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# Investigation Work Plan for S-Site Aggregate Area

Los Alamos
NATIONAL LABORATORY
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Prepared by the Environmental Programs Directorate

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## EXECUTIVE SUMMARY

This investigation work plan presents the proposed investigation activities at solid waste management units (SWMUs) and areas of concern (AOCs) located within the S-Site Aggregate Area. The purpose of the investigation is to determine the nature and extent of potential contamination at these sites.

The S-Site Aggregate Area consists of 105 individual SWMUs and AOCs in Technical Area (TA) 11, TA-13, TA-16, and TA-25. Of the 105 SWMUs and AOCs, 37 are not included in this report. The current regulatory status of the 37 sites is as follows:

- Nine sites were removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit by NMED.
- Eleven sites have no further action (NFA) approval by the U.S. Environmental Protection Agency (EPA).
- One site has an NFA proposal pending action by NMED.
- Two sites are addressed in another investigation work plan approved by NMED.
- Fourteen sites are deferred from investigation pursuant to Table IV-2 of the Consent Order.

The remaining 68 SWMUs and AOCs are included in this work plan. Of these, 3 AOCs require no additional investigation, and 65 are proposed for investigative sampling. Archival documentation demonstrates that no environmental sampling is warranted for AOC C-16-049, AOC C-16-062, and AOC C-16-063; therefore, a statement of basis describing the rationale for NFA and a request for a certificate of completion for each of these AOCs will be submitted with the investigation report associated with this work plan.

A limited sampling campaign is proposed for the K-Site Subaggregate SWMUs and AOCs. The K-Site Subaggregate includes the active K-Site drop tower, which is deferred for investigation per Table IV-2 of the Consent Order. The Consent Order identifies the remaining SWMUs and AOCs in the K-Site subaggregate as nondeferred. These nondeferred sites are located within the radius of influence of the active K-Site drop tower and, therefore, could be potentially impacted by continued site operations. Furthermore, the historical contaminants suspected to be present at these nondeferred sites are the same or similar to the contaminants associated with drop tower activities. Thus, the attribution of contaminants present in environmental media to a particular nondeferred SWMU or AOC is not possible. For these reasons, it is proposed that full characterization of the nondeferred sites within the K-Site subaggregate be delayed until the drop tower ceases operations. An interim sampling strategy is proposed in this work plan.

To facilitate the discussion of, and activities proposed for, the SWMUs and AOCs comprising the S-Site Aggregate Area, the 68 sites included in this work plan are subdivided into four subaggregates according to their location and operational histories:

- K-Site Subaggregate—11 SWMUs and AOCs
- P-Site Subaggregate—22 SWMUs and AOCs
- 300s Line Subaggregate—14 SWMUs and AOCs
- V-Site Subaggregate—21 SWMUs and AOC

The main activities associated with the investigations are (1) conducting geodetic surveys to locate SWMUs and AOCs and associated subsurface structures, historical sampling locations, and new sampling locations; (2) conducting radiological surveys of surface radiation; (3) conducting sampling of surface and subsurface soil and tuff; and (4) drilling boreholes and subsurface sampling.

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# 1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by Los Alamos National Security, LLC. The Laboratory is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory covers 40 $mi^2$ of the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation between 6200 and 7800 ft above mean sea level (amsl).

The Laboratory's Environmental Programs (EP) Directorate, formerly the Environmental Restoration Project, is participating in a national effort initiated by DOE to clean up sites and facilities formerly involved in weapons research and development. The goal of the EP Directorate is to ensure that past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, the EP Directorate is currently investigating sites potentially contaminated by past Laboratory operations. The sites under investigation are designated as either solid waste management units (SWMUs) or areas of concern (AOCs).

The SWMUs and AOCs addressed in this work plan are potentially contaminated with both hazardous and radioactive components. The New Mexico Environment Department (NMED), pursuant to the New Mexico Hazardous Waste Act, regulates the cleanup of hazardous wastes and hazardous constituents. DOE regulates the cleanup of radioactive contamination, pursuant to DOE Order 5400.5, "Radiation Protection of the Public and the Environment," and DOE Order 435.1, "Radioactive Waste Management." Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is provided voluntarily to NMED in accordance with DOE policy.

Corrective actions at the Laboratory are subject to the March 1, 2005, Compliance Order on Consent (the Consent Order), issued pursuant to the New Mexico Hazardous Waste Act New Mexico Statutes Annotated 1978, § 74-4-10, and the New Mexico Solid Waste Act, New Mexico Statutes Annotated 1978, § 74-9-36(D). This investigation work plan describes proposed work activities that will be executed and completed in accordance with the Consent Order.

The S-Site Aggregate Area investigation work plan contains all the information specified in the Consent Order for aggregate areas. Detailed site descriptions, potential contaminants of concern, operations, and historical investigations for each SWMU and AOC are included in a separate historical investigation report (HIR) (LANL 2007, 097685).

## 1.1 General Site Information

The S-Site Aggregate Area is located in the western portion of the Laboratory, and it consists of 105 SWMUs and AOCs (also referred to as sites), many of which comprise consolidated units (Figure 1.1-1 and Table 1.1-1). The sites are either located within the S-Site Canyon Subwatershed or they discharge directly to the Water Canyon Watershed from the mesa tops (Figure 1.1-2).

Of the 105 SWMUs and AOCs at the site, 37 are not included in this work plan (Table 1.1-1). The current regulatory status of the 37 sites is as follows:

- Nine sites were removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit (HWFP) by NMED (NMED 1998, 063042; NMED 2001, 070010).

- Eleven sites were approved for no further action (NFA) by the U.S. Environmental Protection Agency (EPA) (EPA 2005, 088464).
- One site has an NFA proposal pending action by NMED (LANL 2002, 073664).
- Two sites are addressed in another investigation work plan (LANL 2004, 087345) approved by NMED (NMED 2004, 091143).
- Fourteen sites are deferred from investigation pursuant to Table IV-2 of the Consent Order.

The remaining 68 sites are included in this work plan for additional investigation (Table 1.1-2). No characterization activities are planned for AOC C-16-049, AOC C-16-062, and AOC C-16-063. Archival material verifies that these sites are appropriate for NFA. The statements of basis, which provide the rationale for NFA for each of these sites and associated archival materials, will be submitted with the investigation report associated with this work plan.

Investigative sampling is proposed for the remaining 65 sites. To facilitate discussion of the sites within this aggregate area, the 68 SWMUs and AOCs are subdivided into 4 subaggregates, based upon their locations and operational histories (Figures 1.1-2–1.1-5).

- **K-Site Subaggregate:** The Technical Area (TA) 11 firing sites were constructed in 1944 for research on implosion symmetry using x-rays and the magnetic method (Figure 1.1-2). When K-Site was built, it originally housed the Betatron Facility and the Cloud Chamber. These two devices were kept in separate buildings, 11-002 and 11-003, and were used during the Manhattan Project (1942 to 1945). K-Site has also been home to photofission experiments, an air gun firing facility, a mortar impact area, a burning ground, laboratories, storage buildings, sumps, and Material Disposal Area (MDA) S. The major facilities currently in operation are a drop tower and a vibration table used for conducting environmental and effects tests on high explosives (HE) systems and components.

  A limited sampling campaign is proposed for the K-Site Subaggregate SWMUs and AOCs. The K-Site Subaggregate includes the active K-Site drop tower, which is deferred for investigation per Table IV-2 of the Consent Order. The Consent Order identifies the remaining SWMUs and AOCs in this subaggregate as nondeferred. These nondeferred sites are located within the radius of influence of the active K-Site drop tower and, therefore, could be potentially impacted by continued site operations. Furthermore, the historical contaminants suspected to be present at the nondeferred sites are the same or similar to the contaminants associated with drop tower activities. Thus, the attribution of contaminants present in environmental media to a particular nondeferred SWMU or AOC is not possible. For these reasons, it is proposed that full characterization of the nondeferred sites within the K-Site Subaggregate be delayed until the drop tower ceases operations. An interim sampling strategy is proposed in section 4.1 of this work plan.
- **P-Site Subaggregate:** The P-Site Subaggregate consists of the inactive sites at TA-16 and former TA-13 (Figure 1.1-3). TA-13 was used for a wide variety of Laboratory activities dating back to World War II. It was constructed in 1944 to support the HE project of the Manhattan Project as a site for counter x-ray diagnostics of HE lens configurations, testing of initiator assemblies, and HE assembly and research in the magnetic method program. Because of its remote location, the area was also used to machine toxic or extremely sensitive explosives. P-Site included a firing site, a firing site debris area, control bunkers, firing bunkers, storage buildings, purported burn pits, and an experimental chamber. The majority of the buildings in the western half of TA-13 were demolished in the early 1950s to make way for the construction of 16-340 Complex. A wastewater treatment plant (WWTP) was constructed in 1953 and served all

of TA-16. The WWTP was disconnected in 1992 when the sanitary sewer system was connected to a Laboratory-wide system (LANL 1993, 020948, pp. 5-228).

- **300s Line Subaggregate:** The 300s Line Subaggregate consists of HE-processing buildings 16-300, 16-302, 16-304, and 16-306 along with their associated rest houses, structures 16-301, 16-303, 16-305, and 16-307 (Figure 1.1-4). The HE-processing buildings are located on the east side of the facility, and the rest houses are located on the west side of the facility. Construction of the 300s Line began at the end of 1951 and was completed in 1953. The primary function of this facility was casting HE such as TNT (2,4,6-trinitrotoluene), Composition-B, and Baratol.
- **V-Site Subaggregate:** The V-Site Subaggregate is a historical site located at the eastern edge of the old World War II-era complex and included HE-processing, -machining, and -casting buildings; HE magazines; material storage buildings; and the recently restored High Bay assembly building (Figure 1.1-5). V-Site was a critical, top-secret area during the Manhattan Project where operations included handling, loading, and testing of replicas or mockups of the first atomic bomb. This subaggregate was burned over during the 2000 Cerro Grande fire, razing most of its remaining structures, except for buildings 16-516 and 16-517. Building 16-516 [SWMU 16-017(t)-99], is the historic High Bay assembly building where parts of the first atomic bomb were fit-tested before its transport and detonation at the Trinity Site. All V-Site operations have ceased; however, the High Bay building has been restored for historical purposes (LANL 2000, 066885, p. 2).

Additional data are needed to define the extent of potential contamination for all 65 remaining sites. Brief discussions of background information, including historical summaries, site conditions, and proposed investigations for each of the subaggregates, are presented in sections 2.0–5.0. Details of historical investigations for each SWMU or AOC are included in the HIR for the S-Site Aggregate Area (LANL 2007, 097685).

### 1.1.1 Conceptual Site Model

A conceptual site model (CSM) is prepared based on the existing knowledge about the site and describes potential contaminants, environmental media to which receptors may be exposed, media through which chemicals may be transported to potential receptors, and any currently uncontaminated media that may become contaminated in the future resulting from contaminant migration (EPA 1989, 008021, pp. 4-10). In most cases, while the source of contamination is specific to each site, the transport mechanisms and potential receptors for each CSM are similar for all subaggregates in the S-Site Aggregate Area and are summarized below.

#### 1.1.1.1 Transport Mechanisms

The following transport mechanisms (secondary transport if a site is inactive) may lead to the exposure of human and/or ecological receptors:

- dissolution and/or particulate transport of surface contaminants during rainfall and snowmelt runoff events (surface soil only);
- dissolution and/or particulate transport of surface contaminants through nonfractured and fractured tuff and intermediate-depth ephemeral perched groundwater (canyon springs);
- dissolution and/or particulate transport of surface contaminants resulting from active operations (including National Pollutant Discharge Elimination System [NPDES]-permitted outfalls);
- airborne transport of contaminated surface soil (including active deposition at K-Site);

- continued dissolution and advective/dispersive transport of chemical and radiological contaminants contained in surface/subsurface soil; and
- biotic and anthropogenic perturbation and translocation of contaminants in subsurface soil.

#### 1.1.1.2 Potential Receptors

The current and potential human receptors reasonably expected to be present at the S-Site Aggregate Area are on-site workers.

Table 1.1-3 summarizes the industrial soil screening levels (SSLs) for the S-Site Aggregate Area chemicals. The industrial SSLs were obtained from NMED guidance (NMED 2006, 092513) or EPA Region 6 (EPA 2006, 094321) or Region 9 guidance (available at http://www.epa.gov/region09/waste/sfund/prg/index.html#prgtable). For chemicals without NMED SSLs, the EPA Region 6 screening levels (EPA 2006, 094321) or EPA Region 9 preliminary remediation goals (PRGs) were used. For radionuclides, Laboratory screening action levels (SALs) were used (LANL 2005, 088493).

The potential pathways for human exposure to surface soil and tuff are incidental soil ingestion, dermal contact, and inhalation of vapors and particulates. Pathways from subsurface contamination to potential human receptors would be complete only if contaminated subsurface soil or tuff were excavated and brought to the surface. The potential pathways would be similar to those of a surface soil release (e.g., inhalation of vapors or fugitive dust, dermal contact, and incidental soil ingestion).

Terrestrial ecological receptors are expected to be present at the S-Site Aggregate Area. For ecological receptors, exposure pathways from potential contaminants in surface soil include inhalation of fugitive dust, incidental ingestion of soil, dermal contact, root uptake by plants, and food-web transport. Exposure pathways from subsurface contamination to potential surface-dwelling animals would be complete only if contaminated subsurface soil or tuff were excavated and brought to the surface. Pathways from subsurface releases may be complete for plants and burrowing animals, including the uptake of contaminants by plant roots and the exposure of burrowing animals through inhalation of dust, incidental ingestion of soil, dermal contact, and food-web transport.

Exposure to groundwater at the S-Site Aggregate Area occurs when ephemeral intermediate-depth perched groundwater manifests in Martin Spring within S-Site Canyon (also known as Martin Canyon). The groundwater manifested in Martin Spring represents intermediate-depth perched groundwater present primarily in tuff discontinuities such as fractures and surge beds that underlie the northwestern portion of TA-16. Flow in the fractures and surge beds is intermittent and responds to rainfall and snowmelt events (LANL 2003, 077965, pp. iv and 5-4). The potential pathways for human exposure to intermediate-depth perched groundwater are ingestion and dermal contact. For ecological receptors, exposure pathways from potential contaminants in intermediate-depth perched groundwater include ingestion, dermal contact, root uptake by plants, and food-web transport.

Exposure to regional groundwater is an incomplete pathway for both human and ecological receptors because of its depth (approximately 1200 ft), which is discussed further in section 3.4.3.4 of this report. Although precipitation events may result in the short-term intermittent presence of surface water, exposure to surface water at the S-Site Aggregate Area is an incomplete pathway for both human and ecological receptors because, in general, no perennial surface water bodies exist.

### 1.2 Investigation Scope and Objectives

The objectives of this investigation are to determine the nature and extent of contamination at the sites included in this work plan.

To help achieve these objectives, this investigation work plan identifies additional characterization data requirements based upon a review of SWMU and AOC historical data; establishes the rationale for characterization, data collection, and analysis; and determines appropriate methods and protocols for sample collection and analysis to finalize the characterization of each SWMU or AOC.

This work plan consists of the following sections:

- Sections 1.0–3.0 describe the overall S-Site Aggregate Area and SWMU- and AOC-specific conditions.
- Section 4.0 describes the scope of the planned investigation.
- Section 5.0 presents investigation field methods common to all subaggregates. Each procedure cited in this document is identified as a standard operating procedure (SOP).
- Section 6.0 describes ongoing monitoring and sampling programs in the aggregate area.
- Section 7.0 describes the schedule for submitting investigation reports for the S-Site Aggregate Area.
- Section 8.0 contains references and map data sources.
- Appendix A presents the acronyms and abbreviations, the glossary, the metric conversion table, and the data-qualifier definitions.
- Appendix B contains the management plan for investigation-derived waste (IDW).

## 2.0 BACKGROUND

TA-16 contains many of the Laboratory's HE facilities, a state-of-the-art tritium facility, and several administrative support buildings. HE activities conducted at TA-16 are fabricating and testing HE, plastics, and adhesives and conducting research in process development for manufacturing items that use these and other materials. Tritium activities are performed at TA-16 and are a critical function to the Laboratory mission. The 78 HE-processing buildings at TA-16 provide 280,000 $ft^2$ of space. The research, development, and testing operations at these facilities include large-scale HE processing; manufacturing HE powders; casting, machining, and pressing HE components; and inspection and radiography of HE components. Other operations include assembling test devices and chemical analysis of HE. Some of these buildings are used for storing, treating, and disposing of HE (DOE 2007, 098130).

In May 2000, the Cerro Grande fire swept through TA-16 and severely damaged all of the V-Site structures, except for the High Bay building, which is where scientists assembled the first atomic bomb, code-named the Gadget, for the Trinity Test. In addition, the Cerro Grande fire created postfire flood concerns in Los Alamos Canyon, requiring the activities at TA-41, which included a variety of administrative/technical activities, mechanical fabrication, assembly of prototype weapons components, and nontritium research and development activities, to be moved to TA-16 (DOE 2007, 098130).

## 2.1 K-Site Subaggregate

The K-Site Subaggregate firing sites at TA-11 were constructed towards the end of 1944 for research of implosion symmetry using x-rays and the magnetic method (Figure 1.1-2). When K-Site was built, it housed the Betatron Facility and the Cloud Chamber. These two devices were kept in separate buildings, 11-002 and 11-003, and were used during the Manhattan Project (1942 to 1945). TA-11 has also been home to photofission experiments, an air-gun firing facility, a mortar impact area, a burning ground, laboratories, storage buildings, sumps, and an MDA.

The major facility currently in operation is a drop tower and vibration table facility used to conduct environmental and effects tests on HE systems and components. The subaggregate also contains firing sites, burn sites, septic systems, sumps, waste treatment facilities, outfalls, and laboratories. Two SWMUs are deferred: the active drop tower [SWMU 11-004(a)] and an active firing point [SWMU 11-001(b)] (Table 1.1-1). All the SWMUs and AOCs included in this subaggregate are located within the radius of influence of either the drop tower or firing point. None of the sites are completely subterranean; therefore, they all contain a component that is exposed to the air-borne contaminants from the active firing point or drop tower. It is plausible that some materials from the blasting activities may be present at the nearby S-Site Aggregate Area SWMUs and AOCs. In addition, the active sites disperse contaminants that are similar to those suspected at these sites; therefore, attribution of these potential contaminants to any particular SWMU or AOC is not possible.

The K-Site Subaggregate includes 32 SWMUs and AOCs; however, 21 of these sites are not included in this work plan for the following reasons (Table 1.1-1–1.1-2):

- Five [AOCs 11-003(a), 11-008, 11-010(a), 11-010(b), and C-11-003] were approved by EPA;
- Two [SWMU 11-007 and SWMU 11-001(c)] were previously removed from Module VIII of the Laboratory's HWFP by NMED; and
- Fourteen [AOC 11-004(f); SWMUs 11-004(a), 11-004(b), 11-004(c), 11-004(d), and 11-004(e); AOC C-11-001; SWMUs 11-001(a) and 11-002; AOCs 11-003(b), 11-012(c), and 11-012(d); and SWMUs 11-001(b) and 11-009] are deferred pursuant to Table IV-2 in the Consent Order.

The remaining 11 sites, 10 SWMUs and 1 AOC, are included in this work plan (Figure 1.1-2 and Table 1.1-2). Although most of the sites are inactive, two septic systems and one outfall remain active [SWMUs 11-005(a), 11-005(b), and 11-011(a)]. This work plan organizes the sites in the K-Site Subaggregate into areas of potentially contaminated soil; septic systems, sumps, catch basins, and associated outfalls; and outfalls.

The historical locations and analytical data are shown in Figures 2.1-1–2.1-2 and Tables 2.1-1–2.1-3. The text in the following subsection is summarized from the HIR (LANL 2007, 097685).

### 2.1.1 AOC C-11-002: Area of Potentially Contaminated Surface Soil Associated with Former Building 11-012

#### 2.1.1.1 Site Description and Potential Contaminants

**AOC C-11-002** is an area of potentially contaminated surface soil located in the former footprint of a wood-framed structure, building 11-012 (Figure 1.1-2). From 1944 to 1959, it was used as a darkroom and may have housed a laboratory used to prepare samples for P Division photofission experiments on uranium and plutonium isotopes. Building 11-012 was monitored for radioactivity in 1956 and was found to be free of contamination; it was moved to a Laboratory salvage yard in 1959. Engineering drawings

place the former building approximately 65 ft east-northeast of the air gun facility's earthen berm (LANL 1993, 020948, pp. 5-274).

No sampling investigations have been conducted at this AOC; however, based on the operations that took place at the facility (e.g., firing site and drop tower experiments), the potential contaminants of concern are solvents, HE, perchlorate, nitrate, inorganic chemicals (including silver, beryllium, lead, nickel, and uranium), cyanide, depleted uranium (DU), and plutonium.

### 2.1.2 SWMUs 11-005(a) and 11-005(b): Active Septic Systems

#### 2.1.2.1 Site Descriptions and Potential Contaminants

SWMU 11-005(a) is an active septic system that serves two buildings: 11-001, a former storage area, and 11-004, a machine shop and photoprocessing facility (Figure 1.1-2). These buildings were constructed in 1944 and are still in use today. SWMU 11-005(a) consists of the drainlines that extend from buildings 11-004 and 11-001, a septic tank, and an open-joint tile drainline in an 18-in. rock-filled trench that extends from the septic system to the outfall (LANL 1993, 020948, pp. 5-97). The discharge from the outfall is to a slightly sloped area of unconsolidated porous soil. The outflow line from SWMU 11-005(a) is now plugged, and the septic tank is pumped on a regular basis (Birdsall 2007, 097417; Madsen 2007, 098271).

A memorandum from 1950 indicated that a mercury spill occurred in building 11-004; however, the location, source, and extent of this spill are unknown (Ogle 1949, 098124; LANL 1993, 020948).

No sampling investigations have been conducted at this SWMU; however, based on the operational history of the associated buildings, the potential contaminants of concern are organic chemicals, HE, perchlorate, nitrate, inorganic chemicals (including mercury, silver, beryllium, lead, nickel, and uranium), cyanide, DU, and plutonium (LANL 2007, 097685).

**SWMU 11-005(b)** is an active septic system built in 1963 that serves two buildings: 11-24, the machine shop and former air gun facility, and 11-003, the Cloud Chamber (Figure 1.1-2). SWMU 11-005(b) connects drainlines from these two buildings to a collective permitted septic tank (structure 11-043), leach field, and outfall (LANL 1993, 020948; Birdsall 2007, 097417, pp. 5-97).

No sampling investigations have been conducted at this SWMU; however, operations at building 11-024 used materials that may have introduced potential contaminants into this septic system (LANL 1993, 020948). The potential contaminants of concern are organic chemicals, HE, perchlorate, nitrate, inorganic chemicals (including mercury, silver, beryllium, lead, nickel, and uranium), cutting oils, cyanide, DU, and plutonium (LANL 2007, 097685).

### 2.1.3 SWMUs 11-006(a), 11-006(b), 11-006(c), and 11-006(d): HE Sump, Catch Basins, and Associated Outfalls

SWMUs 11-006(a), 11-006(b), 11-006(c), and 11-006(d) are related to active operations at K-Site including activities at the drop tower and vibration test facility, buildings 11-030 and 11-030A (Figure 1.1-2). Weapons components containing metals such as lead, nickel, DU, and possibly HE have been tested at both of these facilities. During testing, components are released from the drop tower, and the debris is dispersed aerially. The drop tower sits on a curbed concrete pad (~130 ft in diameter) and is surrounded by a curbed asphalt apron. After each test drop from the tower, large pieces of unexploded HE were retrieved by hand, and the concrete pad and asphalt apron are washed off using high-pressure water hoses. Cleaning of the pad and apron washes the remaining HE debris and water (collectively

referred to as washdown) into SWMU 11-006(a), an HE sump. The sump drains across the asphalt apron into one of three catch basins: SWMUs 11-006(b), 11-006(c), and 11-006(d) (LANL 1993, 020948; LANL 1995, 057225). In addition, rainfall and snowmelt from the concrete pad and asphalt apron also drain into these SWMUs.

#### 2.1.3.1 Site Descriptions and Potential Contaminants

**SWMU 11-006(a)** is an inactive HE sump, structure 11-039, located in a subsurface concrete box on the east side of the drop tower complex (Figure 1.1-2). The 4.5 ft × 5.3 ft × 4.25 ft deep sump was constructed in 1961 such that its rim was level with the concrete pad of the drop tower. The sump was constructed to collect washdown from the concrete pad at the base of the drop tower (LANL 1993, 020948). Washdown and runoff from the concrete pad entered the sump where larger particles either were trapped in a screening filter or settled out. The particulates were collected for disposal at the TA-16 burning ground (LANL 1993, 020948). The remainder of the washdown exited the sump and flowed across the asphalt apron through SWMU 11-006(c), a catch basin.

**SWMU 11-006(b)** is a concrete catch basin (structure 11-050) and associated outfall. The catch basin was constructed in 1970 and is located north of the drop tower complex (Figure 1.1-2). The catch basin and outfall received washdown from the asphalt apron during drop tower operations. Washdown and runoff entered the concrete box at the head of the catch basin where larger particles either were trapped by a screening filter or settled out. The particulates were collected for disposal at the TA-16 burning ground (LANL 1993, 020948). The remainder of the washdown exited the concrete box and was channeled along an asphalt-lined drainage discharging through an NPDES-permitted outfall (EPA-05A069). Discharge from the outfall entered the drainage northeast of the SWMU (LANL 1993, 020948).

The outfall was removed from the NPDES permit in 1998, and the catch basin was backfilled and capped off. However, the outfall continues to receive stormwater and snowmelt runoff, which have now been diverted to SWMUs 11-006(c) and 11-006(d) (Madsen 2007, 098271).

**SWMU 11-006(c)** is a concrete catch basin (structure 11-051) and associated outfall (Figure 1.1-2). The catch basin was constructed in 1970 and is located east of the drop tower complex. The catch basin and outfall received washdown from the drop tower's asphalt apron and overflow from SWMU 11-006(a). Washdown and runoff entered the concrete box at the head of the catch basin where larger particles either were trapped by a screening filter or settled out. The particulates were collected for disposal at the TA-16 burning ground (LANL 1993, 020948). The remainder of the washdown exited the concrete box and was channeled along an asphalt-lined drainage through an NPDES-permitted outfall (EPA-05A096). Discharge from the outfall entered the natural drainage and flowed east into Water Canyon (LANL 1993, 020948).

The outfall was removed from the NPDES permit in 1998. Currently, rainwater and stormwater runoff that collects at the SWMU is pumped to SWMU 11-006(d) (Madsen 2007, 098271).

**SWMU 11-006(d)** is a concrete catch basin (structure 11-052) and associated outfall (Figure 1.1-2). The catch basin was constructed in 1970 and is located to the south of the drop tower complex. The catch basin received washdown from the asphalt apron and overflow from the concrete pad. Washdown and runoff entered the concrete box at the head of the catch basin where larger particles either were trapped in the screening filter or settled out. The particulates were collected for disposal at the TA-16 burning ground (LANL 1993, 020948). The remainder of the washdown exited the concrete box and was channeled along an asphalt-lined drainage through an NPDES-permitted outfall (EPA-05A097).

Discharge from the outfall entered the natural drainage and flowed east into Water Canyon (LANL 1993, 020948).

The outfall was removed from the NPDES permit. Currently, rainwater and stormwater runoff from the asphalt apron and concrete pad have been diverted by a curb, and runoff now drains offsite through SWMU 11-006(d) only (Madsen 2007, 098271).

Five surface soil samples (0.0 to 0.5 ft) have been collected at these SWMUs: one from each of the three outfalls, one downgradient of SWMU 11-006(d), and one downgradient of SWMU 11-006(c) (Figure 2.1-2). HMX, also known as octogen or cyclotetramethylene-tetranitramine, is a powerful high explosive derivative to research department explosive (RDX) and was detected in samples (locations 16-05900, 16-05901, 16-05902) taken at SWMUs 11-006(c) and 11-006(d), and the location immediately downgradient of SWMU 11-006(d). Inorganic chemicals above background values (BVs) were detected in three of the five samples (locations 16-05900, 16-05902, and 16-05904) and included arsenic, barium, copper, and uranium (Figures 2.1-1–2.1-2 and Tables 2.1-1–2.1-3) (LANL 2007, 097685, Appendix B).

Based on the operational activities at the firing site and drop tower and the analytical results from the five soil samples (LANL 2007, 097685), the potential contaminants of concern are organic chemicals, HE, perchlorate, nitrate, inorganic chemicals (including arsenic, barium, beryllium, cadmium, copper, lead, mercury, nickel, selenium, silver, uranium, and thallium), DU, and plutonium.

### 2.1.4 SWMUs 11-005(c), 11-011(a), 11-011(b), and 11-011(d): Outfalls

#### 2.1.4.1 Site Descriptions and Potential Contaminants

**SWMU 11-005(c)** is an inactive outfall from a boiler steam vent pipe. The boiler served a sink, hot-water heater, and floor drain in the Betatron Facility, building 11-002, which was constructed in 1944 (Figure 1.1-2). The outfall is located to the north of building 11-002 and discharged to a slightly sloped, vegetated area adjacent to a dirt road bed. Before 1956, operations at building 11-002 consisted of photofission experiments conducted during implosion tests at the firing point immediately outside the building. In 1956, building 11-002 was transformed into a control building for drop tower experiments, and the drainline was plugged (LANL 1993, 020948).

No sampling investigations have been conducted at SWMU 11-005(c) (LANL 2007, 097685); however, based on historical operations, the potential contaminants of concern are uranium and plutonium isotopes associated with the photofission experiments. Cleaning solvents may have been used in association with the photofission activities, and photographic processing chemicals (such as arsenic, cyanide, barium, beryllium, cadmium, copper, lead, mercury, nickel, etc.) may have been associated with the Betatron activities (LANL 1993, 020948).

**SWMU 11-011(a)** is an active NPDES-permitted outfall (EPA-03A130) that receives treated discharge water from building 11-030A, which is the cooling tower for building 11-030 (the electrodynamic vibration test facility) (Figure 1.1-2). Buildings 11-030 and 11-030A were constructed between 1958 and 1959 and remain operational. The electrical equipment in building 11-030A is cooled by water circulating through a cooling tower. The blowdown from the cooling tower is released to the outfall that consists of a 2-in. pipe surrounded by a 2-in. layer of insulation. The outfall is located approximately 6 ft east of building 11-030A (LANL 1993, 020948, pp. 5-260).

No sampling investigations have been conducted at SWMU 11-011(a) (LANL 2007, 097685); however, based on historical operations of the electrodynamic vibration test facility, firing point activities, and drop

tower experiments, the potential contaminants of concern are organic chemicals, HE, perchlorate, nitrate, metals (including beryllium, lead, and nickel), uranium, DU, and plutonium (LANL 1993, 020948).

**SWMU 11-011(b)** is an inactive outfall that received effluent from the floor drains in building 11-030A, the electrodynamic vibration test facility (Figure 1.1-2). This facility was constructed between 1958 and 1959 and remains operational. The outfall is a 3-in. pipe that lies on a slope approximately 15 ft north of building 11-030A (LANL 1993, 020948; Birdsall 2007, 097417).

No sampling investigations have been conducted at SWMU 11-011(b) (LANL 2007, 097685); however, based on historical operations of building 11-030A, firing point activities, and drop tower experiments, the potential contaminants of concern are organic chemicals, HE, perchlorate, nitrate, metals (including beryllium, lead, and nickel), uranium, DU, and plutonium (LANL 1993, 020948).

**SWMU 11-011(d)** is an inactive outfall associated with building 11-024 (Figure 1.1-2). Building 11-024 was built in 1956 and originally operated as the air gun facility. The air gun facility was used to conduct acceleration and impact tests on full-scale nuclear warhead mockups (LANL 1993, 020948, pp. 5-263). Later, building 11-024 was converted into offices and a light machine shop (Birdsall 2007, 097417).

No sampling investigations have been conducted at SWMU 11-011(d) (LANL 2007, 097685); however, based on historical operations at the air gun facility, the light machine shop, firing point activities, and drop tower experiments, the potential contaminants of concern are organic chemicals, HE, perchlorate, nitrate, inorganic chemicals (including mercury, silver, beryllium, lead, uranium, and nickel), cutting oils, cyanide, DU, and plutonium (LANL 1993, 020948).

## 2.2 P-Site Subaggregate

The P-Site Subaggregate consists of inactive SWMUs and AOCs located at TA-16 and former TA-13 (Figure 1.1-3). The structures within the P-Site Subaggregate area are a firing site, a landfill (debris disposal area), a sump and drainline, an unlocated burning pit, and a former WWTP.

TA-13 was constructed in the 1940s as a site for counter x-ray diagnostics of HE lens configurations and has since been used for a wide variety of Laboratory activities. Because of its remote location, the TA-13 was used to machine toxic or extremely sensitive explosives (LANL 1993, 020948, pp. 5-226). Additional activities at P-Site included HE assembly and research in the magnetic method program.

In mid-1945, operations at TA-13 tested initiator assemblies containing HE, beryllium, polonium, and other metals. A bulldozer was used to clean up the radioactive residues of these initiator tests. The shot debris was bulldozed to the south and east of the firing point, creating the debris disposal area. Buildings constructed at TA-13 included an office and shop building (13-001), a firing site control laboratory structure (16-476 [formerly structure 13-2]), two firing site bunkers (16-488 and 16-478 [formerly structures 13-003 and 13-004]), an experimental chamber (TA-13-6), a magazine (TA-13-7), and two storage buildings (13-005 and 13-008). TA-13 was located at the eastern end of the current TA-16 explosives manufacturing area and was incorporated into TA-16 in 1957.

A WWTP was constructed in 1953 and served all of TA-16. The WWTP was disconnected in 1992 when the sanitary sewer system was connected to a Laboratory-wide system. The majority of the buildings in the western half of TA-13 were demolished in the early 1950s to make way for the construction of the 16-340 Complex (LANL 1993, 020948, pp. 5-228).

The P-Site Subaggregate includes 25 SWMUs and AOCs (Table 1.1-1); however, of these, 3 are not included in this work plan because

- two [SWMUs 13-003(b) and 13-003(a)] sites are addressed in another investigation work plan approved by NMED (LANL 2004, 087345; NMED 2004, 091143); and
- one [SWMU 16-005(i)] has been previously removed from Module VIII of the Laboratory's HWFP by NMED.

The remaining 22 sites are included in this work plan, 14 of which are inactive SWMUs and 8 inactive AOCs (Figure 1.1-3 and Table 1.1-2). This work plan organizes the sites in the P-Site Subaggregate into areas of potentially contaminated soil; HE sump, drainlines, and outfall; firing site and landfill (debris disposal area); burning pits; and the former TA-16 sanitary WWTP.

The following text is summarized from the detailed SWMU and AOC information found in the associated HIR (LANL 2007, 097685).

### 2.2.1 SWMUs 16-035, 16-036, 16-025(d2), and 16-031(h) and AOCs 16-024(a), 16-024(u), C-16-049, C-16-050, C-16-060, C-16-062, and C-16-063: Areas of Potentially Contaminated Surface Soil

#### 2.2.1.1 Site Descriptions and Potential Contaminants

**SWMU 16-035** is an area potentially contaminated soil associated with the former control bunker 16-476 (previously structure 13-2), which is also described as a firing-site-control laboratory structure (Figure 1.1-3) (LANL 1993, 020948, pp. 5-229). It is unknown whether hazardous waste was released from the building to the soil. The bunker was demolished in 2005 (LANL 1990, 007512).

**SWMU 16-036** is an area of potentially contaminated soil located beneath two former firing site bunkers, 16-477 and 16-478 (formerly structures 13-003 and 13-004) (Figure 1.1-3). The bunkers contained x-ray and magnetic equipment and were capped with steel nose cones to protect them from explosive detonations that occurred between the bunkers (LANL 1993, 020948, pp. 5-229). Building 16-478 was used for remote high-speed machining tests on experimental HE compounds for characterization purposes. Tuballoy/niobium laminates were also machined at building 16-478 because their toxicity, radioactivity, and pyrophoric nature required a remote location. In July 1995, it was noted that building 16-478 was rarely used, water and power had been turned off, and the building was scheduled for decommissioning (LANL 1995, 057225, pp. 5-29-1 through 5-29-3).

**SWMU 16-025(d2)** is an area of potentially contaminated surface soil associated with a former mockup chamber, structure 16-480 (Figure 1.1-3). Structure 16-480 was a temporary mockup chamber that was built in 1947 and removed in 1951. Apparently, no detonation occurred in this structure. No direct documentation concerning the use of structure 16-480 exists, but such a structure is referred to in a 1947 memo that states "…a hutment to be used for certain mockup arrangements of the experimental equipment required for experiments with highly radioactive sources which are actually to be performed at other locations" (LASL 1947, 005581). In addition to radioactive components, equipment used at structure 16-480 is suspected to have contained mercury (Morgan 1994, 054782.75). A former site worker indicated that structure 16-480 was a place where HE and uranium-238 may have been used (LANL 1995, 057225, pp. 5-26-6-5-26-9).

**SWMU 16-031(h)** is an area of potentially contaminated soil associated with an outfall from a utility room in building 16-478, The floor drain and sink in the utility room drained into the NPDES-permitted sewer line and outfall (EPA-04A134), approximately 30 ft from the building (Figure 1.1-3). Building 16-478 was a

bunker for photographing explosive testing. The utility room was added to the building in 1950 when the building was modified to test the effects of machining on HE products. Effluent from the floor drain included washdown water and discharge from a water-sealed/water-cooled vacuum pump (LANL 1995, 057225; LANL 1998, 059685).

**AOC 16-024(a)** is an area of potentially contaminated surface soil associated with former HE magazine, building 16-488, and firing activities at P-Site (Figure 1.1-3). Building 16-488 was constructed in 1944 to store HE in support of x-ray diagnostics work on HE lenses and was decommissioned and removed in 1951. Building 16-488 could have been exposed to uranium, many forms of HE, beryllium, and other metals; however, a former site worker listed HE as the sole contaminant of this structure (Blackwell 1983, 005823; LANL 1995, 057225, p. 5-26-6).

**AOC 16-024(u)** is an area of potentially contaminated surface soil associated with former HE magazine, building 16-481, and firing activities at P-Site (Figure 1.1-3). This former magazine was constructed in 1944 to store HE to support x-ray diagnostics work on HE lenses. In 1950, building 16-481 was retired from use; it was decommissioned and removed in 1951. Building 16-481 could have been exposed to uranium, many forms of HE, beryllium, and other metals; however, a former Laboratory site worker listed HE as the sole contaminant associated with this structure (Blackwell 1983, 005823; LANL 1995, 057225, p. 5-26-6).

**AOC C-16-049** is an area of potential soil contamination associated with the footprint of a former workshop at TA-16 (building 13-1 that was later renumbered to 16-475) (Figure 1.1-3). A 1983 memorandum lists the various hazardous materials associated with removed buildings at TA-16; however, no hazardous materials were associated with building 16-475 (Blackwell 1983, 005823).

**AOC C-16-050** is an area of potential soil contamination associated with the footprint of a former storage building at TA-16, building 16-482 (Figure 1.1-3). A 1983 memorandum lists the various hazardous materials associated with removed buildings at TA-16; however, no hazardous materials were associated with building 16-482 (Blackwell 1983, 005823).

**AOC C-16-060** is an area of potentially contaminated soil associated with former structure 16-479 (Figure 1.1-3). This structure was a small storage building that may have stored materials used in structure 16-480, a mockup chamber. Structure 16-479 was used at P-Site from 1944 until August 1949, when it was moved to TA-33 for further use. A former Laboratory site worker listed this structure as possibly containing uranium-238 (Blackwell 1983, 005823).

**AOCs C-16-062 and C-16-063** are former electrical manholes (structure 16-888 and 16-889) that were installed at P-Site in 1950 (Figure 1.1-3). The manholes were located away from the HE-processing buildings, southwest of the area that eventually became the 340s Line. The manholes were removed in 1972. A 1983 memorandum indicates that no hazardous materials were associated with structures 16-888 and 16-889 (Blackwell 1983, 005823).

No sampling investigations have been conducted at these SWMUs and AOCs (LANL 2007, 097685); however, based on their operational histories, historical memoranda, and statement of a former Laboratory site worker, the potential contaminants of concern are HE, organic chemicals (including solvents), inorganic chemicals (e.g., mercury, lead, barium, and beryllium), nitrate, perchlorate, and radionuclides (uranium and DU).

### 2.2.2 SWMUs 13-001 and 13-002: Firing Site and Landfill

SWMUs 13-001 and 13-002 are inactive firing sites and debris disposal areas (landfills) associated with firing activities at TA-13 (Figure 1.1-3). During 1944 and 1945, HE shots were fired at TA-13. Assemblies contained HE lenses (primarily Baratol and Composition-B), uranium, and other materials. In mid-1945, TA-13 was converted to test initiator assemblies containing HE, beryllium, and polonium (polonium decays quickly with a half-life of 138 days), and other metals. A bulldozer was used to clean up the radioactive residues of these initiator tests, and shot debris was bulldozed to the south and east of the firing point, SWMU 13-001, creating SWMU 13-002.

#### 2.2.2.1 Site Descriptions and Potential Contaminants

**SWMU 13-001** is an inactive firing point and associated potentially contaminated soil located between two battleship bunkers, 16-477 and 16-478 (formerly structures 13-003 and 13-004, respectively) (Figure 1.1-3). The 300-ft radial area around the firing point contains shrapnel and debris, including firing cables, lead balls, and chunks of steel and copper (LANL 1993, 020948, pp. 5-228-5-229).

**SWMU 13-002** is an inactive debris disposal area (landfill) to the south and east of the firing point (Figure 1.1-3). It extends approximately 500 ft due south of the firing point and includes debris and shrapnel from firing point activities. SWMU 13-002 has been decommissioned; however, it is not known whether all contaminated materials were removed (LANL 1990, 007512, pp. 5-228-5-229; LANL 1993, 020948).

No sampling investigations have been conducted at these SWMUs; however, based on the operational history of these SWMUs, the potential contaminants of concern are likely to be associated with HE lens and initiator testing and components of the explosive assemblies. In particular, inorganic chemicals (lead, beryllium, and barium), HE residues (including environmental breakdown products); and radionuclides (e.g., natural and DU) are likely to be present.

### 2.2.3 SWMU 16-029(h) and AOC 16-003(p): HE Sump, Drainlines, and Outfalls

#### 2.2.3.1 Site Descriptions and Potential Contaminants

**SWMU 16-029(h)** is the associated inactive drainlines and outfall from building 16-478 (Figure 1.1-3). The outfall was plugged, but it once discharged to a level grass- and asphalt-covered area that flowed into Cañon de Valle. One of the drainlines exited the southeast corner of the sump and was plugged in July 1987. This drainline runs 80 ft east of the sump, where the 6-in. vitrified clay pipe (VCP) daylights on the canyon rim. Visual inspection of the sump's interior showed that this drainline is the only one currently attached to the sump. There is possibly another drain (reportedly a French drain) that may have existed until the late 1960s. The French drainline is believed to be an 8-in. cast-iron pipe connected to an 8-in. VCP and is thought to extend approximately 125 ft to the south of building 16-478, where it intersects an off-site drainage channel. Because a French drain is semiporous, contaminants could have been released to the surrounding soil. Potential contaminants at both drain sites are HE and uranium (LANL 1995, 057225, pp. 5-29-1-5-29-4).

**AOC 16-003(p)** is a plugged, inactive HE sump located perpendicular to the south wall of former building 16-478 (Figure 1.1-3) (LANL 1995, 057225, pp. 5-29-1, -3, and -4). Several surface samples (0 to 4 in.) were collected over an extended period near building 16-478; however, the locations could not be verified (LANL 2007, 097685).

A sampling program associated with the NPDES permit was conducted over a 16-yr period beginning in 1970. This sampling program identified HE contamination at the outfall (Baytos 1970, 058911; Baytos 1975, 034568; Baytos 1986, 005834). Surface samples (<4 in. deep) collected near building 16-478 detected RDX and HMX. These samples were collected near a culvert from the sump effluent outlet and 3.3 to 9.8 ft below the berm. However, the exact location of the outlet is not known, nor is it known if these locations are identical. The French drain was not located but is believed to have been south of building 16-478 near the berm based on engineering drawing ENG-C 17572. The potential contaminants of concern for AOC 16-003(p) and SWMU 16-029(h) are HE compounds (including RDX, HMX and TNT), HE degradation products (e.g., dinitrotoluene; 1,3,5-trinitrobenzene; and 1,3-dinitrobenzene), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), barium, uranium, and other metals (LANL 2007, 097685, Appendix E).

### 2.2.4 SWMU 13-004: Burning Pits

#### 2.2.4.1 Site Description and Potential Contaminants

**SWMU 13-004** includes one or more inactive burning pits at former TA-13 and were located within the firing site, SWMU 13-001 (Figure 1.1-3). In 1950, an explosives demonstration was held at the firing site for S-Site employees. These pits were not located on engineering diagrams or the 1948 aerial photographs. It is likely that the pits were located in the western half of former TA-13 and have been disturbed by S-Site construction activities (LANL 1993, 020948, pp. 5-228-5-229).

No sampling investigations have been conducted at SWMU 13-004. Because SWMU 13-004 had an explosive demonstration, the potential contaminants of concern include inorganic chemicals from components of the explosive assemblies. In particular, metals such as lead, beryllium and barium; HE residues (including environmental breakdown products); and radionuclides (e.g., natural and DU) are likely to be present.

### 2.2.5 SWMUs 16-004(a), 16-004(b), 16-004(c), 16-004(d), 16-004(e) and 16-004(f): Former Technical Area 16 Sanitary Wastewater Treatment Plant

SWMUs 16-004(a), 16-004(b), 16-004(c), 16-004(d), 16-004(e), and 16-004(f) were components of the former TA-16 sanitary WWTP and are located southeast of the 16-340 Complex (Figure 1.1-3). The WWTP received wastewater from the TA-16 sanitary sewer system, which consisted of thousands of feet of piping, numerous lift stations, and manholes. The WWTP was built in 1953 during the expansion of TA 16 and was disconnected in 1992 when TA-16 was connected to the Laboratory-wide sewage system during the Sanitary Waste System Consolidation (SWSC) project (LANL 1993, 020948, pp. 5-133-5-135).

Wastewater entered the system through the comminutor box designed to shred incoming solid matter then flowed to the Imhoff tank. The comminutor replaced the screen. The Imhoff tank was a settling box and offered some sludge digestion. Sludge that collected in the Imhoff tank was periodically discharged to the two drying beds. The Imhoff tank also had an emergency overflow pipe that discharged onto the slope northeast of the tank. Effluent water flowed through the dosing siphon to the trickling filter, which contained organisms that digest organic waste. Effluent from the filter was routed to a final clarifying tank before discharging to the NPDES-permitted outfall, EPA-SSS03S, which lies on the east edge of the site on top of unstabilized fill about 20 ft high. Discharge from the outfall has caused an erosion gully through the fill into an unlined drainage channel leading into a tributary of S-Site Canyon (LANL 1993, 020948, pp. 5-133-5-135).

#### 2.2.5.1 Site Descriptions and Potential Contaminants

**SWMU 16-004(a)** is an inactive concrete Imhoff tank (structure 16-530), a sewage treatment tank in which digestion and settlement take place in separate compartments (Figure 1.1-3). The Imhoff tank received solids that the comminutor had shredded into fine particles. In addition to its function as a settling box, the Imhoff tank also offered some sludge digestion capability. Effluent from the boxes flowed over a weir into a dosing siphon. Periodically, sludge that collected in the tank would be discharged into two drying beds, SWMU 16-004(d) and SWMU 16-004(f) (LANL 1993, 020948, p. 5-134).

**SWMU 16-004(b)** is an inactive trickling filter (structure 16-531), a wastewater treatment system that biodegrades organic matter and can also be used for nitrification (Figure 1.1-3). The trickling filter received effluent from the dosing siphon and contained organisms that digest organic waste. This filter was equipped with a rotating arm that distributed water from the Imhoff tank over a pebble bed (LANL 1993, 020948, p. 5-133).

**SWMU 16-004(c)** is the final tank (structure 16-352) that received discharge water from the trickling filter (Figure 1.1-3). The tank is currently inactive. An insert in the bottom of this tank received discharged water from the trickling filter. Water spilled over the insert into a surrounding trough and then flowed to an outlet at the southeast corner of the clarifier and discharged to a metering outfall box and to the NPDES-permitted outfall (EPA-SSS03S). The outfall discharged into a tributary of Water Canyon (LANL 1993, 020948, p. 5-133).

**SWMUs 16-004(d) and 16-004(f)** are the two, inactive sludge-drying beds (structures 16-533 and 16-535) located downgradient and southeast of the Imhoff tank (Figure 1.1-3). When the bottom of the Imhoff tank was periodically siphoned, the sludge flowed to the inlet valve on the west end of each bed. Sludge from the drying beds was monitored quarterly for radioactivity and tritium before it was removed and disposed of at MDA G (LANL 1993, 020948, p. 5-133).

**SWMU 16-004(e)** is a screen (structure 16-534) made of round bars that filtered out large solids (Figure 1.1-3). The screen was later discarded at the northwest corner of the site and replaced by the comminutor box (LANL 1993, 020948, p. 5-134). However, a site visit in March 2007 failed to locate the screen (Birdsall 2007, 097416).

The WWTP discharged to an NPDES-permitted outfall (EPA-SSS03S), which was monitored for total metals, organic chemicals, and pesticides. Effluent was monitored bimonthly for radionuclides and standard parameters for wastewater systems (e.g., biological oxygen demand, chemical oxygen demand, total dissolved solids [TDS] and anions). Data submitted for the NPDES Application indicated “all hazardous constituents were well below acceptable levels for water” and that all values for organic compounds were below detection limits (LANL 1993, 020948, pp. 5-133-5-135).

In 1988, three grab samples of sludge were collected from the drying bed, structure 16-535. Field screening indicated organic vapors in excess of 1000 parts per million (ppm). Radiation monitoring showed background levels of activity. All three samples were sent for laboratory analysis for VOCs, inorganic chemicals, HE, gamma analysis, plutonium, strontium and total uranium. Gamma analysis indicated concentrations of Cesium-137 in the three samples, ranging from 40 to 63 pCi/kg. Other radionuclide results included plutonium-238 (9 to 16 pCi/kg), plutonium-239 and plutonium-240 (72 to 168 pCi/kg), total uranium (12,000 to 13,000 µg/kg), and strontium-90 (<650 to <780 pCi/kg) for the three samples. Six VOCs overall were detected at concentrations ranging from 170 to 28,000 µg/kg. Five metals were detected in all samples: barium ranging from 610–1180 mg/kg, chromium ranging from 60 to 140 mg/kg, copper at 220 to 430 mg/kg, silver ranging from 73 to 110 mg/kg, and zinc at 970 to 1830 mg/kg). Beryllium was detected in one sample at 7.4 mg/kg. No HE was detected (DOE 1989,

015364). Beryllium was identified in concentrations above the BV in the sludge. However, the sludge was regularly removed from the beds and disposed of at Area G at TA-54 (LANL 2007, 097685, Appendix E) (LANL 1993, 020948, pp. 5-135-5-138).

