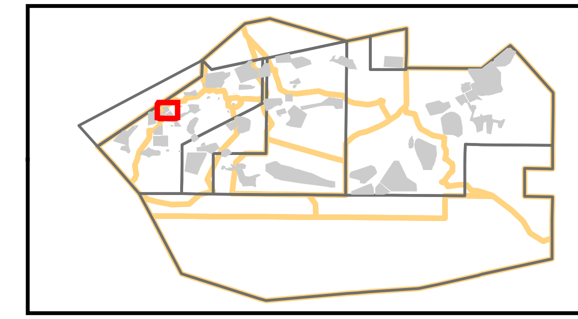
CH2MHILL

Figure T.3-1A

\\..RFI_05\RFI_Report\CDot_BL_PLTSL\RFIGrp5_CDotVOCsSVpr_BL_PLTS.mxd





VOCs in Soil

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

Basemap Legend

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

VOCs in Soil
SNAP RFI Site

Date: September 15, 2008 WORKING DRAFT

1 inch equals 60 feet

0 60 120 Feet

\\..RFI_05\RFI_Report\CDot_BL_PLTS\RFIGrp5_CDotVOCsSoil_BL_PLTS.mxd

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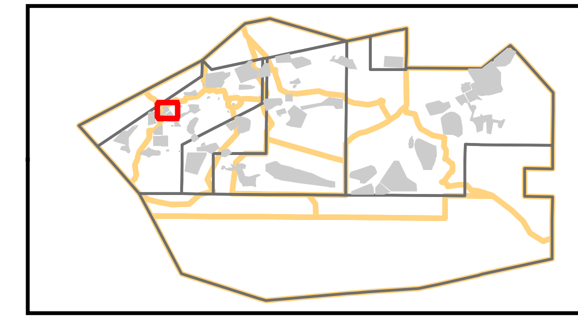
Figure T.3-1B



SVOCs in Soil

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

Basemap Legend

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

SVOCs in Soil
SNAP RFI Site

Date: September 15, 2008 WORKING DRAFT

1 inch equals 60 feet

0 60 120 Feet

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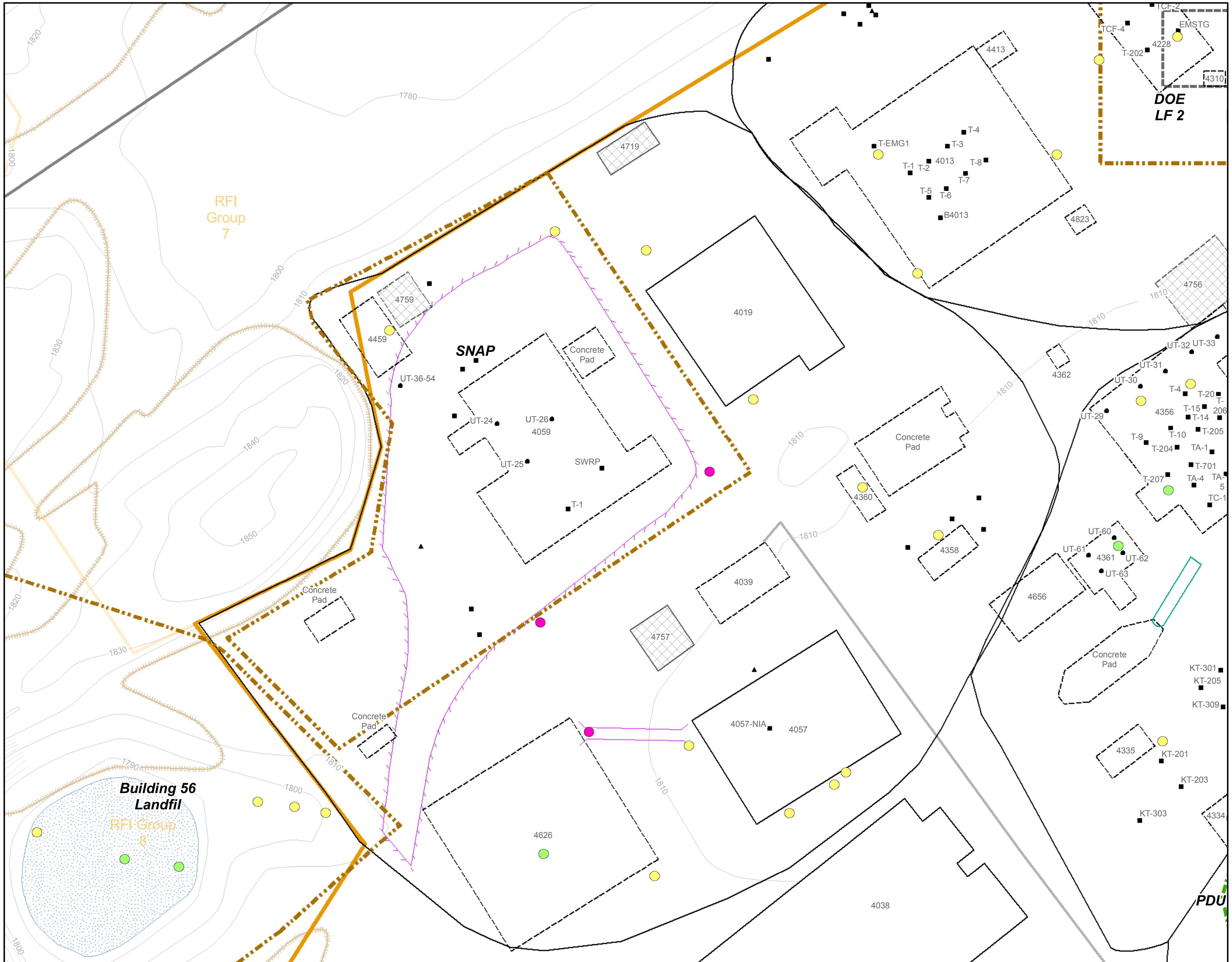
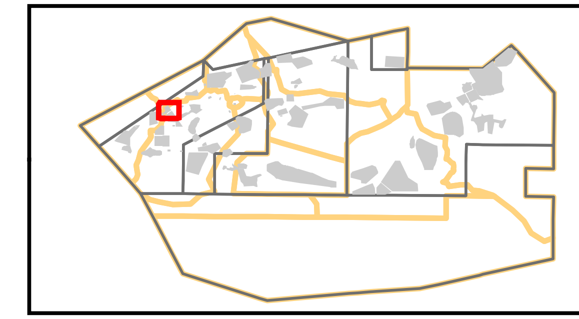
Figure T.3-2