The potential contaminants of concern for the WWTP SWMUs are HE, radionuclides, organic chemicals (including solvents), inorganic chemicals, cyanide, and anions (including nitrate and perchlorate) (LANL 1993, 020948, p. 5-133).

### 2.3 300s Line Subaggregate

The 300s Line Subaggregate consists of several HE-processing buildings and their associated rest houses (Figure 1.1-4 and Table 1.1-2). Construction of the 300s Line began in August 1951 and was completed in November 1953. The primary function of the 300s Line was casting, machining, and pressing HE components for the development of nuclear weapons. Over the years, the various functions of the 300s Line evolved as technologies in explosives advanced. In 1958, the 300s Line moved from casting HE to developing plastic bonded explosives. Only one building, building 11-302, continued to cast HE after 1958. In 1962 or 1963, building 300, the northernmost building in the facility, was converted to an inert processing facility (Barr 1992, 052964.4).

The HE-processing buildings (buildings 16-300, 16-302, 16-304, and 16-306) are located on the east side of the facility. Each building has two HE sumps. HE-contaminated water from the buildings flowed into the sumps and discharged to a shared liquid-waste trunk line on the northeast side of the buildings. The effluent flowed along the waste trunk line into a well-defined drainage discharging through an NPDES-permitted outfall (EPA-05A058) across the road and southwest of building 16-306. The outfall was removed from the NPDES permit in 1996.

The rest houses (buildings 16-301, 16-303, 16-305, and 16-307) are located on the west side of the facility. The rest houses were built to store HE and other weapons components used in the HE-processing buildings. Each rest house has a pair of concrete rectangular HE sumps with removable aluminum lids and associated outfalls. HE-contaminated water from the rest houses flowed into the sumps where the larger particles were collected by a removable, cloth filter bag. The larger HE particles were trapped by the filter bags or settled in the bottom of the sump and were periodically removed and burned offsite. The effluent from each sump drained through an outfall to a drainage adjacent to the roadway west of the rest houses.

Solvents used in the HE-processing buildings (16-302, 16-304, and 16-306) were stored in the southernmost rest house, building 16-307. Effluent from buildings 16-302, 16-304, and 16-306 discharged through the outfall across the road and southwest of building 16-306. Effluent from building 16-307 entered the low-lying area northwest of the building and commingled with the effluent from the HE-processing buildings before entering the shared drainage southwest of building 16-306.

The 300s Line Subaggregate includes 22 SWMUs and AOCs (Table 1.1-1); however, 8 of these are not included in this work plan for the following reasons:

- two [AOCs C-16-056 and C-16-057] have been approved by EPA;
- one [SWMU 16-026(f)] is pending NFA determination by NMED; and
- five [SWMUs 16-012(i), 16-012(j), 16-012(k), 16-012(l), and 16-012(m)] have been previously removed from Module VIII of the Laboratory's HWFP by NMED.

The remaining 14 SWMUs are included in this work plan (Figure 1.1-4 and Table 1.1-2). This work plan organizes the sites in the 300s Line Subaggregate into sumps and an associated dry well and HE sumps and outfalls.

The historical sampling locations and analytical data are shown in Figures 2.3-1–2.3-8 and Tables 2.3-1–2.3-3. The text in the following sections are summarized from the detailed descriptions of the SWMUs and AOCs found in the HIR (LANL 2007, 097685).

### 2.3.1 SWMU 16-026(z): Area of Potentially Contaminated Soil

#### 2.3.1.1 Site Description and Potential Contaminants

**SWMU 16-026(z)** is an area of potentially contaminated soil associated with an outfall from building 16-306 (Figure 1.1-4). Building 16-306 was constructed between 1951 and 1953. SWMU 16-026(z) extends from the roof drain spout of building 16-306 to an asphalt-paved drainage ditch (LANL 1995, 057225).

No sampling investigations have been conducted at this SWMU (LANL 2007, 097685); however, based on the plastics component development operations that occurred in building 16-306, the potential contaminants of concern are organic solvents, HE, perchlorate, nitrate, and inorganic chemicals.

### 2.3.2 SWMUs 16-001(e), 16-003(d), 16-003(e), 16-003(f), and 16-003(g): HE Sumps and Associated Dry Well

SWMUs 16-003(d), 16-003(e), 16-003(f), and 16-003(g) are the HE sumps associated with the HE-processing buildings (16-300, 16-302, 16-304, and 16-306, respectively). SWMU 16-001(e) is the dry well located in the drainage near the NPDES-permitted outfall, EPA-05A058, across the road and southwest of building 16-306.

#### 2.3.2.1 Site Descriptions and Potential Contaminants

**SWMU 16-001(e)** is an inactive dry well associated with the HE-processing buildings (Figure 1.1-4). SWMU 16-001(e) is located near the former NPDES-permitted outfall (EPA-05A058) and was constructed in the 1980s. However, the dry well never functioned properly because it was constructed in a tuff with a low permeability (LANL 1993, 020948). The dry well was never used for its intended purpose; it was backfilled with soil and capped with concrete. The soil used to backfill the dry well was most likely collected from the immediate surrounding area and may have been contaminated (LANL 1993, 020948, p. 5-26; LANL 1995, 057225).

In 1995, three surface and subsurface samples were collected at SWMU 16-001(e) and screened for organic chemicals and radionuclides. Organic chemicals were detected in one sample and radionuclides were detected above background in all three samples (LANL 2007, 097685, Appendix D). However, the background readings were not documented; therefore, the field-screening data is of limited use (ICF Kaiser Engineers 1995, 091135, pp. 70-71).

**SWMU 16-003(d)** is two inactive HE sumps associated with building 16-300 (Figure 1.1-4). Building 16-300 was constructed between 1951 and 1953 and was initially an HE-casting facility that was later converted into a mock explosives preparation facility. The raw materials used in this building include pentaerythritol (an organic compound used in the preparation of explosives), barium nitrate, cyanuric acid, and nitrocellulose (LANL 1993, 020948, p. 5-24; LANL 1995, 057225).

No sampling investigations have been conducted at SWMU 16-003(d).

**SWMU 16-003(e)** is two inactive HE sumps associated with building 16-302 (Figure 1.1-4). Building 16-302 was constructed between 1951 and 1953 for HE casting. Explosives were melted in kettles and poured into molds. The molds and kettles were cleaned with high-pressure, high-temperature water that drained into the sumps.

Explosives cast in this building included Composition-B (a composite of RDX and TNT), Baratol (a compound of barium nitrate and TNT with a wax binder), and TNT. In 1954, concentrations of anthracene in air were detected in building 16-302 and in TNT casting samples (LANL 1933, 020948, p. 5-25; LANL 1995, 057225. Solvents were used during building 16-302 operation and discharged directly into the sumps (LANL 1993, 020948, p. 5-25; LANL 1995, 057225).

In September 1979, a total of eight samples were collected over a four-day period. The samples were taken from the water within SWMU 16-003(e), two HE sumps associated with building 16-302, and sent to a laboratory to be analyzed for HMX, RDX, and TNT. HMX concentrations ranged from 1 to 8 ppm, RDX ranged from 16 to 63 ppm, and TNT ranged from 54 to 199 ppm (LASL 1979, 057081). In addition to the water samples, two subsurface soil samples were collected from two sampling locations (16-01443 and 16-01647) in the vicinity of the southernmost sump during 1995. Metals were detected above BVs and HE was detected. No samples were collected from the vicinity of the northern sump (Figures 2.3-1–2.3-8 and Tables 2.3-1–2.3-3) (LANL 2007, 097685, Appendix B).

In 1995, seven subsurface samples were collected at SWMU 16-003(e) and screened for organic chemicals. Organic chemicals were detected in three of the samples (LANL 2007, 097685, Appendix D). However, the background readings were not documented; therefore, the field-screening data is of limited use (ICF Kaiser Engineers 1995, 091135, pp. 72-73).

**SWMU 16-003(f)** is two inactive sumps associated with building 16-304 (Figure 1.1-4). Building 16-304 was constructed between 1951 and 1953 for the development and production of plastics and plastic components for the weapons program. The operations at building 16-304 consisted of molding and fabricating plastics using large molding machines, hydraulic presses, and high-temperature ovens.

Solvents were used in the building during operation and discharged directly into the sumps. HE was reportedly not used at this building (LANL 1993, 020948, p. 5-25; LANL 1995, 057225).

In 1995, 11 surface samples were collected at SWMU 16-003(f) and screened for organic chemicals and radionuclides. All screening results were negative(ICF Kaiser Engineers 1995, 091135; LANL 2007, 097685, Appendix D).

**SWMU 16-003(g)** is two inactive HE sumps associated with building 16-306 (Figure 1.1-4). Building 16-306 was constructed between 1951 and 1953 for the development and production of plastics and plastic components for the weapons program.

Building 16-306 activities included molding polysiloxane foam and polyurethane components, intrusion molding, and epoxy and laminate work. In 1959, levels of toluene diisocyanate above the permissible exposure limit were discovered by workers (LASL 1959, 021538). In 1971, building 16-306 was one of the largest users of solvents at S-Site. Solvents potentially used in this building include acetone; 1,1,1 trichloroethane; trichlorofluoromethane; and methylene chloride. These solvents were discharged directly into the sumps (LANL 1993, 020948, p. 5-26; LANL 1995, 057225).

No sampling investigations have been conducted at SWMU 16-003(g). Based on historical analytical sampling and the operational history of the site, the potential contaminants of concern are HE, perchlorate, nitrate, organic chemicals, and inorganic chemicals.

### 2.3.3 SWMUs 16-026(b), 16-026(c), 16-026(d), 16-026(e), 16-029(a), 16-029(b), 16-029(c) and 16-029(d): HE Sumps, Outfalls, and Associated Drainlines

SWMUs 16-026(b), 16-026(c), 16-026(d), 16-026(e), 16-029(a), 16-029(b), 16-029(c), and 16-029(d) are the HE sumps, outfalls, and drainlines associated with the rest houses (buildings 16-307, 16-305, 16-303, and 16-301, respectively).

#### 2.3.3.1 Site Descriptions and Potential Contaminants

**SWMU 16-026(b)** is the outfall that received discharges from the two inactive HE sumps at building 16-307, SWMU 16-029(a) (Figure 1.1-4). SWMU 16-026(b) is located on the east side of building 16-307. Building 16-307 was a rest house built between 1951 and 1953 that stored molds and other materials used in the plastics development at building 16-306. In addition, the building housed a solvent disassembly tank that chemically stripped HE from test devices. Releases from the solvent tank are the main cause of HE contamination in the drainage channel (Panowski and Salgado 1971, 015271; LANL 1993, 020948, p. 5-27; LANL 1995, 057225).

In 1995, eight field-screening samples were collected from four locations within SWMUs 16-026(b) and 16-029(a). Four of the samples from SWMU 16-026(b) tested positive for radionuclides (gamma) at a depth of 6 ft. One surface sample was positive for HE, and one surface and one subsurface sample were positive for organic vapors. All eight samples were submitted to a laboratory for analysis of inorganic chemicals, HE, and SVOCs. Metals were detected above BVs (primarily barium and uranium), and polycyclic aromatic hydrocarbon (PAHs) and HE were detected in surface and subsurface samples (ICF Kaiser Engineers 1995, 091135). Seven surface samples were collected and screened for organic chemicals, HE, and radionuclides using an HE spot test, photoionization detector (PID), and sodium iodide (NaI) scintillation detector. HE was detected above background in four of the screening samples and organic chemicals were detected above background in three of the samples. All seven screening samples had detections of radionuclides above BVs (LANL 2007, 097685, Appendix D). One sample, location 16-01453, collected from SWMU 16-029(a) detected inorganic chemicals above BVs, and HE and organic chemicals were detected (Figures 2.3-1–2.3-8 and Tables 2.3-1–2.3-3) (LANL 2007, 097685, Appendix B).

Based upon the analytical results, vertical extent is not defined along the length of the SWMU 16-026(b): no samples were collected below or downgradient of where contaminants were last detected; only surface samples were collected, or samples were not submitted for analysis. The extent of contamination along the length of the SWMUs has not been defined because samples collected at the end of the defined boundary were not submitted for analysis. In addition, field-screening samples were positive for radionuclides (gamma by sodium iodide) but were not submitted for laboratory analysis.

**SWMU 16-026(c)** is the outfall that received discharges from the two inactive HE sumps at building 16-305, SWMU 16-029(b) (Figure 1.1-4). SWMU 16-026(c) is located south of building 16-305, a rest house. Building 16-305 was built between 1951 and 1953 and was used to store the raw materials used in the casting process including chemicals and solvents used for plastics development and production in buildings 16-304 and 16-306. Building 16-305 was also used for filament winding of developmental weapons components (LANL 1993, 020948, pp. 5-27-5-28; LANL 1995, 057225; LANL 1997, 062539).

In 1995, 23 samples were collected from thirteen locations within SWMUs 16-026(c) and 16-029(b). All 23 samples were field screened by an HE spot test, PID, and sodium iodide (NaI) scintillation detector (LANL 2007, 097685, Appendix D). All screening results were nondetects or below background levels. Eleven samples from seven locations [only one location from SWMU 16-029(b)] were submitted to a laboratory for analysis of inorganic chemicals, HE, and SVOCs. Metals were detected above BVs (primarily barium) were detected in surface and subsurface samples. TNT was detected in one sample from 1.0 to 1.5 ft below surface. No samples below 1.5 ft were collected at this location (Figures 2.3-1–2.3-8 and Tables 2.3-1–2.3-3) (LANL 1993, 020948; ICF Kaiser Engineers 1995, 091135; LANL 2007, 097685, Appendix B).

Based upon the analytical results, the vertical extent of contamination is not defined along the length of SWMU 16-026(c): no samples were collected below or downgradient of where contaminants were last detected, only surface samples were collected, or samples were not submitted for analysis. Therefore, the nature and extent of contamination at this SWMU has not been defined.

**SWMU 16-026(d)** is the outfall that received discharges from the two inactive HE sumps at building 16-303, SWMU 16-029(c) (Figure 1.1-4). SWMU 16-029(d) is located southwest of building 16-303, a rest house. Building 16-303 was built between 1951 and 1953 and was used to store raw materials used in the casting process and HE castings produced in the casting buildings 16-302 and 16-304 (LANL 1993, 020948, p. 5-28; LANL 1995, 057225; LANL 1997, 062539).

In 1995, 12 samples were collected from 7 locations and submitted to a laboratory for analysis of metals, HE, and SVOCs (Figures 2.3-1–2.3-8). Metals and PAH compounds were detected in surface and subsurface samples. TNT and RDX were detected in one sample (Tables 2.3-1–2.3-3) (ICF Kaiser Engineers 1995, 091135; LANL 2007, 097685, Appendix B). In addition, samples collected at SWMU 16-026(d) were field screened for the presence of HE and organic vapors (LANL 1997, 062539, p. 5). Two screening samples were positive for PAHs (LANL 2007, 097685, Appendix D); however, the elevated readings were attributed either to the nearby asphalt access road or to roofing tar from nearby buildings (LANL 1997, 062539, pp. 82-84).

**SWMU 16-026(e)** is the outfall that received discharge from the two inactive HE sumps at building 16-301, SWMU 16-029(d) (Figure 1.1-4). SWMU 16-026(e) is located southwest of building 16-301, a rest house. Building 16-301 was built between 1951 and 1953 and was used to store raw materials for the HE-casting facility and the mock HE-processing operations at buildings 16-302 and 16-300, respectively. In 1995, the operations at building 16-301 changed to an environmental testing laboratory where weapons and other components were being subjected to extreme temperatures, pressures, and humidity (LANL 1993, 020948, p. 5-28; LANL 1995, 057225).

Based upon the analytical results, the vertical extent of contamination is not defined for SWMU 16-026(d): no samples were collected below or downgradient of where contaminants were last detected; only surface samples were collected, or samples were not submitted for analysis. Therefore, the extent of contamination along the length of the SWMU has not been defined.

**SWMU 16-029(a)** is two inactive HE sumps located outside of building 16-307, a rest house (Figure 1.1-4). Building 16-307 was constructed between 1951 and 1953. SWMU 16-029(a) discharged to SWMU 16-026(b), the outfall and drainage channel located east of building 16-307. Building 16-307 was used to store molds and other materials used in the plastics development facilities. The building also housed a solvent disassembly tank used to strip HE chemically from test devices (LANL 1993, 020948, p. 5-27; LANL 1995, 057225).

In 1995, eight field-screening samples were collected from four locations within SWMU 16-026(b) and SWMU 16-029(a). Four of the samples from SWMU 16-026(b) tested positive for radionuclides (gamma) at a depth of 6 ft. One surface sample was positive for HE, and one surface and one subsurface sample were positive for organic vapors. All eight samples were submitted to a laboratory for analysis of inorganic chemicals, HE, and SVOCs. Metals were detected above BVs (primarily barium and uranium), and PAHs and HE were detected in surface and subsurface samples (ICF Kaiser Engineers 1995, 091135). Seven surface samples were collected and screened for organic chemicals, HE, and radionuclides using an HE spot test, PID, and sodium iodide (NaI) scintillation detector. HE was detected above background in four of the screening samples, and organic chemicals were detected above background in three of the samples. All seven screening samples had detections of radionuclides above BVs (LANL 2007, 097685, Appendix D). One sample, location 16-01453, collected from SWMU 16-029(a) detected inorganic chemicals above BVs, and HE and organic chemicals were detected (Figures 2.3-1–2.3-8 and Tables 2.3-1–2.3-3) (LANL 2007, 097685, Appendix B).

**SWMU 16-029(b)** is two inactive HE sumps located outside of building 16-305, a rest house (Figure 1.1-4). Building 16-305 was constructed between 1951 and 1953. SWMU 16-029(b) discharged to SWMU 16-026(c), the outfall and drainage channel located southwest of building 16-305. Building 16-305 was used to store chemicals and solvents used for plastics development and production. Building 16-305 was also used for filament winding of developmental weapons components (LANL 1993, 020948, p. 5-28; LANL 1995, 057225). No samples were collected from SWMU 16-029(e).

In 1995, 23 samples were collected from 13 locations within SWMU 16-026(c) and SWMU 16-029(b). All 23 samples were field screened by an HE spot test, PID, and sodium iodide (NaI) scintillation detector (LANL 2007, 097685, Appendix D). All screening results were nondetects or below background levels. Eleven samples from seven locations [only one location from SWMU 16-029(b)] were submitted to a laboratory for analysis of inorganic chemicals, HE, and SVOCs. Metals were detected above BVs (primarily barium) were detected in surface and subsurface samples. TNT was detected in one sample from 1.0 to 1.5 ft below surface. No samples below 1.5 ft were collected at this location (Figures 2.3-1–2.3-8 and Tables 2.3-1–2.3-3) (LANL 1993, 020948; ICF Kaiser Engineers 1995, 091135; LANL 2007, 097685, Appendix B).

**SWMU 16-029(c)** is two inactive HE sumps located outside of building 16-303, a rest house (Figure 1.1-4). Building 16-303 was constructed between 1951 and 1953. SWMU 16-029(c) discharged to SWMU 16-026(d), the outfall and drainage channel located to the southwest of building 16-303. Building 16-303 was used to store the raw materials for the HE-casting facility, building 16-302 (LANL 1993, 020948, p. 5-28; LANL 1995, 057225). No samples were collected from SWMU 16-029(c).

No sampling investigations have been conducted at SWMU 16-029(c).

**SWMU 16-029(d)** is two inactive HE sumps located outside of building 16-301, a rest house (Figure 1.1-4). Building 16-301 was constructed between 1951 and1953. SWMU 16-029(d) discharged to SWMU 16-026(e), the outfall and drainage channel located southwest of building 16-301. Building 16-301 was used to store the raw materials for the HE-casting facility and the mock HE-processing operation, (buildings 16-302 and 16-300, respectively). In 1995, the operations at building 16-301 changed to an environmental testing laboratory where weapons and other components were subjected to extreme temperatures, pressures, and humidity (LANL 1993, 020948, p. 5-28; LANL 1995, 057225). No samples were collected from SWMU 16-029(d).

In 1995, samples were collected from SWMUs 16-026(e) and 16-029(d). Details of the field screening were not found. Eleven samples from SWMU 16-026(e) were collected from six locations and submitted to a laboratory for analysis of inorganic chemicals, HE, and SVOCs. Two subsurface samples were also

collected at location 16-01657 during field activities in 1997. No samples were collected from SWMU 16-029(d). Metals were detected above BVs (primarily barium), and PAHs and HE were detected in surface and subsurface samples. HE was detected at numerous locations, at numerous depths, throughout the length of SWMU 16-026(e). No HE was detected in surface soils at sampling location 16-01476, which is the location farthest from the potential source (Figures 2.3-1–2.3-8 and Tables 2.3-1–2.3-3) (LANL 2007, 097685, Appendix B).

The HE-processing buildings shared a liquid waste trunk line that runs from building 16-300 south to building 16-306. The trunk line discharged through an NPDES-permitted outfall (EPA-05A058) into a well-defined drainage across HE Road and southeast of building 16-306. In 1989, three water and three sediment samples were collected as part of the NPDES permit for the outfall (EPA-05A058) associated with building 16-300 (LANL 2007, 097685, Appendix E). These samples were analyzed for HE, radionuclides, asbestos, organic chemicals, and inorganic chemicals. Organic chemicals, inorganic chemicals, and HE were detected in the both the water and sediment samples. Radionuclides were also detected in the sediment samples (DOE 1989, 015364, pp. 4.10-30-4.10-43).

Based on historical analytical sampling and the operational history of the site, the potential contaminants of concern are HE, perchlorate, nitrate, uranium, organic chemicals, and inorganic chemicals.

## 2.4 V-Site Subaggregate

The V-Site Subaggregate is located at the eastern edge of the old World War II-era complex and includes three main areas: the courtyard, the HE-processing buildings and electroplating laboratory, and HE magazines and research and development (R&D) buildings (Figure 1.1-5).

The courtyard area is an open storage area that at one time was surrounded on three sides by buildings. To the west, the courtyard was bounded by buildings 16-516 and 16-517. These buildings were used as a laboratory, for equipment storage, and to assemble and fit test the first nuclear devices such as the Fat Man. Buildings 16-519, 16-520, and 16-522 (only the foundation) bordered the courtyard to the south. Buildings 16-519 and 16-520 were used for the varnishing and assembly of Fat Man mockups and later for photoprocessing and storage. Buildings 16-516 and 16-517 are the only two surviving structures remaining after the Cerro Grande fire (LANL 2000, 066885, p. 1). Most of these buildings were constructed in the mid 1940s and were destroyed in the 2000 Cerro Grande fire. Building 16-522 was constructed in 1944 and removed in 1945. There is no documentation regarding its operations or use. An open-sided and covered storage area, structure 16-518, bordered the courtyard to the east before 2000. The period of operation of this structure is estimated at 50 yr beginning in the early 1940s.

Buildings 16-515 and 16-100 were the HE-processing buildings and electroplating laboratories located west of the courtyard area. Building 16-515 was constructed in the 1940s and was razed in the 2000 Cerro Grande fire. Only the concrete slab and steel beams remain. Operations in this building included HE processing and casting; electroplating; HE component testing, inspection, and repair; x-ray and photoprocessing; and storage. Building 16-100 was constructed in the 1940s and decommissioned by burning in the 1960s. This building was used as an HE-processing and electroplating laboratory.

Two HE magazines (buildings 16-066 and 16-084) were located southwest of V-Site. These buildings were used to store HE. The two buildings were constructed in the 1940s and were flash-burned before demolition in 1960. Two R&D buildings (buildings 16-083 and 16-086) were also located southwest of V-Site. These buildings were constructed in the 1940s and removed in 1960. Two additional HE magazines, buildings 16-061 and 16-073, were also constructed in the 1940s. Building 16-061 was located approximately 600 ft south of the courtyard, and building 16-073 was located approximately 350 ft northwest of the courtyard (LANL 1994, 039440).

V-Site was burned over during the 2000 Cerro Grande fire razing most of its remaining structures except for buildings 16-516 and 16-517. Building 16-516 [SWMU 16-017(t)-99] is the historic High Bay assembly building where parts of the first atomic bomb were fit tested before its transport and detonation at the Trinity Site (LANL 2000, 066885, p. 2).

The V-Site Subaggregate includes 26 SWMUs and AOCs (Table 1.1-1); however, 5 of these are not included in this work plan for the following reasons:

- Four [AOCs 25-001, C-16-007, C-16-059, and C-25-001] have been approved by EPA; and
- One [SWMU 16-034(g)] has been previously removed from Module VIII of the Laboratory's HWFP by NMED.

The remaining 21 inactive sites are included in this work plan and include 17 SWMUs and 4 AOCs (Figure 1.1-5 and Table 1.1-2). This work plan organizes the sites in the V-Site Subaggregate into areas of potentially contaminated soil (including a septic system and drainline); and former storage areas, pump, and a concrete pit formerly used for vibration tests.

The following text is summarized from the detailed SWMU and AOC information found in the HIR (LANL 2007, 097685).

### 2.4.1 AOC C-16-068; SWMUs 16-017(q)-99, 16-017(v)-99, 16-025(x), 6-029(w), 16-029(x)], 16-017(p)-99, 16-017(w)-99, 16-034(m), and 16-034(n) and AOCs 16-024(m) and 16-024(n): Areas of Potentially Contaminated Soil

#### 2.4.1.1 Site Descriptions and Potential Contaminants

**AOC C-16-068** is potentially contaminated soil associated with former building 16-522, which has not been located on any existing drawings or photographs (Figure 1.1-5). Building 16-522 was constructed in 1944 and removed in 1945. An unidentified building foundation located west of building 16-519 is presumed to be the location of former building 16-522 (LANL 1994, 039440, p. 5-506; LANL 1997, 055512, p. 8; LANL 1997, 056569, p. 24). No documentation is available to indicate what the building may have been used for; however, a former Laboratory site worker suggested that building 16-522 was contaminated with beryllium (Blackwell 1983, 005823; LANL 1997, 055512, p. 8; LANL 1997, 056569, p. 24).

Four surface soil samples were collected from four locations within the former location of building 16-522 in 1997 at AOC C-16-068. Samples were collected from within the building's foundation and were field screened for HE using the HE spot test kit (LANL 2007, 097685, Appendix D). No HE was detected. Two of these samples (locations 16-03028 and 16-03030) were also screened using the D-TECH kits for TNT and RDX. RDX was detected in one of the samples (location 16-03028). Barium, copper, and lead were also detected in the two samples. No field-screening results were reported for the other two samples collected. One sample (location 16-03028) was submitted for laboratory analysis of radioactivity, HE, inorganic chemicals, SVOCs, VOCs. No metals above BVs were detected in this sample; however, bis(2-ethylhexyl)phthalate and PAHs were detected (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (LANL 1997, 056569, pp. 24-27; LANL 2007, 097685, Appendix B).

To the northwest of AOC C-16-068 and south of SWMU 16-006(h), three subsurface samples were collected from locations 16-05813 and 16-05819 and submitted for laboratory analysis. Metals above BVs were the primary analytes detected in the three samples (LANL 1999, 063973; LANL 2007, 097685, Appendix B).

Based on the historical analytical data, operational history of the site and information from a former site worker, the potential contaminants of concern for AOC C-16-068 are HE, uranium, inorganic and organic chemicals, nitrate, and perchlorate.

**SWMU 16-017(q)-99** is structure 16-517, which was constructed in 1944 and originally used as a laboratory (Figure 1.1-5). Structure 16-517 was later used as an equipment storage building (LANL 1994, 039440, pp. 5-503, 6-32). SWMU 16-017(q)-99 was one of two structures that survived the Cerro Grande fire (LANL 2000, 066885, p. 1).

No sampling investigations have been conducted at this SWMU (LANL 2007, 097685); however, based on the operational history, the potential contaminants of concern are HE, uranium, organic chemicals, inorganic chemicals (e.g., silver), cyanide, nitrate, and perchlorate.

**SWMU 16-017(v)-99** is an area of potentially contaminated soil associated with former HE-processing building 16-515 (Figure 1.1-5). Building 16-515 was built in 1944 and housed a warehouse, shop, and a small office. In 1945, the building was remodeled into a laboratory, inspection room, and repair area for HE parts. The primary operations in building 16-515 included x-ray work and photoprocessing in the west end of the building and HE casting in the east end of the building in the 1950s and 1960s (LANL 1999, 063973, p. 6). Parts of the walls near the x-ray machine were covered with lead. The inspection and repair room floors were fitted on three sides with lead-lined troughs that captured HE wastes from the casting room. The lead was removed from the troughs in 1950. In 1963, the laboratory area was remodeled to include a temperature-cycling chamber. The building was later used as a warehouse (LANL 1998, 063069, p. 16). During a March 2007 site visit, it was noted that all that remained of building 16-515 was the iron framework and hoist steel beams on the concrete pad (Birdsall 2007, 097416).

No sampling investigations have been conducted at this SWMU (LANL 2007, 097685); however, based on the operational history of the facility, the potential contaminants of concern are photoprocessing chemicals, inorganic chemicals associated with plating operations, other World War II-era V-Site operations materials, HE, uranium, organic chemicals, nitrate, and perchlorate.

**SWMU 16-025(x)** is an area of potentially contaminated soil associated with former electroplating laboratory, building 16-100, which was located southwest of the V-Site enclave (Figure 1.1-5). According to engineering drawings, building 16-100 contained a utility room and a workroom. Building 16-100 was decontaminated and decommissioned (D&D) by burning in 1960 (LANL 1994, 039440, p. 5-504; LANL 1997, 055653, p. 7). Interviews with a former site worker indicated that HE charges were directly electroplated in this laboratory (Martin and Hickmott 1994, 052964.594). In 1997, the drainline and sump from building 16-100 were removed (IT Corporation 1999, 087145, pp. 54-56).

Concurrent with D&D activities in 1997, eight samples were collected at SWMU 16-025(x) and screened for HE and inorganic chemicals. The samples tested positive for RDX, barium, copper, and lead (LANL 2007, 097685, Appendix D). Based on the screening results, three samples from locations 16-0315, 16-0317, and 16-03022 were submitted for laboratory analysis of inorganic chemicals, radionuclides, HE, and organic chemicals. An additional three samples were collected in 1999 from the tuff at depths from 3 to 6 ft bgs at location 16-03409 and submitted for laboratory analysis. Detected analytes in the three samples include lead and uranium above BVs and PAHs. No HE was detected in the three samples. The results of the tuff samples from location 16-03409 indicated the presence of metals detected above BVs and solvents (e.g., acetone and perchloroethylene) (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (IT Corporation 1999, 087145, pp. 54-56; LANL 2007, 097685, Appendix B).

Based on historical field-screening and analytical results and the operational history of the building 16-100, the potential contaminants of concern are photoprocessing chemicals, inorganic chemicals

associated with plating operations, other World War II-era V-Site operations materials, HE, uranium, organic chemicals, nitrate, and perchlorate.

**SWMU 16-029(w)** is an area of potentially contaminated soil associated with the inactive HE sump, drainline, and outfall from the former electroplating laboratory, building 16-100 (Figure 1.1-5). The HE sump was located on the east side of building 16-100 and drained into a manhole (structure 16-796) and then to the V-Site outfall through SWMU 16-029(x). The building, sump, and line were removed in 1960 (LANL 1994, 039440, p. 5-504; LANL 1997, 055653, p. 7). In 1997, the drainline and sump from building 16-100 were removed (IT Corporation 1999, 087145, pp. 91-97).

Concurrent with D&D activities in 1997, two subsurface (3.0–3.5 ft bgs) soil samples from SWMU 16-029(w) were collected from location 16-03077 and submitted to a laboratory for analysis of HE, PCB, organic and inorganic chemicals, and pesticides. Metals were detected above BVs, and HMX, RDX, TNT, methylene chloride, perchloroethylene, DDT (dichlorodiphenyltrichloroethane), and toluene were detected in the soil sample. Subsurface tuff samples were collected from two locations (16-05985 and 16-05987) at depths from 5.5 to 6.0 ft and 4.3 to 5.5 ft bgs, respectively. The sample from location 16-05985 was analyzed for SVOCs, and the sample from location 16-05987 was analyzed for HE, inorganic chemicals, and VOCs. Only acetone was detected in the two tuff samples (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (IT Corporation 1999, 087145, pp. 91-97; LANL 2007, 097685, Appendix B).

Based on the historical analytical data and the operational history of the building associated with the SWMU, the potential contaminants of concern are photoprocessing chemicals, inorganic chemicals associated with plating operations, and other World War II-era V-Site operations materials, HE, uranium-238, organic chemicals, nitrate, and perchlorate.

**SWMU 16-029(x)** is an area of potentially contaminated soil (surface and subsurface) associated with an HE sump, drainline, manholes, outfall, and resulting outfall pond area (Figure 1.1-5). The inactive HE sump was connected to floor troughs at former HE-processing building 16-515 [SWMU 16-017(v)-99]. The drainline daylighted approximately 800 ft southeast of building 16-515. Branch lines from septic tank 16-527 [SWMU 16-006(g)] and building 16-100 [SWMU 16-025(x)] entered into the system at manhole 16-795. In addition, SWMU 16-031(c), a sanitary and industrial waste drainline from building 16-515, connected into SWMU 16-029(x). The entire drain system then discharged into a low swale, and from there into a drainage ditch beside K-Site Road. A 1970 survey for hazardous material in the drainline found no toxic substances or radioactive contamination but did detect HE contamination (LANL 1994, 039440, pp. 5-504-5-505; LANL 1997, 055653, p. 8; LANL 1998, 063069, pp. 41-42) . In 1997, the drainline and sump from building 16-515 and 3 $yd^3$ of contaminated soil were removed based on field-screening results (IT Corporation 1999, 087145, pp. 98-119).

Concurrent with D&D activities in 1997, 18 subsurface soil and 10 subsurface tuff samples were collected from 18 biased locations (breaks, joints, and cracks found in pipes or sumps and to the pond) from 0.0 to 0.5 ft below the drainline at SWMU 16-029(x). The samples were submitted to a laboratory for analysis of inorganic chemicals, HE, SVOCs, VOCs, PCB, and pesticides (not all suites for all samples). Metals were detected above BVs (primarily boron, barium, silver, and uranium), HE (RDX, HMX, and TNT), methylene chloride, and perchloroethylene (PCE) were the primary analytes detected (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (IT Corporation 1999, 087145, pp. 98-120; LANL 2007, 097685, Appendix B).

Based on historical analytical data in the vicinity and the operational history of the SWMU, the potential contaminants of concern are HE, uranium, boron, organic chemicals, inorganic chemicals, pesticides, nitrate, and perchlorate.

**SWMU 16-017(p)-99** is a former storage magazine (structure 16-61) located approximately 600 ft south of the V-Site courtyard and building 16-515 (Figure 1.1-5). SWMU 16-017(p)-99 underwent D&D in 1995 (LANL 1994, 039440, pp. 6-32).

No sampling investigations have been conducted at this SWMU (LANL 2007, 097685); however, based on the operational history of the SWMU, the potential contaminants of concern are HE, organic and inorganic chemicals, nitrate, and perchlorate.

**SWMU 16-017(w)-99** is a former storage magazine (structure 16-73) located northwest of building 16-515 (Figure 1.1-5). SWMU 16-017(w)-9 underwent D&D in 1995 (LANL 1994, 039440, pp. 6-32).

No sampling investigations have been conducted at this SWMU (LANL 2007, 097685); however, based on the operational history of the SWMU, the potential contaminants of concern are HE, organic chemicals, inorganic chemicals, nitrate, and perchlorate.

**SWMU 16-034(m)** is an area of potentially contaminated soil associated with former laboratory building 16-086 (Figure 1.1-5). Building 16-086 was built in 1945 and may have been used to dry Plumbatol (a compound of lead, nitrate, and TNT) charges and store HE. Building 16-086 was decommissioned by burning in 1960 (LANL 1994, 039440, pp. 6-32).

In 1997, surface soil samples were collected from five locations within the footprint of SWMU 16-034(m) and screened for HE and radiation. One sample (location 16-04037) screened positive for HE. All samples showed only background radioactivity (LANL 2007, 097685, Appendix D). Two samples (location 16-04037 and 16-04038), one of which had screened positive for HE, were submitted for laboratory analysis of organic chemicals, inorganic chemicals, and HE. Copper, lead, silver, and zinc were detected above BVs and benzoic acid and phenol were detected in the samples (Figures 5.4-1–5.4-2 and Tables 5.1-1–5.1-5). No HE was detected in either of the laboratory samples (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (LANL 1997, 056660.289, pp. 208-214; LANL 2007, 097685, Appendix B).

Based on historical analytical data and operational history, the potential contaminants of concern are HE, organic chemicals, inorganic chemicals, nitrate, and perchlorate.

**SWMU 16-034(n)** is an area of potentially contaminated soil associated with former laboratory building 16-083 (Figure 1.1-5). Building 16-083 was built in 1945 and may have been used to dry Plumbatol charges or store HE. Building 16-083 was removed from service in 1959 and decommissioned by burning in 1960 (LANL 1994, 039440, p. 5-396).

No reports detailing the field investigation at SWMU 16-034(n) were located; therefore, information on the samples collected and field screened are not documented. However, two surface soil samples were collected from two locations and submitted for laboratory analysis of inorganic chemicals, HE, and SVOCs. Lead, mercury, and zinc were detected above BVs, and no organic chemicals were detected in either sample (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (LANL 2007, 097685, Appendix B).

Based on historical analytical data and operational history, the potential contaminants of concern are HE, nitrate, and perchlorate.

**AOC 16-024(m)** is an area of potentially contaminated surface soil associated with a former HE magazine (structure 16-66), which was a 6 ft × 6 ft × 7 ft high wood-frame building with a wooden floor and earthen barricades on three sides and on top (Figure 1.1-5). Structure 16-66 was located in the area northeast of building 16-037. HE magazines stored packaged HE and finished HE products before and after processing; however, no production-scale HE operations were conducted in the area. Structure 16-66 was built in the mid-1940s, and use of the structure was discontinued in 1959. Before the structure was

decommissioned by burning in 1960, the magazine was found to be contaminated with HE. Historical evidence documents that radioactive materials were not stored or used in the HE magazine. Residual debris from burning and the remaining subsurface were cleaned up in 1966 (LANL 1994, 039440, pp. 5-388-5-389; LANL 1997, 056660.289, pp. 68-69).

In 1997, field-screening samples were collected from four locations in and downgradient from AOC 16-024(m). Samples were field screened for HE and beta/gamma radioactivity. Field-screening results were negative (e.g., not detected) for radioactivity. One sample (location 16-04041) screened positive for HE and was submitted to a fixed laboratory for the analysis of inorganic chemicals, organic chemicals, and HE (LANL 2007, 097685, Appendix D). Cobalt was detected above BVs and bis(2-ethylhexyl)phthalate and benzoic acid were detected. HE was not detected (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (LANL 1997, 056660.289, pp. 69-74; LANL 2007, 097685, Appendix B).

Based on historical analytical data and the operational history of the AOC 16-024(m), the potential contaminants of concern are HE, inorganic chemicals (e.g., barium, lead, and chromium), nitrate, and perchlorate.

**AOC 16-024(n)** is a former HE magazine (structure 16-84) and the associated potentially contaminated surface soil (Figure 1.1-5). Structure 16-84 was built in the mid-1940s, and its use was discontinued in the early 1950s. Before the structure was decommissioned by burning in 1960, the magazine was found to be contaminated with HE. Residual debris from burning and the remaining subsurface were cleaned up in 1966 (LANL 1994, 039440, pp. 5-381-5-389).

No sampling investigations have been conducted at this site; however, based on the operational history of this AOC, the potential contaminants are HE, inorganic chemicals (e.g., barium, lead, and chromium), nitrate, and perchlorate.

### 2.4.2 SWMUs 16-006(g) and 16-031(c): Septic System and Drainline

#### 2.4.2.1 Site Descriptions and Potential Contaminants

**SWMU 16-006(g)** is an area of potentially contaminated soil from a former septic tank (structure 16-527) and associated drainline (Figure 1.1-5). Engineering drawings (LANL 2007, 097685) indicate that the SWMU served the sinks and toilets but did not serve the HE-processing areas of building 16-515. The drainline from the SWMU discharged through a manhole to an outfall, SWMU 16-029(x). The septic tank, drainline, and manhole were removed from service in 1970. The drainline and septic tank underwent D&D in October 1997 and February 1998, respectively (LANL 1997, 055512, p. 7; LANL 1999, 063973, pp. ES-1, 5). The drainline and septic tank were removed in 1997 (IT Corporation 1999, 087145, pp. 25-27).

Concurrent with D&D activities in 1997, nine samples were collected from SWMU 16-006(g). The locations were chosen based on noted joints or breaks in the drainline. Samples were screened for HE, radioactivity, inorganic chemicals, and organic chemicals. Elevated levels of HE, silver, barium, chromium, and copper were detected. Radioactivity levels were less than 2 times background levels. Organic chemicals were not detected (LANL 2007, 097685, Appendix D). On the basis of screening results, three samples were submitted for laboratory analysis of HE, boron, inorganic chemicals, organic chemicals, and uranium (analyses for boron were run because of the potential use of Boracitol, a boron-containing explosive, at former building 16-515). No inorganic chemicals were above BVs. Uranium results were elevated. In 1999, upon receipt of analytical results, two additional bounding samples were collected from beneath the former septic tank location and from 5 ft down. Samples were sent for laboratory analysis for uranium, HE, boron, and organic chemicals. Organic chemicals detected include

methylene chloride, HMX, RDX, (PCE), trichloroethene (TCE), and acetone (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (IT Corporation 1999, 087145, pp. 25-27; LANL 2007, 097685).

Based on historical analytical data and the operational history of this SWMU, the potential contaminants of concern are HE, uranium, organic chemicals, inorganic chemicals, nitrate, and perchlorate.

**SWMU 16-031(c)** is a drainline that received both sanitary and industrial waste from former HE-processing building 16-515 (Figure 1.1-5). Engineering drawings show that all effluent from building 16-515 entered the drain system described for SWMU 16-029(x) (LANL 1990, 007512). A survey for hazardous material in the drainline of building 16-515 found no toxic substances (Kennedy 1970, 004782) or radioactive contamination (Mitchell 1970, 005790), but the survey did find HE contamination (Courtright 1970, 005787). No sampling investigations have been conducted at this SWMU. The drainline was removed in 1997 and 1 $yd^3$ of soil was remediated based on field-screening results (IT Corporation 1999, 087145, pp. 98-120).

Concurrent with D&D activities in 1997, overburden soil was stockpiled along the excavation and screened for HE. Locations of cracks, broken joints, positive HE results, and sumps were flagged and documented. Thirteen screening samples were collected from 0.0 to 0.5 ft below the removed drainline and screened for RDX, TNT, VOCs, metals and for alpha and beta radioactivity. Field screening indicated HE contamination at location 16-03043 (LANL 2007, 097685, Appendix D); therefore, three soil samples were submitted for laboratory analysis and approximately 1 $yd^3$ of contaminated soil was remediated. Two samples were collected postexcavation and confirmed that remediation goals had been met (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (IT Corporation 1999, 087145, pp. 120-125; LANL 2007, 097685, Appendix B).

Based on historical analytical data and the operational history of this SWMU, the potential contaminants of concern are HE, boron, uranium, organic chemicals, inorganic chemicals, nitrate, and perchlorate.

### 2.4.3 SWMUs 16-006(h), 16-013, 16-017(r)-99, 16-017(s)-99, 16-017(t)-99, and 16-029(g2), and AOC C-16-074: Former Storage Areas, Pump and Concrete Pit

SWMUs 16-006(h), 16-013, 16-017(r)-99, 16-017(s)-99, 16-017(t)-99, and 16-029(g2) and AOCs C-16-068 and C-16-074 are located within the former V-Site courtyard. This area supported miscellaneous activities for HE testing and processing. The Cerro Grande fire destroyed all but two buildings, building 16-516 and 16-517 in the courtyard (LANL 2000, 066885).

#### 2.4.3.1 Site Descriptions and Potential Contaminants

**SWMU 16-006(h)** is a former steam-heating distribution pump pit, structure 16-526, which was located against the berm retaining wall southeast of equipment building 16-517 (Figure 1.1-5). The pit was constructed in 1945 to hold the steam-heating distribution pump. Condensate from radiators from buildings 16-515, 16-516, 16-519, and 16-520 was routed through the pump and returned to the source boiler(LANL 1997, 055653).

To the northwest of AOC C-16-068 and south of SWMU 16-006(h), three subsurface samples were collected from locations 16-05813 and 16-05819 and submitted for laboratory analysis. Metals above BVs were the primary analytes detected in the three samples (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (LANL 1999, 063973; LANL 2007, 097685, Appendix B).

Based on historical analytical data and its proximity to buildings 16-515 and 16-517, the potential contaminants of concern are HE, organic solvents, uranium, beryllium, and radionuclides.

**SWMU 16-013** is a former waste storage area within the asphalt-covered courtyard between buildings 16-516, 16-517, 16-518, 16-519, and 16-520 (Figure 1.1-5). The courtyard and buildings were used for non-HE programmatic activities and storage beginning in the mid-1940s. Before 1993, SWMU 16-013 stored drums of usable material (LANL 1993, 020948, pp. 5-285-5-286). During a 1987 site visit, some drums stored at the site were found to be leaking; some of the drums were labeled as used solvent, while others appeared to contain hydraulic fluid (DOE 1987, 008663). Containers of radioactive material, barium nitrate, and what appeared to be lithium hydride were observed (DOE 1987, 008664). Various chemicals (such as acetone, n-butyl acetate, chloroethene, 2-dichloroethane, dimethylformamide, ethyl acetate, dimethyl sulfoxide, lithium hydride, methanol, methylene chloride, methyl ethyl ketone, toluene, barium nitrate, and uranium) may have been stored in this area (Panowski and Salgado 1971, 015271). At the time the 1990 SWMU report was written, the site was inactive, the drums were removed, and the waste storage area was cleaned (LANL 1990, 007512).

In 1997, two locations (16-03008 and 16-03009) were sampled as part of the investigation of SWMU 16-013. The sample locations are just beyond the northeast corner of the asphalt pad that covers most of the site. One surface soil sample was collected from each of the two locations and field screened using the D-TECH Kit for TNT and RDX and the x-ray fluorescence [XRF] instrument to screen for barium, copper, and lead. The sample from location 16-03008 was positive for RDX and the sample from location 16-03009 was positive for both TNT and RDX (LANL 2007, 097685, Appendix D). Samples from both locations had barium and copper concentrations above BVs. Both samples were submitted for laboratory analysis. The analytical results detected copper, lead, uranium, and zinc above BVs in the sample from location 16-03008. Arsenic, copper, lead, and zinc were detected above BVs in the sample from location 16-03009. Di-n-butylphthalate was also detected in the sample from location 16-03009 (Figures 2.4-1–2.4-6; Tables 2.4-1–2.4-3) (LANL 1997, 056569, pp. 8-12; LANL 2007, 097685, Appendix B).

Three surface samples were collected from within the northern third of SWMU 16-013. Samples were field screened for HE and metals (LANL 2007, 097685, Appendix D). The results of the field screening are available for two locations (16-03005 and 16-03007); barium, copper, and lead were detected above BVs in both samples. TNT and RDX were below the D-TECH kit detection limits. None of the samples were submitted for laboratory analysis (LANL 1997, 056569, pp. 8-12).

Based on historical analytical data and the operational history, the potential contaminants of concern are uranium, other inorganic chemicals, and organic chemicals.

**SWMUs 16-017(r)-99 and 16-017(s)-99** are former buildings 16-519 and 16-520, respectively (Figure 1.1-5). These buildings were used for varnishing and assembly of Fat Man device prototypes. Both buildings were constructed in 1945 and were later used for assembly, photoprocessing, and storage (LANL 1994, 039440, pp. -5-503, 6-32; LANL 1999, 063973).

No sampling investigations have been conducted at these SWMUs; however, based on the operational history of the SWMU, the potential contaminants of concern are HE, organic solvents, silver, cyanide, and uranium.

**SWMU 16-017(t)-99** is former structure 16-516, which was initially used as a laboratory (Figure 1.1-5). In July 1945, SWMU 16-017(t)-99 was used for the final testing to fit the Trinity device. After World War II, the structure housed pioneering work on plastic explosives. Later, structure 16-516 was used for equipment storage (LANL 1994, 039440, pp. 5-503, 6-32). SWMU 16-017(t)-99 was one of two structures that survived the Cerro Grande fire (LANL 2000, 066885, p. 1).

No sampling investigations have been conducted at this SWMU; however, based on the operational history of the SWMU, the potential contaminants of concern are HE, solvents, beryllium, uranium, and radionuclides.

**SWMU 16-029(g2) and AOC C-16-074** were the concrete pit (structure 16-523) and concrete pad located east of building 16-517 (Figure 1.1-5) (LANL 1999, 063973, p. 32). The pit housed a shaker table used in vibration tests on a Fat Man device prototype. Because the device had an HE component, the table was controlled remotely from a bunker west of V-Site. SWMU 16-029(g2) was built in 1944 and abandoned in place in 1945 (LANL 1997, 055653, p. 7). The pit was filled with dirt and covered with a concrete pad, AOC C-16-074. The pad is level, empty, and surrounded by the asphalt paving of the adjacent courtyard. AOC C-16-074 overlies the old concrete pit, which housed the shaker table [SWMU 16-029(g2)]. Even though V-Site was used for many years as a general storage area for TA-16, a few rust rings are all that remain on the pad; no oil stains are present (LANL 1997, 055653, p. 8). Drums containing HE-contaminated hydraulic oil were stored at this location (LANL 1990, 007512). No radioactive materials were used in this pit; however, a 1983 memo lists SWMU 16-029(g2) as having been used in association with HE and beryllium (Blackwell 1983, 005823).

In 1998 and 1999, voluntary corrective measure (VCM) activities included drilling numerous boreholes at SWMU 16-029(g2) and AOC C-16-074. Three of these boreholes were drilled at a 45-degree angle. The locations of these boreholes (surface sampling locations 16-05821, 16-05822, and 16-05823) are nominally located outside the boundaries of SWMU 16-029(g2) and AOC C-16-074. The samples taken at depth reflect conditions from beneath collocated SWMU 16-029(g2) and AOC C-16-074.
AOC C-16-074 is a former drum storage area east of building 16-517. Drums containing residual HE-contaminated hydraulic oil were stored on an asphalt pad. The pad was built of concrete on the surface directly over SWMU 16-029(g2) and is surrounded by the asphalt that makes up the courtyard.

Two vertical boreholes were also drilled outside the boundaries of SWMU 16-029(g2) and AOC C-16-074. At location 16-05820, samples were collected at four depths from 0 to 7 ft. Field-screening results for all four samples were positive for silver and barium at all four depths but were negative for TNT, RDX, chromium, copper, nickel, and lead (LANL 1999, 063973, pp. 32-57; LANL 2007, 097685, Appendix D).

During a 1998 VCM, three vertical borings were drilled to a depth of 2.5 ft through the surface slab (AOC C-16-074) and into the area of the former shaker table pit [SWMU16-029(g2)]. Six samples were collected from these three boreholes and field screened for HE and metals. No HE was detected. Silver and barium were detected. Because the concrete in the bottom of the former shaker table pit could not be penetrated, three 45-degree angled borings were drilled in an attempt to collect samples from below the bottom of the pit [SWMU16-029(g2)]. One sample was collected from the bottom of each of these angled boreholes and field screening for HE and metals (LANL 2007, 097685, Appendix D). No HE was detected. Barium, copper, and silver were detected. None of the samples collected from the six boreholes were submitted for laboratory analysis (LANL 1999, 063973, pp. 32-51).

Based on the historical analytical data and the operational history of the SWMU 16-029(g2) and AOC C-16-074, the potential contaminants of concern are HE, uranium, inorganic chemicals, organic chemicals, and possibly radionuclides.

# 3.0 CONDITIONS

## 3.1 Surface Conditions and Topography

The S-Site Aggregate Area consists of roughly east- to southeast-trending, flat-topped mesas that drain predominantly into Martin Canyon Subwatershed of the Water Canyon Watershed. Martin Spring Canyon Subwatershed terminates in the confluence with Water Canyon. Source waters are predominantly from local storm and snowmelt runoff; storm and snowmelt runoff flowing from the Sierra de Los Valles mountains (e.g., the eastern front of the Jemez Mountains) located to the west of the Laboratory (Collins et al. 2005, 092028, pp. 2-104-2-107); and flow from perennial springs.

The mesa tops, which range from 7600 ft amsl at the western Laboratory boundary to 7200 ft amsl at the southern tip of the mesa, overlook the confluence of S-Site/Martin Spring Canyon. S-Site/Martin Spring Canyon is fairly shallow near its inception between V-Site and the 300s Line subaggregates; it steepens and narrows 100 ft east of the 300s Line Subaggregate. S-Site/Martin Spring Canyon widens as it gets deeper to a low elevation of 6890 ft at its convergence point with Water Canyon.

The S-Site/Martin Spring Canyon Subwatershed is located between the Cañon de Valle and Water Canyon Watersheds. The S-Site Aggregate Area sits primarily at TA-16 and crosses through the northern half of TA-11 and TA-37.

The P-Site, V-Site, and 300s Line subaggregates are within the S-Site/Martin Spring Canyon Subwatershed. The K-Site Subaggregate, however, is located in the east-central portion of TA-16 and has S-Site/Martin Spring Canyon to the north and Water Canyon to the south. Elevations range from 7250 to 7400 ft amsl. The majority of the SWMUs and AOCs in the K-Site Subaggregate are located on the mesa top. In May 2000, the Cerro Grande fire burned areas in and around K-Site but did not damage any structures.

The surface vegetation community at TA-16 consists of species typical of the Rocky Mountain Montane Conifer forest, which contains several distinct habitat types (LANL 1998, 059891, pp. B-41-B-43). The most prevalent habitat type on the mesa tops is ponderosa pine/Gambel oak. Canyon bottoms may grade into ponderosa pine/Douglas fir. Dominant trees within the mesa overstory canopy are ponderosa pine and aspen; the mesa top shrub layer is primarily Gambel oak and New Mexico locust. Dominant forbs and grasses include bluegrass, mountain muhly, blue gramma, pine dropseed, wormwood, false tarragon, tall lupine, and cinquefoil. Additional details on the vegetation communities and habitat types at TA-16 are presented in Appendix B of the Phase II RCRA facility investigation (RFI) report for Consolidated Unit 16-021(c)-99 (LANL 1998, 059891, pp. B-32-B-43).

## 3.2 Surface Water

The S-Site Aggregate Area is bordered to the north by Fishladder Canyon, a tributary of Cañon de Valle, and to the south by Water Canyon. Both the Water Canyon/Cañon de Valle Watershed heads on the flanks of the Sierra de Los Valles on U.S. Forest Service land. The Cañon de Valle drainage terminates at its confluence with Water Canyon, which extends across the Laboratory to the Rio Grande (Collins et al. 2005, 092028, pp. 2-104-2-107; LANL 2006, 094043, p. 6-1). The S-Site Canyon Subwatershed is a smaller watershed located wholly within the Water Canyon/Cañon de Valle Watershed (Figure 3.2-1).

Surface water is ephemeral in most of the S-Site Canyon Subwatershed. A spring, Martin Spring, is located near the P-Site and 300s Line Subaggregates. In addition, hydrophilic vegetation has been observed near the 300s Line and K-Site Subaggregates (Figure 3.2-1) (LANL 1996, 055077).

The following permanent gauging stations are located near the confluence of Martin Spring Canyon: Water above S-Site Canyon (E262) and S-Site Canyon above Water (E261) (LANL 2006, 094043; LANL 2006, 093713, Plate 1).

Surface water in the S-Site Aggregate Area consists of stormwater, snowmelt runoff, and spring flow in small drainages or by sheet flow into S-Site Canyon, Fishladder Canyon, or Water Canyon. These canyons contain flowing water during snowmelt and storm events.

Site-specific stormwater runoff monitoring is conducted by the Federal Facility Compliance Agreement/Administrative Order for sites at site-monitoring area (SMA) sampling locations. Site-specific monitoring is required for sites with a medium or high potential for constituents in surface water and/or sediment in stormwater runoff to migrate off the site and impact surface water quality. Sites with an erosion matrix score of between 40 and 60 are considered to have a medium potential. Sites with an erosion matrix score of >60 are considered to have a high potential. The specific sites monitored in S-Site Aggregate Area that have erosion matrix scores >40 and are included in this work plan are SWMUs 11-005(c), 11-006(b), 11-006(c), 11-006(d), 16-003(f), and 16-006(g).

Surface water runoff and associated infiltration into soil are probably the most important hydrologic transport pathways at S-Site Aggregate Area. HE and inorganic chemicals, the principal potential contaminants of concern at S-Site Aggregate Area, are moderately to strongly soluble and are transported in surface water. The following six aspects of the surface hydrology at S-Site Aggregate Area may be relevant to contaminant transport (LANL 1998, 059891, pp. B-16-B-17):

- location of surface water runoff and associated sediment deposition;
- rates of soil erosion, transport, and sedimentation;
- effects of operational or fire disturbances on surface hydrology;
- relative importance of surface runoff versus infiltration as transport pathways in different soil types;
- solubility and sorption behavior of the potential contaminants of concern; and
- ultimate fate of surface water at S-Site Aggregate Area.

Surface water runoff, alluvial water flow, and associated sediment transport represent key potential migration pathways by which contaminants may be transported off-site.

### 3.3 Soil Types

The soil types of the mesa top are derived from the weathering of the Tshirege Member of the Bandelier Tuff and from the El Cajete pumice (including contributions from phenocrysts and phenocryst fragments, devitrified glasses, and minor lithic fragments) and from wind-blown sources. Native soil has been disturbed by the construction of various facilities.

A detailed discussion of soil types in the vicinity of the S-Site Aggregate Area and TA-16 is provided in the Phase II RFI Report for Consolidated Unit 16-021(c)-99 (LANL 1998, 059891, pp. B-12-B-15).

## 3.4 Subsurface Conditions

### 3.4.1 Stratigraphy

The Laboratory drilled, cored, and sampled several intermediate and deep boreholes to interpret the subsurface stratigraphy across TA-16 (Figures 3.4-1–3.4-2). These include regional wells R-25 (total depth [TD] of 1942 ft bgs), R-26 (TD of 1490.5 ft bgs), CdV-R-15-3 (TD of 1722 ft bgs), and CdV-R-37-2 (TD of 1664 ft bgs). Intermediate depth wells include CdV-16-1(i) (TD of 683 ft bgs), CdV-16-2(i)r (TD of 874.4 ft bgs), and CdV-16-3(i) (TD of 1405 ft bgs) (Collins et al. 2005, 092028, Table 1-2). The stratigraphy beneath TA-16 includes Bandelier Tuff, Cerro Toledo interval, Puye Formation, and Tschicoma Formation (Figure 3.4-3). Descriptions of the stratigraphic units beneath TA-16 are provided in this section. They rely heavily on the stratigraphy observed in wells R-25 (Broxton et al. 2002, 072640, pp. 20-30); CdV-16-1(i) (Kleinfelder 2004, 087844, pp. 12-13); CdV-16-2(i)r (Kleinfelder 2005, 093665, p. 8); CdV-16-3(i) (Kleinfelder 2004, 087845, p. 4); and CdV-R-15-3 (LANL 2002, 073211, pp. 10-14). More detailed descriptions of the stratigraphy, mineralogy, chemistry, and other properties of the rock units described in this section are presented in the Laboratory's hydrogeologic studies of the Pajarito Plateau (Collins et al. 2005, 092028, pp. 2-10-2-29).

#### 3.4.1.1 Bandelier Tuff

The Bandelier Tuff is a chemically zoned ignimbrite that exhibits complex zones of welding and crystallization subdivided into four major cooling units. The term welding is used to distinguish between tuffs that are noncompacted and porous (nonwelded) from tuffs that are more compacted and dense (welded). In the field or in borehole cuttings, the degree of welding is quantified by the degree of flattening of pumice fragments (a higher degree of flattening and elongation equals a higher degree of welding). Petrographically, welded tuffs show adhesion (welding) of grains and nonwelded tuffs do not. The term devitrified is applied to tuffs in which volcanic glass has crystallized (LANL 2006, 091698).

#### 3.4.1.2 Tshirege Member

The Pleistocene Tshirege Member of the Bandelier Tuff is a compound cooling unit that resulted from several successive ash flow depositions separated by periods of inactivity that allowed partial cooling of each unit. Properties related to water flow and contaminant migration (e.g., density, porosity, degree of welding, fracture content, and mineralogy) vary both vertically and laterally because of localized variations in emplacement temperature, cooling history, thickness, gas content, and chemical composition. The Tshirege Member of the Bandelier Tuff is 383 ft thick in well R-25 (LANL 2006, 091698).

#### 3.4.1.3 Tshirege Member Unit 4 (Qbt 4)

Unit 4 of the Tshirege Member of the Bandelier Tuff comprises a series of variably welded vitric to devitrified ash-flow tuffs that extend from near surface to a depth of 84 ft bgs in well R-25, from surface to a depth of 56 ft bgs in well CdV-16-2(i)r, from surface to a depth of 56 ft bgs in well CdV-16-16-3(i), and from 5 to 34 ft bgs in well CdV-R-15-3. Unit 4 is characterized by local thin, discontinuous, crystal-rich, fine- to coarse-grained volcanic surge deposits. The lower, more indurated parts of Unit 4 are also significantly fractured. These fractures and surge beds are potential groundwater pathways (LANL 2006, 091698).

#### 3.4.1.4 Tshirege Member Unit 3 (Qbt 3 and Qbt 3t)

Unit 3 of the Tshirege Member of the Bandelier Tuff is poorly to moderately welded and indurated to slightly indurated. It tends to be a cliff-forming unit of the Pajarito Plateau. In well R-25 and at TA-16 in general, it is typically divided into two subunits, Qbt 3t (t for transitional) and Qbt 3. Qbt 3t is a devitrified ignimbrite that grades from partially welded at the top to moderately welded at the base. Qbt 3 is a second devitrified ignimbrite that grades from moderately welded at the top to nonwelded at the base. Qbt 3t and upper Qbt 3 also contain localized thin, discontinuous, crystal-rich, fine- to coarse-grained, surge deposits that may represent potential groundwater pathways. Unit 3 (including both subunits Qbt 3 and Qbt 3t) is 198 ft thick in well R-25, extending from 84 to 229 ft bgs. Unit 3 comprises the mesa-top unit at MDA R. Unit 3 extends from 9 to 85 ft bgs in well CdV-16-1(i), from 56 to 195 ft bgs in well CdV-16-2(i)r, from 77 to 195 ft bgs in well CdV-16-16-3(i), and from 34 to 152 ft bgs in well CdV-R-15-3 (LANL 2006, 091698).

#### 3.4.1.5 Tshirege Member Unit 2 (Qbt 2)

Unit 2 of the Tshirege Member of the Bandelier Tuff is a competent, resistant unit that forms cliffs where it is exposed on the sides of the mesa. It is a moderately welded, well-indurated, devitrified ignimbrite. Welding grades from moderately welded at the top of the unit to partially welded at the base. Unit 2 is 103 ft thick in well R-25, extending from 229 to 332 ft bgs. Qbt 2 extends from 85 to 195 ft bgs in well CdV-16-1(i), from 195 to 305 ft bgs in well CdV-16-2(i)r, from 195 to 305 ft bgs in well CdV-16-16-3(i), and from 152 to 236 ft bgs in well CdV-R-15-3 (LANL 2006, 091698).

Unit 2 of the Tshirege Member is extensively fractured in many outcrops across the Laboratory as a result of contraction during postdepositional cooling. The cooling fractures are visible on mesa edges. In general, such fractures are vertical to subvertical and dissipate near the bottom of the unit. Near the base of Unit 2 is a series of thin, discontinuous, crystal-rich, fine- to coarse-grained, surge deposits. Bedding structures are often observed in these deposits. These surge beds mark the base of Unit 2 (LANL 2006, 091698).

#### 3.4.1.6 Tshirege Member Unit 1v (Qbt 1v)

Unit 1v of the Tshirege Member is a vapor-phase-altered cooling unit that underlies Unit 2. This unit forms sloping outcrops that contrast with the near-vertical cliffs of Unit 2. Qbt 1v is further subdivided into units 1 vu and 1 vc in many parts of the Laboratory. Qbt 1v is 29.5 ft thick in well R-25, extending from 332 to 361.5 ft bgs, but was not broken out into subunits based on the cuttings from that borehole. In addition, Qbt 1v, was not broken out in subunits; it extends from 195 to 223 ft bgs in well CdV-16-1(i), from 305 to 348 ft bgs in well CdV-16-2(i)r, from 305 to 348 ft bgs in well CdV-16-16-3(i), and from 236 to 290 ft bgs in well CV-R-15-3 (LANL 2006, 091698).

Unit 1 vu (u for upper) is the uppermost portion of Unit 1v. It is devitrified and consists of vapor-phase-altered ash-fall and ash-flow tuff. Unit 1 vu is unconsolidated at its base and becomes moderately welded near overlying Unit 2. Only the most prominent cooling fractures that originate in Unit 2 continue into the more welded upper section of Unit 1 vu; however, these end in the less consolidated lower section of the unit (LANL 2006, 091698).

Unit 1 vc (c for colonnade) is named for the columnar jointing visible in cliffs formed from this unit. Unit 1 vc is a poorly welded, devitrified ash-flow tuff at its base and top, becoming more welded in its interior.

#### 3.4.1.7 Tshirege Member Unit 1g (Qbt 1g)

Unit 1g of the Tshirege Member is a massive, poorly consolidated, vitric ash-flow tuff. Few fractures are observed in outcrops of this unit, and the weathered cliff faces have a distinct Swiss-cheese appearance that reflects the variable hardness of the unit. The upper portion of Qbt 1g is resistant to erosion, which helps to preserve the vapor-phase notch in outcrop. A distinctive pumice-poor surge bed forms the base of Qbt 1g. Qbt 1g is 20.3 ft thick in well R-25 and extends from 361.5 to 381.8 ft bgs. Qbt 1g extends from 223 to 240 ft bgs in well CdV-16-1(i), from 348 to 398 ft bgs in well CdV-16-2(i)r, from 348 to 395 ft bgs in well CdV-16-16-3(i), and from 290 to 350 ft bgs in well CdV-R-15-3 (LANL 2006, 091698).

#### 3.4.1.8 Tsankawi Pumice Bed

The Tsankawi Pumice Bed is the basal Plinian, air-fall deposit of the Tshirege Member of the Bandelier Tuff. It is a thin bed of gravel-sized vitric pumice. The unit is 2.2 ft thick in well R-25 and extends from 381.8 to 384 ft bgs. The Tsankawi Pumice Bed extends from 223 to 240 ft bgs in well CdV-16-1(i),and from 350 to 362 ft bgs in well CdV-R-15-3 (LANL 2006, 091698).

#### 3.4.1.9 Cerro Toledo Interval (Qct)

The Cerro Toledo interval separates the Tshirege and Otowi Members of the Bandelier Tuff and consists of thin beds of tuffaceous sandstones, paleosols, siltstones, ash, and pumice falls. The Cerro Toledo interval also includes localized gravel- and cobble-rich fluvial deposits predominantly derived from intermediate-composition lavas eroded from the Jemez Mountains west of the Pajarito Plateau. Numerous large lithics, including native dacites, are present in well R-25. The interval is 125 ft thick in the well R-25 borehole and extends from 384 to 509 ft bgs. This large thickness indicates that well R-25 is located in a paleodrainage on the surface of the underlying Otowi Member of the Bandelier Tuff. The Cerro Toledo extends from 240 to 457 ft bgs in well CdV-16-1(i), from 395 to 570 ft bgs in well CdV-16-2(i)r, from 395 to 570 ft bgs in well CdV-16-16-3(i), and from 362 to 582 ft bgs in well CdV-R-15-3 (LANL 2006, 091698).

#### 3.4.1.10 Otowi Member and Guaje Pumice Bed (Qbo)

The Otowi Member tuffs are 341.5 ft thick in well R-25, extending from 509 to 843.8 ft bgs. The tuffs are a massive, poorly consolidated, nonwelded, pumice-rich, and mostly vitric ash flow. The pumices are fully inflated and support tubular structures that have not collapsed as a result of welding. The matrix is an unsorted mix of glass shards, phenocrysts, perlite clasts, and broken pumice fragments. The Otowi member extends from 457 ft bgs to below the TD of 683 ft bgs in well CdV-16-1(i), from 570 to 802 ft bgs in well CdV-16-2(i)r, from 570 to 802 ft bgs in well CdV-16-16-3(i), and from 582 to 750 ft bgs in well CdV-R-15-3 (LANL 2006, 091698).

The Guaje Pumice Bed forms the lowermost 6.7 ft of the Otowi Member in well R-25, extending from 843.8 to 850.5 ft bgs. It is the basal air-fall deposit of the Otowi Member of the Bandelier Tuff. The occurrence of the Guaje Pumice Bed at well R-25 is thinner than occurrences farther to the east and north, indicating either that this area was south of the main dispersal axis for this fall deposit or that this deposit was partly eroded before, or during, emplacement of the main Otowi ignimbrite. Two cycles of pumice fall were noted in well R-25. The Guaje Pumice Bed extends from 802 to 818 ft bgs in well CdV-16-2(i)r, from 802 to 818 ft bgs in well CdV-16-16-3(i), and from 750 to 800 ft bgs in well CdV-R-15-3 (LANL 2006, 091698).

#### 3.4.1.11 Puye Formation Fanglomerates (Tpf)

The Puye Formation in well R-25 is an alluvial fan deposit made up primarily of coarse, clastic rocks derived from the rhyodacite units of the Tschicoma Formation that crop out in the Jemez Mountains west of the Pajarito fault. Because of the proximity of these source rocks, these fanglomerate deposits consist of poorly consolidated and poorly sorted boulders, cobble, gravels, and sands. Boulders up to 2 ft in diameter are present in well R-25 (LANL 2006, 091698).

Based on cuttings and lithologic description, the Puye Formation exists in wells R-25 from 852 ft to below the TD of 1942 ft bgs, CdV-16-2(i)r from 818 ft bgs to below the TD of 1063 ft bgs, and CdV-16-3(i) from 900 to 995 ft bgs (LANL 2006, 091698).

#### 3.4.1.12 Tschicoma Formation Dacite Lavas

Lava flows of the Tschicoma Formation occur in both wells CdV-R-37-2 and CdV-16-3(i) to the southeast of well R-25 but were not found in well R-25. The dacite lavas are massive, apparently homogeneous, locally rubbly intermediate lavas. Minor siltstones are present in the upper 142 ft at the CdV-R-37-2 borehole. The Tschicoma dacite lavas extend from a depth of 1072 ft bgs to TD (1664 ft bgs) in well CdV-R-37-2 and from 995 ft bgs to TD (1405 ft bgs) in well CdV-16-3(i) (LANL 2006, 091698).

### 3.4.2 Cliff Retreat and Fractures

Minimal cliff retreat is evident in the TA-16 vicinity as a result of the generally shallow nature of most of the surrounding canyons. SWMUs and AOCs within S-Site Aggregate Area are unlikely to be exposed by cliff retreat. Fracture studies completed for the nearby Cañon de Valle watershed identified and analyzed hundreds of fractures and small faults across a bedrock exposure and indicated a link between the fracture density and proximity to the Pajarito fault zone (LANL 2005, 092251). Ephemeral intermediate-depth perched groundwater has been encounter in the S-Site Aggregate Area at several intermediate-depth wells: MSC-16-06293, MSC-16-06294, and MSC-16-06295. One spring, Martin Spring, is also an example of the manifestation of the intermediate-depth perched groundwater present primarily in tuff discontinuities such as fractures and surge beds in the S-Site Aggregate Area (LANL 2003, 077965, pp. iv, 5-4).

### 3.4.3 Hydrogeology

The hydrogeologic conceptual model for S-Site Aggregate Area is presented in Figure 3.4-3. The model postulates infiltration of water into the subsurface and subsequent transport of water, natural solutes, and contaminants at multiple recharge zones at S-Site Aggregate Area. Shallow transport pathways are heterogeneous, with water transport primarily along fast pathways such as surge beds and fracture zones. Perched and regional groundwater flow directions are generally from west to east, but there are significant complexities in flow in the deep aquifers at S-Site Aggregate Area.

#### 3.4.3.1 Infiltration

Surface water infiltration is a potential mechanism for surface contaminant migration into subsurface soil and tuff and eventually into perched or regional aquifers. In general, the hydrologic conditions on the surface and within the mesas of the Pajarito Plateau lead to slow, unsaturated flow and transport. The mesas shed precipitation as surface runoff to the surrounding canyons such that most deep infiltration occurs episodically following snowmelt. Much of the water entering the soil zone is lost through evapotranspiration. As a result, annual net infiltration rates for dry mesas are less than 10 mm/yr and are

more often estimated to be about 1 mm/yr or less. Flow is likely to be matrix-dominated as a result of the nonwelded to moderately welded tuffs with low water content that are located near the surface of the mesa (LANL 2005, 092028, p. 2–89).

Anthropogenic discharges and surface disturbances resulting from Laboratory operations can drive infiltration rates higher in usually dry mesas. In some cases, multiple disturbances of mesa sites through liquid waste disposal, asphalt covers, and/or devegetation have caused mesa infiltration rates to increase temporarily to near-wet canyon levels. Fracture flow has occurred in a few instances beneath long-term liquid disposal sites with ponded conditions, however, fracture flow ceases once liquid releases stop. Infiltration rates return to low, near-background levels when the surface and vegetation return to normal conditions (LANL 2005, 092028, pp. 2–89).

Surface water infiltration recharges perched aquifers at TA-16 (LANL 1998, 059891, p. B-18; LANL 2003, 077965, p. B-16). The presence of HE in well R-25 indicates that transport from surface water to the deep perched, and possibly the regional, aquifer at S-Site Aggregate Area is relatively rapid (less than 50 yr). The surface water and alluvial groundwater present in Cañon de Valle are hypothesized to be the major source of these contaminated waters. Geophysical surveys and other lines of evidence presented in the Phase III RFI report for Consolidated Unit 16-021(c)-99 (LANL 2003, 077965) indicate that a key area of infiltration is a zone of Cañon de Valle west of MDA P. Surface water infiltration, whether through matrix or fracture flow, is an important contaminant transport pathway at TA-16 in Cañon de Valle.

The studies of the hydrogeology of the Pajarito Plateau reported that focused infiltration is expected in the faulted regions associated with the Pajarito fault zone within S-Site Aggregate Area with local infiltration rates up to 1000 mm/yr (LANL 2005, 092028, p. 4-A-5). The report concluded that the highest net infiltration rates are estimated to occur in canyons, especially those that head in the mountains with magnitudes of up to a few hundred mm/yr caused by channel runoff. Much lower net infiltration rates occur across the mesas and in the smaller canyons that head on the Pajarito Plateau (LANL 2005, 092028, p. 5-3).

#### 3.4.3.2 Groundwater

Groundwater beneath the Laboratory occurs in the regional aquifer at a depth of approximately 1286 ft bgs (well R-25) (Figures 3.4-3–3.4-4) and in perched aquifers at both shallow (less than 200 ft) and deep (up to approximately 1000 ft) depths (LANL 2005, 092028, pp. 2-B-10–2-B-12). Canyon and mesa topography and the internal structures (surge beds, fracture zones, permeable units) of the Bandelier Tuff and other subsurface units control the hydrogeology of the S-Site Aggregate Area. The hydrology (occurrence and movement of water in the surface and subsurface environments) of individual sites is controlled by the physiographic location (e.g., in canyon bottoms, on canyon edges, or on mesa tops) of each SWMU and AOC.

#### 3.4.3.3 Perched Intermediate Waters

Perched groundwater systems beneath the Pajarito Plateau are identified primarily from direct observation of saturation in boreholes, wells, piezometers, or from borehole geophysics (LANL 2005, 092028, p. 2-96). Perched water has been identified in the following wells: R-25, CdV-16-1(i), CdV-16-2(i)r, R-26, and CdV-R-15-3 (tentative identification). The perched zone characteristics for each well are presented in Table 3.0-1.

A deep-sounding surface-based magnetotelluric survey was conducted in the Cañon de Valle/Water Canyon area. The survey results indicate that perched groundwater is discontinuous laterally, occurring instead as vertical, finger-like groundwater bodies (LANL 2005, 092028, pp. 2-96–2-97).

The following conditions are necessary to support perched groundwater (LANL 2005, 092028, pp. 2-97–2-100).

- A surface source must exist, either natural or anthropogenic, that supplies water to alluvial systems. The alluvial groundwater acts as storage for groundwater entering underlying bedrock units at high infiltration rates. A special situation exists in the mountain-front region at TA-16. In contrast to the dry mesas prevalent farther east, these mesas receive greater precipitation (e.g., 500 mm/yr) and increased runoff and infiltration. The wet mountain-front mesas contain numerous perennial and ephemeral springs.
- In addition to high local infiltration rates, low-permeability barriers to downward vertical flow are required to induce perched groundwater. Deep, perched groundwater occurs most frequently in the Puye Formation and the Cerros del Rio basalt, but some of the thickest and/or most laterally extensive zones involve units of the Bandelier Tuff. Perching horizons include a wide variety of layered geologic lithologies, including unfractured basalt flows; clay-rich interflow zones in basalt; buried soil and other fine-grained deposits in fanglomerate; clay-altered, tuffaceous sediments; and lake deposits. An alternative hypothesis is that the deepest perched water occurrences are a manifestation of complex groundwater flow within the phreatic zone at the top of the regional aquifer. An important hydrostratigraphic feature in the mountain-front region of TA-16 is that the upper tuff units are often moderately to strongly welded, but the fracture densities are relatively high. Fracturing appears to control the locations of springs along the mountain-front mesas and fracture flow is indicated by water content and contaminant distributions in tuff near outfalls and wastewater lagoons.

Perched ground water flow conditions were categorized by the following conceptual site models (LANL 2005, 092028, p. 2-100).

- Low-velocity, virtually stagnant water resting in a perching horizon within a local structural or stratigraphic depression. Water percolates very slowly out of the bottom of this zone, or spills over the sides of the depression. Once the stagnant water is depleted, the recharge is not sufficient to keep the zone saturated.
- High-velocity, laterally migrating fluid that travels on top of the perching horizon. This conceptualization indicates that once groundwater reaches a perched zone, it rapidly percolates laterally along high-permeability pathways until the perching horizon pinches out or is breached by high-permeability features such as fractures or later changes in lithology. In this scenario, water could move in stairstep fashion from one perching horizon to another. There are no confirmed instances of large-scale, lateral vadose zone pathways beneath the Pajarito Plateau at depths greater than the alluvial ground water. The case of lateral flow through the wet, mountain-front mesas at TA-16 indicates that this possibility exists at greater depths.

#### 3.4.3.4 Regional Aquifer

The regional aquifer of the Pajarito Plateau is the groundwater zone most directly accessible to humans through municipal water-supply wells or springs issuing to the Rio Grande. Additionally, it is a major source of drinking water and agricultural water supply for northern New Mexico (LANL 2005, 092028, p. 2-103; LANL 2006, 091698). The regional aquifer, extending throughout the

Española Basin (an area of roughly 6000 $km^2$), consists of basin-fill sediments reaching a maximum thickness near the basin axis [>9800 ft in thickness; (Cordell 1979, 076049, p. 61)]. The aquifer is predominantly composed of Santa Fe Group rocks, which are weakly consolidated basin-fill sediments more than 3000 m in thickness (LANL 2005, 092028, p. 2-103).

Depths to the regional aquifer range from approximately 1300 ft bgs (along the western edge of the plateau) to 600 ft bgs (to the east). The depths to the regional aquifer at TA-16 that have been determined by drilling are 1245 ft bgs at well CdV-R-15-3 east of Cañon de Valle, 1197 ft bgs at well CdV-R-37-2 southeast of TA-16, 1286 ft bgs at well R-25 (LANL 2003, 077965, p. B-20), 604 ft bgs at well R-26 (LANL 2005, 092028, p. 1-B-22), and 1350 ft bgs at well CdV-16-3(i) (Kleinfelder 2004, 087845). The regional aquifer was not penetrated at a depth of 1400 ft bgs in the CdV-16-3(i) borehole. The nearest production well to TA-16 is PM-2 in Pajarito Canyon 4 to 5 mi east of the operational areas at TA-16. Figure 3.4-4 depicts water table elevations in the regional aquifer across the Pajarito Plateau.

The regional aquifer model proposed in the report of the hydrogeology of the Pajarito Plateau (LANL 2005, 092028, pp. 4-1–4-60) was used to produce a map of velocities at the water table. The velocities, which are considered highly uncertain, were used to illustrate the following key points.

- The aquifer is heterogeneous, and groundwater velocity is likely to vary considerably over short distances.
- The flow in the eastern portion of the Laboratory is predicted to be very slow.
- The regional aquifer around water-supply well PM-2 is vertically anisotropic with pronounced resistance to vertical propagation of drawdown at shallower depths.
- The hydraulically, the regional aquifer exhibits semiconfined characteristics at depth, with leaky units located above (and perhaps below) a highly conductive layer. It appears that water-table conditions exist near the water table but at greater depths, the regional aquifer becomes semiconfined.

#### 3.4.3.5 Vadose Zone

The region beneath the ground surface and above the regional aquifer is called the vadose (unsaturated) zone. This discussion focuses on the vadose zone beneath the mesa top underlying TA-16 and the adjacent alluvial canyons. The principal sources of moisture in the vadose zone are precipitation (much of which is removed as runoff), evaporation and transpiration, and infiltration from canyon bottoms. Characteristics of infiltration in the vadose zone are described in the preceding sections that address infiltration and perched intermediate groundwater. Subsurface movement of moisture is predominantly vertical in direction and is influenced by the properties and conditions of the vadose zone. Lateral flow can also occur when significant contrasts in hydrologic properties occur between adjacent units. Surge beds may be a particularly favorable zone of lateral mobility because of their high porosity.

The geologic properties of the Bandelier Tuff that most influence fluid flow in the vadose zone are the degree of welding and hydraulic conductivity. Significant heterogeneities occur in both of these properties within the TA-16 vadose zone. Welded tuffs tend to have less matrix porosity and more fractures than nonwelded tuffs. Fractures in welded tuffs may include relatively closely spaced cooling joints as well as tectonic fractures. Nonwelded tuffs also have fractures but generally fewer than welded tuffs. Saturated hydraulic conductivities in the Bandelier Tuff beneath the mesa top range by more than 5 orders of magnitude between subunits in Tshirege Units 4 and 3t (LANL 2003, 077965, p. 4-58). In boreholes drilled at TA-16, saturated hydraulic conductivity ranges from $3.8 \times 10^{-3}$ cm/sec in a surge unit to $9.8 \times 10^{-9}$ cm/sec in a densely welded subunit (LANL 2006, 091698).

Several competing effects determine the moisture content, degree of saturation, and resultant likelihood of flow and contaminant transport. In the western portion of TA-16, some of the Tshirege units of the Bandelier Tuff have densely welded intervals as a result of being closer to the volcanic source. These more welded units are less porous, with porosities ranging from 17% to 40%, and have low saturated hydraulic conductivities (e.g., $10^{-6}$ to $10^{-9}$ cm/sec) (LANL 2006, 091698). These units are also more fractured and can support fracture flow and transport when sufficient water is present (LANL 2005, 092028, p. 2-92). Because of the higher precipitation levels at TA-16, volumetric moisture levels at TA-16 tend to be higher than at TAs east of TA-16. Several zones in boreholes at TA-16 were at, or near, saturation, particularly the intermittent saturated zones in boreholes located near both the 90s Line Pond and the head of Martin Spring Canyon (LANL 2003, 077965, p. 4-55).

### 3.5 Current Site Usage and Operations

The K-Site Subaggregate is located in remote TA-11 (Figures 1.1-1 and 1.1-2). Facilities at this site are used for testing explosive and nonexplosive components and systems, including shock, vibration, thermal and drop-testing materials and components under a variety of extreme physical environments. These facilities are arranged so that testing may be controlled and observed remotely (DOE 2007, 098130). Plastics testing laboratories and training are located at the 300s Line Subaggregate. There are no current operations at P-Site or V-Site Subaggregates.

## 4.0 SCOPE OF INVESTIGATION ACTIVITIES

Four distinct types of sites have been identified in the S-Site Aggregate Area including

- SWMUs and AOCs that are discrete and relatively small (e.g., buildings, manholes, etc);
- SWMUs and AOCs that are related by processes or are geographically located in an area (e.g., HE-processing buildings and their associated sumps and drainlines);
- SWMUs and AOCs influenced by active operations; and
- SWMUs and AOCs that cover a large geographical area (e.g., firing sites and their debris zones).

Because little or no analytical data exist for most sites within the four subaggregates (see LANL 2007, 097685, section 2.0 and Appendix B), a phased sampling approach will be conducted (LANL 2007, 097685). The sampling strategy for each of the subaggregates is summarized in Tables 4.0-1–4.0-5.

For discrete and relatively small sites, 6 to 10 samples will be collected from both the surface and subsurface (0.0 to 0.5 ft and 5.5 to 6.0 ft) to determine the nature and extent of potential contamination. For sites that are related by processes or are geographically concentrated, a larger number of samples will be collected from both the surface and subsurface (0.0 to 0.5 ft and 5.5 to 6.0 ft) at regular intervals to supplement existing data and to define the nature and extent of contamination. For sites included in this work plan that are influenced by active operations, a limited sampling campaign will be conducted to identify potential sources and releases only. Samples will be collected at two depths (0.0 to 0.5 ft and 5.5 to 6.0 ft) and submitted for laboratory analysis. Field screening will be conducted to bias sampling locations for laboratory analysis. For sites of large aerial extent, a sampling grid will be established based on process knowledge and historical operations to define the nature and extent of contamination. Samples will be collected at two depths (0.0 to 0.5 ft and 5.5 to 6.0 ft) and field screened for contaminants of concern.

All samples at each of the subaggregates will be field screened for various constituents as described in sections 4.1, 4.2, 4.3 and 4.4. In general, two analytical samples will be collected at two depths (0.0 to 0.5 ft and 5.5 to 6.0 ft) at each sampling location.

All samples from each of the subaggregates (excluding the extended drainages) that screen positive for a constituent of concern will be submitted to an analytical laboratory for analysis. At a minimum, 30% of all field-screening samples will be sent for laboratory analysis: 10% of the samples will be randomly selected and 20% of the samples will be biased toward identifying contaminant sources and defining the extent of contamination based on geomorphology and the methods of contaminant transport. If contaminants are detected in a field-screening sample, additional field-screening samples will be collected both horizontally and vertically until the contamination has been bounded. Field screening will be performed using the methodologies described in section 5.0.

A total of seven borings will be drilled at V-Site and 300s Line Subaggregates. These borings will be drilled to a minimum depth of 20 ft. Field screening samples will be collected from most of these boreholes beginning at 0.0 to 0.5 ft and continuing at 5-ft intervals until contamination is no longer detected. All screening detects will be submitted to an analytical laboratory for analysis. At a minimum, samples from two depths intervals will be collected and submitted for analysis from each borehole.

Sampling activities in drainages outside SWMU or AOC boundaries are discussed in section 4.5, Extended Drainages.

### 4.1 K-Site Subaggregate

A limited sampling campaign is proposed for the SWMUs and AOCs of the K-Site Subaggregate. This subaggregate includes the active K-Site drop tower, which is deferred for investigation per Table IV-2 of the Consent Order. The Consent Order identifies the remaining SWMUs and AOCs in this subaggregate as nondeferred. These nondeferred sites are located within the radius of influence of the active K-Site drop tower and, therefore, continue to be exposed to contaminant disposition from the ongoing testing conducted at the drop tower. Furthermore, the historical contaminants suspected to be present at these nondeferred sites are the same or similar to the contaminants associated with drop tower activities. Thus, the attribution of contaminants present in environmental media to a particular nondeferred SWMU or AOC is not possible. For these reasons, it is proposed that full characterization of the nondeferred sites with the K-Site Subaggregate be delayed until the drop tower ceases operations. Proposed sampling locations for this subaggregate are shown in Figure 4.1-1 and presented in Table 4.1-1.

Some historical analytical data and field-screening data are available for the K-Site Subaggregate (LANL 2007, 097685, Appendixes B and D); however, these data do not define the nature and extent of contamination. Therefore, this work plan proposes sampling this subaggregate to quantify the nature and extent of contamination.

All samples will be field screened for HE, radionuclides, inorganic chemicals, and organic chemicals as discussed in section 4.0. Samples selected for laboratory analysis will be biased to identify the locations with the highest potential for contamination to define the nature of contamination, if present, and to determine of contaminants are migrating from the sources (Tables 4.0-1 and 4.1-1).

In summary, samples will be collected for laboratory analysis from the location or locations with the greatest potential for contamination. Additional surface and subsurface samples will be collected at two or three locations downgradient of each SWMU or AOC to determine if contaminants are migrating downgradient. No additional samples will be collected at this time in the extended drainages because they are currently influenced by active drop tower operations.

### 4.1.1 AOC C-11-002: Area of Potentially Contaminated Soil at Former Building 11-012

Because no samples have been collected from AOC C-11-002, two samples (one surface and one subsurface) will be collected at one location from within the boundary of the SWMU to define the nature of potential contamination. An additional four samples (two surface and two subsurface) will be collected at two locations in the drainage downgradient of the AOC to determine if potential contaminants are present in the drainage (Figure 4.1-1 and Table 4.1-1).

### 4.1.2 SWMUs 11-005(a), 11-005(b), and 11-011(d): Active Septic Systems and Associated Outfall for Buildings 11-001, 11-003, and 11-004

#### 4.1.2.1 SWMU 11-005(a): Active Septic System for Buildings 11-001 and 11-004

No sampling investigations have been conducted at this SWMU; therefore, two samples (one surface and one subsurface) will be collected at one location from within the boundary of the SWMU to determine the nature of potential contamination. An additional two samples (one surface and one subsurface) will be collected at one location within the drainage between SWMU 11-005(a) and SWMU 11-005(b) to determine if potential contaminants are present in the drainage between the SWMUs (Figure 4.1-1 and Table 4.1-1).

#### 4.1.2.2 SWMU 11-005(b): Active Septic System for Buildings 11-003 and 11-043

No sampling investigations have been conducted at this SWMU; therefore, two samples (one surface and one subsurface) will be collected at one location from within the boundary of the SWMU to determine the nature of potential contamination. An additional two samples (one surface and one subsurface) will be collected from one location within the drainage between SWMU 11-005(b) and SWMU 11-006(d) to determine if potential contaminants are present in the drainage between the SWMUs (Figure 4.1-1 and Table 4.1-1).

#### 4.1.2.3 SWMU 11-011(d): Active Outfall for Building 11-024

No sampling investigations have been conducted at this SWMU; therefore, two samples(one surface and one subsurface) will be collected at one location at the outfall to determine the nature of potential contamination. Because SWMU 11-011(d) is adjacent to SWMU 11-005(b) and located within the same drainage, only one sample will be collected downgradient of SWMU 11-005(b) (Figure 4.1-1 and Table 4.1-1). No additional samples outside the boundary of SWMU 11-011(d) will be collected at this time.

### 4.1.3 SWMUs 11-006(a), 11-006(b), 11-006(c), and 11-006(d): HE Sump, Catch Basins, and Associated Outfalls

#### 4.1.3.1 SWMU 11-006(a): HE Sump

No sampling investigations have been conducted at this SWMU; therefore, three samples (one surface and two subsurface) will be collected at two locations at this SWMU. One subsurface sample will be collected downgradient and below the base of the sump at a depth of 5.0 to 5.5 ft to determine the nature of potential contamination. Two samples (one surface and one subsurface) will be collected at one location in the drainage downgradient between SWMU 11-006(a) and SWMU 11-006(c) to determine if contaminants are present (Figure 4.1-1 and Table 4.1-1).

#### 4.1.3.2 SWMU 11-006(b): Catch Basin and Associated Outfall

One analytical surface sample has been collected at sampling location 16-05904 downgradient of this SWMU's concrete box. The analytical results from this sample indicate the presence of inorganic chemicals above BVs (Figures 2.1-1–2.1-2 and Tables 2.1-1–2.1-3). Additional samples will be collected from this SWMU because no analytical samples have been collected at depth below or downgradient of this SWMU. In addition, the isotopes of the uranium detected in the sample are unknown (Figure 4.1-1 and Table 4.1-1).

One subsurface sample will be collected below the base of the concrete box at a depth of 2.5 to 3.0 ft to determine the nature of contamination at the head of the catch basin and to determine if contaminants are migrating vertically below the SWMU. An additional four samples (two surface and two subsurface) will be collected from two locations within the drainage northeast and downgradient of historical sampling location 16-05904 to determine if potential contaminants are present in the drainage further from the SWMU (Figure 4.1-1 and Table 4.1-1).

#### 4.1.3.3 SWMU 11-006(c): Catch Basin and Associated Outfall

Two surface soil samples have been collected from this SWMU at sampling locations 16-05902 and 16-05903 (Figures 2.1-1–2.1-2 and Tables 2.1-1–2.1-3). No analytes were detected at sampling location 16-05903. HMX was detected and barium and copper were detected above BVs at sampling location 16-05903. Additional samples will be collected from this SWMU because the extent of these contaminants has not been defined.

One subsurface sample will be collected beneath the catch basin at a depth of 2.5 to 3.0 ft to determine the nature of potential contamination. An additional six samples (three surface and three subsurface) will be collected from three locations within the drainage downgradient of the SWMU to determine if potential contaminants are present in the drainage further from the SWMU (Figure 4.1-1 and Table 4.1-1).

#### 4.1.3.4 SWMU 11-006(d): Catch Basin and Associated Outfall

Two surface samples have been collected from this SWMU: sampling locations 16-05900 and 16-05901. HMX was detected at both sampling locations and uranium was detected above BVs at sampling location 16-05900 (Figures 2.1-1–2.1-2 and Tables 2.1-1–2.1-3). Additional samples will be collected from this SWMU because the extent of these contaminants has not been defined. In addition, the isotopes of the uranium detected in the sample are unknown.

One subsurface sample will be collected beneath the catch basin at a depth of 2.5 to 3.0 ft to determine the nature of potential contamination. An additional two samples (one surface and one subsurface) will be collected from one location within the drainage between SWMU 11-006(d) and SWMU 11-006(c) to determine if contaminants are present (Figure 4.1-1 and Table 4.1-1).

### 4.1.4 SWMUs 11-005(c), 11-011(a), and 11-011(b): Inactive Outfalls from Drainlines at Buildings 11-002, 11-030A, and 11-030

#### 4.1.4.1 SWMU 11-005(c): Inactive Outfalls from Drainlines at Buildings 11-002, 11-030A , and 11-030

No sampling investigations have been conducted at this SWMU; therefore, two samples (one surface and one subsurface) will be collected at one location from the SWMU at the outfall to determine the nature of potential contamination. An additional four samples (two surface and two subsurface) will be collected

from two locations within the drainage north and downgradient of the SWMU to determine if contaminants are present in the drainage (Figure 4.1-1 and Table 4.1-1).

#### 4.1.4.2 SWMU 11-011(a): Inactive Outfall from Drainlines at Buildings 11-002, 11-030A, and 11-030

No sampling investigations have been conducted at this SWMU; therefore, two (one surface and one subsurface) samples will be collected at one location from the SWMU at the outfall to determine the nature of potential contamination. An additional four samples (two surface and two subsurface) will be collected from two locations within the drainage north and downgradient of the SWMU to determine if contaminants are present in the drainage (Figure 4.1-1 and Table 4.1-1).

#### 4.1.4.3 SWMU 11-011(b): Inactive Outfall from Drainlines at Buildings 11-002, 11-030A, and 11-030

No sampling investigations have been conducted at this SWMU; therefore, two samples (one surface and one subsurface) will be collected at one location from within the SWMU at the outfall to determine the nature of potential contamination. An additional four samples (two surface and two subsurface) will be collected from two locations within the drainage north and downgradient of the SWMU to determine if contaminants are present in the drainage (Figure 4.1-1 and Table 4.1-1).

### 4.2 P-Site Subaggregate

The P-Site Subaggregate contains small, discrete sites; sites of greater aerial extent that are related by processes or geography; and sites of large aerial extent. A firing site and its supporting structures, a landfill (disposal area created by debris from the firing site), and a WWTP are the three main areas of concern at the P-Site Subaggregate. In addition, there are unlocated burn pits and several discrete sites at former building footprints (control laboratory, firing site bunkers, a workshop, storage buildings, and HE magazines).

Some historical analytical data and field-screening data are available from the WWTP at the P-Site Subaggregate (LANL 2007, 097685, Appendix E). Samples were collected at the NPDES-permitted outfall, EPA-SSS03S, and within SWMU 16-004(f), the sludge drying beds; no other sampling has been conducted at the P-Site Subaggregate. These data do not define the nature and extent of contamination. Therefore, this work plan proposes sampling this subaggregate to quantify the nature and extent of contamination. Proposed sampling locations for this subaggregate are shown in Figures 4.2-1–4.2-3 and described in Tables 4.0-2 and 4.2-1.

All samples collected will be field screened for HE, radionuclides, inorganic chemicals, and organic chemicals. A minimum of 30% of the field-screening samples collected will be submitted for laboratory analysis. Samples selected for laboratory analysis will be biased toward identifying contaminant sources and defining the extent of contamination based on geomorphology and the methods of contaminant transport. If contaminants are detected in the field-screening samples, additional screening samples will be collected both horizontally and vertically until contamination has been bounded (see section 4.0).

Laboratory samples will be collected from each SWMU or AOC as described in the following subsections. Sampling of the drainages extending beyond SWMU or AOC boundaries is discussed in section 4.5.

### 4.2.1 SWMUs 13-001 and 13-002: Firing Site and Landfill

No sampling investigations have been conducted at SWMU 13-001, the firing site. Therefore, a bullseye sampling grid has been established for SWMU 13-001 based on process knowledge and historical operations (Figure 4.2-2 and Table 4.2-1). The bullseye grid was chosen to define the nature and extent of contamination and was based on the radial dispersion of potential contaminants from the firing point. It includes 74 sampling locations. One surface (0.0 to 0.5 ft) and one subsurface (5.5 to 6.0 ft) sample will be collected from each sampling location in the bullseye grid. Sample locations of the grid will also be used to characterize the soil at SWMUs 16-035, 16-036, and 13-004.

No sampling investigations have been conducted at the SWMU 13-002, the landfill (debris disposal area). Therefore, eight surface and eight subsurface samples will be collected at depths from 0.0 to 0.5 ft and 5.5 to 6.0 ft on a random grid over the area of the SWMU to define the nature and extent of contamination (Figure 4.2-2 and Table 4.2-1).

### 4.2.2 SWMUs 16-035, 16-036, 16-025(d2), and 16-031(h) and AOCs 16-024(a), 16-024(u), C-16-049, C-16-050, C-16-060, C-16-062, and C-16-063: Areas of Potentially Contaminated Surface Soil

#### 4.2.2.1 SWMUs 16-035 and 16-036: Areas of Potentially Contaminated Surface Soil

No sampling investigations have been conducted at these SWMUs. SWMUs 16-035 and 16-036 are former bunkers located within the area for the bullseye grid sampling proposed for SWMU 13-001 (Figure 4.2-2 and Table 4.2-1). Samples collected from the grid will be used to characterize the soil at SWMUs 16-035 and 16-036; therefore, no additional samples will be collected.

#### 4.2.2.2 SWMUs 16-025(d2) and 16-031(h) and AOCs 16-024(a), 16-024(u), C-16-050, and C-16-060: Areas of Potentially Contaminated Surface Soil

No sampling investigations have been conducted at these SWMUs and AOCs. SWMUs 16-025(d2) and 16-031(h) and AOCs 16-024(a), 16-024(u), C-16-050 and C-16-060 are small, discrete areas of potentially contaminated soil (Figures 4.2-1 and 4.2-2).

At SWMU 16-025(d2) and at AOCs 16-024(a), 16-024(u), C-16-050 and C-16-060, 10 samples (5 surface and 5 subsurface) will be collected at each SWMU or AOC to define the nature and extent of contamination (Figure 4.2-2 and Table 4.2-1).

For SWMU 16-031(h), a former outfall, six samples (three surface and three subsurface) will be collected to define the nature and extent of contamination (Figure 4.2-2 and Table 4.2-1). In addition, this SWMU is located within the bullseye sampling grid for SWMU 13-001. The grid samples may be used to characterize further the potential soil contamination adjacent to SWMU 16-031(h).

#### 4.2.2.3 AOCs C-16-049, C-16-062, and C-16-063: Areas of Potentially Contaminated Surface Soil

No characterization activities are planned for AOCs C-16-049, C-16-062, and C-16-063. Archival material documents that these sites are appropriate for NFA. The statement of basis providing the rationale for NFA for each of these sites and associated archival materials will be submitted as part of the investigation report associated with this work plan.

### 4.2.3 AOC 16-003(p) and SWMU 16-029(h): HE Sump, Drainlines, and Outfalls

No samples have been collected at this SWMU and AOC. Several samples will be collected in addition to the bullseye grid samples collected for SWMU 13-001.