\\..RFI_05\RFI_Report\CDot_BL_PLTS\RFIGrp5_CDotSVCsSoil_BL_PLTS.mxd





TPH in Soil

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

Basemap Legend

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

**TPH in Soil
SNAP RFI Site**

Date: September 15, 2008 WORKING DRAFT

1 inch equals 60 feet

0 60 120 Feet

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

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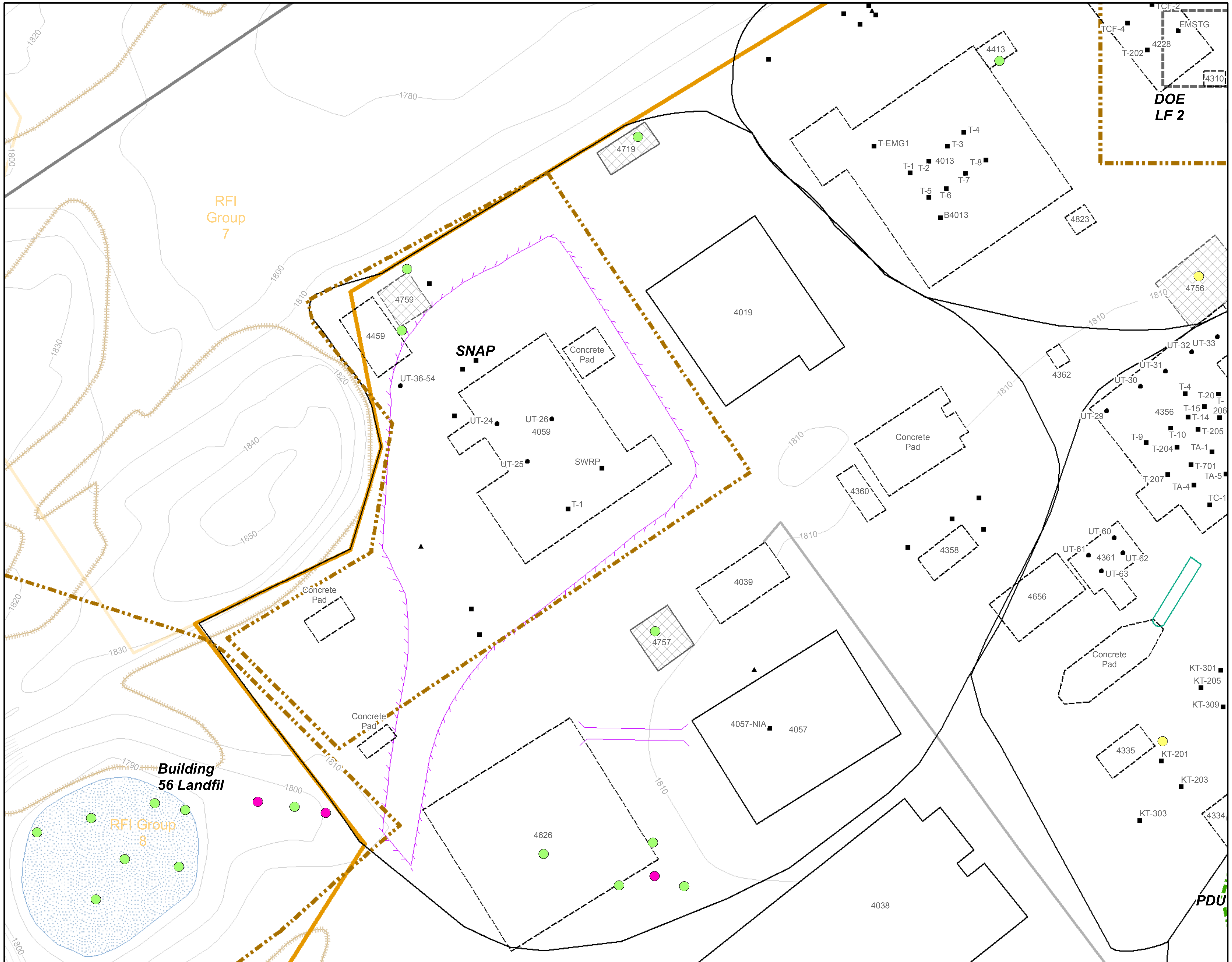
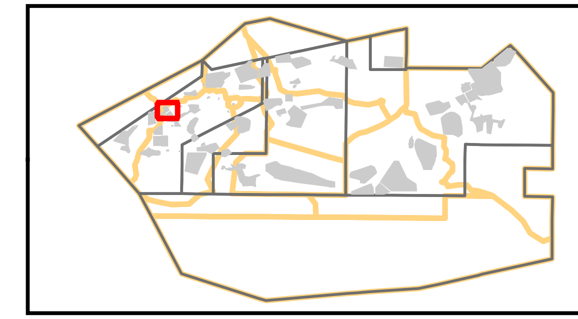
Figure T.3-3