Six (three surface and three subsurface) samples will be collected at three locations at AOC 16-003(p) to define the nature and extent of contamination (Figure 4.2-2 and Table 4.2-1).

For SWMU 16-029(h), 32 (16 surface and 16 subsurface) samples will be collected at 16 locations to define the nature and extent of contamination (Figure 4.2-2 and Table 4.2-1).

### 4.2.4 SWMU 13-004: Burning Pits

No sampling investigations have been conducted at this SWMU. The area where SWMU 13-004 may be located was disturbed and covered by past S-Site construction (Figure 4.2-2 and Table 4.2-1). Samples collected for the bullseye grid will be used to characterize the soil at SWMU 13-004; therefore, no additional samples will be collected.

### 4.2.5 SWMUs 16-004(a), 16-004(b), 16-004(c), 16-004(d), 16-004(e), and 16-004(f): Former TA-16 Sanitary Wastewater Treatment Plant

The WWTP discharged to an NPDES-permitted outfall (EPA-SSS03S), which was monitored for inorganic chemicals, radionuclides, organic chemicals, pesticides, and standard parameters for wastewater systems (e.g., biological oxygen demand, chemical oxygen demand, TDS and anions) (LANL 1993, 020948, 5-135). Sludge samples were also collected from the drying beds and analytical results detected cesium-137, plutonium-238, plutonium-239, and plutonium-240. Beryllium was also detected above BVs in the sludge (LANL 1993, 020948, pp. 5-135–5-138; LANL 2007, 097685, Appendix E). However, these data can only be used for screening purposes because of current data quality standards.

Therefore, 10 samples (5 surface and 5 subsurface) will be collected at each of the structures of the former WWTP, except for SWMU 16-004(e), to define the nature and extent of contamination below the SWMU (Figure 4.2-3 and Table 4.2-1).

SWMU 16-004(e) was not located during a 2007 site visit (Birdsall 2007, 097416). Therefore, no sampling is planned for this SWMU. However, if the SWMU is located during the field campaign, a minimum of six samples (three surface and three subsurface) will be collected to define the nature and extent of contamination below the SWMU.

Twenty-four samples (12 surface and 12 subsurface) will be collected downgradient of the WWTP to define the nature and extent of contamination in the drainage below the outfall (Figure 4.2-3 and Table 4.2-1).

## 4.3 300s Line Subaggregate

The 300s Line Subaggregate consists of four areas of investigation: (1) HE-processing facilities on the east side of the complex, (2) a liquid waste trunk line along the east side, (3) shared drainages on the south end of the complex, and (4) rest houses on the west side of the complex. A large number of surface and subsurface samples will be collected at regular intervals in all three areas to supplement existing data and to define the nature and extent of contamination.

Some historical analytical data and field-screening data are available for the 300s Line Subaggregate (LANL 2007, 097685, Appendixes B, D, and E); however, these data do not define the nature and extent of contamination. Therefore, this work plan proposes sampling this subaggregate to quantify the nature and extent of contamination. Proposed sampling locations for this subaggregate are shown in Figure 4.3-1 and described in Tables 4.0-3 and 4.3-1.

All samples collected will be field screened for HE, organic chemicals, and inorganic chemicals as discussed in section 4.0. A minimum of 30% of the field-screening samples collected will be sent for analytical laboratory (see section 4.0). Samples selected for laboratory analysis will be biased toward identifying contaminant sources and defining the extent of contamination based on geomorphology and the methods of contaminant transport. The biased sampling will ensure that confluences of drainages and tributaries are targeted for sampling and analysis. If contaminants are detected in the screening samples, additional screening samples will be collected both horizontally and vertically until contamination has been bounded.

Historical analytical data for the 300s Line identified potential contamination at depths >10 ft but did not define the horizontal or vertical extent. Therefore, three boreholes will be drilled and sampled at 5-ft intervals beginning at 0.0 to 0.5 ft to a minimum depth of 20 ft. Two boreholes will be located in the low-lying drainage area between buildings 16-307 and 16-306, and another one will be located on the east side of HE Road at the confluence of the outfalls associated with the rest houses and the HE-processing facilities (Figure 4.3-1 and Table 4.3-1).

### 4.3.1 SWMU 16-026(z): Area of Potentially Contaminated Soil Resulting from Roof Drain Spout at Building 16-306

No sampling investigations have been conducted at this SWMU; therefore, eight samples (four surface and four subsurface) will be collected at four locations in and around the base of the roof drain spout (Figure 4.3-1 and Table 4.3-1).

### 4.3.2 SWMUs 16-001(e), 16-003(d), 16-003(e), 16-003(f), and 16-003(g): HE Sumps and Associated Dry Well

#### 4.3.2.1 SWMU 16-001(e): Inoperable Dry Well

The dry well never operated and was backfilled with soil of unknown origin (most likely from the immediate surroundings).

The 1995 field screening of three samples collected at SWMU 16-001(e) indicated the presence of organic chemicals in the subsurface and radionuclides in the surface and subsurface (LANL 2007, 097685, Appendix D). No analytical samples have been collected at this SWMU.

Therefore, 10 samples (5 surface and 5 subsurface) will be collected at 5 locations surrounding and within the footprint of the dry well (Figure 4.3-1and Table 4.3-1).

#### 4.3.2.2 SWMU 16-003(d): HE Sumps for Building 16-300

No sampling investigations have been conducted at this SWMU; therefore, four subsurface samples will be collected, at a depth of 5.0 to 5.5 ft and 10.5 to 11.0 ft, immediately outside and below the bottom of each of the two inactive HE sumps and submitted for analysis (Figure 4.3-1 and Table 4.3-1). Additional samples will be taken in the shared liquid waste trunk line and are discussed in section 4.3.3.

#### 4.3.2.3 SWMU 16-003(e): HE Sumps for Building 16-302

The 1995 field screening of seven subsurface samples collected at SWMU 16-003(e) indicated the presence of organic chemicals (LANL 2007, 097685, Appendix D). No analytical samples have been collected at this SWMU.

Four subsurface samples will be collected, at a depth of 5.0 to 5.5 ft and 10.5 to 11.0 ft, immediately outside and below the bottom of each of the two inactive HE sumps and submitted for analysis (Figure 4.3-1 and Table 4.3-1). Additional samples will be taken in the shared liquid waste trunk line and are discussed in section 4.3.3.

#### 4.3.2.4 SWMU 16-003(f): HE Sumps for Building 16-304

The 1995 field screening of 11 surface samples collected at SWMU 16-003(f) did not identify organic chemicals or radionuclides (LANL 2007, 097685, Appendix D).

Four subsurface samples will be collected, at a depth of 5.0 to 5.5 ft and 10.5 to 11.0 ft, immediately outside and below the bottom of each of the two inactive HE sumps and submitted for analysis (Figure 4.3-1 and Table 4.3-1). Additional samples will be taken in the shared liquid waste trunk line and are discussed in section 4.3.3.

#### 4.3.2.5 SWMU 16-003(g): HE Sumps for Building 16-306

No sampling investigations have been conducted at this SWMU; therefore, four subsurface samples will be collected at depths of 5.0 to 5.5 ft and 10.5 to 11.0 ft immediately outside and below the bottom of each of the two inactive HE sumps and submitted for analysis (Figure 4.3-1 and Table 4.3-1). Additional samples will be taken in the shared liquid-waste trunk line and are discussed in section 4.3.3.

### 4.3.3 Shared Liquid Waste Trunk Line

The HE-processing buildings shared a liquid-waste trunk line that runs from building 16-300 south to building 16-306. The trunk line discharged through an NPDES-permitted outfall (EPA-05A058) into a well-defined drainage across HE Road and southeast of building 16-306. Twelve surface and 12 subsurface samples will be collected from 12 sampling locations along the shared liquid waste trunk line to determine if potential contaminants are present (Figure 4.3-1 and Table 4.3-1).

### 4.3.4 Shared Drainages

In 1989, three water and three sediment samples were collected as part of the NPDES permit for the outfall (EPA-05A058) associated with building 16-300 (LANL 2007, 097685, Appendix E). These samples were analyzed for HE, radionuclides, asbestos, organic chemicals, and inorganic chemicals. Organic chemicals, inorganic chemicals, and HE were detected in the both the water and sediment samples. Radionuclides were also detected in the sediment samples (DOE 1989, 015364, pp. 4.10-30-4.10-43).

Four samples (two surface and two subsurface) will be collected from two locations in the low lying area and shared drainage between the rest houses and HE-processing facilities west of HE Road (Figure 4.3-1 and Table 4.3-1).

Ten samples (five surface and five subsurface) will be taken at five location in the drainages along the east side of HE Road [across from building 16-306 and upgradient of SWMU 16-001(e)] that converge and run into S-Site canyon (Figure 4.3-1 and Table 4.3-1).

A borehole will be located downgradient of SWMU 16-026(z) in the drainage near the outfalls for the HE-processing building and rest houses. The borehole will be sampled at 5-ft intervals to a minimum depth of 20 ft (Figure 4.3-1 and Table 4.3-1). If perched water is encountered, samples will be collected as discussed in section 5.5

### 4.3.5 SWMUs 16-026(b), 16-026(c), 16-026(d), 16-026(e), 16-029(a), 16-029(b), 16-029(c), and 16-029(d): HE Sumps and Outfalls

#### 4.3.5.1 SWMUs 16-026(b), 16-026(c), 16-026(d), and 16-026(e): HE Outfalls

The 1995 field screening of 12 surface samples collected at SWMU 16-026(c) did not identify HE or organic chemicals (LANL 2007, 097685, Appendix D). However, analytical results from surface and subsurface samples collected concurrently detected polycyclic aromatic hydrocarbons above background (Figures 2.3-1–2.3-8 and Tables 2.3-1–2.3-3).

The 1995 field screening of seven surface samples collected at SWMU 16-026(b) detected HE, radionuclides, and organic chemicals above background (LANL 2007, 097685, Appendix D).

Six samples (three surface and three subsurface) will be collected at three locations for each outfall except at SWMU 16-026(b): at the discharge of the outfall, approximately midway between outfalls, and immediately before the subsequent outfall. At SWMU 16-026(b), four samples (two surface and two subsurface) will be collected at two locations (Figure 4.3-1 and Table 4.3-1).

In addition, two 20-ft boreholes will be drilled in the shared drainage. One will be drilled between buildings 16-306 and 16-307 and another will be drilled due east of building 16-307. Samples will be collected from the borehole at 5-ft intervals until a depth of 20 ft. An additional 20-ft borehole will be drilled at the southeast area of SWMU 16-026(c) and sampled at 5-ft intervals (Figure 4.3-1 and Table 4.3-1). If perched water is encountered in either borehole, samples will be collected as discussed in section 5.5.

#### 4.3.5.2 SWMUs 16-029(a), 16-029(b), 16-029(c), and 16-029(d): HE Sumps

Two subsurface samples will be collected at 5.0 to 5.5 ft and 10.5 to 11.0 ft immediately outside and below the bottom of each of the inactive HE sumps and submitted for analysis. Samples will also be collected in the associated drainage (Figure 4.3-1 and Table 4.3-1). These samples are discussed in section 4.3.4.1.

## 4.4 V-Site Subaggregate

The V-Site Subaggregate consists of three areas of investigation: (1) a courtyard area with several miscellaneous SWMUs and AOCs, (2) the HE-processing facilities and electroplating laboratory located west of the courtyard, and (3) several discrete, outlying SWMUs and AOCs. A large number of surface and subsurface analytical samples will be collected from all three areas to supplement the existing data and to define further the nature and extent of contamination.

Some historical analytical data and field-screening data are available for the V-Site Subaggregate (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3) (LANL 2007, 097685, Appendixes B and D). Sampling was conducted in coordination with the 1997 D&D activities on aboveground and belowground structures at V-Site (LANL 1997, 055653). However, these data do not define the nature and extent of contamination. Therefore, this work plan proposes sampling to quantify the nature and extent of contamination at this subaggregate, which contains small, discrete sites and sites of greater aerial extent that are related by

processes or geography. Proposed sampling locations for this subaggregate are shown in Figures 4.4-1–4.4-2 and described in Tables 4.0-4 and 4.4-1.

All samples collected will be field screened for HE, organic chemicals, and inorganic chemicals. A minimum of 30% of the samples collected will be sent for analytical laboratory. Samples selected for laboratory analysis will be biased toward identifying contaminant sources and defining the extent of contamination based on geomorphology and the methods of contaminant transport. If contaminants are detected in the field-screening samples, additional screening samples will be collected both horizontally and vertically until contamination has been bounded (see section 4.0).

### 4.4.1 AOC C-16-068; SWMUs 16-017(q)-99, 16-017(v)-99, 16-025(x), 16-029(w), 16-029(x), 16-017(p)-99, 16-017(w)-99, 16-034(m), and 16-034(n) and AOCs 16-024(m) and 16-024(n): Areas of Potentially Contaminated Soil

SWMUs 16-017(p)-99, 16-017(w)-99, 16-034(m), and 16-034(n) and AOCs 16-024(m) and 16-024(n) are outlying SWMUs and AOCs of discrete, potentially contaminated soil that are not directly associated with the courtyard or the HE-processing facility. SWMUs 16-017(v)-99, 16-025(x), 16-029(w), and 16-029(x) are either associated with building 16-515, an HE-processing facility, or building 16-100, an electroplating laboratory. AOC C-16-068 and SWMU 16-017(q)-99 are located in the courtyard area of V-Site.

Historical analytical data are available for some of these SWMUs (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3): however, these data do not adequately define the nature and extent of contamination. Therefore, this work plan proposes to collect data to supplement the existing data and further define the nature and extent of contamination.

#### 4.4.1.1 SWMUs 16-017(p)-99, 16-017(w)-99, 16-034(m), and 16-034(n) and AOCs 16-024(m), and 16-024(n): Areas of Potentially Contaminated Soil

Historical analytical data are available for SWMUs 16-024(m), 16-034(m), and 16-034(n) (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3). However, these data do not define the nature and extent of contamination. Eight samples (four surface and four subsurface) will be collected at each of these three sites to further define extent (Figures 4.4-1–4.4-2 and Table 4.4-1).

#### 4.4.1.2 SWMUs 16-017(v)-99, 16-025(x), 16-029(w), and 16-029(x): Areas of Potentially Contaminated Soil

Historical analytical data are available for SWMUs 16-025(x), 16-029(w), and 16-029(x) (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3); however, these data do not define the nature and extent of contamination.

No sampling investigations have been conducted for SWMU 16-017(v)-99; therefore, eight samples (four surface and four subsurface) will be collected at four locations around the concrete pad of building 16-515. The samples will target potential contamination draining off the concrete pad and below former drainlines to define the nature and extent of contamination (Figures 4.4-1–4.4-2 and Table 4.4-1).

Historical analytical data for SWMU 16-025(x) indicate the presence of inorganic and organic chemicals in surface soils; however, no samples were collected at depth or surrounding the building (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3). Therefore, six samples (three surface and three subsurface) will be collected at three locations to the north, south, and west outside of the building's footprint to define the nature and extent of contamination (Figures 4.4-1–4.4-2 and Table 4.4-1).

Historical analytical data for SWMU 16-029(w) indicate the presence of organic chemicals and inorganic chemicals at a depth of 2.5 ft (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3). Therefore, 10 subsurface samples will be collected at 5 locations along the drainline. Six subsurface samples will be collected at two depths (11.0 to 11.5 ft and 16.5 to 17.0 ft) to the north, northwest, and south of sampling location 16-05829 to define both the vertical and horizontal extent of previously identified contamination. Because of its proximity to SWMU 16-029(x), the sampling location to the north of former sampling location 16-05829 will be collocated with a subsurface sample also being collected for SWMU 16-029(x). Four other subsurface samples will be collected at two depths (7.5 to 8.0 ft and 12.5 to 13.0 ft) to the north and south of sampling location 16-03409 to define both the vertical and horizontal extent of previously identified contamination. The deepest sampling locations for these samples deepened slightly to aid in the definition of the extent of contamination at SWMU 16-029(x) (Figures 4.4-1–4.4-2 and Table 4.4-1).

Historical analytical data for SWMU 16-029(x) indicate the presence of organic chemicals and inorganic chemicals at a various depths. The maximum depth of inorganic chemicals detected above BVs is 6.5 ft; organic chemicals were also detected at a depth of 6.5 ft along the former drainline (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3). Therefore, 34 subsurface samples will be collected at 2 depths (11.5 to 12.0 ft and 16.5 to 17.0 ft) approximately every 100 ft along the drainline. The samples will be collected 5 ft on either side of the centerline of the historical sampling locations. One sample north of sampling location 16-03409 will be collocated with a sample taken for SWMU 16-029(w) (Figures 4.4-1–4.4-2 and Table 4.4-1).

In the ponded area or swale at the end of the drainline, 16 subsurface samples will be collected at 7 locations between the outfall of the drainline and K-Site Road to define the extent of potential contamination. These samples will be collected at depths of 11.5 to 12.0 ft and 16.5 to 17.0 ft, which is 5 ft below the deepest known contamination (Figures 4.4-1–4.4-2 and Table 4.4-1).

#### 4.4.1.3 AOC C-16-068 and SWMU 16-017(q)-99: Areas of Potentially Contaminated Soil

Historical analytical data for AOC C-16-068 indicate the presence of organic chemicals and inorganic chemicals at a depth of 7.0 ft (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3). A total of eight samples (four surface and four subsurface) will be collected from two depths at four locations. Subsurface samples (at 12.0 to 12.5 ft and 17.0 to 17.5 ft) will be collected from within the site boundary to define vertical extent. Six subsurface samples at three sampling locations to the west, southwest, and south of the site will be collected (at 12.0 to 12.5 and 17.0 to 17.5 ft) to define lateral and vertical extent of previously identified contamination at AOC C-16-068 (Figures 4.4-1–4.4-2 and Table 4.4-1).

No historical analytical data are available for SWMU 16-017(q)-99. SWMU 16-017(q)-99 is building 16-517, which is one of two structures that survived the Cerro Grande fire (LANL 2000, 066885, p. 1); however, the building has no active operations. Because the building is still intact and contamination is not anticipated beneath it, samples will only be collected from the perimeter of SWMU 16-017(q)-99. The historic High Bay assembly building [SWMU 16-017(t)-99], is located immediately north of SWMU 16-017(q)-00. Because of the proximity of the historic building, six samples will be collected from three locations around the accessible corners south and west of building 517. These soil samples will be collected at two depths (0.0 to 0.5 ft and 5.5 to 6.0 ft) to determine the nature and extent of contamination, if it is present. Borehole samples collected in association with SWMU 16-029(g2) and AOC C-16-074 will be used to bound the potential contamination from SWMU 16-017(q)-99 to the east (Figures 4.4-1–4.4-2 and Table 4.4-1).

### 4.4.2 SWMUs 16-006(g) and 16-031(c): Septic System and Drainline

Some historical analytical data are available for these SWMUs (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3); however, these data do not define the nature and extent of contamination. Therefore, additional samples will be collected to supplement the existing data and further define the nature and extent of contamination.

Historical analytical data for SWMU 16-006(g) indicate the presence of organic chemicals and inorganic chemicals at a depth of 3.5 ft (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3). Therefore, four subsurface samples will be collected at two depths (8.5 to 9 and 13.5 to 14.0 ft) at two locations northwest and southeast of sampling location 16-03357 to define the vertical and horizontal extent of previously identified contamination (Figures 4.4-1–4.4-2 and Table 4.4-1).

Historical analytical data for SWMU 16-031(c) indicate the presence of HE, organic chemicals, and inorganic chemicals at a depth of 4.5 ft (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3). Therefore, eight subsurface samples will be collected at two depths (9.5 to 10.0 ft and 14.5 to 15.0 ft) at four locations west and east of sampling locations 16-03043 and 16-03051 to define the vertical and horizontal extent of previously identified contamination (Figures 4.4-1–4.4-2 and Table 4.4-1).

### 4.4.3 SWMUs 16-006(h), 16-013, 16-017(r)-99, 16-017(s)-99, 16-017(t)-99, and 16-029(g2) and AOC C-16-074: Former Storage Areas, Pump and Concrete Pit

Though historical analytical data are available for SWMU 16-029(g2) and AOC C-16-074 (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3), the data do not define the nature and extent of contamination. Therefore, this work plan proposes collecting additional data to supplement the existing data and further define the nature and extent of contamination.

Two angled and two vertical boreholes will be drilled to define the vertical extent of contamination at SWMU 16-029(g2) and AOC C-16-074. Vertical boreholes will be drilled near the structures, and angled boreholes will be drilled where space allows. Samples will be collected from the angled boreholes at 5-ft intervals to a minimum depth of 20 ft until directly beneath the SWMU and AOC. Field screening samples will be collected from the boreholes at 5-ft intervals until contaminants are no longer detected (Figures 4.4-1–4.4-2 and Table 4.4-1).

For SWMU 16-017(t)-99, an existing structure, only six surface and subsurface samples will be collected from three unique locations immediately adjacent to the structure's concrete slab. These locations will bound the SWMU on the northeast, northwest, and southwest corners. Borehole samples collected in association with SWMU 16-029(g2) and AOC C-16-074 will be used to bound the potential contamination from SWMU 16-017(t)-99 to the south (Figures 4.4-1–4.4-2 and Table 4.4-1).

For SWMUs 16-017(r)-99 and 16-017(s)-99, 16 surface and subsurface samples will be collected from 8 unique locations. Four of these samples are located at each of the corners of the adjoining buildings and one at the center of each structure (Figures 4.4-1–4.4-2 and Table 4.4-1).

For SWMU 16-006(h), six surface and subsurface samples at two depths (0.0 to 0.5 and 5.5 to 6.0 ft) will be collected from three locations (Figures 4.4-1–4.4-2 and Table 4.4-1).

SWMU 16-013 is bounded on the south side by SWMUs 16-017(r)-99 and 16-017(s)-99. Therefore, data collected for those SWMUs will bound the nature and extent of contamination for the southern part of SWMU 16-013. Another 20 samples will be collected at two depths (0.0 to 0.5 ft and 5.5 to 6.0 ft) from 10 sampling locations around the perimeter and within the interior of the footprint of SWMU 16-013.

In addition, historical data collected from the northeast corner of the site detected organic chemicals and inorganic chemicals (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3). Therefore, six surface and subsurface samples will be collected at three locations around sampling locations 16-03008 and 16-03009 to determine the nature and extent of contamination (Figures 4.4-1–4.4-2 and Table 4.4-1).

Some historical analytical data are available for the small drainage area at the northeast corner of SWMU 16-013 (Figures 2.4-1–2.4-6 and Tables 2.4-1–2.4-3). For this area, 12 surface and subsurface samples will be collected at 2 depths at 6 new locations (Figures 4.4-1–4.4-2 and Table 4.4-1).

In addition, eight (four surface and four subsurface) samples will be collected from four locations in the relatively level drainage area north of SWMU 16-013 and west of K-Site Road (Figures 4.4-1–4.4-2 and Table 4.4-1).

### 4.5 Extended Drainages

The S-Site Aggregate Area is located in a watershed addressed under the South Canyons investigation. The South Canyons investigation work plan will address the sources of contamination and the nature and extent of contamination in sediments, surface water of the active stream channel, and groundwater beneath the canyon floor (canyons media) in the South Canyons system. The scope of the South Canyons investigation includes the sampling and analysis of canyons media from the watersheds associated with Cañon de Valle and Ancho, Chaquehui, Fence, Indio, Potrillo, and Water Canyons (LANL 2006, 093713, p. 2).

The Canyons Watershed investigation for the South Canyons will address contamination potentially transported from S-Site Aggregate Area SWMUs and AOCs by surface water. Specifically, reaches designated within the South Canyons investigation work plan will address all S-Site drainages except for two extending from the P-Site Subaggregate: one drainage extends eastward and another extends southward (Figure 3.2-1).

The eastern drainage is within Fishladder Canyon and extends eastward approximately 385 ft before encountering a reach, designated as FL-1 in the South Canyons investigation work plan (Figure 4.5-1). This area has been previously sampled during investigations associated with building 16-340 (LANL 2004, 087345); however, additional samples in this drainage will be collected to provide more comparable analytical data. The southern drainage extends approximately 725 ft before encountering a reach, designated SS-2 in the South Canyons investigation work plan in S-Site Canyon; this drainage has not been sampled previously.

A total of 42 samples will be collected from transects (approximately every 200 ft) along these 2 drainages. Field-screening samples will be collected along two transects in the east drainage and five transects in the southern drainage. The transects and sampling locations will be determined based on geomorphology and the results of field screening for HE, radionuclides, organic chemicals, and inorganic chemicals. Three surface (0.0 to 0.5 ft) and three subsurface (1.0 to 1.5 ft) samples will be collected from three locations across each transect and submitted for laboratory analysis (Figure 4.5-1 and Tables 4.0-5–4.5-1).

## 5.0 INVESTIGATION METHODS

The current versions of EP-Environment and Remediation Support Services (ERSS) SOPs apply to the investigation methods proposed in this plan. The methods are summarized in Table 5.0-1.

The procedures are available at the following web site: http://www.lanl.gov/environment/all/qa.shtml. Additional procedures may be added as necessary or appropriate to describe and document activities. All work will be performed in accordance with applicable procedures and the EP-ERSS quality management program.

## 5.1 Field Surveys

The following sections describe the field surveys that will be conducted at some or all of the S-Site Aggregate Area sites.

### 5.1.1 Geodetic Surveys

Geodetic surveys will be conducted in accordance with the latest version of SOP-03.11 to locate historical structures and proposed sampling locations. Geodetic surveys will also document field activities such as new sampling and excavation locations. Geodetic surveys will be completed using a Trimble GeoXT hand-held global positioning system (GPS), or equivalent. The coordinate values will be expressed in the New Mexico State Plane Coordinate System (Transverse Mercator), Central Zone, North American Datum 1983. All GPS equipment used will meet the accuracy requirements specified in the SOP.

### 5.1.2 Radiological Surveys

Surface radiological walkover surveys will be conducted at selected sites before fieldwork begins to confirm worker safety according to health and safety requirements and to identify target sampling locations to define the nature and extent of contamination. At SWMUs and AOCs (e.g., buildings, building foundations, drainage channels, leach fields, etc.) with structures or former structures, a survey will be completed that fully covers the structure. The focus of the walkover survey will be to locate areas with elevated counts of alpha-, beta-, and gamma-emitting radionuclides. Locations with radioactivity measuring 2 times greater than the instrument background level[s] will be marked for additional sampling.

The surface radiological walkover survey will be performed by the on-site radiological control technician (RCT) before any fieldwork begins at the site. The survey equipment will be capable of detecting the presence of radiological anomalies. It will be conducted using sodium iodide gamma scintillometers (or equivalent) to identify either point-source anomalies (isolated metallic fragments or areas that decrease uniformly away from a discrete point) or area anomalies (disseminated oxidized uranium or other large area anomalies sometimes associated with disturbed areas such as roads, berms, etc.). If the measurements exceed the scintillometer, a portable ion chamber may be used.

Radiological walkover surveys will be performed in accordance with SOP-10.14. All instrumentation will be calibrated twice daily before the instrument background level is determined. This calibration will be performed according to the manufacturer's specifications. A RCT will collect a minimum of two instrument background levels each day, one in the morning and one in the afternoon. If more than one site is visited each day, an instrument background level will be calculated before work begins at each individual site. Background levels will be calculated by taking ten 1-min counts surrounding the area to be surveyed and outside the zone of possible radioactive contamination. These 10 values will then be averaged and this instrument background level will be the background level for the purpose of the radiological walkover survey.

## 5.2 Subsurface Characterization

### 5.2.1 Drilling Methods for Boreholes

Boreholes will be drilled using mechanical methods, such as a hand auger or air-rotary drill rig. As required, drilling plans will be developed in accordance with SOP-04.01.

Samples will be collected at the target depths and screened for contaminants called out in section 4.0 of this work plan. Boreholes completed using mechanical drilling methods will be advanced 5 ft beyond elevated field-screening results for any field screen. If elevated field-screening results are recorded within 5 ft of the target depth, the borehole will be advanced using mechanical drilling methods in 5-ft intervals until no elevated field-screening results are recorded over a 5-ft interval. Samples may be collected at additional depths depending upon screening results. The samples will be visually inspected and geologically logged. IDW produced during drilling operations will be properly containerized and disposed per SOP-01.06 and SOP-01.10 (Appendix B).

The exact location of each borehole will be determined using geodetic field surveys, utility locations identified as part of the excavation permitting process, and other access-restrictive surface conditions, in accordance with the current version of SOP-03.11. Each location will be thoroughly examined to identify potential hazards for subsurface drilling. All borehole locations will be field-verified, surveyed in advance relative to subaggregate features, and recorded in field logbooks.

## 5.3 Collection of Subsurface Samples

All boreholes greater than 6 ft advanced through mechanical drilling methods will be cored continuously to TD. The cores will be geologically logged to TD following the current versions of SOP-04.01 and SOP-12.01. Following the current version of SOP-06.24 and SOP-06.26, subsurface samples will be collected from core extracted in a split-spoon core barrel. Samples collected for chemical analysis will be placed in the appropriate sample containers, depending on the analytical method requirement in accordance with the current version of SOP-01.02. The analytical suites for the samples from each borehole will vary according to the data requirements of each site, as discussed in section 4.0 and Tables 4.1-1–4.4-1 of this work plan.

Quality assurance/quality control (QA/QC) samples will include: (1) field duplicate samples to evaluate the reproducibility of the sampling technique and (2) rinsate blanks to evaluate the effectiveness of decontamination procedures. These samples will be collected following the current version of SOP-01.05 and will comply with a field duplicate collection frequency of 10% of total samples collected and a rinsate blank collection frequency of 10% of total samples collected. Trip blanks will be supplied by the Sample Management Office (SMO) before the start of each field day and will remain with analytical samples when collecting samples for VOC analysis.

Following the current version of SOP-12.01, field documentation of samples collected from fractures encountered will include a detailed physical description of the fracture-fill material and rock matrix sampled. The volumes of fracture-fill and rock-matrix material included in the sample will be estimated from field measurements. Additional samples will be collected from the rock matrix adjacent to the fracture sample material allowing for comparison.

Field documentation will also include detailed borehole logs for each borehole drilled. The borehole logs will document the matrix material in detail and will include the results of all field screening; fractures and matrix samples will be assigned unique identifiers. Field documentation will be completed in accordance with the current version of SOP-12.01.

### 5.3.1 Field Screening of Subsurface Samples

The primary field-screening methods to be used on subsurface samples include (1) visual examination, (2) radiological screening, and (3) vapor screening for VOCs using a PID. Additional screening for release-specific characteristics (e.g., HE and barium) may be conducted using field analytical methods such as immunoassay (e.g., HE spot test; Strategic Diagnostics, Inc.; and D-TECH RDX test kits) and x-ray fluorescence (XRF) techniques (SOP-10.08), respectively.

#### 5.3.1.1 Radiological Screening

Radiological screening will target gross alpha-, beta-, and gamma-emitting radionuclides. Field screening will be conducted within 1 in. of sample material by the RCT from surface, shallow subsurface, and subsurface material in core or in the sample-mixing bowl before material is placed in sample jars. All radiological screening will be conducted using an Eberline E-600 radiation meter with an SHP-380AB alpha/beta scintillation detector, or equivalent. This equipment consists of a dual phosphor plate covered by two mylar windows housed in a light-excluding metal body. The phosphor plate is a plastic scintillator for the detection of beta emissions and is thinly coated with zinc sulfide for detecting alpha emissions. The operational range varies from trace emissions to 1-mm disintegrations per min (dpm).

Should a sample indicate a field-screening result >2 times the instrument background level for the site, a sample will be collected for laboratory analysis. Instrument background levels will be collected, at a minimum, twice daily, once in the morning and once in the afternoon. If more than one site is visited in a day, background levels will be calculated before work begins at each new site. Background will be measured from 10 locations surrounding the site and away from known or suspected areas of radiological contamination. An average will then be calculated to determine the instrument background level for the site. Radiological field screening will be conducted in accordance with SOP 10.14. All instrument background checks, background ranges, and calibration procedures will be documented daily in the field logbook in accordance with the current version of SOP-12.01.

#### 5.3.1.2 Vapor Screening for Volatile Organic Compounds

Organic vapor screening of samples will conducted using a MiniRAE 2000 portable VOC monitor, model PGM-7600 PID, or equivalent, and will be equipped with an 11.7-electron volt lamp and sensitivity reading to 1 ppm. Before each day's fieldwork begins, the PID will be calibrated to the manufacturer's standard for instrument operation (all daily calibration results will be documented in the field logbook). The maximum value and ambient-air temperature will be recorded for each sample. A VOC field-screening result that exceeds the ambient background measurement is defined as greater than 2 times the measured background value. Ambient background measurement is collected by setting aside an empty, sealed plastic Ziploc bag for no longer than 5 min and collecting the measurement from inside the plastic bag. Field screening for VOCs should be taken in the same manner but with the sample in a new, sterile bag.

Based on field screening, samples with the highest field-screening results and with the deepest detected field-screening results will be submitted for laboratory analysis. Samples collected at key locations (e.g., below the base of waste units, fracture zones, TD, etc.) will also be submitted for laboratory analysis, regardless of screening results.

#### 5.3.1.3 Field Analytical Methods

At certain sites, screening for release-specific compounds (e.g., HE, metals) will be used to help guide sampling locations. Quantitative field screening may be completed for target metals and HE. This quantitative field screening will be used to aid in defining the nature and extent of contamination.

**HE (RDX) Screening**

D-TECH RDX immunoassay test kits will be used to field screen quantitatively for RDX. All assays will be conducted following the manufacturer's instructions, including equipment calibration, equipment use, sample dilution, and reagent storage. An elevated immunoassay result is defined as 2 times the estimated quantitation limit (approximately 2 ppm). Immunoassay field-screening results will be recorded on the field boring or test pit logs.

**Metals Field Screening**

A Spectrace 9000 (or similar make and model) field-portable XRF instrument will used to field screen for metals such as barium in accordance with SOP-10.08. An elevated detection for XRF analysis is defined as an instrument reading that exceeds 2 times the BV of the sample matrix. The XRF field-screening results will be recorded on the field boring or test pit logs.

### 5.3.2 Fixed Laboratory Analytical Methods for Subsurface Samples

The analytical suites required for fixed laboratory analyses vary by subaggregate and are specified in the scope of investigation activities for each subaggregate in section 4.0. All required laboratory analytical suites are presented in the statement of work for analytical laboratories (LANL 2000, 071233). Sample collection and analysis will be coordinated with the SMO. A complete list of all fixed laboratory analytical methods is summarized in Table 5.3-1.

## 5.4 Collection of Surface and Shallow Subsurface Samples

While surface and shallow subsurface samples will be collected during drilling activities, the most common method for collecting samples will be the spade-and-scoop method, as described in the current version of SOP-06.09. Stainless-steel shovels, spades, scoops, and bowls will be used for ease of decontamination. Decontamination will be completed using a dry decontamination method with disposable paper towels and over-the-counter cleaner, such as Fantastik or equivalent. Disposable tools made of polystyrene or Teflon will also be used, if necessary. In some cases, for deeper sample intervals, hand-augering tools, including power augers, will be used to collect shallow subsurface samples if geologic material conditions permit. The tools to be used and their applicability are described in the current version of SOP-06.10. If the surface location is at bedrock, an axe or hammer and chisel will be used to collect samples. Most surface and shallow subsurface samples will be collected from two sample depths: 0.0 to 0.5 ft and 5.5 to 6.0 ft (or at the depth of where the auger is refused). In some instances where the soil horizon is known to be shallow (such as in the extended drainages), subsurface samples will be collected at shallower depths as described in section 4.0.

Samples will be field screened, as described in the following section, and placed in the appropriate sample container(s) as grab samples collected with hand augers, scoops, or chiseling devices in accordance with the sampling guidance document and appropriate SOPs in Table 5.0-1.

### 5.4.1 Field Screening of Surface and Shallow Subsurface Samples

The primary screening methods to be used for surface and shallow subsurface soil and tuff samples are the same as those described in section 5.3.1 and may include (1) visual examination, (2) radiological screening, and (3) D-TECH RDX immunoassay test kits for HE. Additional screening for release-specific characteristics (e.g., HE and barium), as specified in sampling plans, may be conducted using field analytical methods such as immunoassay in accordance with the manufacturer's instructions and XRF techniques (SOP-10.08).

### 5.4.2 Fixed Laboratory Analytical Methods for Surface and Shallow Subsurface Samples

The analytical suites required for fixed laboratory analyses vary by subaggregate and are specified in the scope of investigation activities for each subaggregate (section 4.0). Sample collection and analysis will be coordinated with the SMO. A complete list of all fixed laboratory analytical methods is summarized in Table 5.3-1.

## 5.5 Collection of Perched Water Samples

During drilling operations, zones of elevated moisture content, localized saturation, and groundwater are not anticipated but may be encountered. These zones may not be assignable to either an alluvial or regional groundwater system and may represent a localized phenomenon. If saturation is encountered as a borehole advances, drilling will be stopped to determine whether sufficient water volume is available for analyzing the water quality. Generally, the total water volume required is approximately 0.5 to 1.0 L. If this minimum volume of groundwater cannot be collected, the borehole will be advanced to the targeted depth, until saturation is encountered and the process is repeated, or until the required TD is achieved. Insufficient water sample volumes from discrete depths will not be composited to make up the required volume for screening analysis.

If a sufficient volume exists, a groundwater sample will be collected and analyzed for target analyte list (TAL) metals, explosive compounds, anions, VOCs, SVOCs, perchlorate, radionuclides (by alpha and gamma spectroscopy), alkalinity, total organic carbon, total inorganic carbon, and total dissolved solids at a Laboratory-certified geochemistry laboratory. Typically, results of groundwater samples are available within 48 hr. During this time, the borehole may be advanced to the targeted depth, and the perched zone (and any subsequent perched zones encountered during drilling) will be isolated to prevent downhole migration.

## 5.6 Borehole Abandonment

Shallow boreholes, with a TD of 30 ft or less, will be abandoned by filling the borehole with bentonite chips that are subsequently hydrated. The borehole will be visually inspected while the bentonite chips are being added to ensure that bridging does not occur.

All boreholes will be properly abandoned according to the current version of SOP 5.03. The use of backfill materials, such as bentonite and concrete, will be documented in a field logbook with regard to volume (calculated and actual), intervals of placement, and additives used to enhance backfilling. All cuttings will be managed as IDW, as specified in Appendix B of this document. All borehole abandonment information will be provided in the investigation report.

### 5.7 Equipment Decontamination

All equipment used for drilling and sampling will be decontaminated before and after drilling and sampling activities. Residual material adhering to equipment will be removed using dry decontamination methods (e.g., use of wire brushes and scrapers) in accordance with Laboratory procedures. If equipment cannot be free-released using dry-decontamination methods, wet-decontamination methods will be used. The equipment will be pressure-washed on a temporary decontamination pad. Cleaning solutions and wash water will be collected and contained for proper disposal. Decontamination water will be sampled and analyzed to determine the final disposition of the wastewater and the effectiveness of the decontamination procedures. All parts of the drilling equipment, including the undercarriage, wheels, tracks, chassis, and cab, will be thoroughly cleaned. All equipment will be certified as free of HE before removing equipment from the site.

## 6.0 MONITORING AND SAMPLING PROGRAM

Martin Spring and several intermediate depth groundwater wells (MSC-16-06293, MSC-16-06294 and MSC-16-09295) in the S-Site Aggregate Area are monitored as part of the Laboratory's Interim Facility Site-Wide Groundwater Monitoring Plan (LANL 2006, 094043, pp. 6-7-6-8). In addition, several automated surface-water gauging stations within the S-Site Aggregate Area are monitored under the FFCA established to regulate storm water discharges from SWMUs and AOCs (LANL 2006, 093925, p. 52).

## 7.0 SCHEDULE

The S-Site Aggregate Area investigation work plan will be submitted to NMED on September 30, 2007. The notice schedule for NMED comments or approval of the work plan is January 28, 2008. Field activity preparation will begin after NMED approves the work plan. Based upon site-access restrictions, all four subaggregates will be investigated and reported in one investigation report. The schedule calls for the investigation report for the S-Site Aggregate Area to be submitted in August 2010.

## 8.0 REFERENCES AND MAP DATA SOURCES

### 8.1 References

*The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.*

*Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.*

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## 8.2 Map Data Sources

Data sources for all figures are provided below, unless otherwise indicated on the figures themselves.

Aggregate Areas; Los Alamos National Laboratory, ENV Environmental Remediation & Surveillance Program, ER2005-0496; 1:2,500 Scale Data; 22 Sept 2005.

Drainage; Los Alamos National Laboratory, Information Management, Environmental Restoration Project; 1:24,000 Scale Data; Unknown publication date.

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Land Ownership; Los Alamos National Laboratory, Site Planning & Project Initiation (SPPI), Infrastructure Planning (IP); 21 Dec 2006. Major Roads, Primary Paved Roads, Secondary Paved Roads; Census 2000 TIGER/Line Data; ESRI, United States Census Bureau;1:100,000 Scale Data; 2001. New Mexico Color Relief Image; Bureau of Land Management – New Mexico State Office; 15 Sept 2004.

NPDES Outfalls, Inactive Outfalls; Los Alamos National Laboratory, ENV Water Quality and Hydrology Group; Edition 2002.01; 01 September 2003.

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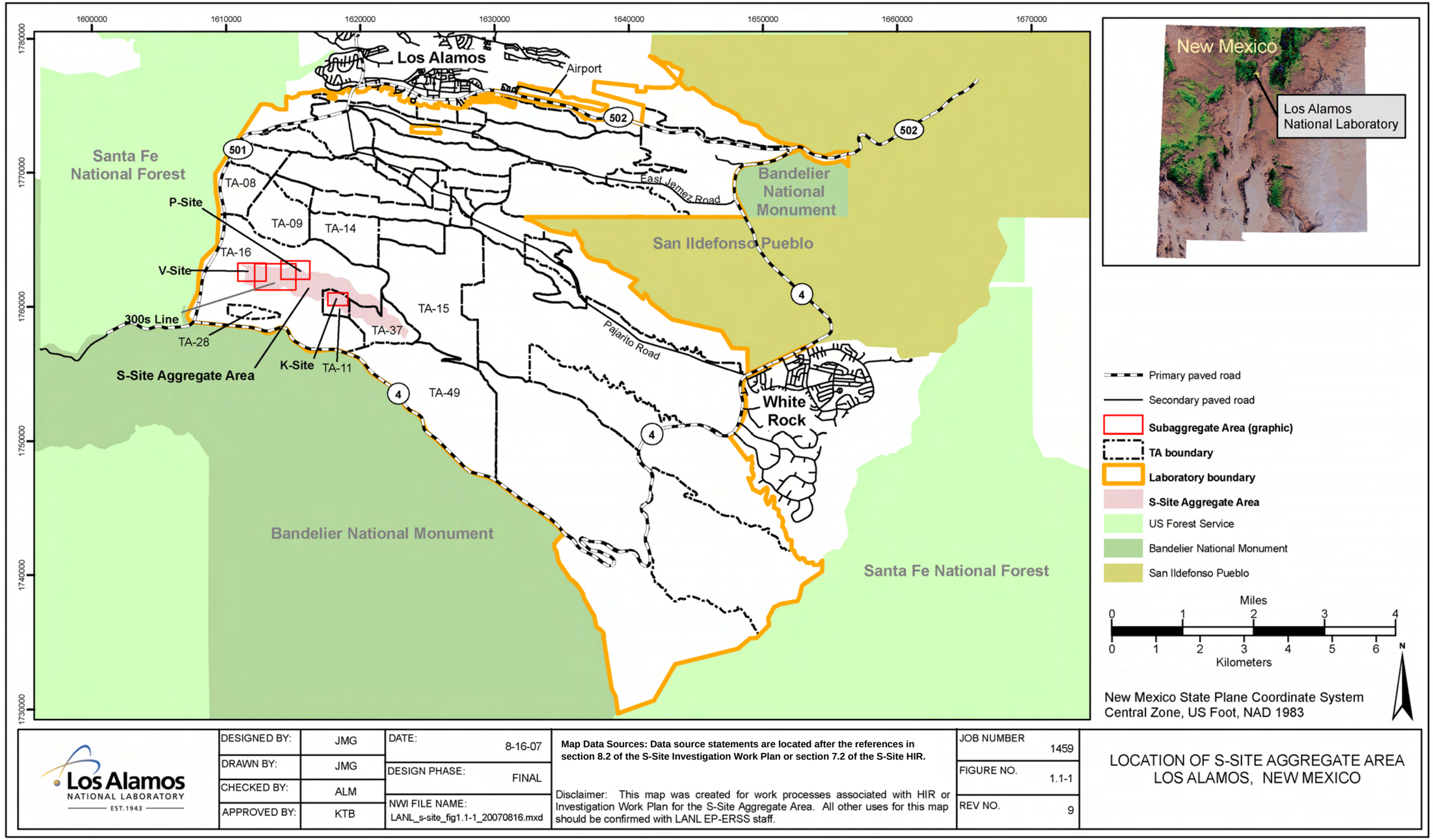
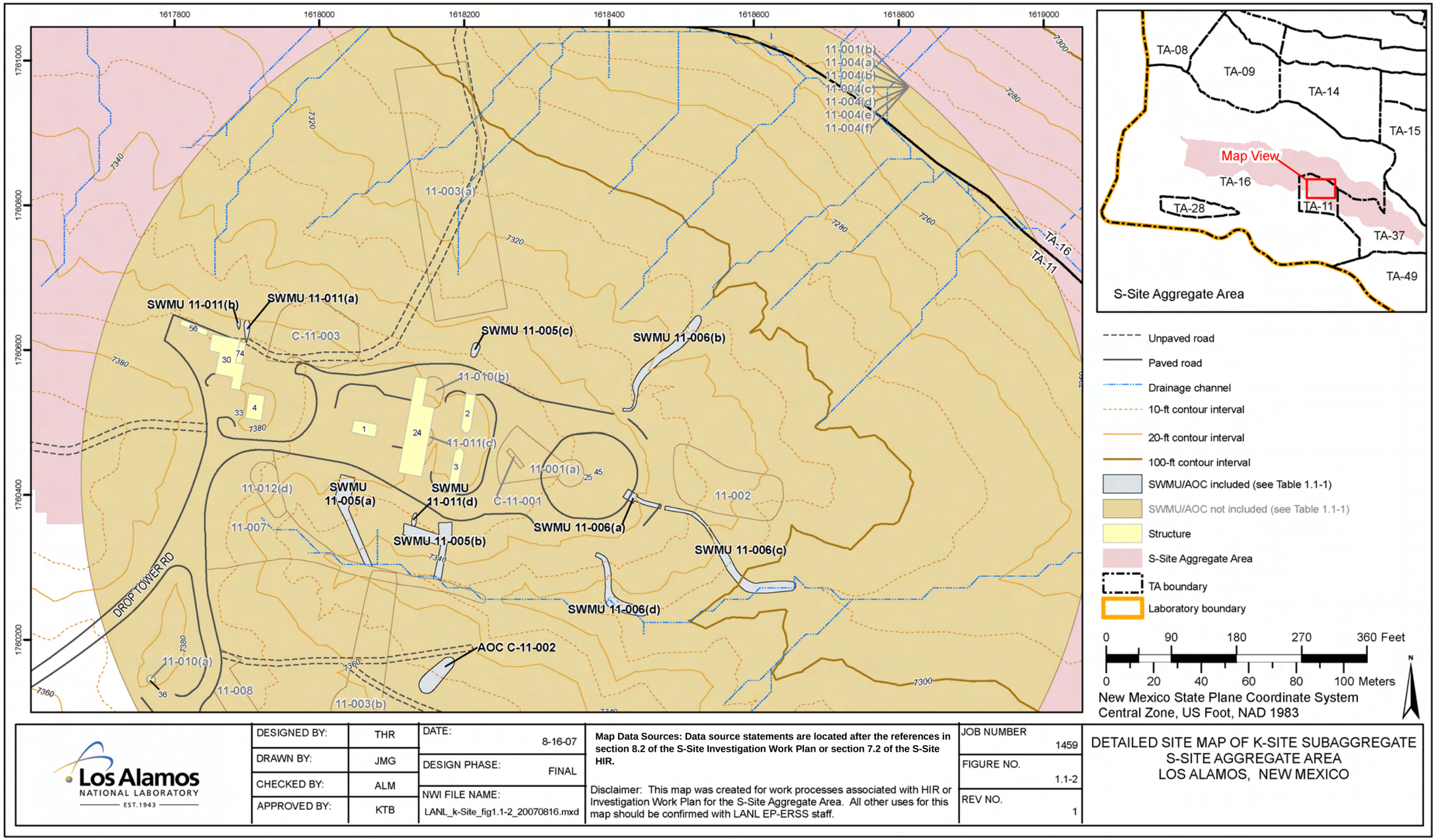



**Figure 1.1-1 Location of S-Site Aggregate Area**

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| | DRAWN BY: | JMG | DESIGN PHASE: FINAL | | FIGURE NO. 1.1-2 | |
| | CHECKED BY: | ALM | NWI FILE NAME: LANL_k-Site_fig1.1-2_20070816.mxd | Disclaimer: This map was created for work processes associated with HIR or Investigation Work Plan for the S-Site Aggregate Area. All other uses for this map should be confirmed with LANL EP-ERSS staff. | REV NO. 1 | |
| | APPROVED BY: | KTB | | | | |

**Figure 1.1-2 Detailed site map of K-Site Subaggregate**

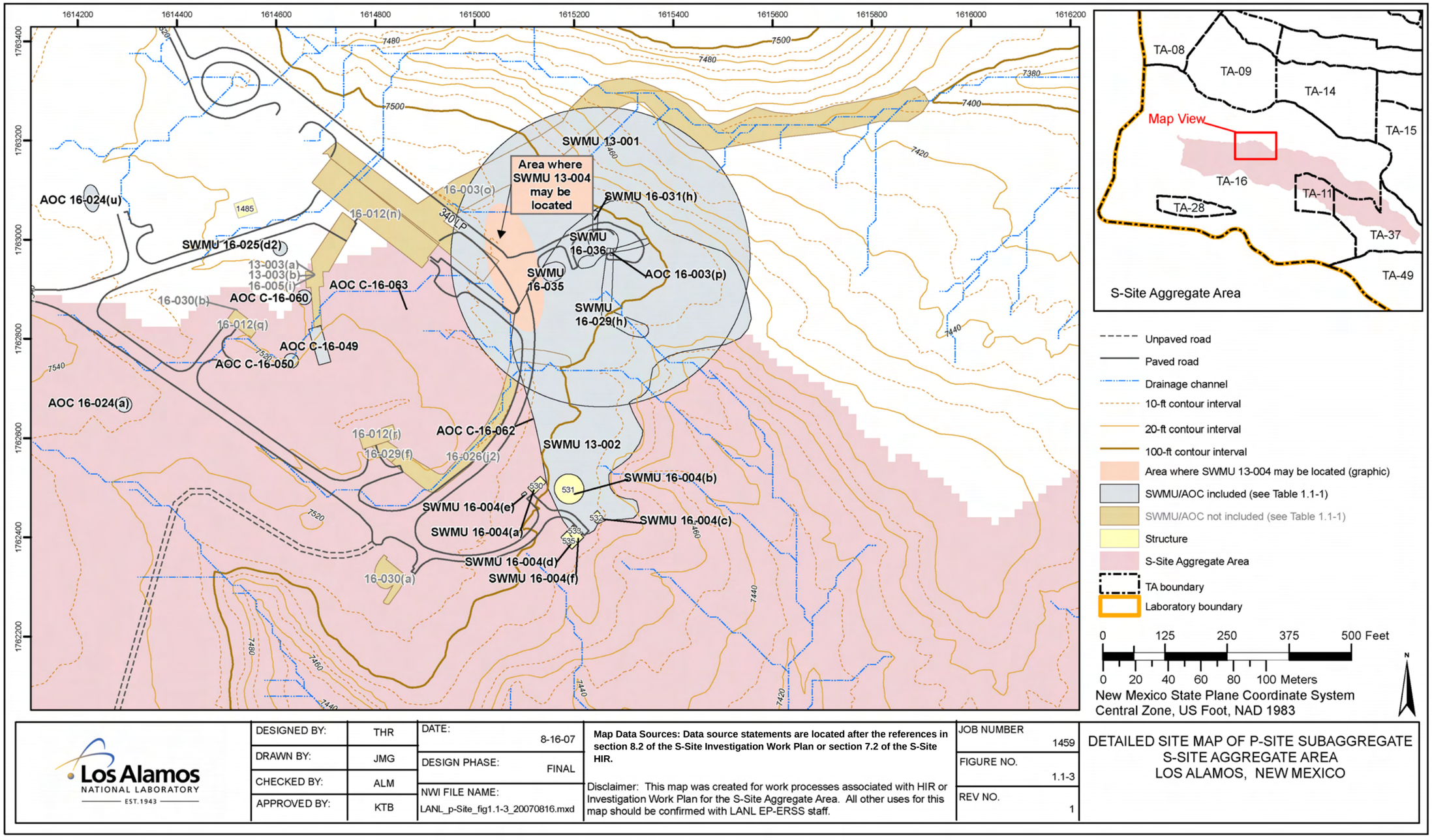
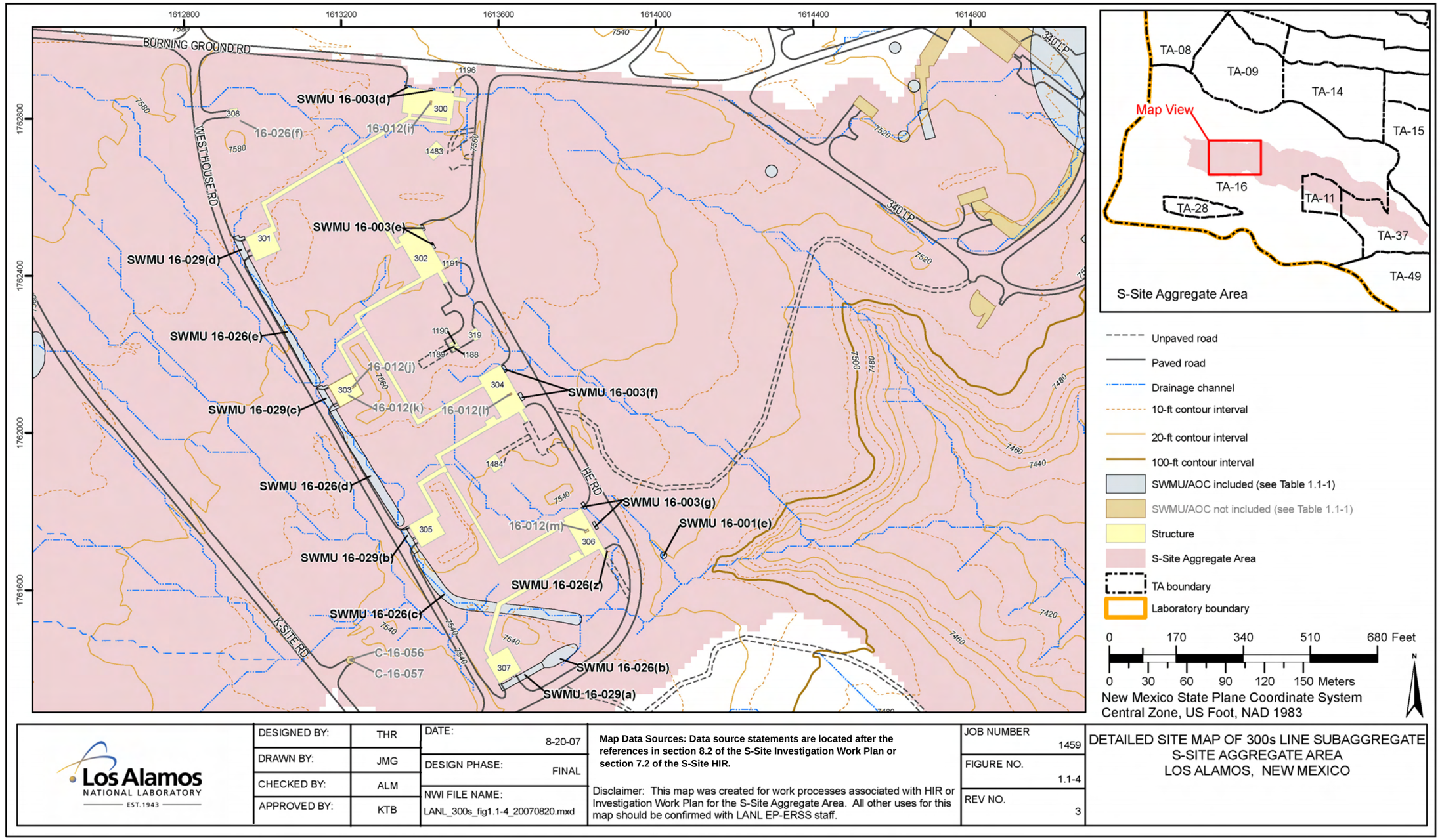



**Figure 1.1-3 Detailed site map of P-Site Subaggregate**

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| Los Alamos NATIONAL LABORATORY EST.1943 | DESIGNED BY: | THR | DATE: 8-20-07 | **Map Data Sources: Data source statements are located after the references in section 8.2 of the S-Site Investigation Work Plan or section 7.2 of the S-Site HIR.** | JOB NUMBER 1459 | DETAILED SITE MAP OF 300s LINE SUBAGGREGATE S-SITE AGGREGATE AREA LOS ALAMOS, NEW MEXICO |
| | DRAWN BY: | JMG | DESIGN PHASE: FINAL | | FIGURE NO. 1.1-4 | |
| | CHECKED BY: | ALM | NWI FILE NAME: LANL_300s_fig1.1-4_20070820.mxd | Disclaimer: This map was created for work processes associated with HIR or Investigation Work Plan for the S-Site Aggregate Area. All other uses for this map should be confirmed with LANL EP-ERSS staff. | REV NO. 3 | |
| | APPROVED BY: | KTB | | | | |

**Figure 1.1-4 Detailed site map of 300s Line Subaggregate**

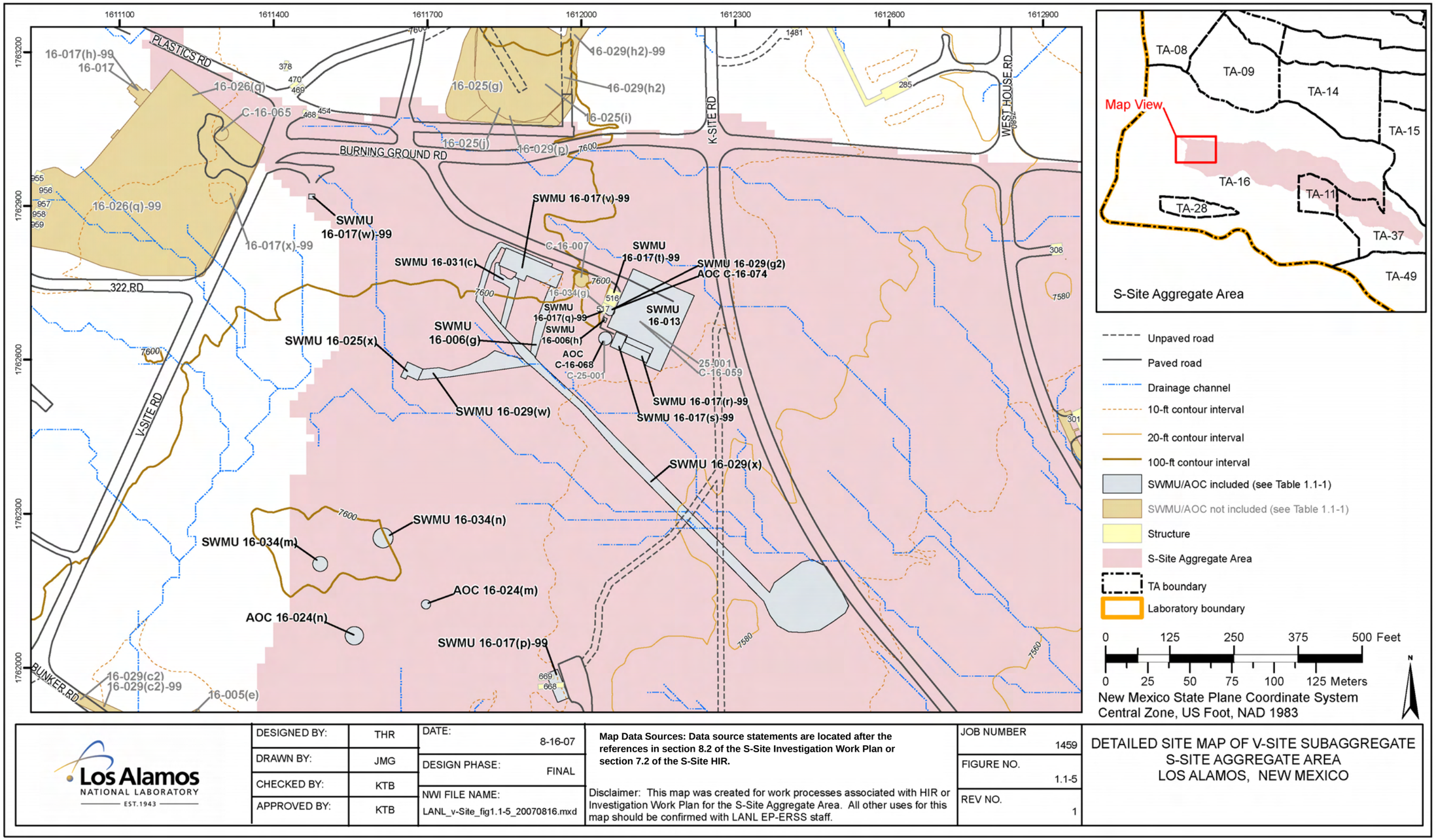


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**Figure 1.1-5 Detailed site map of V-Site Subaggregate**

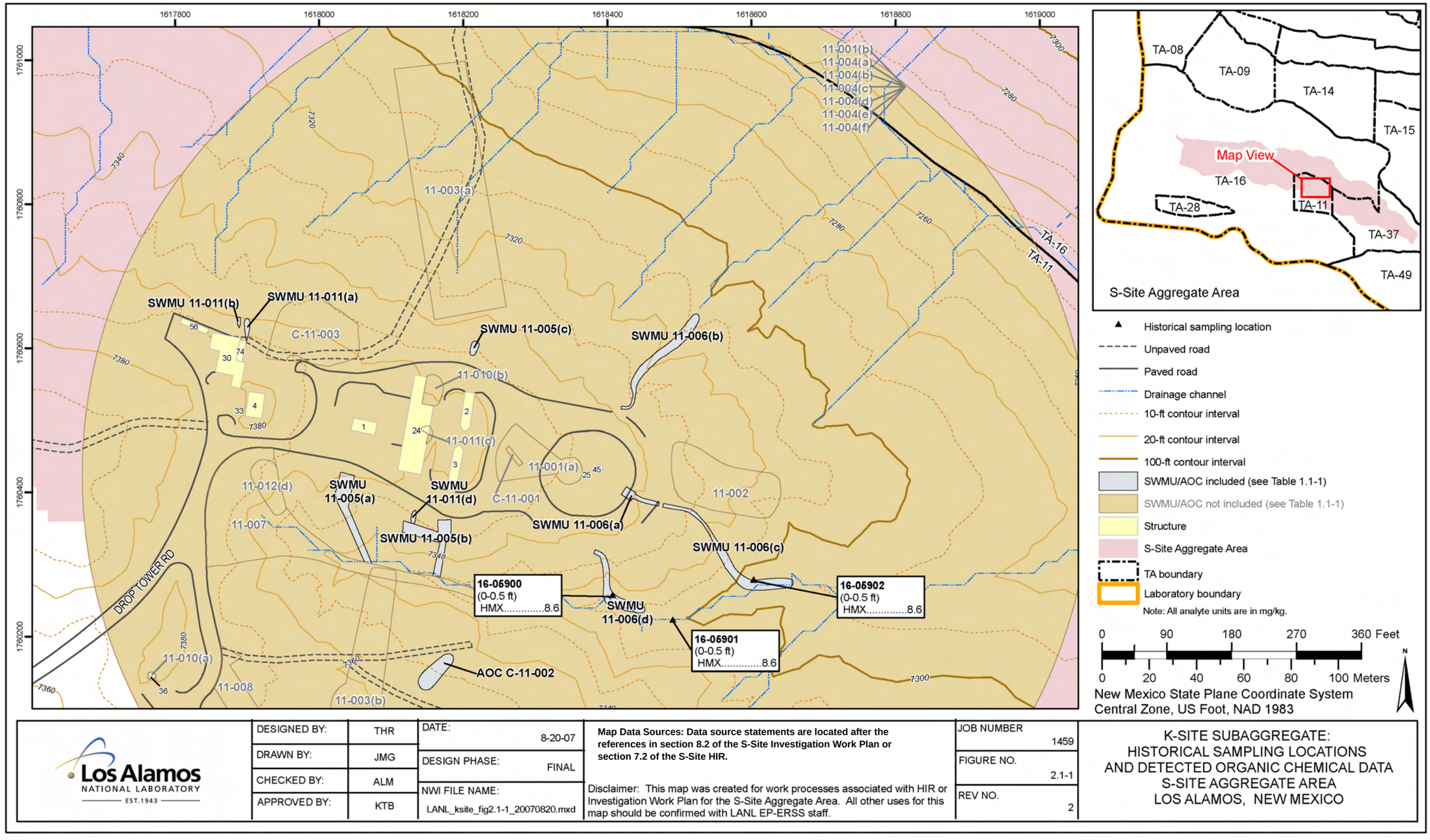



**Figure 2.1-1 K-Site Subaggregate: historical sampling locations and analytical data**

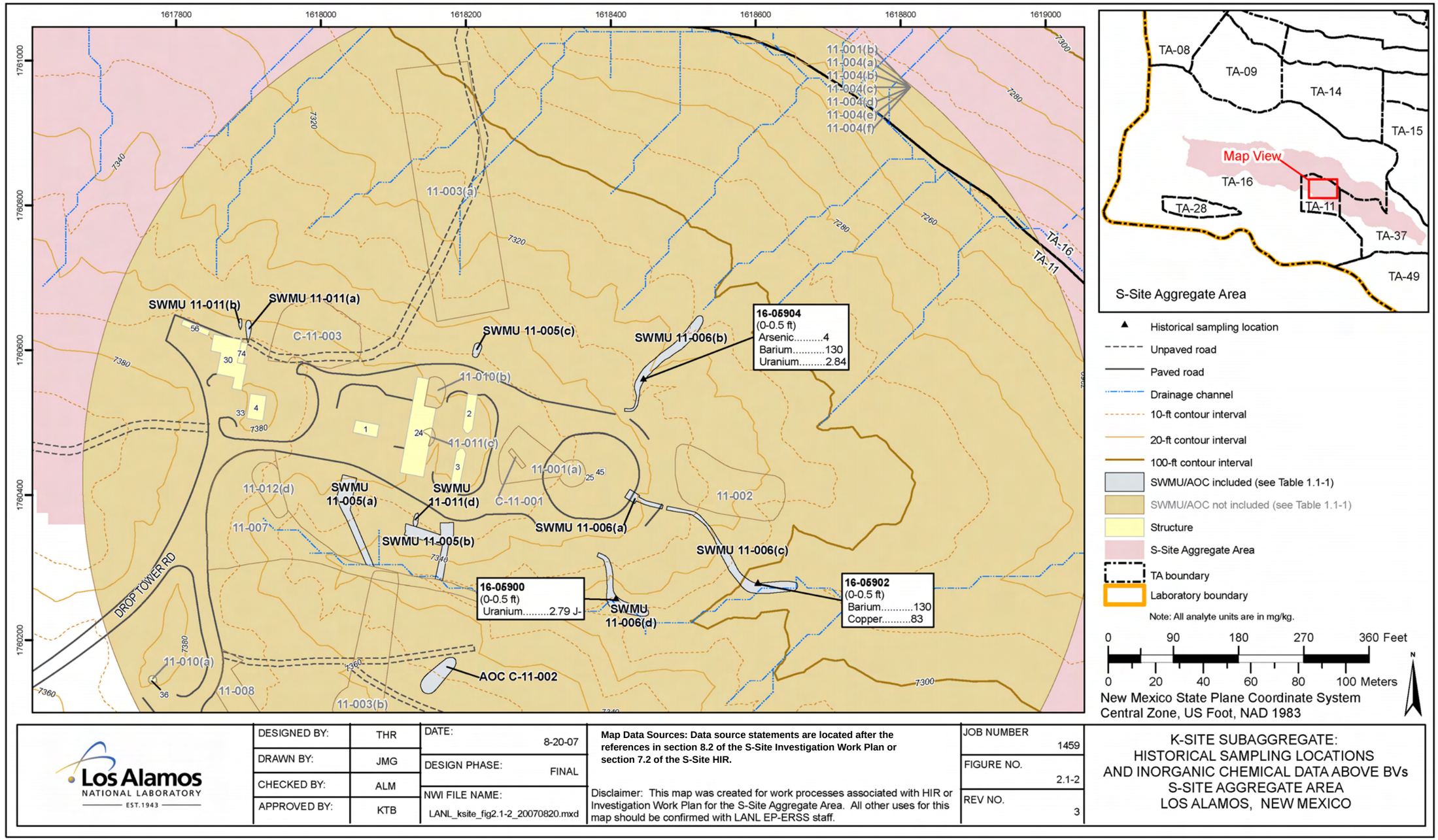



**Figure 2.1-2 K-Site Subaggregate: historical sampling locations and inorganic chemical data above BVs**

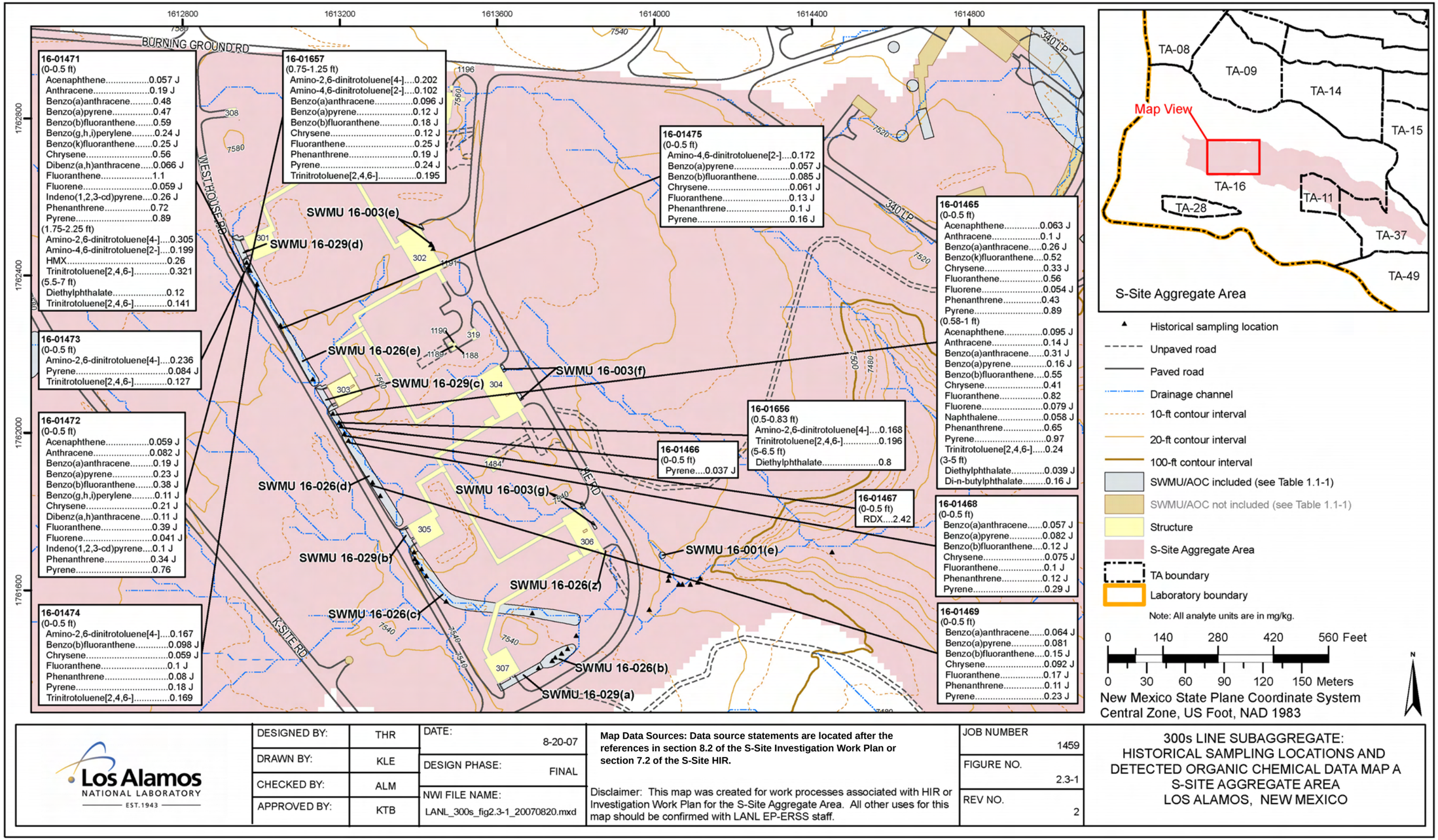



**Figure 2.3-1 300s Line Subaggregate historical sampling locations and organic analytical data**

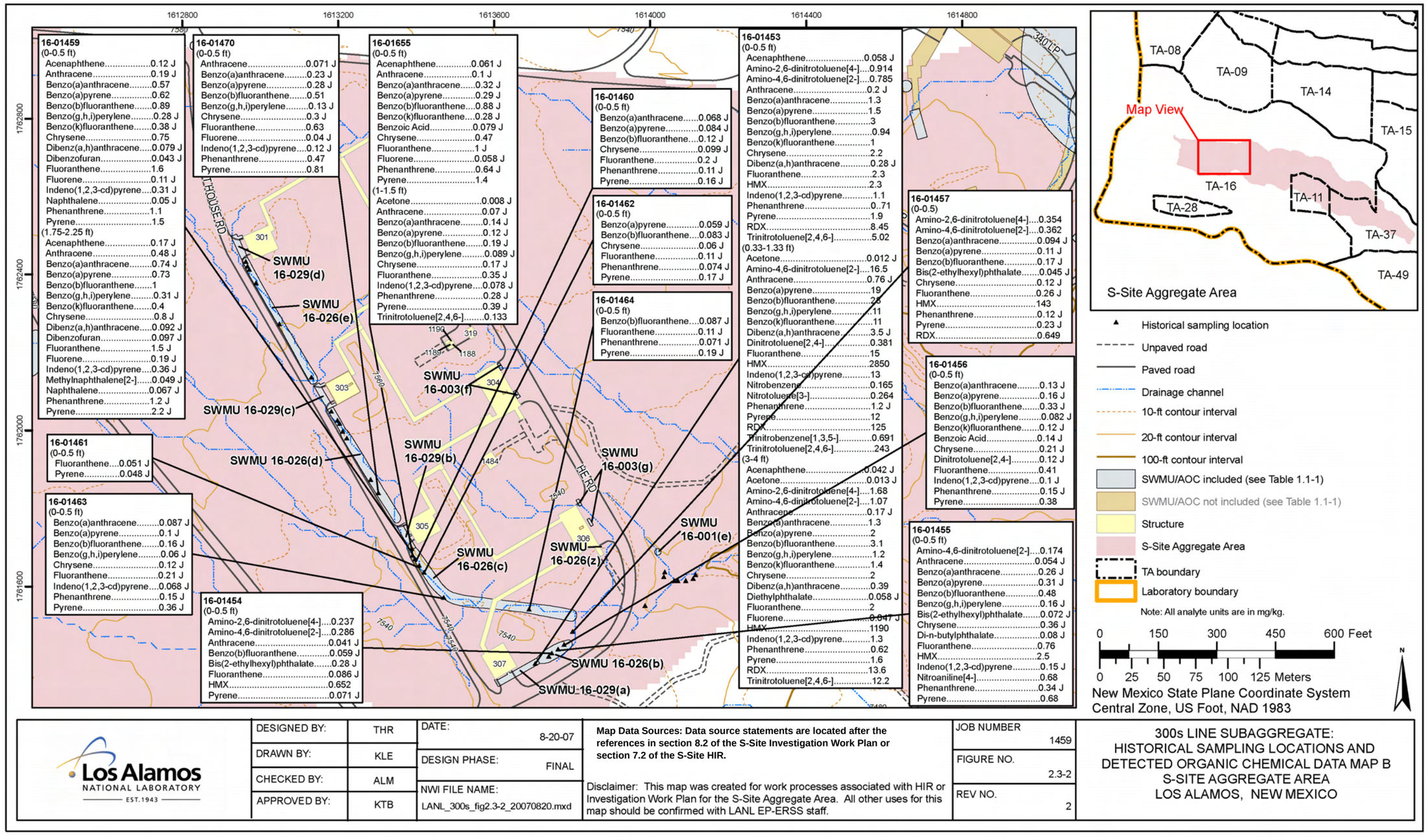



**Figure 2.3-2 300s Line Subaggregate historical sampling locations and organic analytical data**

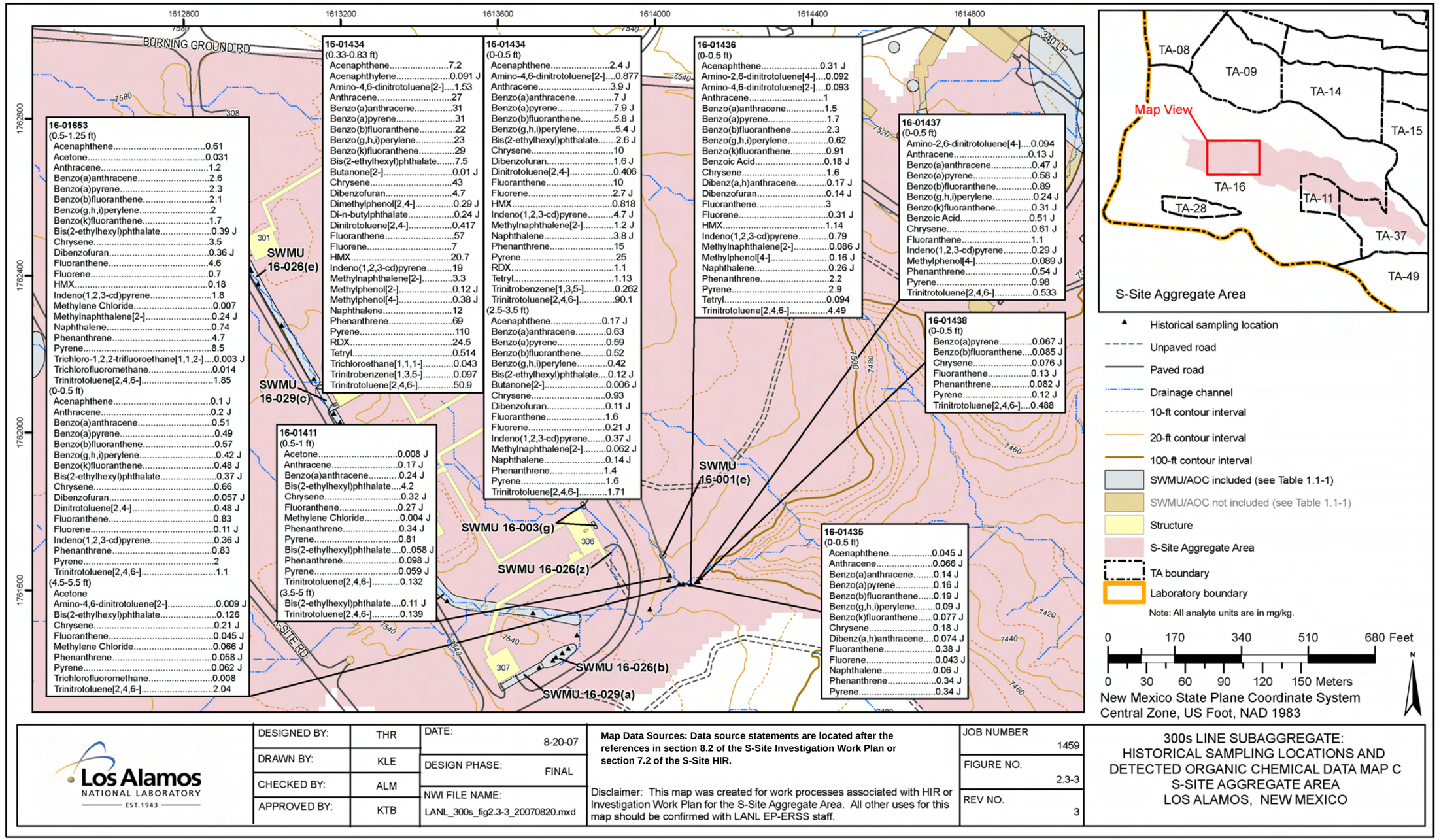



**Figure 2.3-3 300s Line Subaggregate historical sampling locations and organic analytical data**

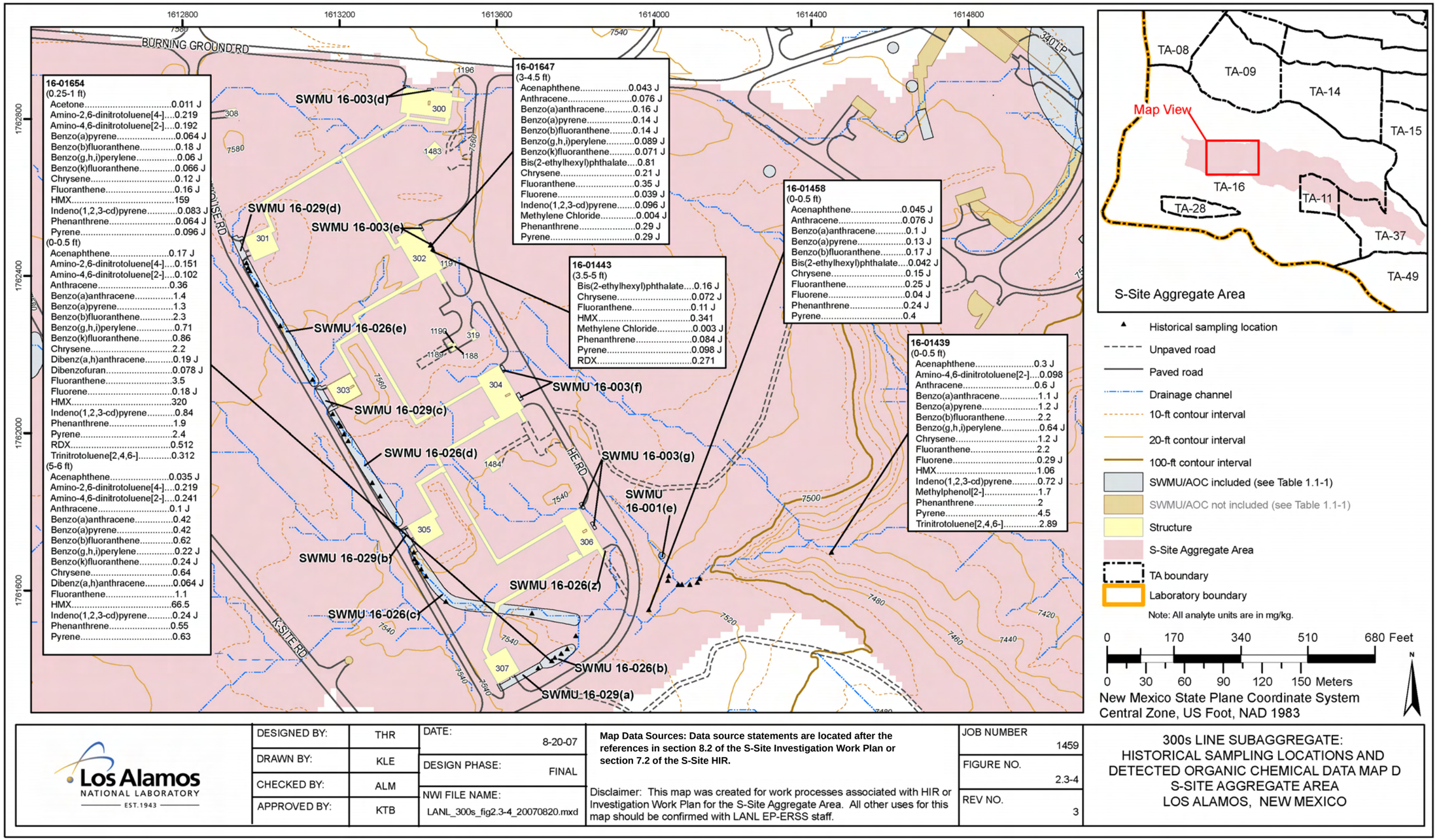



**Figure 2.3-4 300s Line Subaggregate historical sampling locations and organic analytical data**

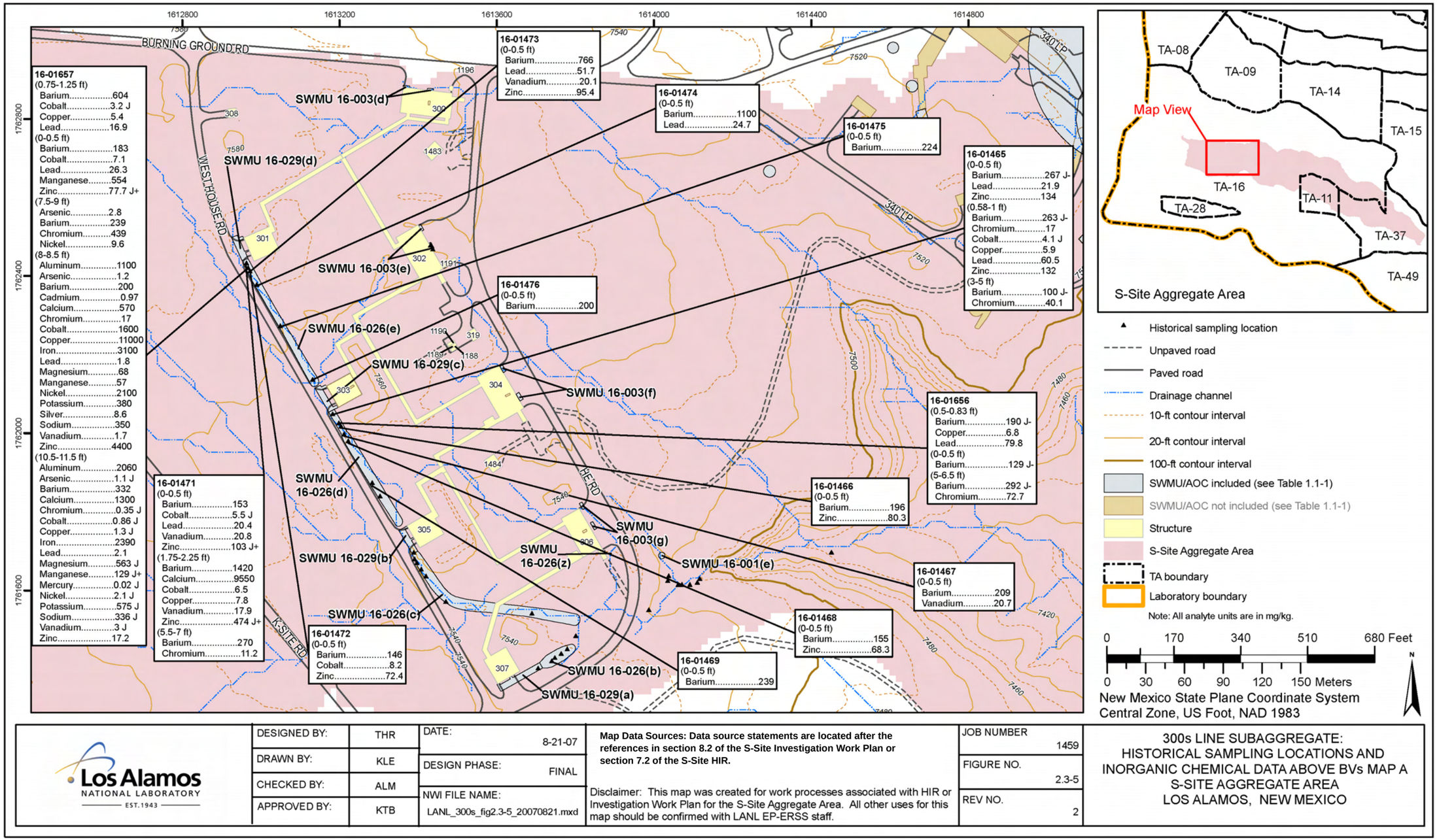



**Figure 2.3-5 300s Line Subaggregate historical sampling locations and inorganic analytical data**

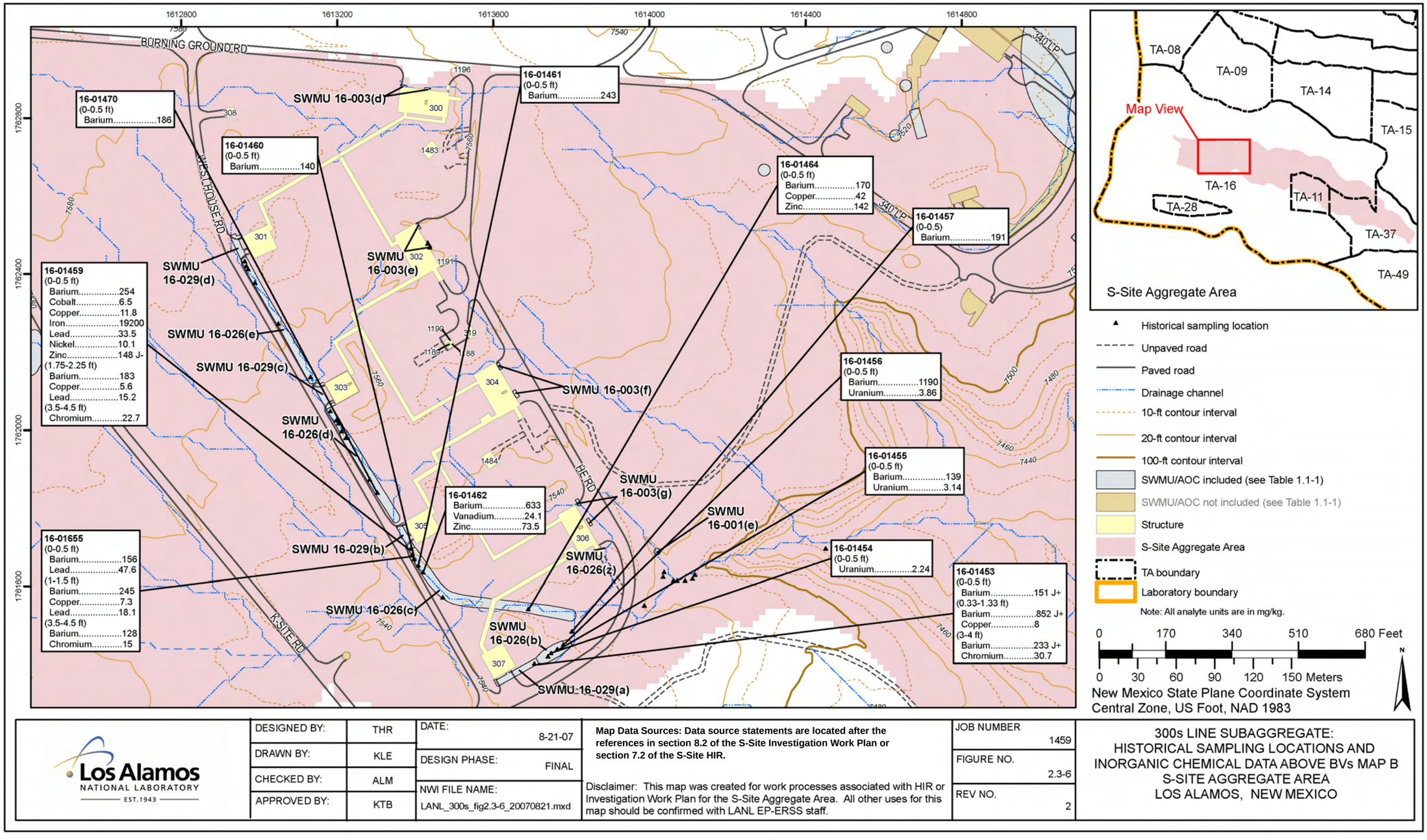



**Figure 2.3-6 300s Line Subaggregate historical sampling locations and inorganic analytical data**

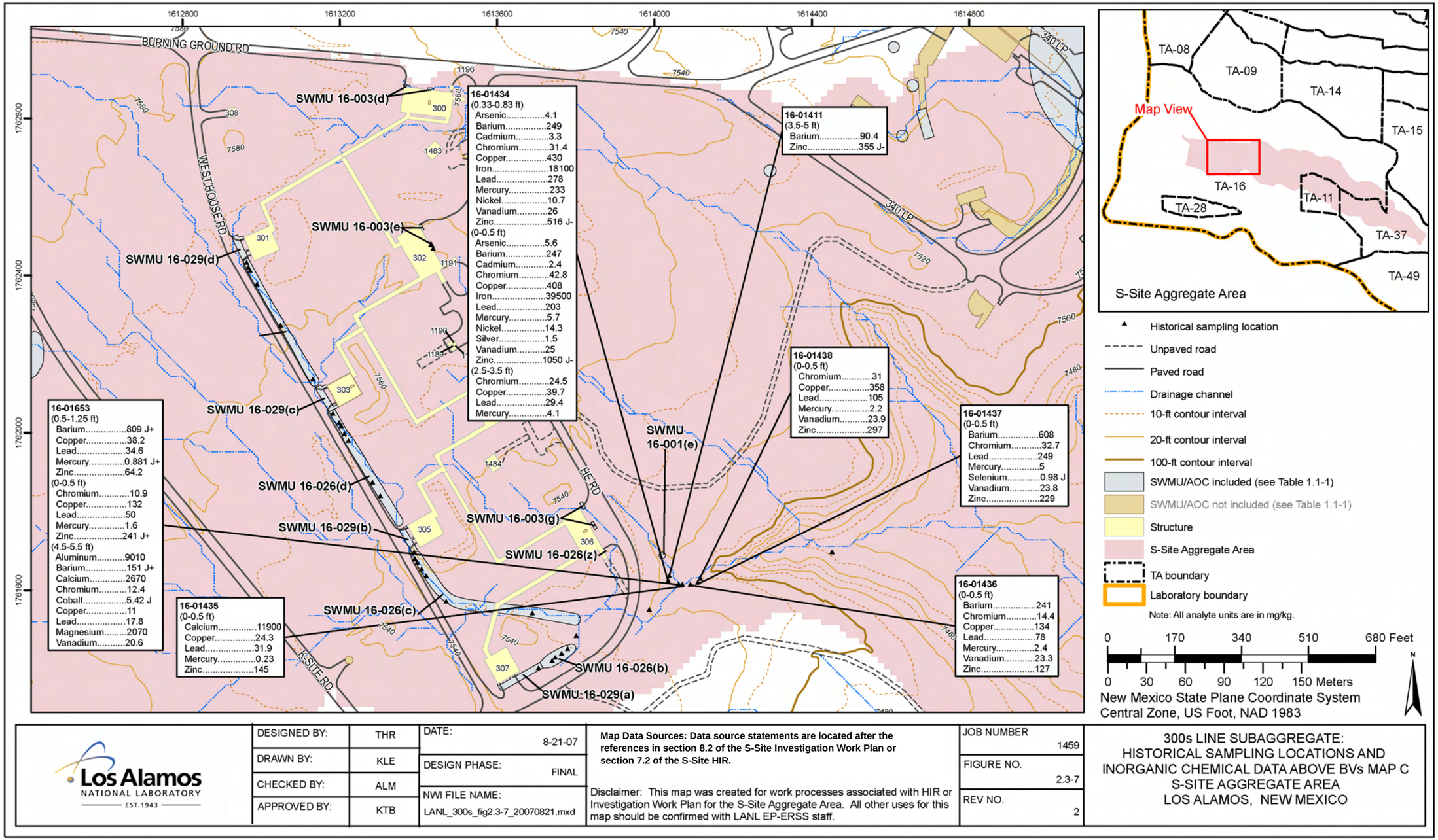



**Figure 2.3-7 300s Line Subaggregate historical sampling locations and inorganic analytical data**

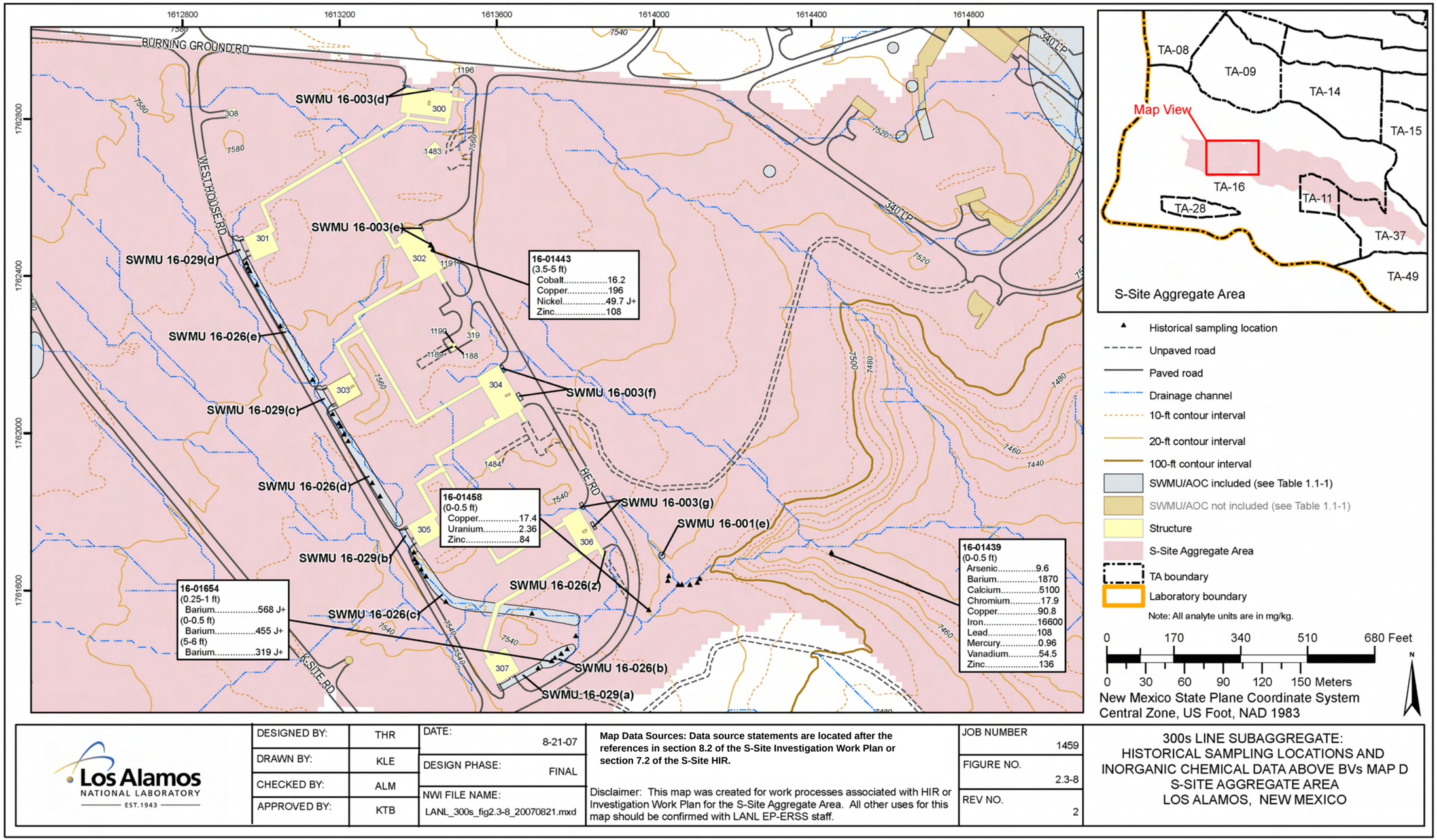



**Figure 2.3-8 300s Line Subaggregate historical sampling locations and inorganic analytical data**

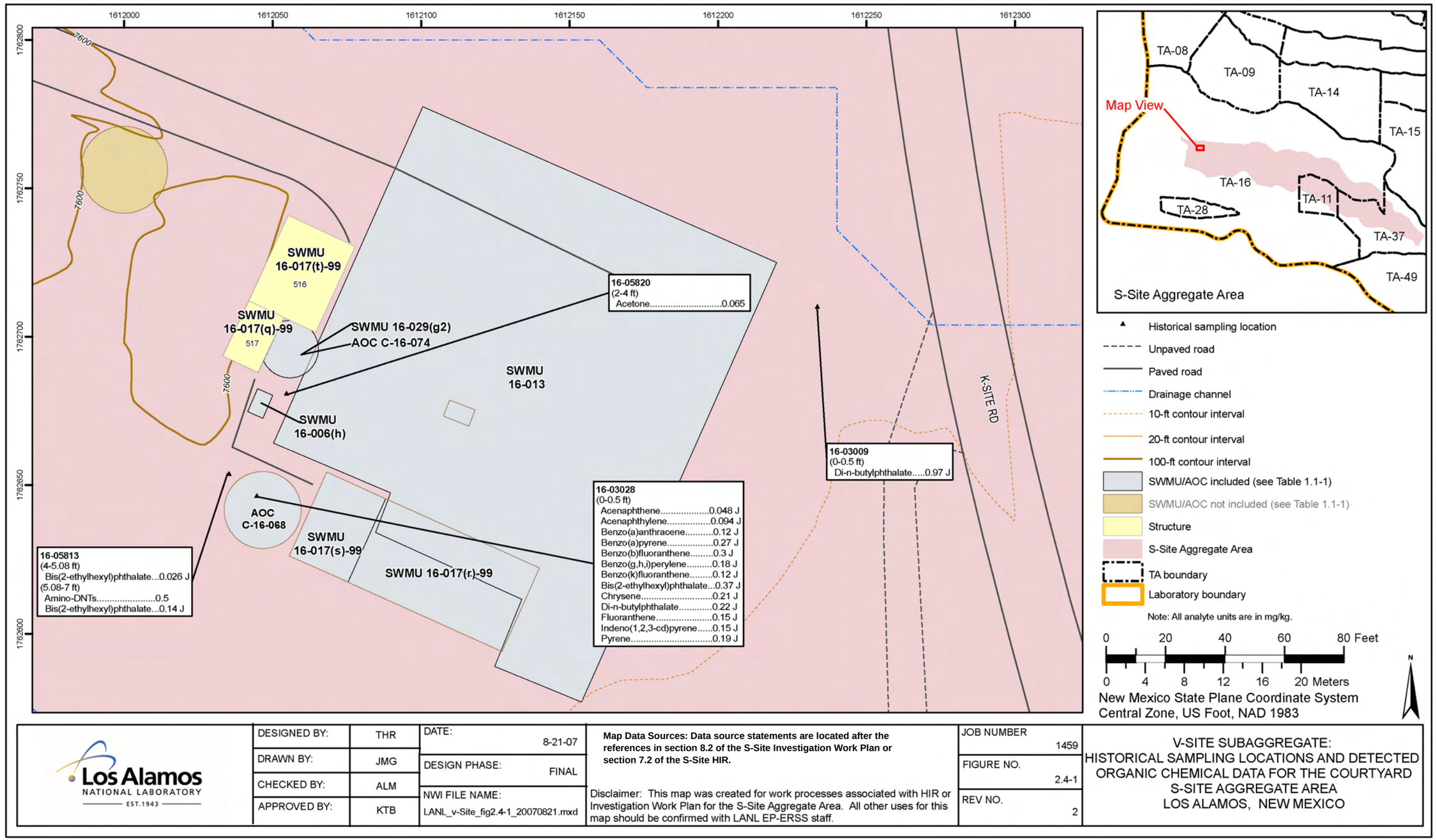



**Figure 2.4-1 V-Site Subaggregate: historical sampling locations and detected organic chemical data for the courtyard**

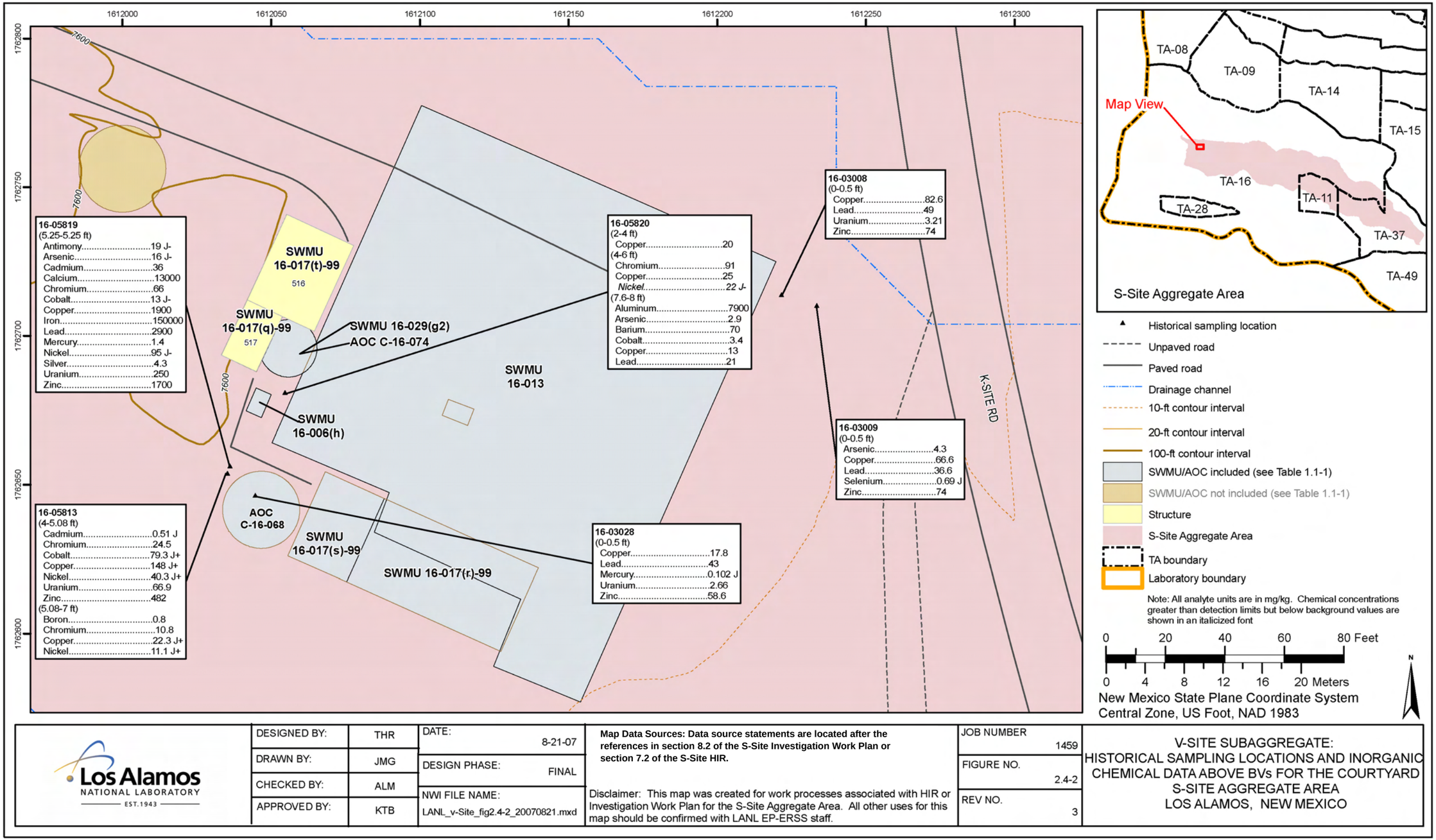



**Figure 2.4-2 V-Site Subaggregate: historical sampling locations and inorganic chemical data above BVs for the courtyard**