PCBs in Soil

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

Basemap Legend

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

PCBs in Soil
SNAP RFI Site

Date: September 11, 2008

WORKING DRAFT

1 inch equals 60 feet

Feet 0 60 120

SANTA SUSANA FIELD LABORATORY

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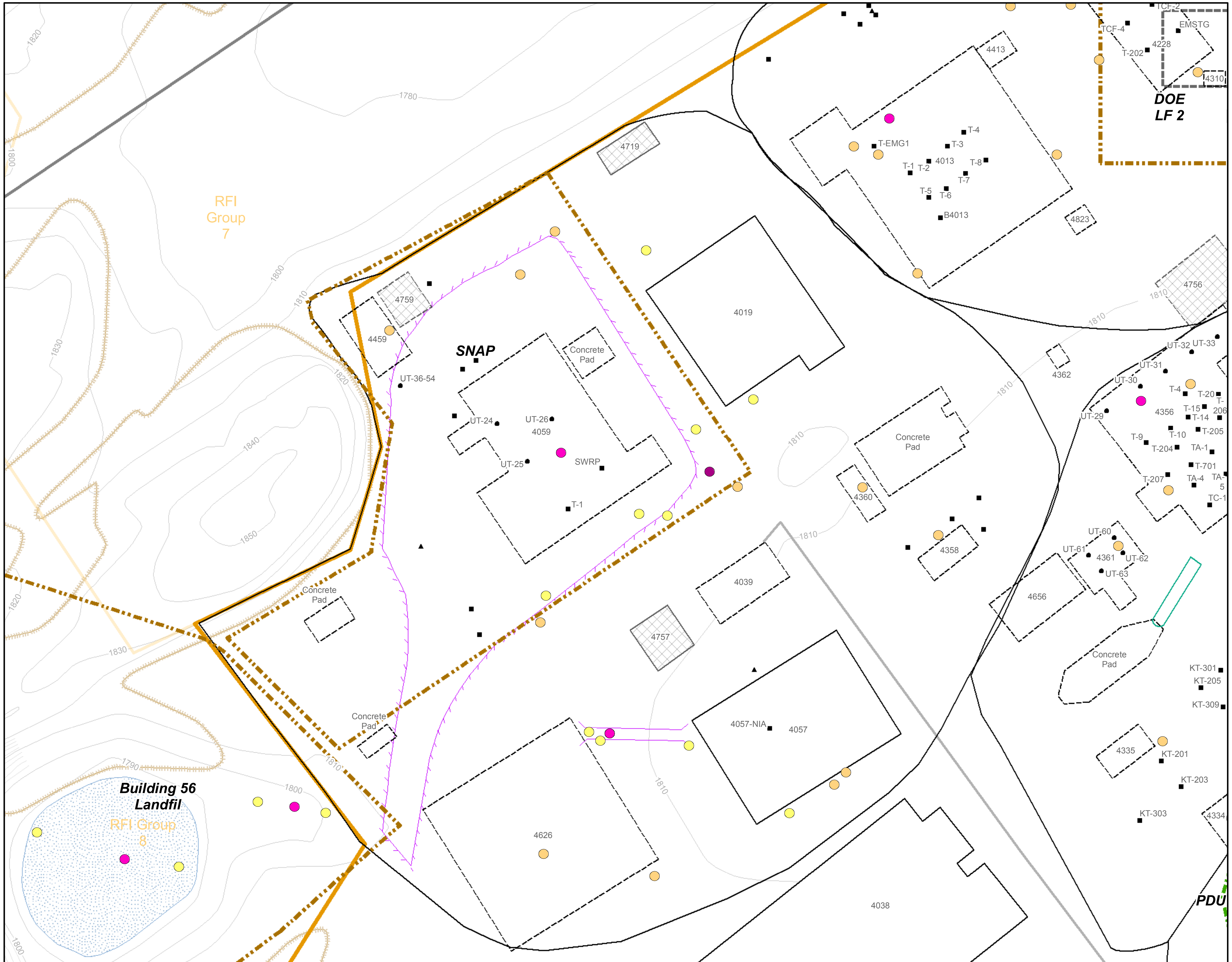
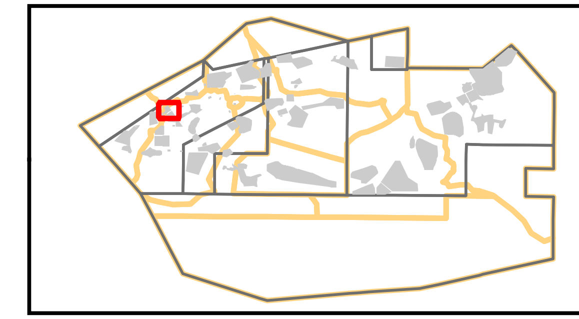
Figure T.3-4

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





Metals in Soil

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

Basemap Legend

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

Metals in Soil
SNAP RFI Site

Date: September 11, 2008 WORKING DRAFT

1 inch equals 60 feet

0 60 120 Feet

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Figure T.3-5

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

Soil Sample Locations

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

Data Box Information

	1.00	Depth in Feet
Sample Location ID	Primary	Sample Type
B9BS01	B9BS01S01	Unique Sample Identifier
	7/10/2005	Date

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

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

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

= 2008 Data

= Pre-2008 Data

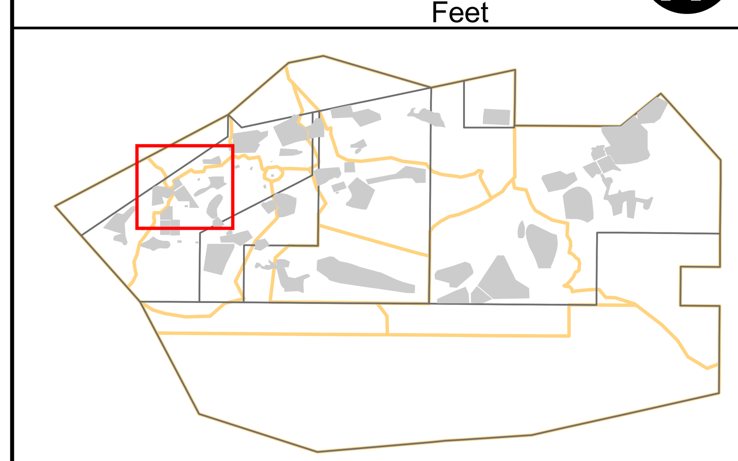
Basemap Legend

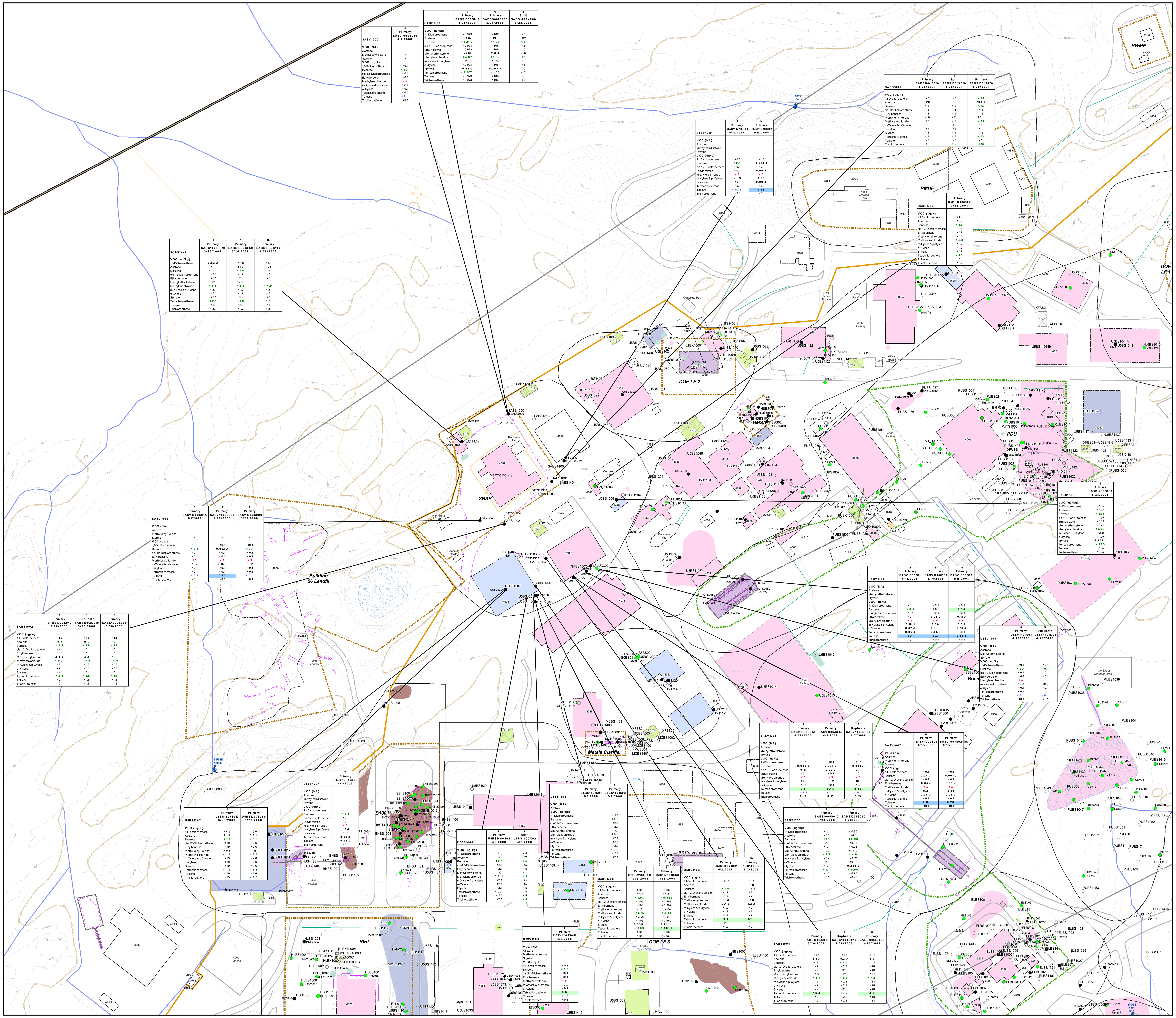
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Debris
- Multiple Use
- Solvent
- Petroleum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