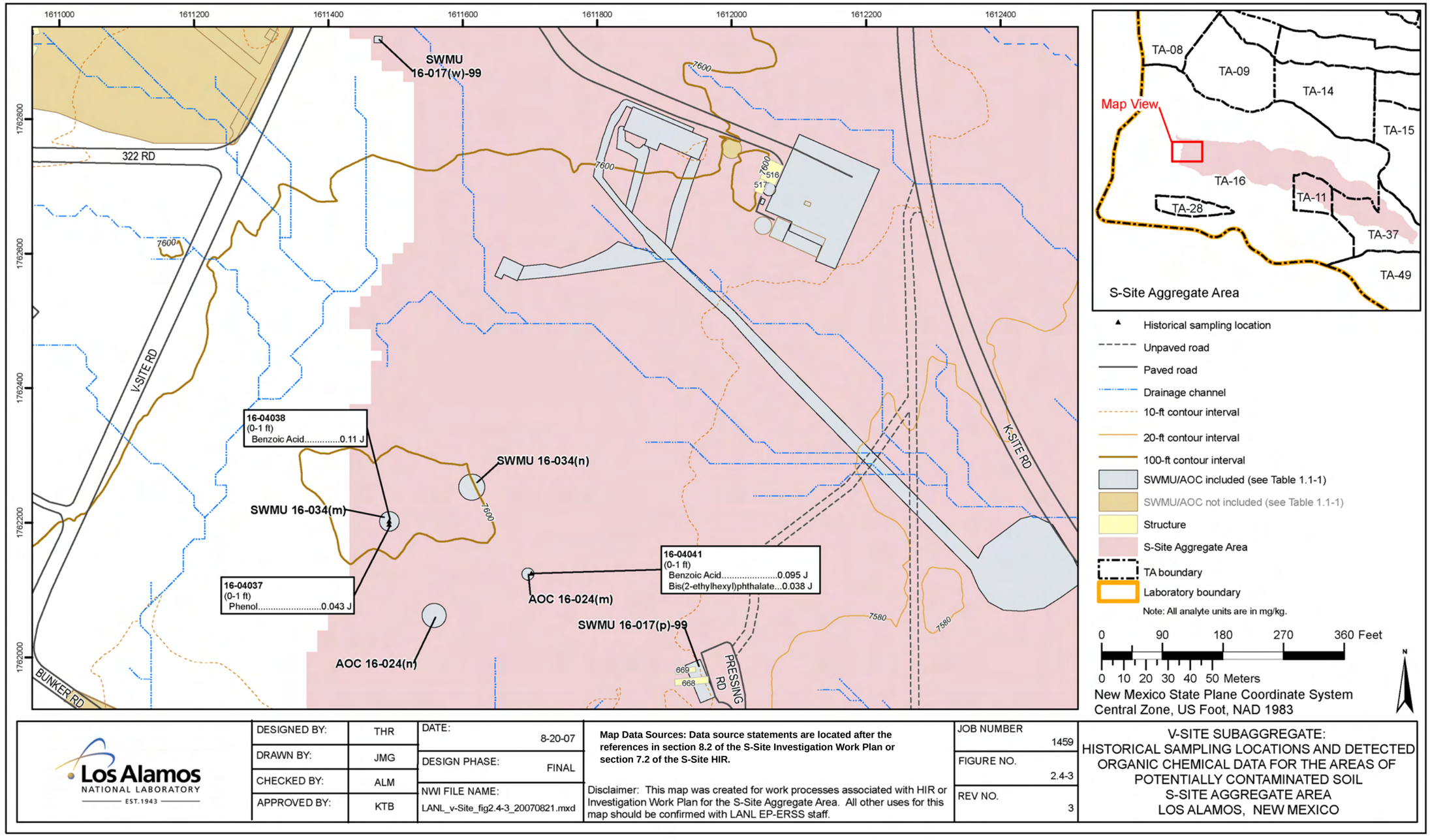



**Figure 2.4-3 V-Site Subaggregate: historical sampling locations and detected organic chemical data for the areas of potentially contaminated soil**

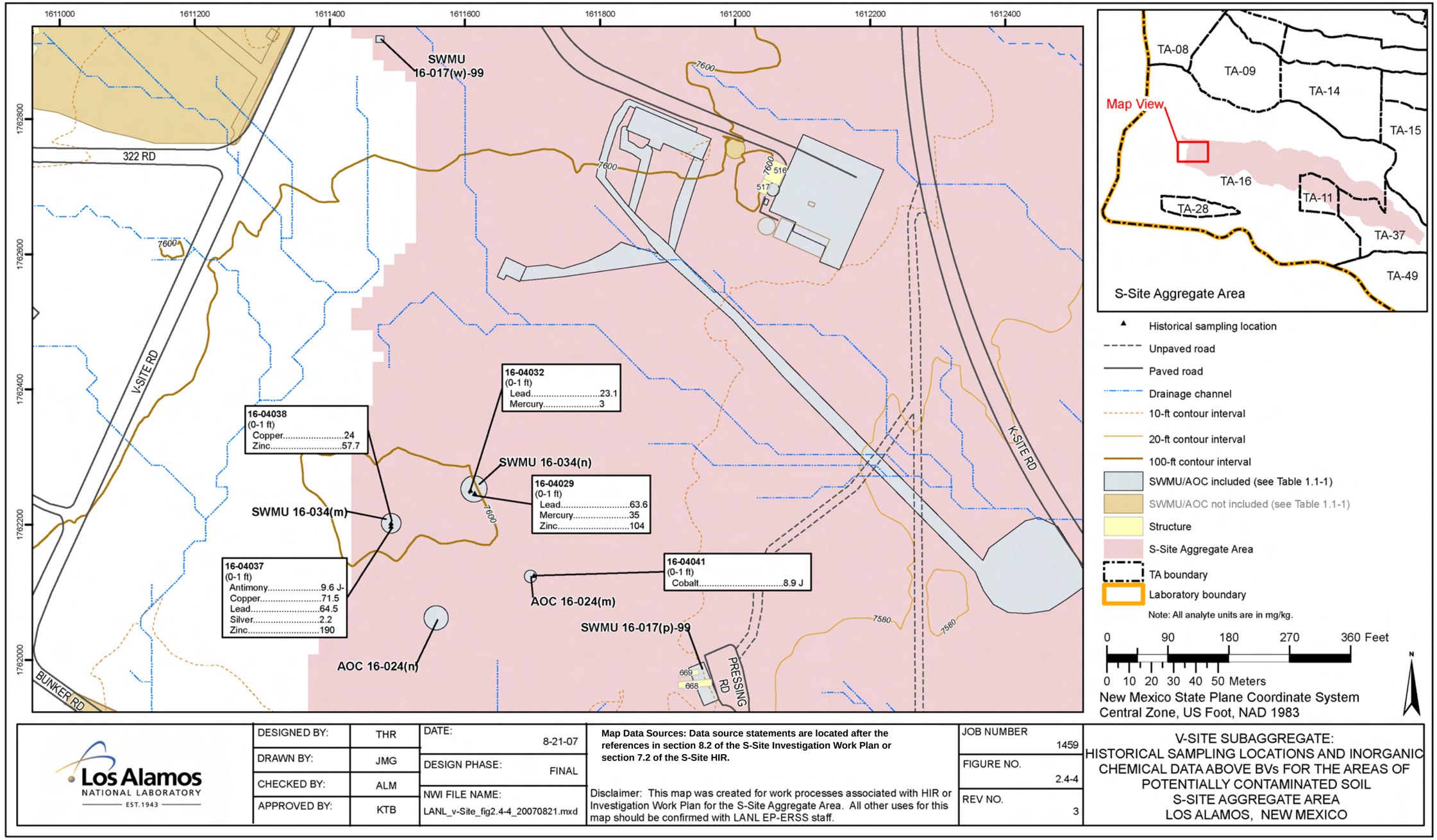
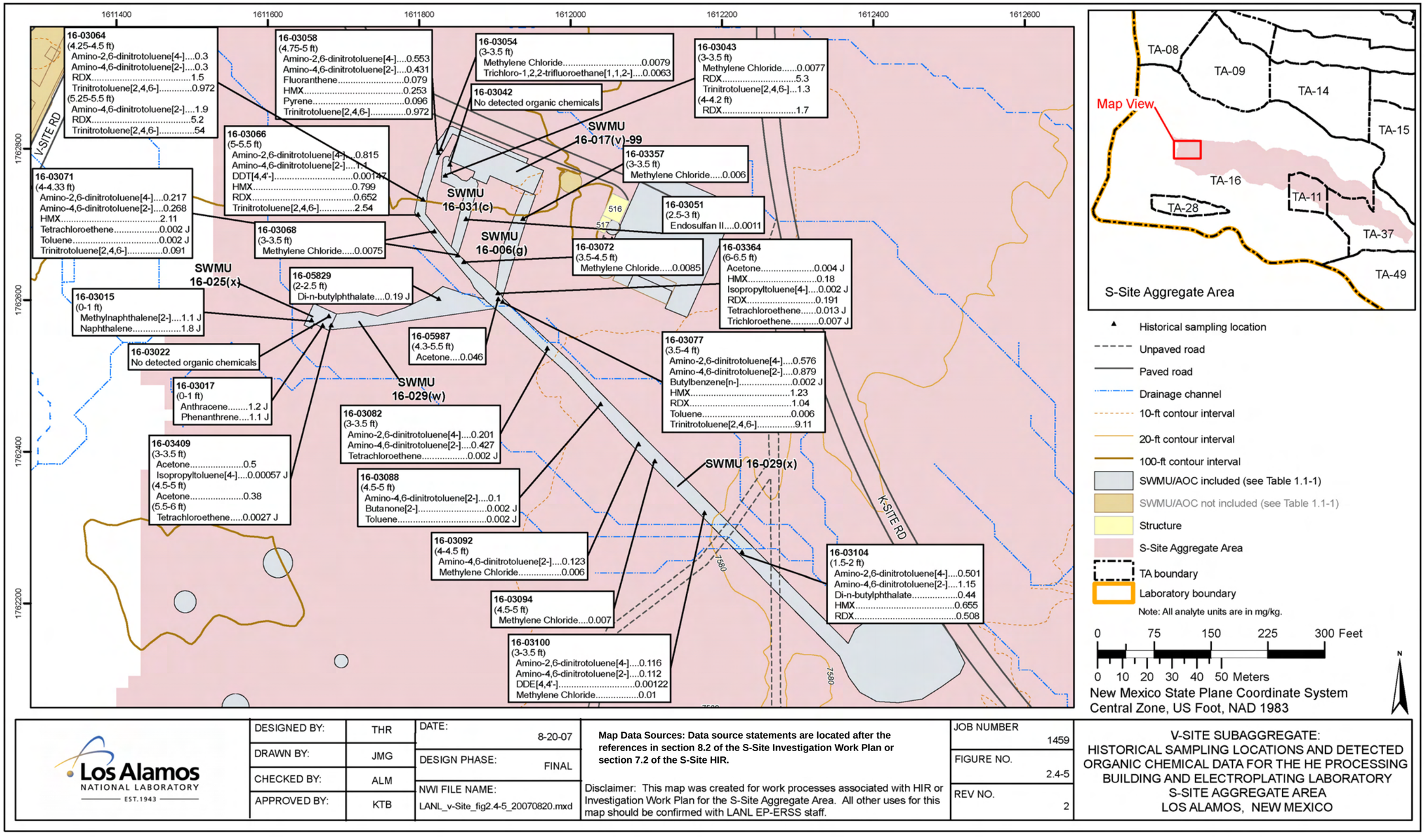



**Figure 2.4-4 V-Site Subaggregate: historical sampling locations and inorganic chemical data above BVs for the areas of potentially contaminated soil**

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|---|---|---|---|---|---|---|
| Los Alamos NATIONAL LABORATORY EST.1943 | DESIGNED BY: | THR | DATE: 8-20-07 | **Map Data Sources: Data source statements are located after the references in section 8.2 of the S-Site Investigation Work Plan or section 7.2 of the S-Site HIR.** | JOB NUMBER 1459 | V-SITE SUBAGGREGATE: HISTORICAL SAMPLING LOCATIONS AND DETECTED ORGANIC CHEMICAL DATA FOR THE HE PROCESSING BUILDING AND ELECTROPLATING LABORATORY S-SITE AGGREGATE AREA LOS ALAMOS, NEW MEXICO |
| | DRAWN BY: | JMG | DESIGN PHASE: FINAL | | FIGURE NO. 2.4-5 | |
| | CHECKED BY: | ALM | NWI FILE NAME: LANL_v-Site_fig2.4-5_20070820.mxd | Disclaimer: This map was created for work processes associated with HIR or Investigation Work Plan for the S-Site Aggregate Area. All other uses for this map should be confirmed with LANL EP-ERSS staff. | REV NO. 2 | |
| | APPROVED BY: | KTB | | | | |

**Figure 2.4-5 V-Site Subaggregate: historical sampling locations and detected organic chemical data for the HE processing building and electroplating laboratory**

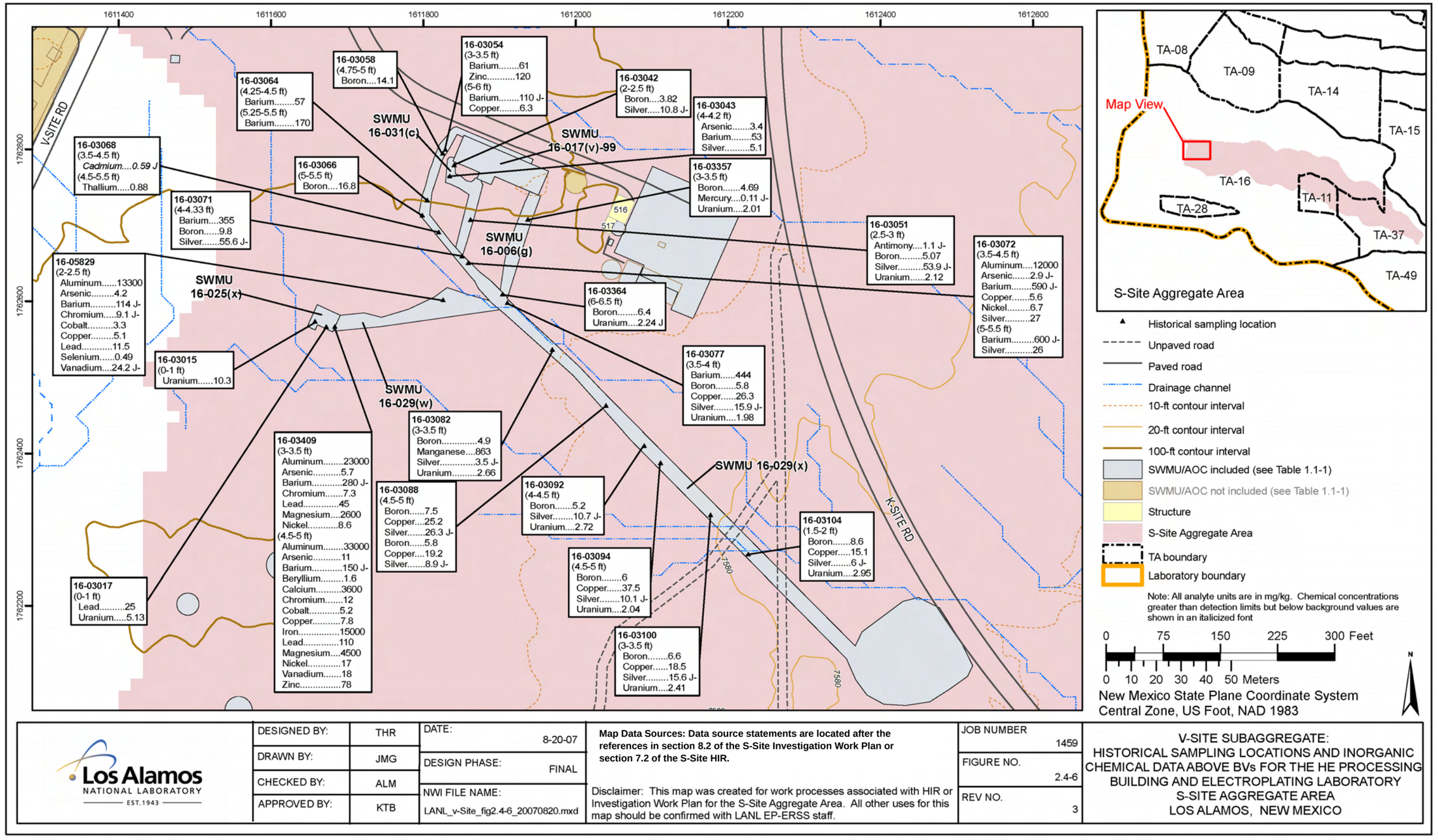
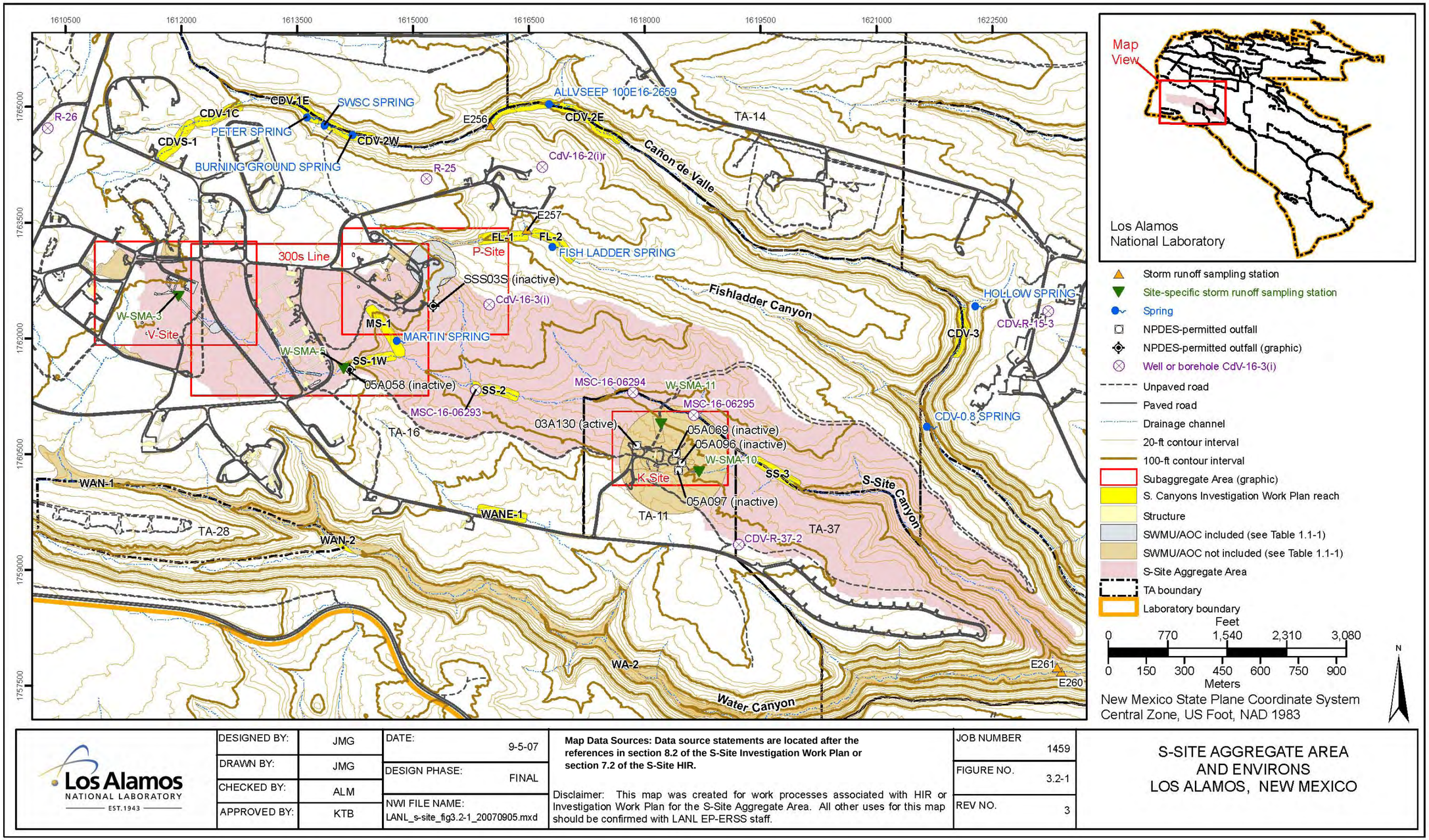



**Figure 2.4-6 V-Site Subaggregate: historical sampling locations and inorganic chemical data above BVs for the HE processing building and electroplating laboratory**




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Los Alamos NATIONAL LABORATORY EST.1943 | DESIGNED BY: | JMG | DATE: 9-5-07 | **Map Data Sources: Data source statements are located after the references in section 8.2 of the S-Site Investigation Work Plan or section 7.2 of the S-Site HIR.** | JOB NUMBER 1459 | S-SITE AGGREGATE AREA AND ENVIRONS LOS ALAMOS, NEW MEXICO |
| | DRAWN BY: | JMG | DESIGN PHASE: FINAL | | FIGURE NO. 3.2-1 | |
| | CHECKED BY: | ALM | NWI FILE NAME: LANL_s-site_fig3.2-1_20070905.mxd | Disclaimer: This map was created for work processes associated with HIR or Investigation Work Plan for the S-Site Aggregate Area. All other uses for this map should be confirmed with LANL EP-ERSS staff. | REV NO. 3 | |
| | APPROVED BY: | KTB | | | | |

**Figure 3.2-1 S-Site Aggregate Area and environs**

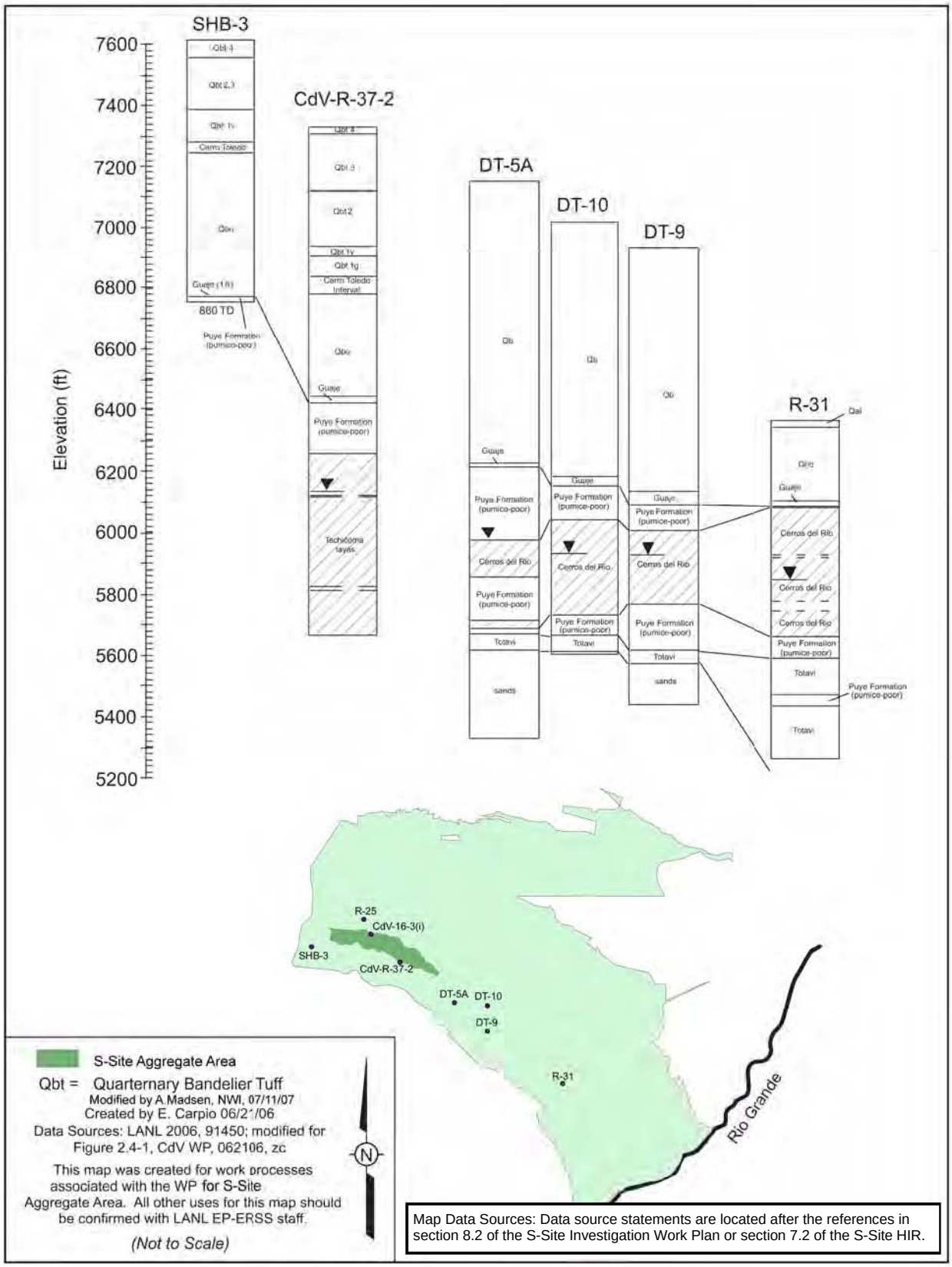



**Figure 3.4-1 Stratigraphy and geologic correlations at selected borings (west-northwest to east southeast)**

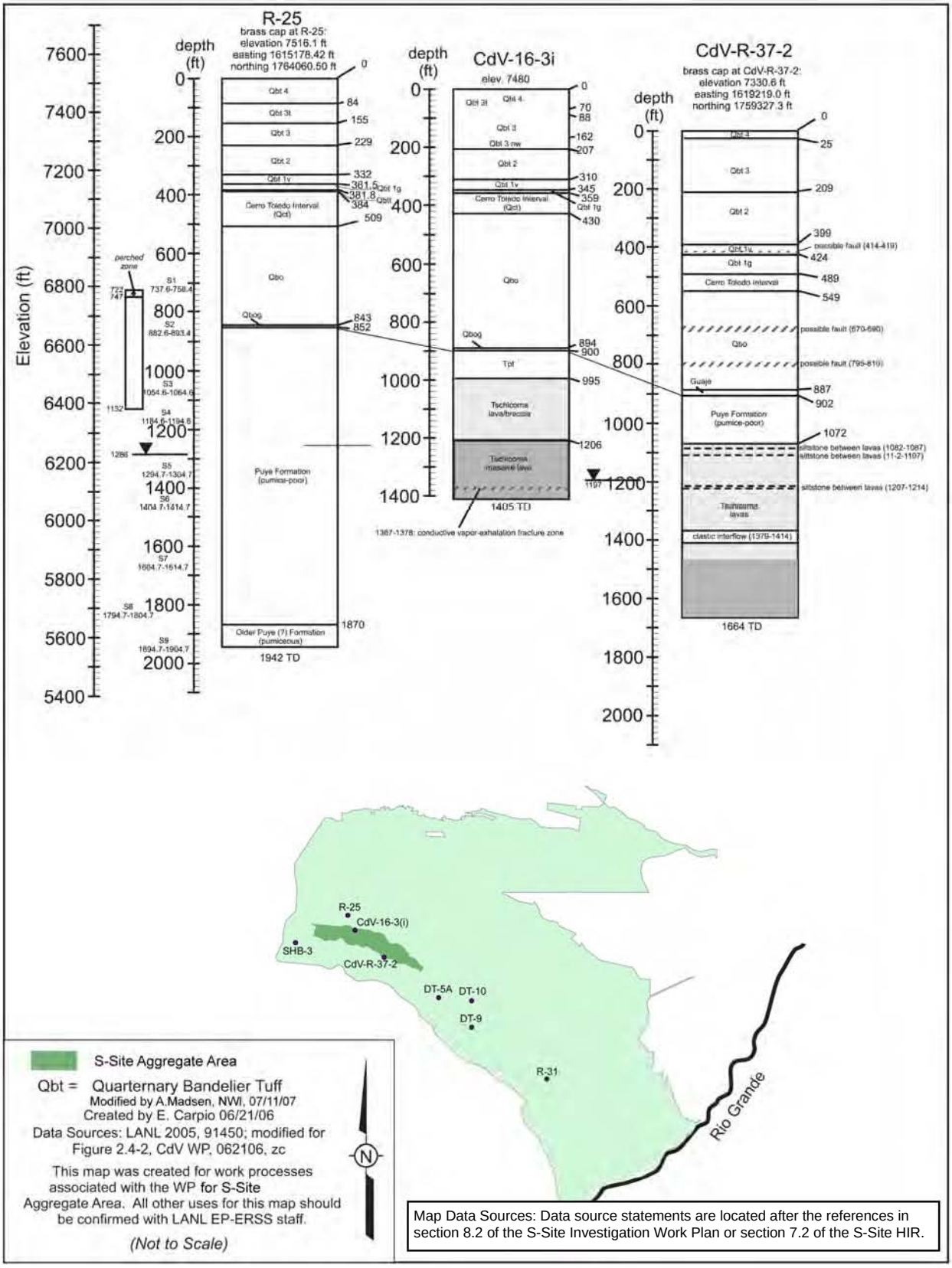



**Figure 3.4-2 Stratigraphy and geologic correlations at selected borings (north to south)**

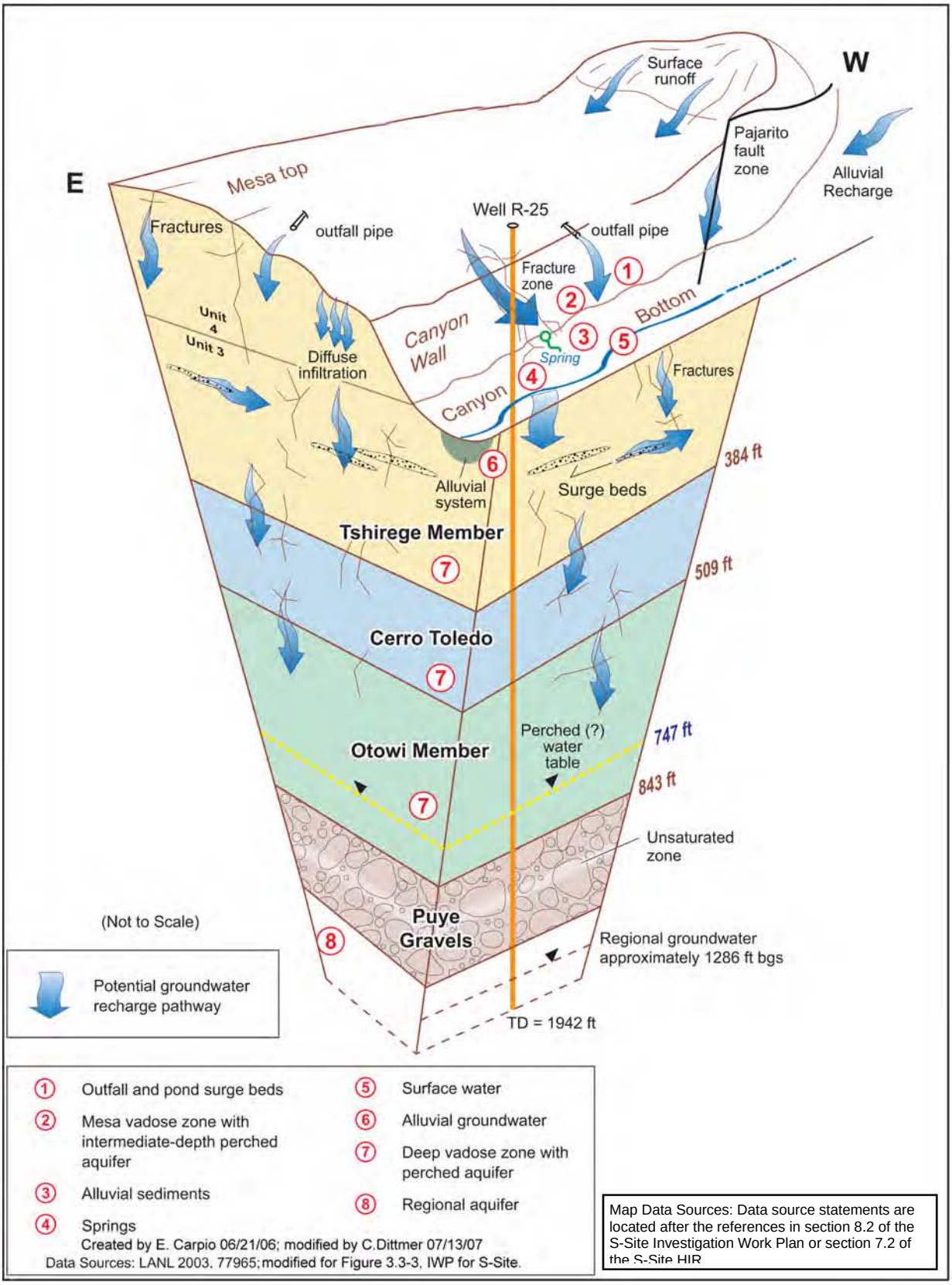
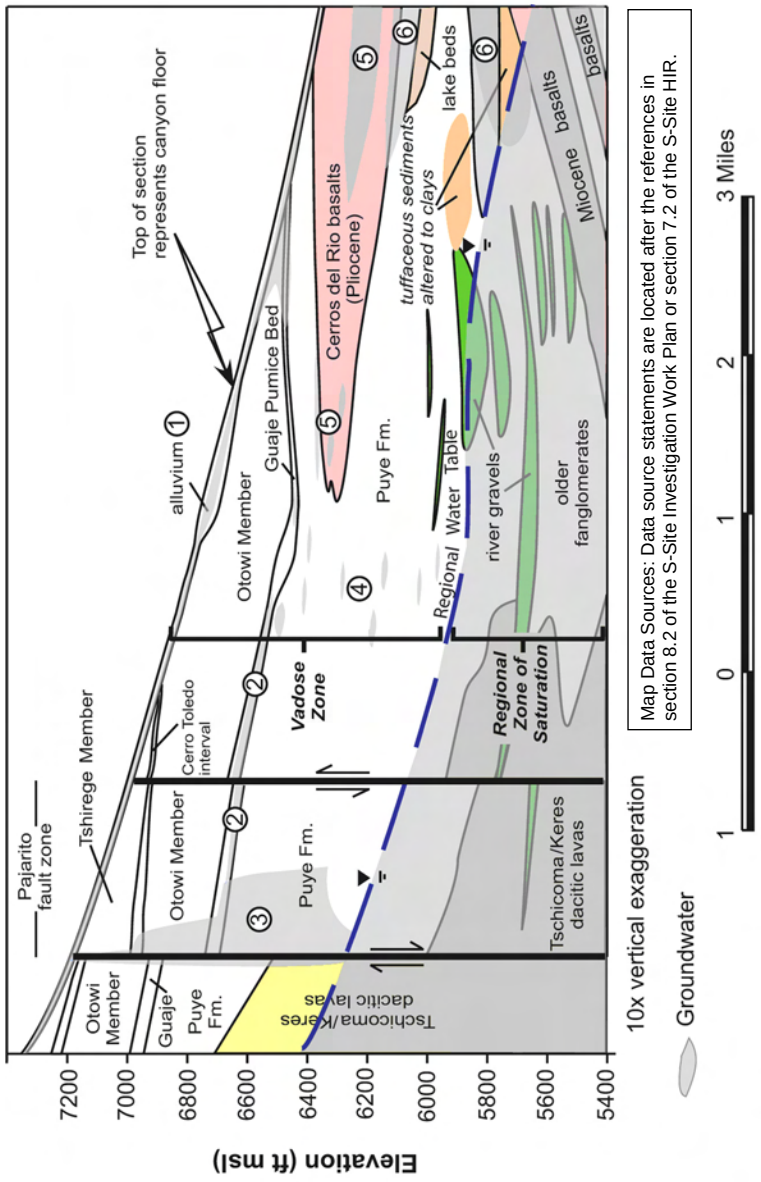



**Figure 3.4-3 Hydrogeologic conceptual model for the S-Site Aggregate Area**




① Canyon-floor alluvial groundwater - most commonly found in large, wet watersheds with significant snow and storm runoff or in smaller watersheds that receive liquid effluent from wastewater treatment plants. Saturated thickness and downcanyon extent varies seasonally.

② Perched groundwater is associated with the Guaje Pumice Bed in Los Alamos Canyon. This perched water body has a lateral extent of up to 3.7 mi. Guaje Pumice Bed has a high moisture content but is not fully saturated in most other locations.

③ Cañon de Valle area in the southwest part of LANL. This is the largest perched zone identified on the plateau. A deep-sounding surface-based magnetotelluric survey suggests that this perched zone is discontinuous laterally, occurring as vertical, pipelike groundwater bodies. One interpretation of this zone is that it represents groundwater mound(s) formed in response to local recharge beneath a wet canyon floor. Recharge may be enhanced across the Pajarito fault zone where shallow, densely welded tuffs rocks are highly fractured.

④ Small zones of perched water formed above stratigraphic traps in Puye fanglomerate. These perched zones tend to be more numerous beneath large wet canyons and less frequent beneath dry mesa tops.

⑤ Perched groundwater associated with Cerro del Rio basalt. Saturation occurs in fractured basalt flows and in interflow breccias and sediments.

⑥ Perched zones form in response to local geologic conditions on the eastern side of the plateau. These include perch zones within clay-altered tuffaceous sediments and above lake deposits.

Source: LANL 2005, 92028; modified for Figure 3.3-4, IWP for S-Site.