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

1 inch equals 70 feet

0 140 Feet





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SANTA SUSANA FIELD LABORATORY

VOC Data Results SNAP RFI Site

FIGURE T.3-6

Soil Sample Locations

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

Data Box Information

Sample Location ID — B9BS01; 1.00 — Depth in Feet; Primary — Sample Type; B9BS01S01 — Unique Sample Identifier; 7/10/2005 — Date

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

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

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

= 2008 Data

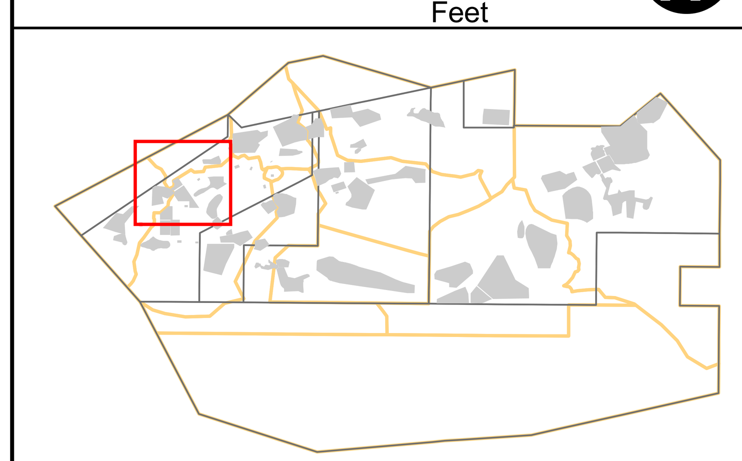
= Pre-2008 Data

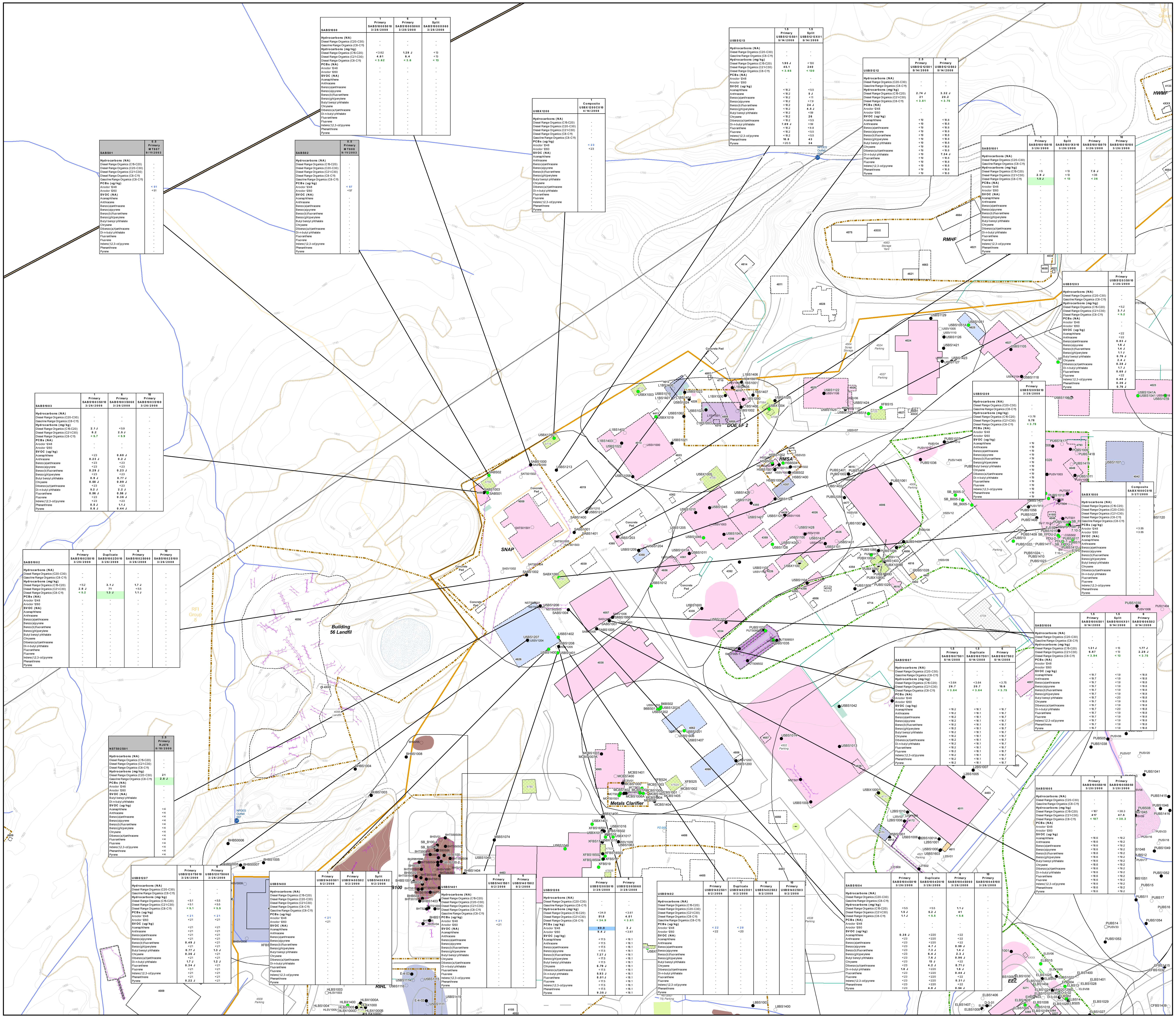
Basemap Legend

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

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

1 inch equals 70 feet — 0 140 Feet





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SANTA SUSANA FIELD LABORATORY

SVOCs, TPH, and PCBs Data Results SNAP RFI Site

FIGURE T.3-7

Soil Sample Locations

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

Data Box Information

Sample Location ID – B9BS01; 1.00 – Depth in Feet; Primary – Sample Type; B9BS01S01 – Unique Sample Identifier; 7/10/2005 – Date

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

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

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

= 2008 Data

= Pre-2008 Data

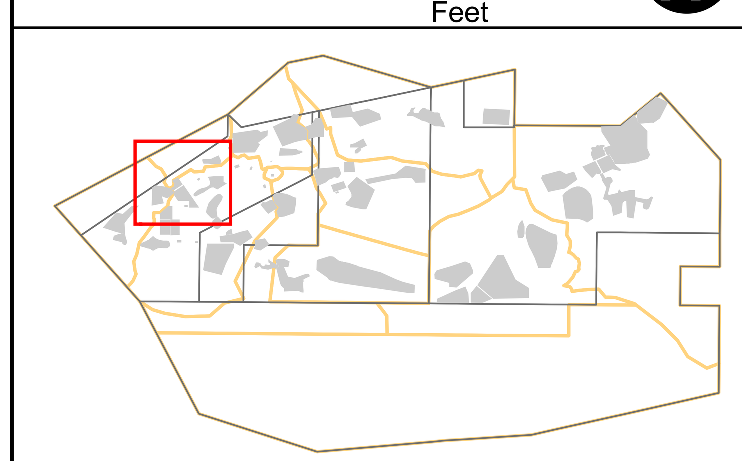
Basemap Legend

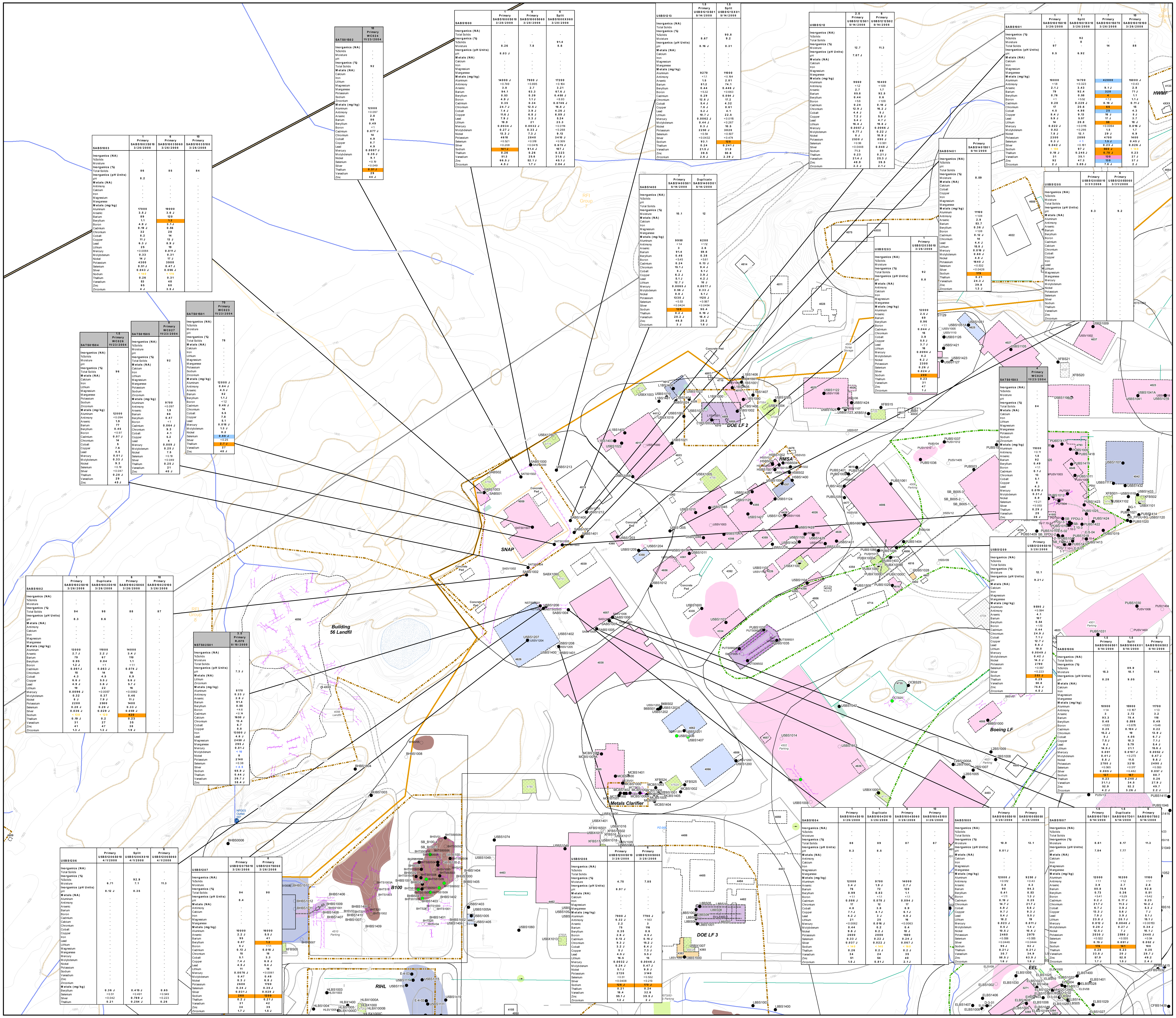
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Debris
- Multiple Use
- Solvent
- Petroleum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