**Figure 3.4-4 Generalized east-west hydrostratographic cross section through the Pajarito Mesa**

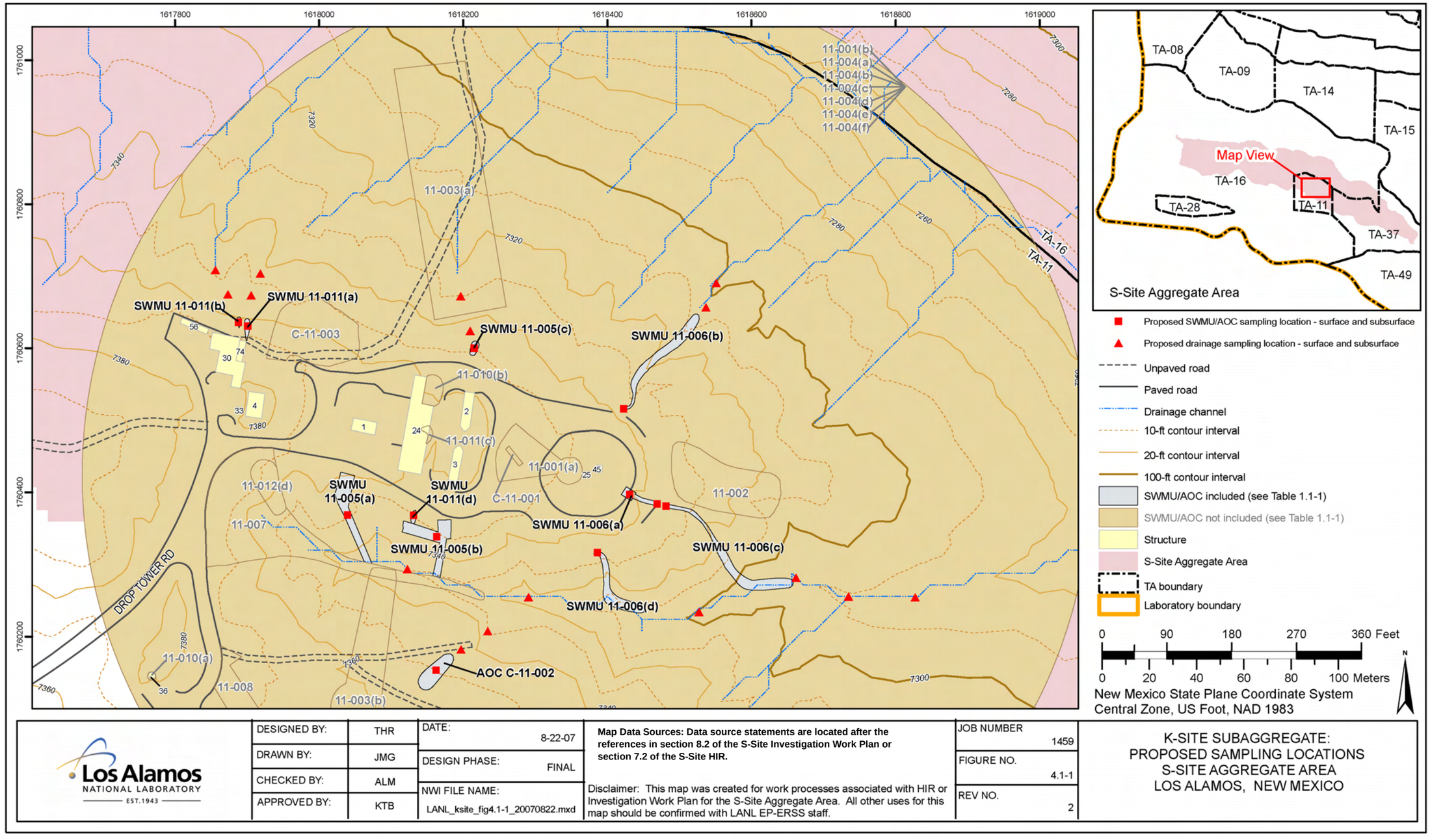



**Figure 4.1-1 K-Site Subaggregate: proposed sampling locations**

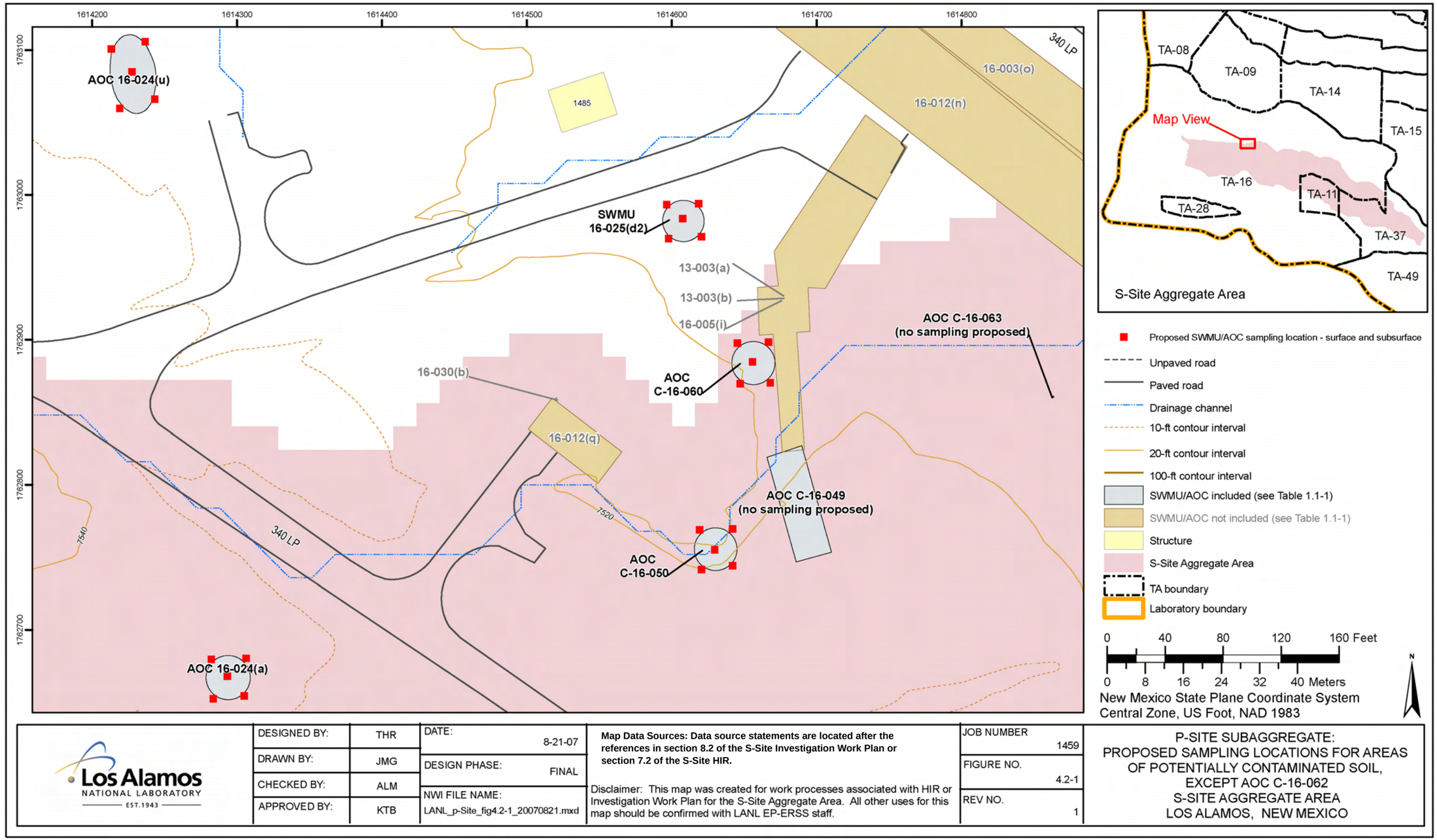



**Figure 4.2-1 P-Site Subaggregate: proposed sampling locations for areas of potentially contaminated soil, except AOC C-16-062**

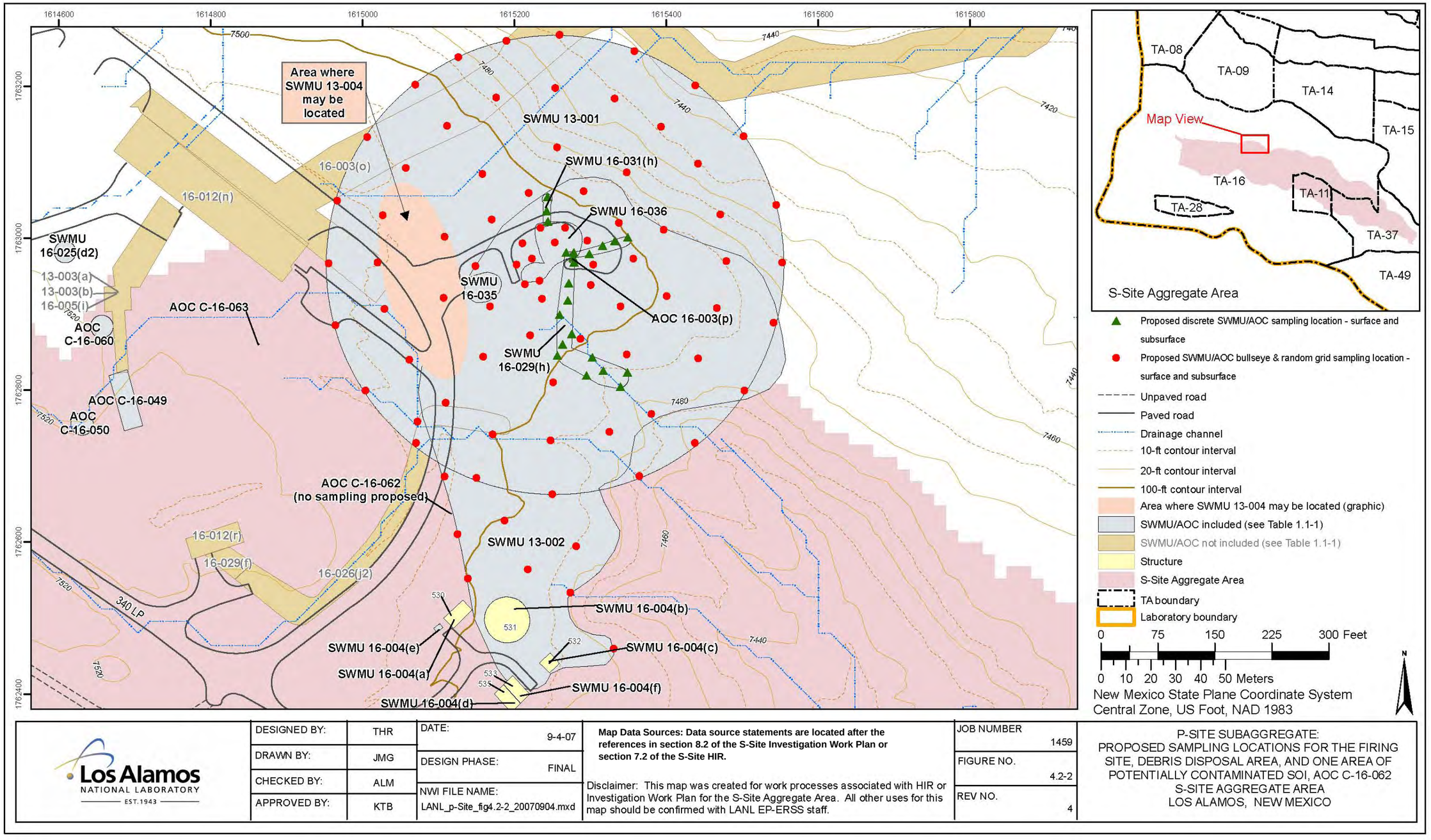



**Figure 4.2-2 P-Site Subaggregate: proposed sampling locations for the firing site, debris disposal area, and one area of potentially contaminated soil, AOC C-16-062**

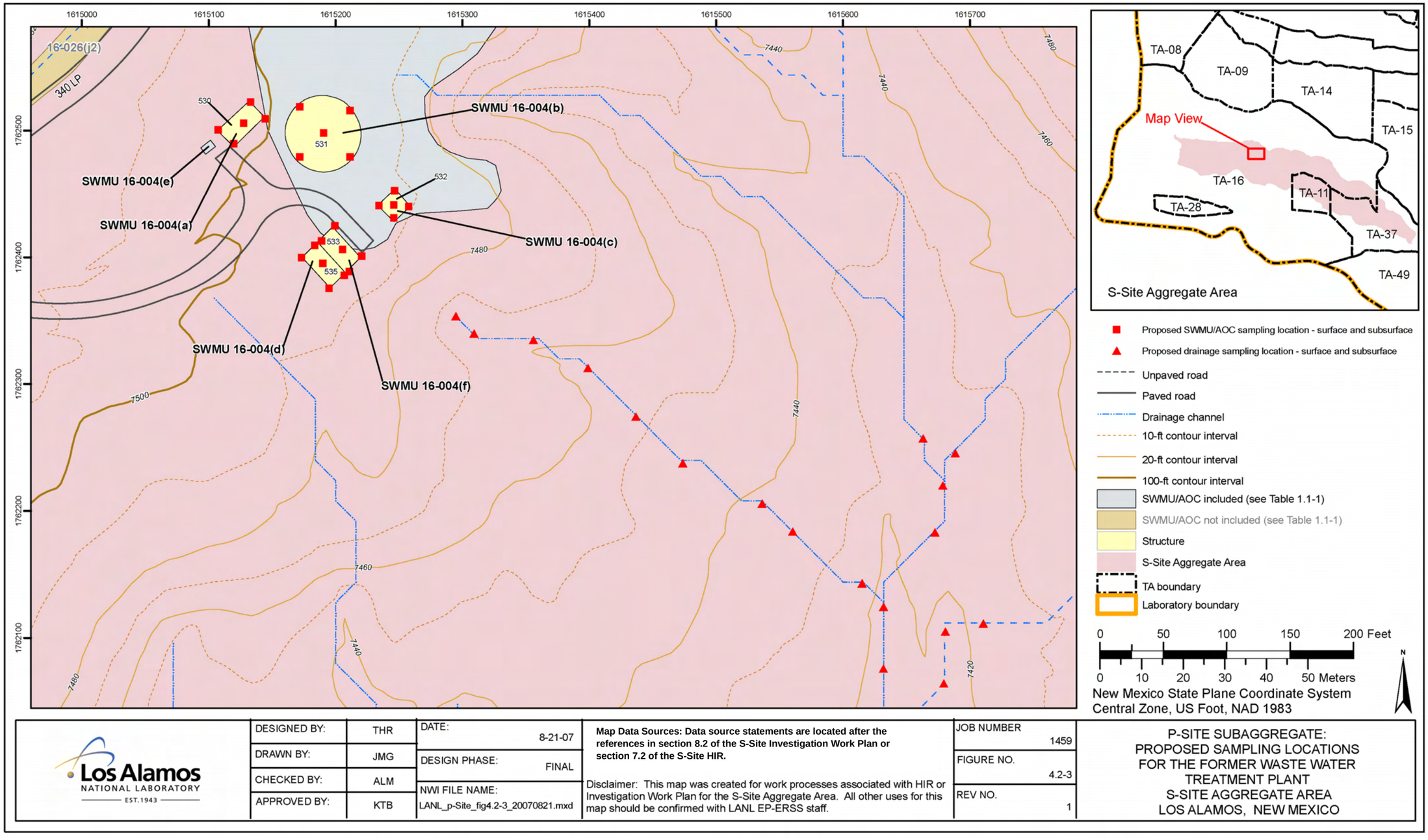



**Figure 4.2-3 P-Site Subaggregate: proposed sampling locations for the former waste water treatment plant**

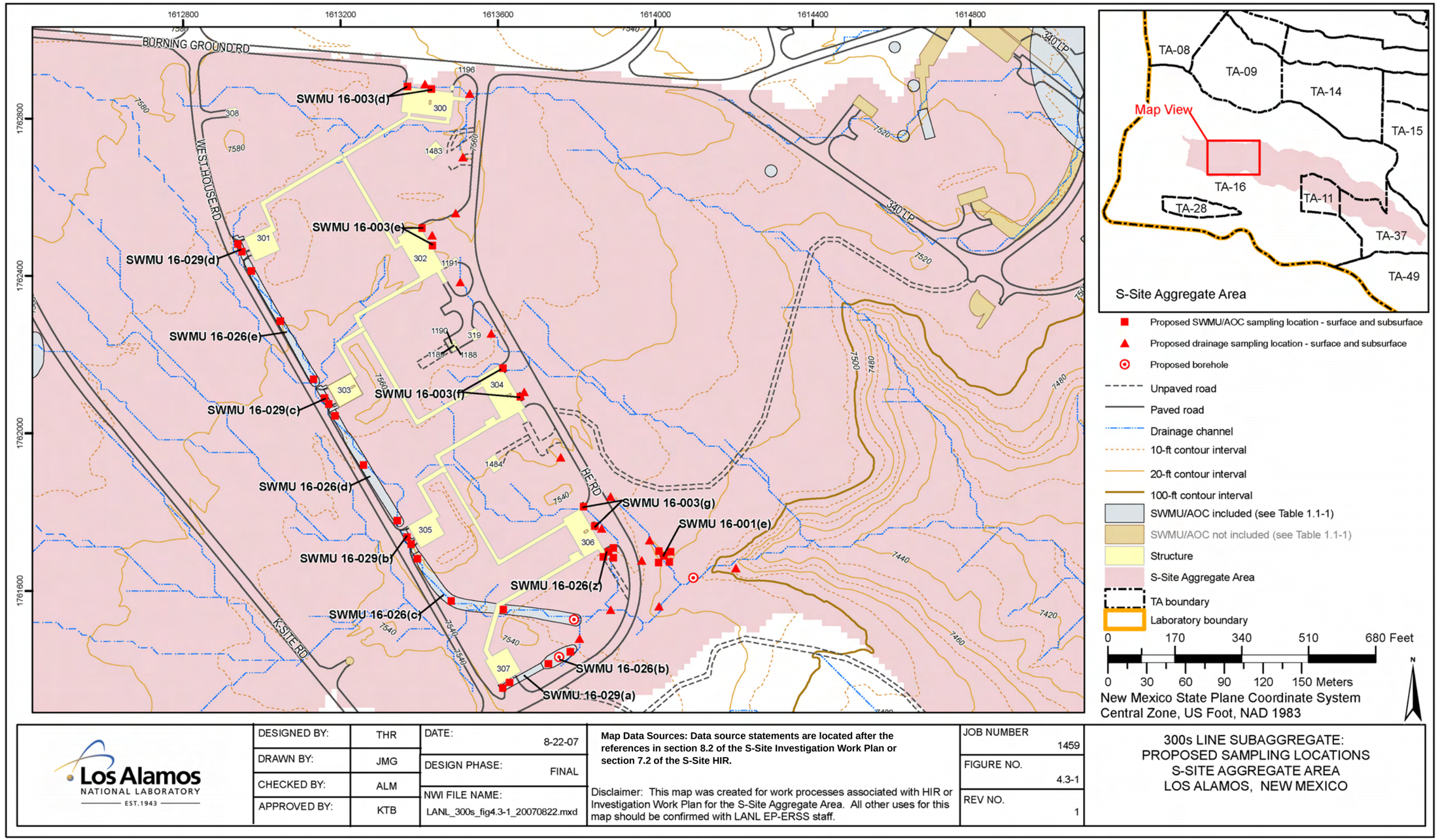



**Figure 4.3-1 300s Line Subaggregate: proposed sampling locations**

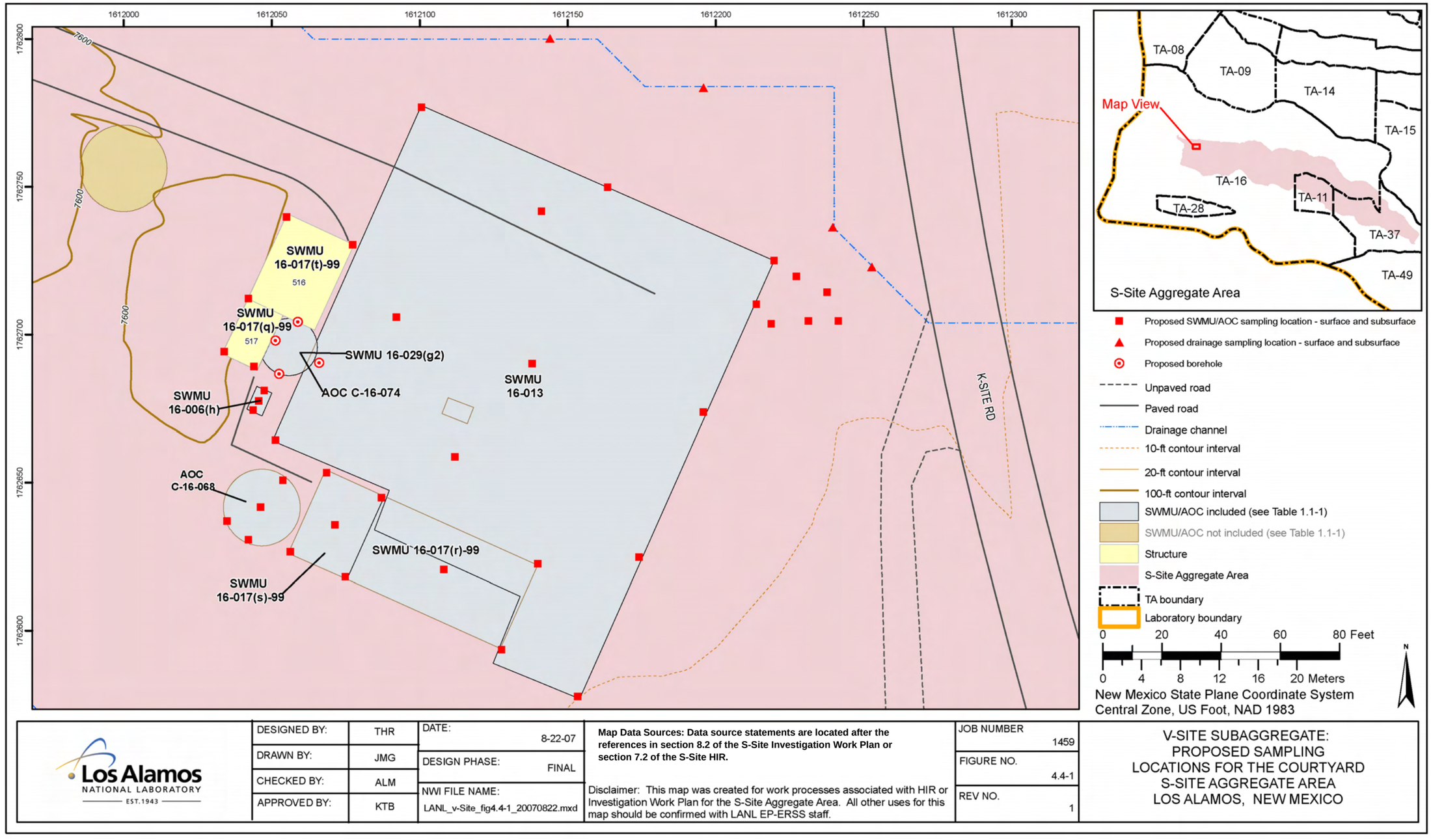



**Figure 4.4-1 V-Site Subaggregate: proposed sampling locations for the courtyard**

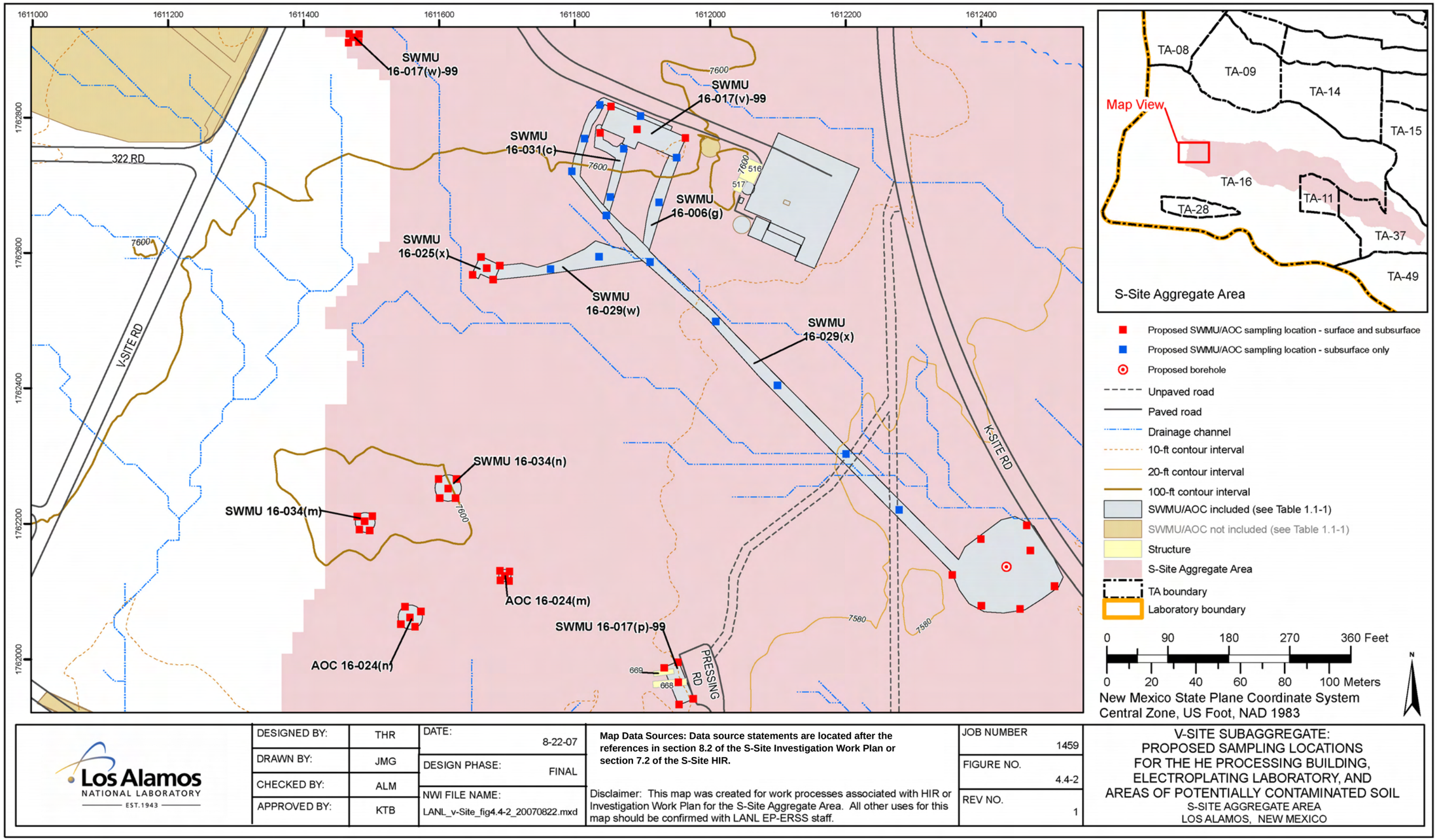
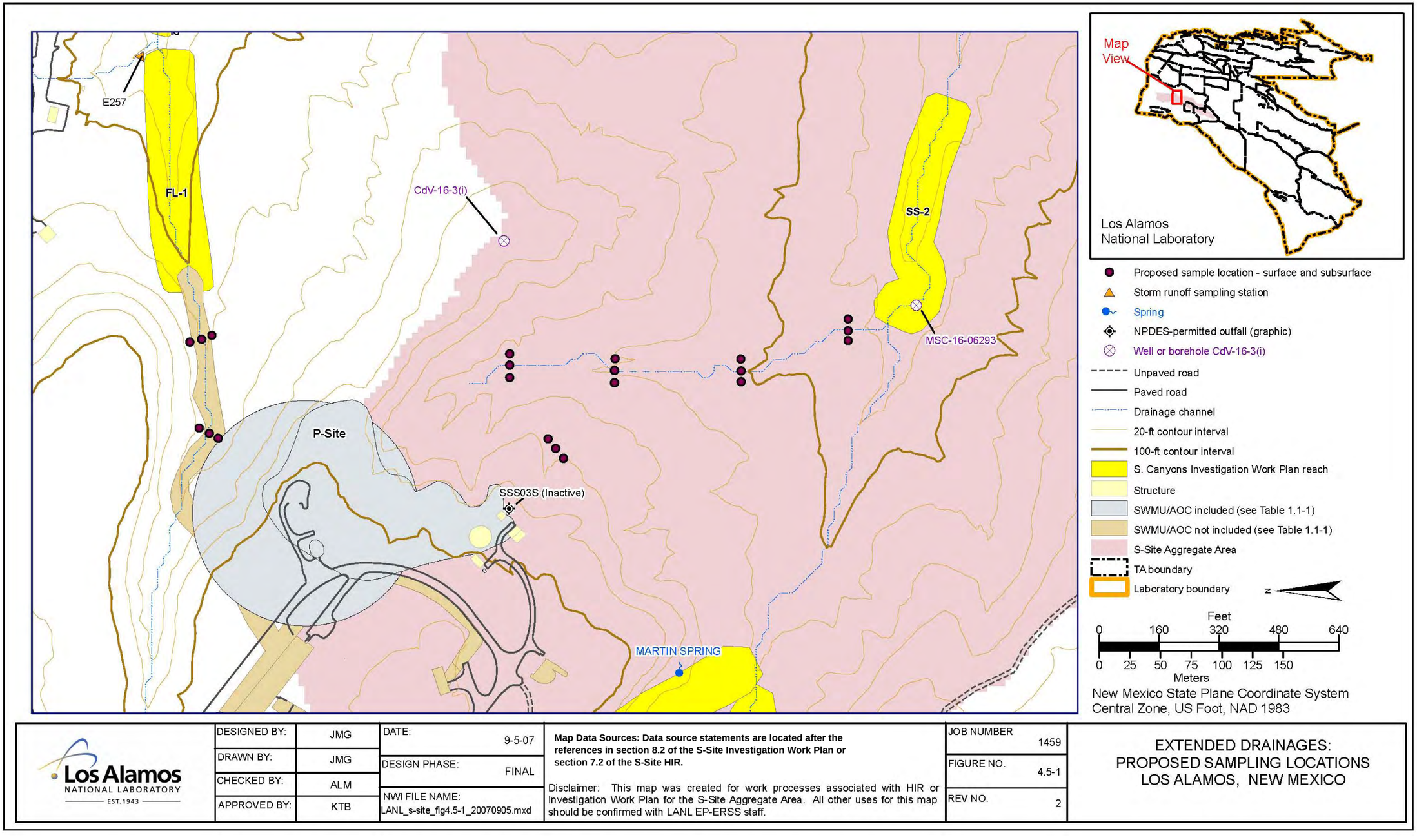



**Figure 4.4-2 V-Site Subaggregate: proposed sampling locations for the HE processing building, electroplating laboratory, and areas of potentially contaminated soil**

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|---|---|---|---|---|---|
| Los Alamos NATIONAL LABORATORY EST. 1943 | DESIGNED BY: JMG<br>DRAWN BY: JMG<br>CHECKED BY: ALM<br>APPROVED BY: KTB | DATE: 9-5-07<br>DESIGN PHASE: FINAL<br>NWI FILE NAME: LANL_s-site_fig4.5-1_20070905.mxd | **Map Data Sources: Data source statements are located after the references in section 8.2 of the S-Site Investigation Work Plan or section 7.2 of the S-Site HIR.**<br>Disclaimer: This map was created for work processes associated with HIR or Investigation Work Plan for the S-Site Aggregate Area. All other uses for this map should be confirmed with LANL EP-ERSS staff. | JOB NUMBER 1459<br>FIGURE NO. 4.5-1<br>REV NO. 2 | EXTENDED DRAINAGES: PROPOSED SAMPLING LOCATIONS LOS ALAMOS, NEW MEXICO |

**Figure 4.5-1 Extended Drainages: Proposed sampling locations**

**Table 1.1-1**
**S-Site Aggregate Area List of Consolidated Units, SWMUs, and AOCs**

| Consolidated Unit | Site Number | Description | Reference | Comment |
|---|---|---|---|---|
| 11-004(a)-99 | AOC 11-004(f) | Asphalt drop pad | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or investigation work plan. |
| | SWMU 11-004(a) | 160-ft high drop tower used to conduct drop-sensitivity and skid-sensitivity tests for explosives | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or investigation work plan. |
| | SWMU 11-004(b) | Concrete pad | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or investigation work plan. |
| | SWMU 11-004(c) | Hoist | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or investigation work plan. |
| | SWMU 11-004(d) | Hoist | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or investigation work plan. |
| | SWMU 11-004(e) | Asphalt drop pad | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or investigation work plan. |
| 11-006(a)-99 | AOC C-11-001 | Former site of a building that may have housed a photofission laboratory or a darkroom | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or investigation work plan. |
| | SWMU 11-001(a) | Former HE firing pit | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or investigation work plan. |
| | SWMU 11-002 | Active burning area | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or investigation work plan. |

**Table 1.1-1 (continued)**

| Consolidated Unit | Site Number | Description | Reference | Comment |
|---|---|---|---|---|
| | SWMU 11-006(a) | HE sump | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| | SWMU 11-006(b) | Catch basin and associated outfall | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| | SWMU 11-006(c) | Catch basin and associated outfall | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| | SWMU 11-006(c) | Catch basin and associated outfall | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| | SWMU 11-006(d) | Catch basin and associated outfall | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| 11-011(a)-00 | SWMU 11-011(a) | Active NPDES-permitted outfall, receives cooling-tower blowdown | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| | SWMU 11-011(b) | Active outfall, serves floor drains in building 11-030 | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| 13-001-99 | SWMU 13-001 | Inactive firing site | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 13-002 | Debris disposal area (landfill) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-035 | Area of potentially contaminated soil associated with a control bunker | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-036 | Area of potentially contaminated soil associated with two bunkers | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| 13-003(a)-99 | AOC 13-003(b) | Associated drainfield | LANL 2004, 087345 | This site is included in the investigation of the 16-340 Complex and is, therefore, not included in this HIR or the investigation work plan. |
| | SWMU 13-003(a) | Septic tank (removed) | LANL 2004, 087345 | This site is included in the investigation of the 16-340 Complex and is, therefore, not included in this HIR or the investigation work plan. |
| 16-003(d)-99 | SWMU 16-001(e) | Inactive dry well (now filled w/soil) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-003(d) | Sump | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |

**Table 1.1-1 (continued)**

| Consolidated Unit | Site Number | Description | Reference | Comment |
|---|---|---|---|---|
| | SWMU 16-003(e) | Two inactive HE sumps, served an inactive mock explosives (inert) preparation facility | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-003(f) | Two inactive HE sumps, served an inactive plastics development and preparation facility | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-003(g) | Two inactive HE sumps that formerly served a plastics development & preparation facility | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| 16-004(a)-99 | SWMU 16-004(a) | Concrete Imhoff tank | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-004(b) | Trickling filter, received effluent from the dosing siphon | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-004(c) | Tank, received discharge water from trickling filter | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-004(d) | Sludge drying bed | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-004(e) | Filter screen used to filter large solids | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-004(f) | Sludge drying bed | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| 16-013-99 | AOC C-16-068 | Area of potentially contaminated soil associated with former building 16-522 | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | AOC C-16-074 | Former drum storage area, stored HE-contaminated hydraulic oil | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-006(h) | Former steam-heating distribution pump pit | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-013 | Former container storage area | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-017(q)-99 | Former storage magazine | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |

**Table 1.1-1 (continued)**

| Consolidated Unit | Site Number | Description | Reference | Comment |
|---|---|---|---|---|
| | SWMU 16-017(r)-99 | Site of former building used for varnishing operations and storage | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-017(s)-99 | Site of former building used for assembly operations and storage | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-017(t)-99 | Building 16-516, originally housed a laboratory; later used for equipment storage | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-029(g2) | Decommissioned concrete pit used in vibration tests | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| 16-026(b)-99 | SWMU 16-026(b) | Inactive outfall associated with building 16-307 | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-026(c) | Inactive outfall associated with building 16-305 | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-026(d) | Inactive outfall associated with building 16-303 | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-026(e) | Inactive outfall associated with building 16-301 | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-029(a) | Inactive sump associated with building 16-307 | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-029(b) | Inactive sump associated with building 16-305 | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| 16-029(h)-99 | SWMU 16-029(c) | Inactive sump associated with building 16-303 | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-029(d) | Inactive sump associated with building 16-301 | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| | AOC 16-003(p) | HE sump (now plugged) associated with former HE-machining building 16-478 | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |

**Table 1.1-1 (continued)**

| Consolidated Unit | Site Number | Description | Reference | Comment |
|---|---|---|---|---|
| | SWMU 16-029(h) | Drainlines and outfall associated with former HE-machining building 16-478 | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| 16-029(x)-99 | SWMU 16-006(g) | Former septic system | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-017(v)-99 | Area of potentially contaminated soil associated with a former electroplating laboratory | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-025(x) | Area of potentially contaminated soil associated with a former HE-processing building | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-029(w) | Area of potentially contaminated soil associated with the former HE-sump, former drainline, and outfall of a former electroplating laboratory | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-029(x) | Area of potentially contaminated soil associated with the HE-sump and drainage systems, former buildings 16-100 and 16-515 | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-031(c) | Drainline that received sanitary and industrial waste from a former HE-processing building 16-515 | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| n/a* | AOC 11-003(a) | Inactive mortar impact area | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |
| | AOC 11-003(b) | Former mortar impact area, decommissioned TA-11 air-gun facility | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or the investigation work plan. |
| | AOC 11-008 | Surface disposal area | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |

**Table 1.1-1 (continued)**

| Consolidated Unit | Site Number | Description | Reference | Comment |
|---|---|---|---|---|
| | AOC 11-010(a) | Container storage area | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |
| | AOC 11-010(b) | Container storage area | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |
| | AOC 11-012(c) | Area of potential surface-soil contamination associated with a former building | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or the investigation work plan. |
| | AOC 11-012(d) | Area of potential surface-soil contamination associated with a former building | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or the investigation work plan. |
| | AOC 16-024(a) | Area of potentially contaminated soil associated with a former HE magazine (removed) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | AOC 16-024(m) | Former HE storage magazine | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | AOC 16-024(n) | Former HE storage magazine | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | AOC 16-024(u) | Area of potentially contaminated soil associated with a former HE magazine (removed) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | AOC 25-001 | Duplicate of SWMU 16-029(g2) | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |
| | AOC C-11-002 | Area of potential surface soil contamination associated with a former building | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| | AOC C-11-003 | Area of potential surface soil contamination associated with a one-time spill | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |

**Table 1.1-1 (continued)**

| Consolidated Unit | Site Number | Description | Reference | Comment |
|---|---|---|---|---|
| | AOC C-16-007 | Tank stand | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |
| | AOC C-16-049 | Area of potentially contaminated soil associated with a former workshop (removed) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | AOC C-16-050 | Area of potentially contaminated soil associated with a former workshop (removed) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | AOC C-16-056 | Steam manhole (removed) | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |
| | AOC C-16-057 | Steam manhole (removed) | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |
| | AOC C-16-059 | Former location of a pit (structure 16-0524) that contained electrical service outlets | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |
| | AOC C-16-060 | Area of potentially contaminated soil associated with a former storage building (removed) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | AOC C-16-062 | Area of potentially contaminated soil associated with a former workshop (removed) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | AOC C-16-063 | Area of potentially contaminated soil associated with a former workshop (removed) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | AOC C-25-001 | Duplicate of AOC C-16-068 | EPA 2005, 088464 | This site has been approved for NFA by EPA. Therefore, it is not included in the HIR or the investigation work plan. |

**Table 1.1-1 (continued)**

| Consolidated Unit | Site Number | Description | Reference | Comment |
|---|---|---|---|---|
| | SWMU 11-001(b) | Inactive munitions firing pit | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or the investigation work plan. |
| | SWMU 11-005(a) | Active septic system | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| | SWMU 11-005(b) | Active septic system | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| | SWMU 11-005(c) | Inactive outfall (capped drainline) | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| | SWMU 11-007 | Surface disposal area | NMED 1998, 063042 (Table A1, 12/23/98) | This site has been removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit. Therefore, it is not included in the HIR or the investigation work plan. |
| | SWMU 11-009 | MDA S, active experimental test plot used to study explosives degradation | March 1, 2005, Compliance Order on Consent, Table IV-2 | The investigation of this site has been deferred as specified in the Consent Order. Deferred sites are not included in the HIR or the investigation work plan. |
| | SWMU 11-011(c) | Boiler discharge (misidentified) | NMED 2001, 070010 (Table A1, 5/02/01) | This site has been removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit. Therefore, it is not included in the HIR or the investigation work plan. |
| | SWMU 11-011(d) | Active outfall associated with a building that houses offices and a light-machine shop | Investigation work plan, section 4.1 | This site is included in both the HIR and investigation work plan. |
| | SWMU 13-004 | Burning pits (unlocated) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-005(i) | Septic tank (structure 13-12); duplicate of SWMU 13-003(a) | NMED 1998, 063042 (Table A1, 12/23/98) | This site has been removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit. Therefore, it is not included in the HIR or the investigation work plan. |
| | SWMU 16-012(i) | Satellite accumulation area, room 102, building 16-300 | NMED 1998, 063042 (Table A1, 12/23/98) | This site has been removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit. Therefore, it is not included in the HIR or the investigation work plan. |

**Table 1.1-1 (continued)**

| Consolidated Unit | Site Number | Description | Reference | Comment |
|---|---|---|---|---|
| | SWMU 16-012(j) | Satellite accumulation area, building 16-303 | NMED 1998, 063042 (Table A1, 12/23/98) | This site has been removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit. Therefore, it is not included in the HIR or the investigation work plan. |
| | SWMU 16-012(k) | HE rest house, building 16-303 | NMED 1998, 063042 (Table A1, 12/23/98) | This site has been removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit. Therefore, it is not included in the HIR or the investigation work plan. |
| | SWMU 16-012(l) | Satellite accumulation area, room 103, building 16-306 | NMED 1998, 063042 (Table A1, 12/23/98) | This site has been removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit. Therefore, it is not included in the HIR or the investigation work plan. |
| | SWMU 16-012(m) | Satellite accumulation area, room 103, building 16-304 | NMED 1998, 063042 (Table A1, 12/23/98) | This site has been removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit. Therefore, it is not included in the HIR or the investigation work plan. |
| | SWMU 16-017(p)-99 | Former storage magazine | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-017(w)-99 | Former storage magazine | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-025(d2) | Area of potentially contaminated soil associated with a former mockup chamber (removed) | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-026(f) | Area of potentially contaminated soil associated with two active outfalls from building 16-308 | LANL 2002, 073664 | A response from NMED regarding a previous NFA proposal is pending for this site. Therefore, this site is not included in the HIR or the investigation work plan. |
| | SWMU 16-026(z) | Area of potentially contaminated soil associated with an active outfall from building 16-306 | Investigation work plan, section 4.3 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-031(h) | Area of potentially contaminated soil associated with the outfall from a utility room in a machine shop | Investigation work plan, section 4.2 | This site is included in both the HIR and investigation work plan. |

**Table 1.1-1 (continued)**

| Consolidated Unit | Site Number | Description | Reference | Comment |
|---|---|---|---|---|
| | SWMU 16-034(g) | Duplicate of SWMU 16-017(q)-99 | NMED 1998, 063042 (Table A1, 12/23/98) | This site has been removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit. Therefore, it is not included in the HIR or the investigation work plan. |
| | SWMU 16-034(m) | Area of potentially contaminated soil associated with a former building (16-086) used for experimental HE research and development | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |
| | SWMU 16-034(n) | Area of potentially contaminated soil associated with a former building (16-083) used for experimental HE research and development | Investigation work plan, section 4.4 | This site is included in both the HIR and investigation work plan. |

*n/a = Not applicable.

**Table 1.1-2**
**List of Consolidated Units, SWMUs, and AOCs and**
**Planned Activities in the S-Site Aggregate Area Investigation Work Plan**

| Subaggregate Name | Consolidated Unit | Site Number | Description | Proposed Activity | Reference |
|---|---|---|---|---|---|
| 300s Line | 16-003(d)-99 | SWMU 16-001(e) | Inactive dry well (now filled w/soil) | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-003(d) | Sump | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-003(e) | Two inactive HE sumps, served an inactive mock explosives (inert) preparation facility | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-003(f) | Two inactive HE sumps, served an inactive plastics development and preparation facility | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-003(g) | Two inactive HE sumps that formerly served a plastics development & preparation facility | Investigation sampling | Investigation Work Plan, section 4.3 |
| | 16-026(b)-99 | SWMU 16-026(b) | Inactive outfall associated with building 16-307 | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-026(c) | Inactive outfall associated with building 16-305 | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-026(d) | Inactive outfall associated with building 16-303 | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-026(e) | Inactive outfall associated with building 16-301 | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-029(a) | Inactive sump associated with building 16-307 | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-029(b) | Inactive sump associated with building 16-305 | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-029(c) | Inactive sump associated with building 16-303 | Investigation sampling | Investigation Work Plan, section 4.3 |
| | | SWMU 16-029(d) | Inactive sump associated with building 16-301 | Investigation sampling | Investigation Work Plan, section 4.3 |

**Table 1.1-2 (continued)**

| Subaggregate Name | Consolidated Unit | Site Number | Description | Proposed Activity | Reference |
|---|---|---|---|---|---|
| | n/a* | SWMU 16-026(z) | Area of potentially contaminated soil associated with an active outfall from building 16-306 | Investigation sampling | Investigation Work Plan, section 4.3 |
| K-Site | 11-006(a)-99 | SWMU 11-006(a) | HE sump | Investigation sampling | Investigation Work Plan, section 4.1 |
| | | SWMU 11-006(b) | Catch basin and associated outfall | Investigation sampling | Investigation Work Plan, section 4.1 |
| | | SWMU 11-006(c) | Catch basin and associated outfall | Investigation sampling | Investigation Work Plan, section 4.1 |
| | | SWMU 11-006(d) | Catch basin and associated outfall | Investigation sampling | Investigation Work Plan, section 4.1 |
| | 11-011(a)-00 | SWMU 11-011(a) | Active NPDES-permitted outfall, receives cooling-tower blowdown | Investigation sampling | Investigation Work Plan, section 4.1 |
| | | SWMU 11-011(b) | Active outfall, serves floor drains in building 11-030 | Investigation sampling | Investigation Work Plan, section 4.1 |
| | n/a | AOC C-11-002 | Area of potential surface soil contamination associated with a former building | Investigation sampling | Investigation Work Plan, section 4.1 |
| | | SWMU 11-005(a) | Active septic system | Investigation sampling | Investigation Work Plan, section 4.1 |
| | | SWMU 11-005(b) | Active septic system | Investigation sampling | Investigation Work Plan, section 4.1 |
| | | SWMU 11-005(c) | Inactive outfall (capped drainline) | Investigation sampling | Investigation Work Plan, section 4.1 |
| | | SWMU 11-011(d) | Active outfall associated with a building that houses offices and a light-machine shop | Investigation sampling | Investigation Work Plan, section 4.1 |
| P-Site | 13-001-99 | SWMU 13-001 | Inactive firing site | Investigation sampling | Investigation Work Plan, section 4.2 |

**Table 1.1-2 (continued)**

| Subaggregate Name | Consolidated Unit | Site Number | Description | Proposed Activity | Reference |
|---|---|---|---|---|---|
| | | SWMU 13-002 | Inactive landfill containing debris and shrapnel | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | SWMU 16-035 | Area of potentially contaminated soil associated with a control bunker | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | SWMU 16-036 | Area of potentially contaminated soil associated with two bunkers | Investigation sampling | Investigation Work Plan, section 4.2 |
| | 16-004(a)-99 | SWMU 16-004(a) | Concrete Imhoff tank | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | SWMU 16-004(b) | Trickling filter, received effluent from the dosing siphon | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | SWMU 16-004(c) | Tank, received discharge water from trickling filter | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | SWMU 16-004(d) | Sludge drying bed | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | SWMU 16-004(e) | Filter screen used to filter large solids | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | SWMU 16-004(f) | Sludge drying bed | Investigation sampling | Investigation Work Plan, section 4.2 |
| | 16-029(h)-99 | AOC 16-003(p) | HE sump (now plugged) associated with former HE-machining building 16-478 | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | SWMU 16-029(h) | Drainlines and outfall associated with former HE-machining building 16-478 | Investigation sampling | Investigation Work Plan, section 4.2 |
| | n/a | AOC 16-024(a) | Area of potentially contaminated soil associated with a former HE magazine (removed) | Investigation sampling | Investigation Work Plan, section 4.2 |

**Table 1.1-2 (continued)**

| Subaggregate Name | Consolidated Unit | Site Number | Description | Proposed Activity | Reference |
|---|---|---|---|---|---|
| | | AOC 16-024(u) | Area of potentially contaminated soil associated with a former HE magazine (removed) | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | AOC C-16-049 | Area of potentially contaminated soil associated with a former workshop (removed) | Archival documentation demonstrates that no environmental sampling is warranted this site. A statement of basis describing the rationale for NFA and a request for a Certificate of Completion for this site will be submitted with the investigation report associated with this work plan. | Investigation Work Plan, section 4.2 |
| | | AOC C-16-050 | Area of potentially contaminated soil associated with a former workshop (removed) | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | AOC C-16-060 | Area of potentially contaminated soil associated with a former storage building (removed) | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | AOC C-16-062 | Area of potentially contaminated soil associated with a former workshop (removed) | Archival documentation demonstrates that no environmental sampling is warranted this site. A statement of basis describing the rationale for NFA and a request for a Certificate of Completion for this site will be submitted with the investigation report associated with this work plan. | Investigation Work Plan, section 4.2 |

**Table 1.1-2 (continued)**

| Subaggregate Name | Consolidated Unit | Site Number | Description | Proposed Activity | Reference |
|---|---|---|---|---|---|
| | | AOC C-16-063 | Area of potentially contaminated soil associated with a former workshop (removed) | Archival documentation demonstrates that no environmental sampling is warranted this site. A statement of basis describing the rationale for NFA and a request for a Certificate of Completion for this site will be submitted with the investigation report associated with this work plan. | Investigation Work Plan, section 4.2 |
| | | SWMU 13-004 | Burning pits (unlocated) | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | SWMU 16-025(d2) | Area of potentially contaminated soil associated with a former mockup chamber (removed) | Investigation sampling | Investigation Work Plan, section 4.2 |
| | | SWMU 16-031(h) | Area of potentially contaminated soil associated with the outfall from a utility room in a machine shop | Investigation sampling | Investigation Work Plan, section 4.2 |
| V-Site | 16-013-99 | AOC C-16-068 | Area of potentially contaminated soil associated with former building 16-522 | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | AOC C-16-074 | Former drum storage area, stored HE-contaminated hydraulic oil | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-006(h) | Former steam-heating distribution pump pit | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-013 | Former container storage area | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-017(q)-99 | Former storage magazine | Investigation sampling | Investigation Work Plan, section 4.4 |

**Table 1.1-2 (continued)**

| Subaggregate Name | Consolidated Unit | Site Number | Description | Proposed Activity | Reference |
|---|---|---|---|---|---|
| | | SWMU 16-017(r)-99 | Site of former building used for varnishing operations and storage | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-017(s)-99 | Site of former building used for assembly operations and storage | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-017(t)-99 | Building 16-516, originally housed a laboratory; later used for equipment storage | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-029(g2) | Decommissioned concrete pit used in vibration tests | Investigation sampling | Investigation Work Plan, section 4.4 |
| | 16-029(x)-99 | SWMU 16-006(g) | Former septic system | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-017(v)-99 | Area of potentially contaminated soil associated with a former electroplating laboratory | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-025(x) | Area of potentially contaminated soil associated with a former HE-processing building | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-029(w) | Area of potentially contaminated soil associated with the former HE-sump, former drainline, and outfall of a former electroplating laboratory | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-029(x) | Area of potentially contaminated soil associated with the HE-sump and drainage systems, former buildings 16-100 and 16-515 | Investigation sampling | Investigation Work Plan, section 4.4 |

**Table 1.1-2 (continued)**

| Subaggregate Name | Consolidated Unit | Site Number | Description | Proposed Activity | Reference |
|---|---|---|---|---|---|
| | | SWMU 16-031(c) | Drainline that received sanitary and industrial waste from a former HE-processing building 16-515 | Investigation sampling | Investigation Work Plan, section 4.4 |
| | n/a | AOC 16-024(m) | Former HE storage magazine | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | AOC 16-024(n) | Former HE storage magazine | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-017(p)-99 | Former storage magazine | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-017(w)-99 | Former storage magazine | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-034(m) | Area of potentially contaminated soil associated with a former building (16-86) used for experimental HE R&D | Investigation sampling | Investigation Work Plan, section 4.4 |
| | | SWMU 16-034(n) | Area of potentially contaminated soil associated with a former building (16-83) used for experimental HE R&D | Investigation sampling | Investigation Work Plan, section 4.4 |

*n/a = Not applicable.