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

1 inch equals 70 feet

0 140 Feet





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SANTA SUSANA FIELD LABORATORY

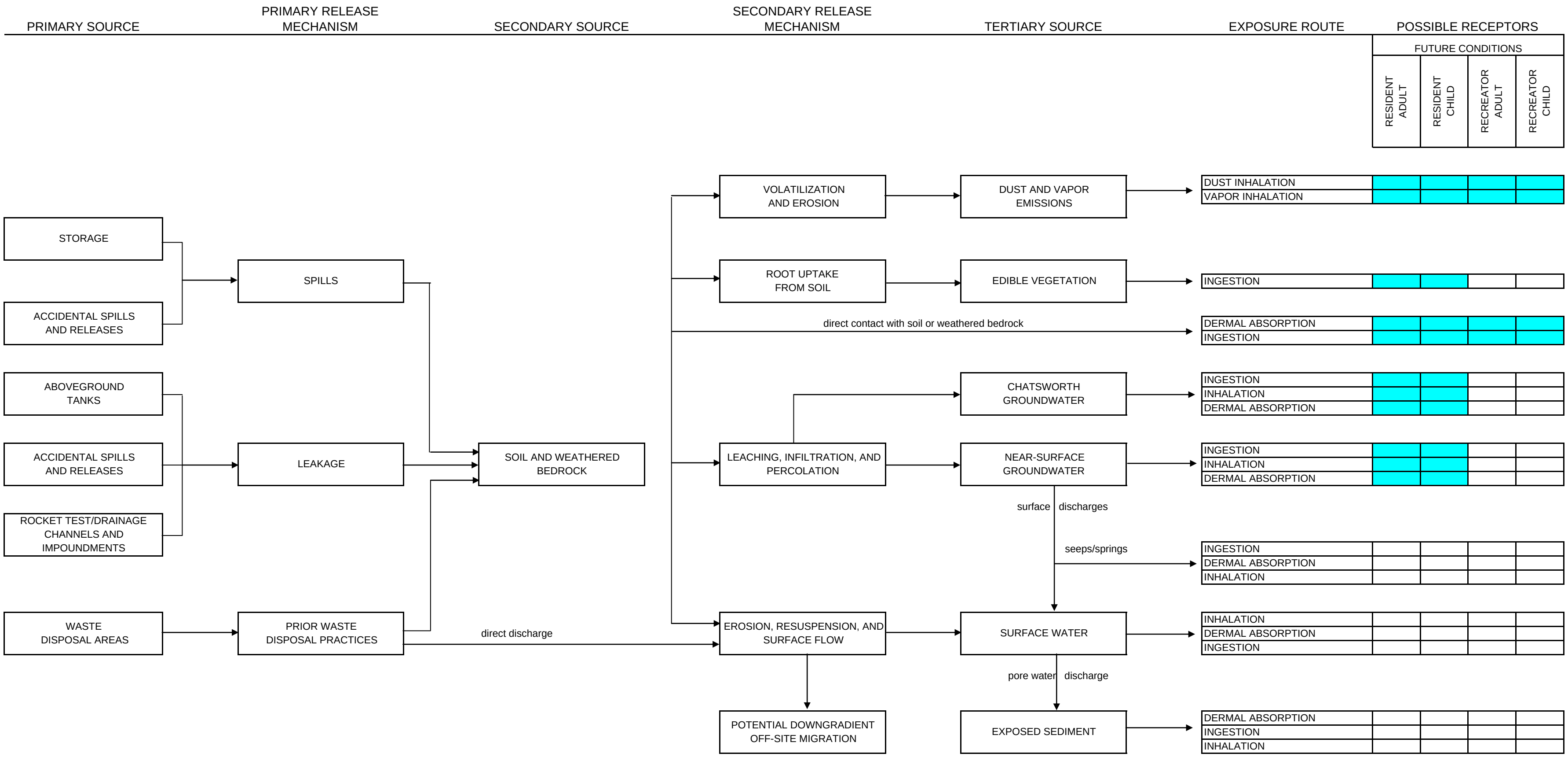
Metals and Inorganics Data Results SNAP RFI Site

FIGURE T.3-8

Figure T.4-1

Human Health Risk Assessment Conceptual Site Model

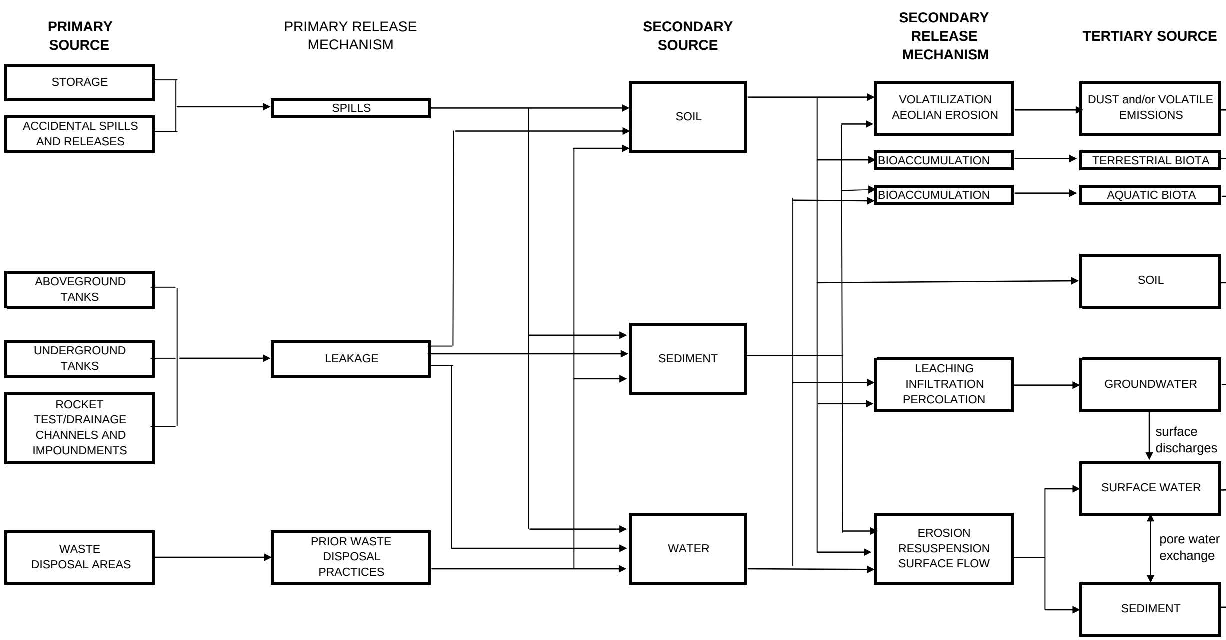
Systems for Nuclear Auxilary Power RFI Site



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

[cyan box] - complete and potentially complete exposure pathways evaluated in this risk assessment

[white box] - incomplete exposure pathways not evaluated in this risk assessment



Tertiary Source	Exposure Route	Aquatic Plants	Benthic Macroinvertebrates	Fish/Other Aquatic Organisms	Great Blue Heron	Terrestrial Plants	Soil Invertebrates	Hermit Thrush	Red-tailed Hawk	Deer Mouse	Bobcat	Mule Deer
		AQUATIC				**TERRESTRIAL**						
DUST and/or VOLATILE EMISSIONS	Inhalation (vapor)				P			P	P	C	P	P
	Inhalation (dust)				P			P	P	P	P	P
	Foliar Uptake	P				P						
TERRESTRIAL BIOTA	Ingestion						P	C	C	C	C	C
AQUATIC BIOTA	Ingestion		P	P	P							
SOIL	Root Contact					C						
	Dermal Contact						C	P	P	P	P	P
	Ingestion						P	C		C		C
GROUNDWATER	Root Contact					P						
SURFACE WATER	Root Contact	P				P						
	Dermal Contact		P	P	P			P	P	P	P	P
	Ingestion		P	C	P			P	P	P	P	P
SEDIMENT	Root Contact	P				P						
	Dermal Contact		P	P	P			P	P	P	P	P
	Ingestion		P	P	P			P	P	P	P	P

Ecological Receptors

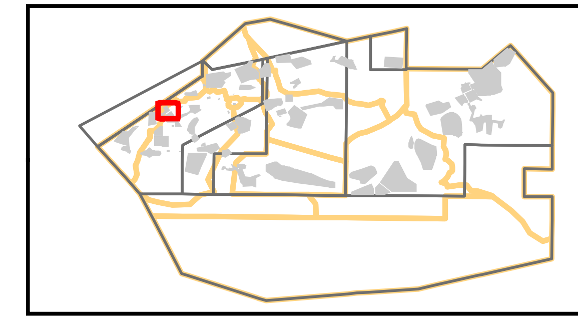
C - Pathway considered complete for purposes of ecological risk assessment

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 T.4-2
Ecological Conceptual Site Model
Group 5 RFI Report, Systems for Nuclear Auxiliary Power
Santa Susana Field Laboratory



Basemap Legend

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

Surficial Media Site Action Recommendations SNAP RFI Site

Date: September 10, 2008 WORKING DRAFT

1 inch equals 60 feet

0 60 120 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure T.5-1

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

Attachments