**Table 1.1-3**
**Human Health Industrial Soil Screening Levels**

| Chemical | Industrial Soil Screening Level[a] | End Point[b] |
|---|---|---|
| **Inorganic Chemicals (mg/kg)** | | |
| Aluminum | 100,000[c] | max |
| Antimony | 454 | nc |
| Arsenic | 17.7 | ca |
| Barium | 100,000[c] | max |
| Beryllium | 2250[d] | nc |
| Boron | 100,000[c] | max |
| Cadmium | 564 | nc |
| Calcium | Essential Nutrient | en |
| Chromium (total) | 100,000[c] | max |
| Chromium (hexavalent) | 3400 | nc |
| Cobalt | 20,500 | nc |
| Copper | 45,400 | nc |
| Cyanide (total) | 13,700 | nc |
| Iron | 100,000[c] | max |
| Lead | 800[d] | IEBUK |
| Magnesium | Essential Nutrient | en |
| Manganese | 48,400 | nc |
| Mercury | 100,000[c] | max |
| Nickel | 22,700 | nc |
| Nitrate-Nitrite as N | 100,000[c] | max |
| Perchlorate | 795[e] | nc |
| Potassium | Essential Nutrient | en |
| Selenium | 5680 | nc |
| Silver | 5680 | nc |
| Sodium | Essential Nutrient | en |
| Thallium | 74.9 | nc |
| Thorium | —[f] | — |
| Titanium | 100,000[c,g] | max |
| Uranium | 200[g] | nc |
| Vanadium | 1140 | nc |
| Zinc | 100,000[c] | max |
| **Organics (mg/kg)** | | |
| Acenaphthene | 33,500 | nc |
| Acetone | 100,000 | max |
| Acrylonitrile | 12.6 | ca |
| Acrolein | 0.752 | nc |

**Table 1.1-3 (continued)**

| Chemical | Industrial Soil Screening Level[a] | End Point[b] |
|---|---|---|
| Aldrin | 1.12 | ca |
| Anthracene | 100,000 | max |
| Benzene | 25.8 | ca |
| Benzidine | 0.0833 | ca |
| Benzo(a)anthracene | 23.4 | ca |
| Benzo(a)pyrene | 2.34 | ca |
| Benzo(b)fluoranthene | 23.4 | ca |
| Benzo(k)fluoranthene | 234 | ca |
| a-BHC (HCH) | 3.99 | ca |
| b-BHC (HCH) | 14 | ca |
| g-BHC | 19.3 | ca |
| Bis(2-chloroethyl) ether | 7.45 | ca |
| Bis(2-ethylhexyl) phthalate | 1370 | ca |
| Bromobenzene | 137 | nc |
| Bromodichloromethane | 37.2 | ca |
| Bromomethane | 32.8 | nc |
| 2-Butanone | 48,700 | sat |
| tert-Butyl methyl ether (MTBE) | 984 | ca |
| n-Butylbenzene | 62.1 | sat |
| tert-Butylbenzene | 106 | sat |
| Carbon disulfide | 460 | sat |
| Carbon tetrachloride | 8.64 | ca |
| Chlordane | 71.9 | ca |
| 2-Chloro-1,3-butadiene | 23 | nc |
| Chlorobenzene | 245 | sat |
| Chloroethane | 154 | ca |
| Chloroform | 9.59 | ca |
| Chloromethane | 53.4 | ca |
| b-Chloronaphthalene | 27800 | nc |
| 2-Chlorophenol | 885 | nc |
| o-Chlorotoluene | 202 | sat |
| Chrysene | 2310 | ca |
| Cumene (isopropylbenzene) | 389 | sat |
| DDD | 111 | ca |
| DDE | 78.1 | ca |
| DDT | 78.1 | ca |
| Dibenz(a,h)anthracene | 2.34 | ca |
| Dibenzofuran | 1620 | nc |
| 1,2-Dibromo-3-chloropropane | 9.68 | nc |

**Table 1.1-3 (continued)**

| Chemical | Industrial Soil Screening Level[a] | End Point[b] |
|---|---|---|
| Dibromochloromethane | 39.5 | ca |
| 1,2-Dibromoethane | 1.31 | ca |
| 1,2-Dichlorobenzene | 37.4 | sat |
| 1,3-Dichlorobenzene | 37.4 | sat |
| 1,4-Dichlorobenzene | 103 | ca |
| 3,3-Dichlorobenzidine | 42.6 | ca |
| Dichlorodifluoromethane | 211 | sat |
| 1,1-Dichloroethane | 1420 | sat |
| 1,2-Dichloroethane | 15.2 | ca |
| cis-1,2-Dichloroethene | 300 | nc |
| trans-1,2-Dichloroethene | 429 | nc |
| 1,1-Dichloroethene | 777 | nc |
| 2,4-Dichlorophenol | 2050 | nc |
| 1,2-Dichloropropane | 14.9 | ca |
| Dieldrin | 1.2 | ca |
| Diethyl phthalate | 100,000 | max |
| Dimethyl phthalate | 100,000 | max |
| 2,4-Dimethylphenol | 13700 | nc |
| 4,6-Dinitro-o-cresol | 68.4 | nc |
| 2,4-Dinitrophenol | 1370 | nc |
| 2,4-Dinitrotoluene | 1370 | nc |
| Endrin | 205 | nc |
| Ethyl chloride | 154 | ca |
| Ethyl methacrylate | 52.7 | sat |
| Ethylbenzene | 128 | sat |
| Fluoranthene | 24,400 | nc |
| Fluorene | 26,500 | nc |
| Heptachlor | 4.26 | ca |
| Hexachlorobenzene | 12 | ca |
| Hexachloro-1,3-butadiene | 137 | nc |
| Hexachlorocyclopentadiene | 4100 | nc |
| Hexachloroethane | 684 | nc |
| HMX | 34,200 | nc |
| Indeno(1,2,3-c,d)pyrene | 23.4 | ca |
| Isobutanol | 22,600 | sat |
| Isophorone | 20,200 | ca |
| Methacrylonitrile | 22 | nc |
| Methyl isobutyl ketone | 7010 | sat |
| Methyl methacrylate | 2920 | sat |

**Table 1.1-3 (continued)**

| Chemical | Industrial Soil Screening Level[a] | End Point[b] |
|---|---|---|
| Methylene bromide | 785 | nc |
| Methylene chloride | 490 | ca |
| Naphthalene | 300 | nc |
| Nitrobenzene | 147 | nc |
| Nitroglycerin | 1370 | ca |
| N-Nitrosodimethylamine | 0.376 | ca |
| N-Nitrosodiphenylamine | 3910 | ca |
| m-Nitrotoluene | 569 | sat |
| o-Nitrotoluene | 32.3 | ca |
| p-Nitrotoluene | 437 | ca |
| Pentachlorophenol | 100 | ca |
| Phenanthrene | 20,500 | nc |
| Phenol | 100,000 | max |
| Aroclor-1016 | 41.3 | nc |
| Aroclor-1221 | 8.26 | ca |
| Aroclor-1232 | 8.26 | ca |
| Aroclor-1242 | 8.26 | ca |
| Aroclor-1248 | 8.26 | ca |
| Aroclor-1254 | 8.26 | ca |
| Aroclor-1260 | 8.26 | ca |
| n-Propylbenzene | 62.1 | sat |
| Pyrene | 30,900 | nc |
| RDX | 174 | ca |
| Styrene | 100 | sat |
| 1,1,1,2-Tetrachloroethane | 114 | ca |
| 1,1,2,2-Tetrachloroethane | 14.6 | ca |
| Tetrachloroethene | 31.6 | ca |
| Toluene | 252 | sat |
| Toxaphene | 17.4 | ca |
| Tribromomethane | 2460 | ca |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 3280 | sat |
| 1,2,4-Trichlorobenzene | 269 | nc |
| 1,1,1-Trichloroethane | 563 | sat |
| 1,1,2-Trichloroethane | 30.2 | ca |
| Trichloroethylene | 1.56 | ca |
| Trichlorofluoromethane | 983 | sat |
| 2,4,5-Trichlorophenol | 68,400 | nc |
| 2,4,6-Trichlorophenol | 68.4 | nc |
| 1,2,3-Trichloropropane | 0.209 | ca |

**Table 1.1-3 (continued)**

| Chemical | Industrial Soil Screening Level[a] | End Point[b] |
|---|---|---|
| 1,2,4-Trimethylbenzene | 213 | nc |
| 1,3,5-Trimethylbenzene | 69.2 | sat |
| 2,4,6-Trinitrotoluene | 342 | nc |
| Vinyl acetate | 3680 | sat |
| Vinyl chloride (adult) | 14 | ca |
| o-Xylene | 99.5 | sat |
| Xylenes | 82 | sat |
| **Radionuclides (pCi/g)p** | | |
| Americium-241 | 180 | — |
| Cesium-137 | 23 | — |
| Plutonium-238 | 240 | — |
| Plutonium-239 | 210 | — |
| Strontium-90 | 1900 | — |
| Tritium | 440,000 | — |
| Uranium-234 | 1500 | — |
| Uranium-235 | 87 | — |
| Uranium-238 | 430 | — |

[a] SSLs are from the "Technical Background Document for Development of Soil Screening Levels (NMED 2006, 092513).

[b] max = Maximum, sat = saturated, nc = noncarcinogen, c = carcinogen, IEBUK = denotes integrated exposure uptake biokinetic, en = essential nutrient.

[c] SSL exceeds 105 mg/kg.

[d] IEUBK denotes integrated exposure uptake biokinetic.

[e] SSL from 2006 Region 6 Risk-Based Human Health Screening Values (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm).

[f] — = SSL/SAL is not available.

[g] SSL from 2006 Region 9 Preliminary Remediation Goals (www.epa.gov/region09/waste/sfund/prg).

**Table 1.1-4**
**Standard Operating Procedures Used for Data Validation**

| Procedure Identifier | Title | Effective Date |
|---|---|---|
| SOP-15.01, Rev. 1 | Routine Validation of Volatile Organic Data | 4/20/2004 |
| SOP-15.02, Rev. 1 | Routine Validation of Semivolatile Organic Data | 4/10/2004 |
| SOP-15.03, Rev. 1 | Routine Validation of Organochlorine Pesticides and Polychlorinated Biphenyls Data | 4/20/2004 |
| SOP-15.04, Rev. 1 | Routine Validation of High Explosives Data | 4/20/2004 |
| SOP-15.05, Rev. 1, ICN 1 | Routine Validation of Inorganic Data | 4/30/2004 |
| SOP-15.06, R1, ICN1 | Routine Validation of Gamma Spectroscopy Data | 10/3/2005 |
| SOP-15.07, R1, ICN1 | Routine Validation of Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Data | 10/3/2005 |

**Table 2.1-1**
**K-Site Subaggregate: Samples Taken**

| SWMU/AOC | Sample ID | Location ID | Depth (ft) | Media Code | HEXP* | Metals | SVOC |
|---|---|---|---|---|---|---|---|
| 11-006(b) | RE16-98-2004 | 16-05904 | 0–0.5 | SED | 4958R | 4959R, 4957R | 4956R |
| 11-006(c) | RE16-98-2002 | 16-05902 | 0–0.5 | SED | 4958R | 4959R, 4957R | 4956R |
| 11-006(c) | RE16-98-2003 | 16-05903 | 0–0.5 | SED | 4958R | 4959R, 4957R | 4956R |
| 11-006(d) | RE16-98-2000 | 16-05900 | 0–0.5 | SED | 4958R | 4959R, 4957R | 4956R |
| 11-006(d) | RE16-98-2001 | 16-05901 | 0–0.5 | SED | 4958R | 4959R, 4957R | 4956R |

*Analytical data package request number.

**Table 2.1-2**
**K-Site Subaggregate: Historical Analytical Results of Inorganic Chemicals Greater Than BVs in Sediment: Decision-Level Data**

| SWMU/AOC | Location ID | Sample ID | Media | Depth (ft) | Antimony | Arsenic | Barium | Cadmium | Copper | Mercury | Selenium | Silver | Thallium | Uranium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sediment BV**[a] | | | | | 0.83 | 3.98 | 127 | 0.4 | 11.2 | 0.1 | 0.3 | 1 | 0.73 | 2.22 |
| 11-006(b) | 16-05904 | RE16-98-2004 | SED | 0–0.5 | 13 (UJ) | 4 | 130 | 0.63 (U) | —[b] | 0.13 (U) | 1.3 (U) | 2.5 (U) | 2.5 (U) | 2.84 |
| 11-006(c) | 16-05902 | RE16-98-2002 | SED | 0–0.5 | 11 (UJ) | — | 130 | 0.56 (U) | 83 | 0.11 (U) | 1.1 (U) | 2.2 (U) | 2.2 (U) | — |
| 11-006(c) | 16-05903 | RE16-98-2003 | SED | 0–0.5 | 11 (UJ) | — | — | 0.54 (U) | — | 0.11 (U) | 1.1 (U) | 2.2 (U) | 2.2 (U) | — |
| 11-006(d) | 16-05900 | RE16-98-2000 | SED | 0–0.5 | 12 (UJ) | — | — | 0.6 (U) | — | 0.12 (U) | 1.2 (U) | 2.4 (U) | 2.4 (U) | 2.79 (J-) |
| 11-006(d) | 16-05901 | RE16-98-2001 | SED | 0–0.5 | 13 (UJ) | — | — | 0.66 (U) | — | 0.13 (U) | 1.3 (U) | 2.6 (U) | 2.6 (U) | — |

[a] BVs are from LANL 1998, 059730.

[b] — = The analysis was not performed or the result was not above the BV.

**Table 2.1-3**
**K-Site Subaggregate: Historical Analytical Results of Organic Chemicals Detected in Sediment: Decision-Level Data**

| SWMU/AOC | Location ID | Sample ID | Media | Depth (ft) | HMX |
|---|---|---|---|---|---|
| 11-006(c) | 16-05902 | RE16-98-2002 | SED | 0–0.5 | 10 |
| 11-006(d) | 16-05900 | RE16-98-2000 | SED | 0–0.5 | 8.6 |
| 11-006(d) | 16-05901 | RE16-98-2001 | SED | 0–0.5 | 46 |

**Table 2.3-1**
**300s Line Subaggregate: Samples Taken**

| Consolidated Unit/SWMU/ AOC | Sample ID | Location ID | Depth (ft) | Media Code | CN | HEXP[a] | Metals | SVOC | VOC |
|---|---|---|---|---|---|---|---|---|---|
| 16-003(d)-99 | 0316-95-0092 | 16-01411 | 0–0.5 | FILL | 981 | 980 | 982, 981 | 980 | —[b] |
| 16-003(d)-99 | 0316-95-0093 | 16-01411 | 0.5–1 | ALLH | 981 | 980 | 982, 981 | 980 | 980 |
| 16-003(d)-99 | 0316-95-0094 | 16-01411 | 3.5–5 | QBT4 | 981 | 980 | 982, 981 | 980 | 980 |
| 16-003(d)-99 | 0316-95-0095 | 16-01434 | 0–0.5 | SED | 981 | 980 | 981 | 980 | — |
| 16-003(d)-99 | 0316-95-0096 | 16-01434 | 0.33–0.83 | SED | 981 | 980 | 981 | 980 | 980 |
| 16-003(d)-99 | 0316-95-0097 | 16-01434 | 2.5–3.5 | QBT4 | 981 | 980 | 981 | 980 | 980 |
| 16-003(d)-99 | 0316-95-0098 | 16-01653 | 0–0.5 | SED | 996 | 995 | 996 | 995 | — |
| 16-003(d)-99 | 0316-95-0099 | 16-01653 | 0.5–1.25 | ALLH | 996 | 995 | 996 | 995 | 995 |
| 16-003(d)-99 | 0316-95-0100 | 16-01653 | 4.5–5.5 | QBT4 | 996 | 995 | 996 | 995 | 995 |
| 16-003(d)-99 | 0316-95-0101 | 16-01435 | 0–0.5 | SED | 117 | 116 | 117 | 116 | — |
| 16-003(d)-99 | 0316-95-0102 | 16-01436 | 0–0.5 | SED | 117 | 116 | 117 | 116 | — |
| 16-003(d)-99 | 0316-95-0105 | 16-01439 | 0–0.5 | SED | 120 | 118 | 120 | 118 | — |
| 16-003(e) | 0316-95-0107 | 16-01443 | 3.5–5 | ALLH | 1193 | 1192 | 1193 | 1192 | 1192 |
| 16-003(e) | 0316-95-0109 | 16-01647 | 3–4.5 | ALLH | 1193 | 1192 | 1193 | 1192 | 1192 |
| 16-003(f) | 0316-95-0103 | 16-01437 | 0–0.5 | SED | 117 | 116 | 117 | 116 | — |
| 16-003(f) | 0316-95-0104 | 16-01438 | 0–0.5 | SED | 120 | 118 | 120 | 118 | — |
| 16-026(b) | 0316-95-0113 | 16-01654 | 0–0.5 | SED | 978 | 972 | 979, 978 | 972 | — |
| 16-026(b) | 0316-95-0114 | 16-01654 | 0.25–1 | QBT4 | 978 | 972 | 979, 978 | 972 | 972 |
| 16-026(b) | 0316-95-0115 | 16-01654 | 5–6 | QBT4 | 978 | 972 | 979, 978 | 972 | 972 |
| 16-026(b) | 0316-95-0116 | 16-01454 | 0–0.5 | SED | 131 | 130 | 132, 131 | 130 | — |
| 16-026(b) | 0316-95-0117 | 16-01455 | 0–0.5 | SED | 131 | 130 | 132, 131 | 130 | — |
| 16-026(b) | 0316-95-0118 | 16-01456 | 0–0.5 | SED | 310 | — | 311, 310 | 309 | — |
| 16-026(b)-99 | 0316-95-0119 | 16-01457 | 0–0.5 | SED | 131 | 130 | 132, 131 | 130 | — |
| 16-026(b)-99 | 0316-95-0120 | 16-01458 | 0–0.5 | SED | 131 | 130 | 132, 131 | 130 | — |
| 16-026(c) | 0316-95-0121 | 16-01459 | 0–0.5 | SED | 622 | 621 | 622 | 621 | — |
| 16-026(c) | 0316-95-0122 | 16-01459 | 1.75–2.25 | QBT4 | 622 | 621 | 622 | 621 | 621 |
| 16-026(c) | 0316-95-0123 | 16-01459 | 3.5–4.5 | QBT4 | 875 | 874 | 875 | 874 | 874 |
| 16-026(c) | 0316-95-0124 | 16-01655 | 0–0.5 | SED | 622 | 621 | 622 | 621 | — |
| 16-026(c) | 0316-95-0125 | 16-01655 | 1–1.5 | QBT4 | 622 | 621 | 622 | 621 | 621 |
| 16-026(c) | 0316-95-0126 | 16-01655 | 3.5–4.5 | QBT4 | 875 | 874 | 875 | 874 | 874 |
| 16-026(c) | 0316-95-0127 | 16-01460 | 0–0.5 | SED | 120 | 118 | 120 | 118 | — |
| 16-026(c) | 0316-95-0128 | 16-01461 | 0–0.5 | SED | 120 | 118 | 120 | 118 | — |
| 16-026(c) | 0316-95-0129 | 16-01462 | 0–0.5 | SED | 120 | 118 | 120 | 118 | — |
| 16-026(c) | 0316-95-0130 | 16-01463 | 0–0.5 | ALLH | 120 | 118 | 120 | 118 | — |
| 16-026(c) | 0316-95-0131 | 16-01464 | 0–0.5 | SED | 120 | 118 | 120 | 118 | — |
| 16-026(d) | 0316-95-0132 | 16-01465 | 0–0.5 | SED | 547 | 546 | 547 | 546 | — |

**Table 2.3-1 (continued)**

| Consolidated Unit/SWMU/ AOC | Sample ID | Location ID | Depth (ft) | Media Code | CN | HEXP[a] | Metals | SVOC | VOC |
|---|---|---|---|---|---|---|---|---|---|
| 16-026(d) | 0316-95-0133 | 16-01465 | 0.58–1 | QBT4 | 547 | 546 | 547 | 546 | 546 |
| 16-026(d) | 0316-95-0134 | 16-01465 | 3–5 | QBT4 | 547 | 546 | 547 | 546 | 546 |
| 16-026(d) | 0316-95-0135 | 16-01656 | 0–0.5 | SED | 547 | 546 | 547 | 546 | — |
| 16-026(d) | 0316-95-0136 | 16-01656 | 0.5–0.83 | QBT4 | 547 | 546 | 547 | 546 | 546 |
| 16-026(d) | 0316-95-0137 | 16-01656 | 5–6.5 | QBT4 | 547 | 546 | 547 | 546 | 546 |
| 16-026(d) | 0316-95-0138 | 16-01466 | 0–0.5 | SED | 122 | 121 | 122 | 121 | — |
| 16-026(d) | 0316-95-0139 | 16-01467 | 0–0.5 | SED | 122 | 121 | 122 | 121 | — |
| 16-026(d) | 0316-95-0140 | 16-01468 | 0–0.5 | SED | 122 | 121 | 122 | 121 | — |
| 16-026(d) | 0316-95-0141 | 16-01469 | 0–0.5 | SED | 122 | 121 | 122 | 121 | — |
| 16-026(d) | 0316-95-0142 | 16-01470 | 0–0.5 | SED | 122 | 121 | 122 | 121 | — |
| 16-026(e) | 0316-95-0143 | 16-01471 | 0–0.5 | SED | 526 | 525 | 526 | 525 | — |
| 16-026(e) | 0316-95-0144 | 16-01471 | 1.75–2.25 | QBT4 | 526 | 525 | 526 | 525 | 525 |
| 16-026(e) | 0316-95-0145 | 16-01471 | 5.5–7 | QBT4 | 526 | 525 | 526 | 525 | 525 |
| 16-026(e) | 0316-95-0146 | 16-01657 | 0–0.5 | SED | 526 | 525 | 526 | 525 | — |
| 16-026(e) | 0316-95-0147 | 16-01657 | 0.75–1.25 | QBT4 | 526 | 525 | 526 | 525 | 525 |
| 16-026(e) | 0316-95-0148 | 16-01657 | 7.5–9 | QBT4 | 526 | 525 | 526 | 525 | 525 |
| 16-026(e) | 0316-95-0149 | 16-01472 | 0–0.5 | SED | 122 | 121 | 122 | 121 | — |
| 16-026(e) | 0316-95-0150 | 16-01473 | 0–0.5 | SED | 122 | 121 | 122 | 121 | — |
| 16-026(e) | 0316-95-0151 | 16-01474 | 0–0.5 | SED | 122 | 121 | 122 | 121 | — |
| 16-026(e) | 0316-95-0152 | 16-01475 | 0–0.5 | SED | 122 | 121 | 122 | 121 | — |
| 16-026(e) | 0316-95-0153 | 16-01476 | 0–0.5 | SED | 122 | 121 | 122 | 121 | — |
| 16-026(e) | 0316-97-0606 | 16-01657 | 8–8.5 | QBT5 | — | — | 3676R | — | — |
| 16-026(e) | 0316-97-0614 | 16-01657 | 10.5–11.5 | QBT5 | — | — | 3724R | — | — |
| 16-029(a) | 0316-95-0110 | 16-01453 | 0–0.5 | SED | 978 | 972 | 979, 978 | 972 | — |
| 16-029(a) | 0316-95-0111 | 16-01453 | 0.33–1.33 | QBT4 | 978 | 972 | 979, 978 | 972 | 972 |
| 16-029(a) | 0316-95-0112 | 16-01453 | 3–4 | QBT4 | 978 | 972 | 979, 978 | 972 | 972 |

[a] Analytical data package request number.

[b] — = The analysis was not performed or the result was not above the BV.

**Table 2.3-2**
**300s Line Subaggregate: Historical Analytical Results of Inorganic Chemicals Greater Than BVs in Soil, Sediment, Tuff, and Fill: Decision-Level Data**

| Consolidated Unit/SWMU/AOC | Location ID | Sample ID | Media | Depth (ft) | Aluminum | Antimony | Arsenic | Barium | Cadmium | Calcium | Chromium | Cobalt | Copper | Cyanide (Total) | Iron | Lead | Magnesium | Manganese | Mercury | Nickel | Selenium | Silver | Uranium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Soil BV[a]** | | | | | **29200** | **0.83** | **8.17** | **295** | **0.4** | **6120** | **19.3** | **8.64** | **14.7** | **0.5** | **21500** | **22.3** | **4610** | **671** | **0.1** | **15.4** | **1.52** | **1** | **1.82** | **39.6** | **48.8** |
| **Sediment BV** | | | | | **15400** | **0.83** | **3.98** | **127** | **0.4** | **4420** | **10.5** | **4.73** | **11.2** | **0.82** | **13800** | **19.7** | **2370** | **543** | **0.1** | **9.38** | **0.3** | **1** | **2.22** | **19.7** | **60.2** |
| **QBT 2,3,4 BV** | | | | | **7340** | **0.5** | **2.79** | **46** | **1.63** | **2200** | **7.14** | **3.14** | **4.66** | **0.5** | **14500** | **11.2** | **1690** | **482** | **0.1** | **6.58** | **0.3** | **1** | **2.4** | **17** | **63.5** |
| **Fill BV** | | | | | **29200** | **0.83** | **8.17** | **295** | **0.4** | **6120** | **19.3** | **8.64** | **14.7** | **0.5** | **21500** | **22.3** | **4610** | **671** | **0.1** | **15.4** | **n/a** | **1** | **1.82** | **39.6** | **48.8** |
| 16-003(d)-99 | 16-01411 | 0316-95-0093 | ALLH | 0.5-1 | —[b] | 5.4 (U) | — | — | 0.54 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | 0.11 (U) | — | — | — | — | — | — |
| 16-003(d)-99 | 16-01411 | 0316-95-0092 | FILL | 0-0.5 | — | 5.3 (U) | — | — | 0.53 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | 0.23 (U) | — | — | — | — | — | — |
| 16-003(d)-99 | 16-01411 | 0316-95-0094 | QBT4 | 3.5-5 | — | 5.9 (U) | — | 90.4 | — | — | — | — | — | 1.2 (U) | — | — | — | — | — | — | — | — | — | — | 355 (J-) |
| 16-003(d)-99 | 16-01434 | 0316-95-0096 | SED | 0.33-0.83 | — | 7 (U) | 4.1 | 249 | 3.3 | — | 31.4 | — | 430 | 1.4 (U) | 18100 | 278 | — | — | 233 | 10.7 | 0.34 (UJ) | — | — | 26 | 516 (J-) |
| 16-003(d)-99 | 16-01434 | 0316-95-0095 | SED | 0-0.5 | — | 7.3 (U) | 5.6 | 247 | 2.4 | — | 42.8 | — | 408 | 1.5 (U) | 39500 | 203 | — | — | 5.7 | 14.3 | 0.37 (UJ) | 1.5 | — | 25 | 1050 (J-) |
| 16-003(d)-99 | 16-01434 | 0316-95-0097 | QBT4 | 2.5-3.5 | — | 5.4 (U) | — | — | — | — | 24.5 | — | 39.7 | 1.1 (U) | — | 29.4 | — | — | 4.1 | — | — | — | — | — | — |
| 16-003(d)-99 | 16-01435 | 0316-95-0101 | SED | 0-0.5 | — | 6.3 (U) | — | — | 0.63 (U) | 11900 | — | — | 24.3 | 1.3 (U) | — | 31.9 | — | — | 0.23 | — | 0.31 (U) | — | — | — | 145 |
| 16-003(d)-99 | 16-01436 | 0316-95-0102 | SED | 0-0.5 | — | 8.4 (U) | — | 241 | 0.84 (U) | — | 14.4 | — | 134 | 1.7 (U) | — | 78 | — | — | 2.4 | — | 0.43 (U) | 4.2 (U) | — | 23.3 | 127 |
| 16-003(d)-99 | 16-01439 | 0316-95-0105 | SED | 0-0.5 | — | 12.8 (U) | 9.6 | 1870 | 1.3 (U) | 5100 | 17.9 | — | 90.8 | 2.6 (U) | 16600 | 108 | — | — | 0.96 | — | 0.62 (U) | 1.3 (U) | — | 54.5 | 136 |
| 16-003(d)-99 | 16-01653 | 0316-95-0099 | ALLH | 0.5-1.25 | — | 6.3 (U) | — | 809 (J+) | 0.63 (U) | — | — | — | 38.2 | 1.31 (U) | — | 34.6 | — | — | 0.881 | — | — | — | — | — | 64.2 (J+) |
| 16-003(d)-99 | 16-01653 | 0316-95-0098 | SED | 0-0.5 | — | 7.03 (U) | — | — | 0.703 (U) | — | 10.9 | — | 132 | 1.46 (U) | — | 50 | — | — | 1.6 | — | 0.35 (U) | — | — | — | 241 (J+) |
| 16-003(d)-99 | 16-01653 | 0316-95-0100 | QBT4 | 4.5-5.5 | 9010 | 5.88 (U) | — | 151 (J+) | — | 2670 | 12.4 | 5.42 (J) | 11 | 1.2 (U) | — | 17.8 | 2070 | — | — | — | — | — | — | 20.6 | — |
| 16-003(e) | 16-01443 | 0316-95-0107 | ALLH | 3.5-5 | — | 5.6 (U) | — | — | 0.56 (U) | — | — | 16.2 | 196 | 1.2 (U) | — | — | — | — | — | 49.7 (J+) | — | — | — | — | 108 |
| 16-003(e) | 16-01647 | 0316-95-0109 | ALLH | 3-4.5 | — | 5.7 (U) | — | — | 0.57 (U) | — | — | — | — | 1.2 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-003(f) | 16-01437 | 0316-95-0103 | SED | 0-0.5 | — | 10.5 (U) | — | 608 | 1 (U) | — | 32.7 | — | 195 | 2.1 (U) | — | 249 | — | — | 5 | — | 0.98 (J) | — | — | 23.8 | 229 |
| 16-003(f) | 16-01438 | 0316-95-0104 | SED | 0-0.5 | — | 9.3 (U) | — | — | 0.93 (U) | — | 31 | — | 358 | 1.9 (U) | — | 105 | — | — | 2.2 | — | 0.46 (U) | — | — | 23.9 | 297 |
| 16-026(b) | 16-01454 | 0316-95-0116 | SED | 0-0.5 | — | 5.6 (U) | — | — | 0.56 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | 2.24 | — | — |
| 16-026(b) | 16-01455 | 0316-95-0117 | SED | 0-0.5 | — | 5.6 (U) | — | 139 | 0.56 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | 3.14 | — | — |
| 16-026(b) | 16-01456 | 0316-95-0118 | SED | 0-0.5 | — | 5.3 (U) | — | 1190 | 0.53 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | 3.86 | — | — |
| 16-026(b) | 16-01654 | 0316-95-0114 | QBT4 | 0.25-1 | — | 5.3 (U) | — | 568 (J+) | — | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(b) | 16-01654 | 0316-95-0113 | SED | 0-0.5 | — | 5.2 (U) | — | 455 (J+) | 0.52 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(b) | 16-01654 | 0316-95-0115 | QBT4 | 5-6 | — | 5.1 (U) | — | 319 (J+) | — | — | — | — | — | 1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(b)-99 | 16-01457 | 0316-95-0119 | SED | 0-0.5 | — | 5.6 (U) | — | 191 | 0.56 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(b)-99 | 16-01458 | 0316-95-0120 | SED | 0-0.5 | — | 5.4 (U) | — | — | 0.54 (U) | — | — | — | 17.4 | 1.1 (U) | — | — | — | — | — | — | — | — | 2.36 | — | 84 |
| 16-026(c) | 16-01459 | 0316-95-0121 | SED | 0-0.5 | — | 6.1 (U) | — | 254 | 0.61 (U) | — | — | 6.5 | 11.8 | 1.2 (U) | 19200 | 33.5 | — | — | — | 10.1 | — | — | — | — | 148 (J-) |
| 16-026(c) | 16-01459 | 0316-95-0122 | QBT4 | 1.75-2.25 | — | 5.8 (U) | — | 183 | — | — | — | — | 5.6 | 1.2 (U) | — | 15.2 | — | — | — | — | — | — | — | — | — |
| 16-026(c) | 16-01459 | 0316-95-0123 | QBT4 | 3.5-4.5 | — | 6 (U) | — | — | — | — | 22.7 | — | — | 1.2 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(c) | 16-01460 | 0316-95-0127 | SED | 0-0.5 | — | 5.6 (U) | — | 140 | 0.56 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(c) | 16-01461 | 0316-95-0128 | SED | 0-0.5 | — | 5.4 (U) | — | 243 | 0.54 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |

**Table 2.3-2 (continued)**

| Consolidated Unit/SWMU/AOC | Location ID | Sample ID | Media | Depth (ft) | Aluminum | Antimony | Arsenic | Barium | Cadmium | Calcium | Chromium | Cobalt | Copper | Cyanide (Total) | Iron | Lead | Magnesium | Manganese | Mercury | Nickel | Selenium | Silver | Uranium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-026(c) | 16-01462 | 0316-95-0129 | SED | 0-0.5 | — | 5.4 (U) | — | 633 | 0.54 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | 24.1 | 73.5 |
| 16-026(c) | 16-01463 | 0316-95-0130 | ALLH | 0-0.5 | — | 5.5 (U) | — | — | 0.55 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(c) | 16-01464 | 0316-95-0131 | SED | 0-0.5 | — | 5.8 (U) | — | 170 | 0.58 (U) | — | — | — | 42 | 1.2 (U) | — | — | — | — | — | — | — | — | — | — | 142 |
| 16-026(c) | 16-01655 | 0316-95-0124 | SED | 0-0.5 | — | 5.8 (U) | — | 156 | 0.58 (U) | — | — | — | — | 1.2 (U) | — | 47.6 | — | — | — | — | — | — | — | — | — |
| 16-026(c) | 16-01655 | 0316-95-0125 | QBT4 | 1-1.5 | — | 6.5 (U) | — | 245 | — | — | — | — | 7.3 | 1.3 (U) | — | 18.1 | — | — | — | — | 0.32 (UJ) | — | — | — | — |
| 16-026(c) | 16-01655 | 0316-95-0126 | QBT4 | 3.5-4.5 | — | 5.8 (U) | — | 128 | — | — | 15 | — | — | 1.2 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(d) | 16-01465 | 0316-95-0133 | QBT4 | 0.58-1 | — | 5.7 (U) | — | 263 (J-) | — | — | 17 | 4.1 (J) | 5.9 | 1.2 (U) | — | 60.5 | — | — | — | — | — | — | — | — | 132 |
| 16-026(d) | 16-01465 | 0316-95-0132 | SED | 0-0.5 | — | 5.5 (U) | — | 267 (J-) | 0.55 (U) | — | — | — | — | 1.1 (U) | — | 21.9 | — | — | — | — | — | — | — | — | 134 |
| 16-026(d) | 16-01465 | 0316-95-0134 | QBT4 | 3-5 | — | 5.5 (U) | — | 100 (J-) | — | — | 40.1 | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(d) | 16-01466 | 0316-95-0138 | SED | 0-0.5 | — | 5.4 (U) | — | 196 | 0.54 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | 80.3 |
| 16-026(d) | 16-01467 | 0316-95-0139 | SED | 0-0.5 | — | 5.1 (U) | — | 209 | 0.51 (U) | — | — | — | — | 1 (U) | — | — | — | — | — | — | — | — | — | 20.7 | — |
| 16-026(d) | 16-01468 | 0316-95-0140 | SED | 0-0.5 | — | 5.1 (U) | — | 155 | 0.51 (U) | — | — | — | — | 1 (U) | — | — | — | — | — | — | — | — | — | — | 68.3 |
| 16-026(d) | 16-01469 | 0316-95-0141 | SED | 0-0.5 | — | 5.4 (U) | — | 239 | 0.54 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(d) | 16-01470 | 0316-95-0142 | SED | 0-0.5 | — | 6 (U) | — | 186 | 0.6 (U) | — | — | — | — | 1.2 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(d) | 16-01656 | 0316-95-0136 | QBT4 | 0.5-0.83 | — | 5.4 (U) | — | 190 (J-) | — | — | — | — | 6.8 | 1.1 (U) | — | 79.8 | — | — | — | — | — | — | — | — | — |
| 16-026(d) | 16-01656 | 0316-95-0135 | SED | 0-0.5 | — | 5.2 (U) | — | 129 (J-) | 0.52 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(d) | 16-01656 | 0316-95-0137 | QBT4 | 5-6.5 | — | 5.3 (U) | — | 292 (J-) | — | — | 72.7 | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(e) | 16-01471 | 0316-95-0143 | SED | 0-0.5 | — | 5.8 (U) | — | 153 | 0.58 (U) | — | — | 5.5 (J) | — | 1.2 (U) | — | 20.4 | — | — | — | — | — | — | — | 20.8 | 103 (J+) |
| 16-026(e) | 16-01471 | 0316-95-0144 | QBT4 | 1.75-2.25 | — | 6.4 (U) | — | 1420 | — | 9550 | — | 6.5 | 7.8 | 1.3 (U) | — | — | — | — | — | — | — | — | — | 17.9 | 474 (J+) |
| 16-026(e) | 16-01471 | 0316-95-0145 | QBT4 | 5.5-7 | — | 5.6 (U) | — | 270 | — | — | 11.2 | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(e) | 16-01472 | 0316-95-0149 | SED | 0-0.5 | — | 6 (U) | — | 146 | 0.6 (U) | — | — | 8.2 | — | 1.2 (U) | — | — | — | — | — | — | — | — | — | — | 72.4 |
| 16-026(e) | 16-01473 | 0316-95-0150 | SED | 0-0.5 | — | 6.3 (U) | — | 766 | 0.63 (U) | — | — | — | — | 1.3 (U) | — | 51.7 | — | — | — | — | 0.32 (U) | — | — | 20.1 | 95.4 |
| 16-026(e) | 16-01474 | 0316-95-0151 | SED | 0-0.5 | — | 5.5 (U) | — | 1100 | 0.55 (U) | — | — | — | — | 1.1 (U) | — | 24.7 | — | — | — | — | — | — | — | — | — |
| 16-026(e) | 16-01475 | 0316-95-0152 | SED | 0-0.5 | — | 5.5 (U) | — | 224 | 0.55 (U) | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(e) | 16-01476 | 0316-95-0153 | SED | 0-0.5 | — | 5.1 (U) | — | 200 | 0.51 (U) | — | — | — | — | 1 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(e) | 16-01657 | 0316-95-0147 | QBT4 | 0.75-1.25 | — | 6.5 (U) | — | 604 | — | — | — | 3.2 (J) | 5.4 | 1.3 (U) | — | 16.9 | — | — | — | — | — | — | — | — | — |
| 16-026(e) | 16-01657 | 0316-95-0146 | SED | 0-0.5 | — | 6.2 (U) | — | 183 | 0.62 (U) | — | — | 7.1 | — | 1.3 (U) | — | 26.3 | — | 554 | — | — | — | — | — | — | 77.7 (J+) |
| 16-026(e) | 16-01657 | 0316-95-0148 | QBT4 | 7.5-9 | — | 5.7 (U) | 2.8 | 239 | — | — | 439 | — | — | 1.1 (U) | — | — | — | — | — | 9.6 | — | — | — | — | — |
| 16-029(a) | 16-01453 | 0316-95-0111 | QBT4 | 0.33-1.33 | — | 5.9 (U) | — | 852 (J+) | — | — | — | — | 8 | 1.2 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(a) | 16-01453 | 0316-95-0110 | SED | 0-0.5 | — | 5.9 (U) | — | 151 (J+) | 0.59 (U) | — | — | — | — | 1.2 (U) | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(a) | 16-01453 | 0316-95-0112 | QBT4 | 3-4 | — | 5.3 (U) | — | 233 (J+) | — | — | 30.7 | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — |

[a] BVs are from LANL 1998, 059730.

[b] — = The analysis was not performed or the result was not above the BV.

**Table 2.3-3**
**300s Line Subaggregate: Historical Analytical Results of Organic Chemicals Detected in Soil, Sediment, Tuff, and Fill: Decision-Level Data**

| Consolidated Unit/ SWMU/AOC | Location ID | Sample ID | Media | Depth (ft) | Acenaphthene | Acenaphthylene | Acetone | Amino-2,6-dinitrotoluene4- | Amino-4,6-dinitrotoluene2- | Anthracene | Benzo(a)anthracene | Benzo(a)pyrene | Benzo(b)fluoranthene | Benzo(g,h,i)perylene | Benzo(k)fluoranthene | Benzoic Acid | Bis(2-ethylhexyl)phthalate | Butanone2- | Chrysene | Dibenz(a,h)anthracene | Dibenzofuran | Diethylphthalate | Dimethylphenol2,4- | Di-n-butylphthalate | Dinitrotoluene2,4- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-003(d)-99 | 16-01411 | 0316-95-0093 | ALLH | 0.5–1 | —* | — | 0.008 (J) | — | — | 0.17 (J) | 0.24 (J) | — | — | — | — | — | 4.2 | — | 0.32 (J) | — | — | — | — | — | — |
| 16-003(d)-99 | 16-01411 | 0316-95-0092 | FILL | 0–0.5 | — | — | — | — | — | — | — | — | — | — | — | — | 0.058 (J) | — | — | — | — | — | — | — | — |
| 16-003(d)-99 | 16-01411 | 0316-95-0094 | QBT4 | 3.5–5 | — | — | — | — | — | — | — | — | — | — | — | — | 0.11 (J) | — | — | — | — | — | — | — | — |
| 16-003(d)-99 | 16-01434 | 0316-95-0096 | SED | 0.33–0.83 | 7.2 | 0.091 (J) | — | — | 1.53 | 27 | 31 | 31 | 22 | 23 | 29 | — | 7.5 | 0.01 (J) | 43 | — | 4.7 | — | 0.29 (J) | 0.24 (J) | 0.417 |
| 16-003(d)-99 | 16-01434 | 0316-95-0095 | SED | 0–0.5 | 2.4 (J) | — | — | — | 0.877 | 3.9 (J) | 7 (J) | 7.9 (J) | 5.8 (J) | 5.4 (J) | — | — | 2.6 (J) | — | 10 | — | 1.6 (J) | — | — | — | 0.406 |
| 16-003(d)-99 | 16-01434 | 0316-95-0097 | QBT4 | 2.5–3.5 | 0.17 (J) | — | — | — | — | — | 0.63 | 0.59 | 0.52 | 0.42 | — | — | 0.12 (J) | 0.006 (J) | 0.93 | — | 0.11 (J) | — | — | — | — |
| 16-003(d)-99 | 16-01435 | 0316-95-0101 | SED | 0–0.5 | 0.045 (J) | — | — | — | — | 0.066 (J) | 0.14 (J) | 0.16 (J) | 0.19 (J) | 0.09 (J) | 0.077 (J) | — | — | — | 0.18 (J) | 0.074 (J) | — | — | — | — | — |
| 16-003(d)-99 | 16-01436 | 0316-95-0102 | SED | 0–0.5 | 0.31 (J) | — | — | 0.092 | 0.093 | 1 | 1.5 | 1.7 | 2.3 | 0.62 | 0.91 | 0.18 (J) | — | — | 1.6 | 0.17 (J) | 0.14 (J) | — | — | — | — |
| 16-003(d)-99 | 16-01439 | 0316-95-0105 | SED | 0–0.5 | 0.3 (J) | — | — | — | 0.098 | 0.6 (J) | 1.1 (J) | 1.2 (J) | 2.2 | 0.64 (J) | — | — | — | — | 1.2 (J) | — | — | — | — | — | — |
| 16-003(d)-99 | 16-01653 | 0316-95-0099 | ALLH | 0.5–1.25 | 0.61 | — | 0.031 | — | — | 1.2 | 2.6 | 2.3 | 2.1 | 2 | 1.7 | — | 0.39 (J) | — | 3.5 | — | 0.36 (J) | — | — | — | — |
| 16-003(d)-99 | 16-01653 | 0316-95-0098 | SED | 0–0.5 | 0.1 (J) | — | — | — | — | 0.2 (J) | 0.51 | 0.49 | 0.57 | 0.42 (J) | 0.48 (J) | — | 0.37 (J) | — | 0.66 | — | 0.057 (J) | — | — | — | 0.48 (J) |
| 16-003(d)-99 | 16-01653 | 0316-95-0100 | QBT4 | 4.5–5.5 | — | — | 0.009 (J) | — | 0.126 | — | — | — | — | — | — | — | 0.21 (J) | — | 0.045 (J) | — | — | — | — | — | — |
| 16-003(e) | 16-01443 | 0316-95-0107 | ALLH | 3.5–5 | — | — | — | — | — | — | — | — | — | — | — | — | 0.16 (J) | — | 0.072 (J) | — | — | — | — | — | — |
| 16-003(e) | 16-01647 | 0316-95-0109 | ALLH | 3–4.5 | 0.043 (J) | — | — | — | — | 0.076 (J) | 0.16 (J) | 0.14 (J) | 0.14 (J) | 0.089 (J) | 0.071 (J) | — | 0.81 | — | 0.21 (J) | — | — | — | — | — | — |
| 16-003(f) | 16-01437 | 0316-95-0103 | SED | 0–0.5 | — | — | — | 0.094 | — | 0.13 (J) | 0.47 (J) | 0.58 (J) | 0.89 | 0.24 (J) | 0.31 (J) | 0.51 (J) | — | — | 0.61 (J) | — | — | — | — | — | — |
| 16-003(f) | 16-01438 | 0316-95-0104 | SED | 0–0.5 | — | — | — | — | — | — | — | 0.067 (J) | 0.085 (J) | — | — | — | — | — | 0.076 (J) | — | — | — | — | — | — |
| 16-026(b) | 16-01454 | 0316-95-0116 | SED | 0–0.5 | — | — | — | 0.237 | 0.286 | 0.041 (J) | — | — | 0.059 (J) | — | — | — | 0.28 (J) | — | — | — | — | — | — | — | — |
| 16-026(b) | 16-01455 | 0316-95-0117 | SED | 0–0.5 | — | — | — | — | 0.174 | 0.054 (J) | 0.26 (J) | 0.31 (J) | 0.48 | 0.16 (J) | — | — | 0.072 (J) | — | 0.36 (J) | — | — | — | — | 0.08 (J) | — |
| 16-026(b) | 16-01456 | 0316-95-0118 | SED | 0–0.5 | — | — | — | — | — | — | 0.13 (J) | 0.16 (J) | 0.33 (J) | 0.082 (J) | 0.12 (J) | 0.14 (J) | — | — | 0.21 (J) | — | — | — | — | — | 0.12 (J) |
| 16-026(b) | 16-01654 | 0316-95-0114 | QBT4 | 0.25–1 | — | — | 0.011 (J) | 0.219 | 0.192 | — | — | 0.064 (J) | 0.18 (J) | 0.06 (J) | 0.066 (J) | — | — | — | 0.12 (J) | — | — | — | — | — | — |
| 16-026(b) | 16-01654 | 0316-95-0113 | SED | 0–0.5 | 0.17 (J) | — | — | 0.151 | 0.102 | 0.36 | 1.4 | 1.3 | 2.3 | 0.71 | 0.86 | — | — | — | 2.2 | 0.19 (J) | 0.078 (J) | — | — | — | — |
| 16-026(b) | 16-01654 | 0316-95-0115 | QBT4 | 5–6 | 0.035 (J) | — | — | 0.219 | 0.241 | 0.1 (J) | 0.42 | 0.42 | 0.62 | 0.22 (J) | 0.24 (J) | — | — | — | 0.64 | 0.064 (J) | — | — | — | — | — |
| 16-026(b)-99 | 16-01457 | 0316-95-0119 | SED | 0–0.5 | — | — | — | 0.354 | 0.362 | — | 0.094 (J) | 0.11 (J) | 0.17 (J) | — | — | — | 0.045 (J) | — | 0.12 (J) | — | — | — | — | — | — |
| 16-026(b)-99 | 16-01458 | 0316-95-0120 | SED | 0–0.5 | 0.045 (J) | — | — | — | — | 0.076 (J) | 0.1 (J) | 0.13 (J) | 0.17 (J) | — | — | — | 0.042 (J) | — | 0.15 (J) | — | — | — | — | — | — |
| 16-026(c) | 16-01459 | 0316-95-0121 | SED | 0–0.5 | 0.12 (J) | — | — | — | — | 0.19 (J) | 0.57 | 0.62 | 0.89 | 0.28 (J) | 0.38 (J) | — | — | — | 0.75 | 0.079 (J) | 0.043 (J) | — | — | — | — |
| 16-026(c) | 16-01459 | 0316-95-0122 | QBT4 | 1.75–2.25 | 0.17 (J) | — | — | — | — | 0.48 (J) | 0.74 (J) | 0.73 | 1 | 0.31 (J) | 0.4 | — | — | — | 0.8 (J) | 0.092 (J) | 0.097 (J) | — | — | — | — |
| 16-026(c) | 16-01460 | 0316-95-0127 | SED | 0–0.5 | — | — | — | — | — | — | 0.068 (J) | 0.084 (J) | 0.12 (J) | — | — | — | — | — | 0.099 (J) | — | — | — | — | — | — |
| 16-026(c) | 16-01461 | 0316-95-0128 | SED | 0–0.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(c) | 16-01462 | 0316-95-0129 | SED | 0–0.5 | — | — | — | — | — | — | — | 0.059 (J) | 0.083 (J) | — | — | — | — | — | 0.06 (J) | — | — | — | — | — | — |
| 16-026(c) | 16-01463 | 0316-95-0130 | ALLH | 0–0.5 | — | — | — | — | — | — | 0.087 (J) | 0.1 (J) | 0.16 (J) | 0.06 (J) | — | — | — | — | 0.12 (J) | — | — | — | — | — | — |
| 16-026(c) | 16-01464 | 0316-95-0131 | SED | 0–0.5 | — | — | — | — | — | — | — | — | 0.087 (J) | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(c) | 16-01655 | 0316-95-0124 | SED | 0–0.5 | 0.061 (J) | — | — | — | — | 0.1 (J) | 0.32 (J) | 0.29 (J) | 0.88 (J) | — | 0.28 (J) | 0.079 (J) | — | — | 0.47 | — | — | — | — | — | — |

**Table 2.3-3 (continued)**

| Consolidated Unit/ SWMU/AOC | Location ID | Sample ID | Media | Depth (ft) | Acenaphthene | Acenaphthylene | Acetone | Amino-2,6-dinitrotoluene4- | Amino-4,6-dinitrotoluene2- | Anthracene | Benzo(a)anthracene | Benzo(a)pyrene | Benzo(b)fluoranthene | Benzo(g,h,i)perylene | Benzo(k)fluoranthene | Benzoic Acid | Bis(2-ethylhexyl)phthalate | Butanone2- | Chrysene | Dibenz(a,h)anthracene | Dibenzofuran | Diethylphthalate | Dimethylphenol2,4- | Di-n-butylphthalate | Dinitrotoluene2,4- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-026(c) | 16-01655 | 0316-95-0125 | QBT4 | 1–1.5 | — | — | 0.008 (J) | — | — | 0.07 (J) | 0.14 (J) | 0.12 (J) | 0.19 (J) | 0.089 (J) | — | — | — | — | 0.17 (J) | — | — | — | — | — | — |
| 16-026(d) | 16-01465 | 0316-95-0133 | QBT4 | 0.58–1 | 0.095 (J) | — | — | — | — | 0.14 (J) | 0.31 (J) | 0.16 (J) | 0.55 | — | — | — | — | — | 0.41 | — | — | — | — | — | — |
| 16-026(d) | 16-01465 | 0316-95-0132 | SED | 0–0.5 | 0.063 (J) | — | — | — | — | 0.1 (J) | 0.26 (J) | — | — | — | 0.52 | — | — | — | 0.33 (J) | — | — | — | — | — | — |
| 16-026(d) | 16-01465 | 0316-95-0134 | QBT4 | 3–5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.039 (J) | — | 0.16 (J) | — |
| 16-026(d) | 16-01466 | 0316-95-0138 | SED | 0–0.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(d) | 16-01467 | 0316-95-0139 | SED | 0–0.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(d) | 16-01468 | 0316-95-0140 | SED | 0–0.5 | — | — | — | — | — | — | 0.057 (J) | 0.082 (J) | 0.12 (J) | — | — | — | — | — | 0.075 (J) | — | — | — | — | — | — |
| 16-026(d) | 16-01469 | 0316-95-0141 | SED | 0–0.5 | — | — | — | — | — | — | 0.064 (J) | 0.081 (J) | 0.15 (J) | — | — | — | — | — | 0.092 (J) | — | — | — | — | — | — |
| 16-026(d) | 16-01470 | 0316-95-0142 | SED | 0–0.5 | — | — | — | — | — | 0.071 (J) | 0.23 (J) | 0.28 (J) | 0.51 | 0.13 (J) | — | — | — | — | 0.3 (J) | — | — | — | — | — | — |
| 16-026(d) | 16-01656 | 0316-95-0136 | QBT4 | 0.5–0.83 | — | — | — | 0.168 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(d) | 16-01656 | 0316-95-0137 | QBT4 | 5–6.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.8 | — | — | — |
| 16-026(e) | 16-01471 | 0316-95-0143 | SED | 0–0.5 | 0.057 (J) | — | — | — | — | 0.19 (J) | 0.48 | 0.47 | 0.59 | 0.24 (J) | 0.25 (J) | — | — | — | 0.56 | 0.066 (J) | — | — | — | — | — |
| 16-026(e) | 16-01471 | 0316-95-0144 | QBT4 | 1.75–2.25 | — | — | — | 0.305 | 0.199 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(e) | 16-01471 | 0316-95-0145 | QBT4 | 5.5–7 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.12 (J) | — | — | — |
| 16-026(e) | 16-01472 | 0316-95-0149 | SED | 0–0.5 | 0.059 (J) | — | — | — | — | 0.082 (J) | 0.19 (J) | 0.23 (J) | 0.38 (J) | 0.11 (J) | — | — | — | — | 0.21 (J) | 0.11 (J) | — | — | — | — | — |
| 16-026(e) | 16-01473 | 0316-95-0150 | SED | 0–0.5 | — | — | — | 0.236 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(e) | 16-01474 | 0316-95-0151 | SED | 0–0.5 | — | — | — | 0.167 | — | — | — | — | 0.098 (J) | — | — | — | — | — | 0.059 (J) | — | — | — | — | — | — |
| 16-026(e) | 16-01475 | 0316-95-0152 | SED | 0–0.5 | — | — | — | — | 0.172 | — | — | 0.057 (J) | 0.085 (J) | — | — | — | — | — | 0.061 (J) | — | — | — | — | — | — |
| 16-026(e) | 16-01657 | 0316-95-0147 | QBT4 | 0.75–1.25 | — | — | — | 0.202 | 0.102 | — | 0.096 (J) | 0.12 (J) | 0.18 (J) | — | — | — | — | — | 0.12 (J) | — | — | — | — | — | — |
| 16-029(a) | 16-01453 | 0316-95-0111 | QBT4 | 0.33–1.33 | — | — | 0.012 (J) | — | 16.5 | 0.76 (J) | — | 19 | 28 | 11 | 11 | — | — | — | — | 3.5 (J) | — | — | — | — | 0.381 |
| 16-029(a) | 16-01453 | 0316-95-0110 | SED | 0–0.5 | 0.058 (J) | — | — | 0.914 | 0.785 | 0.2 (J) | 1.3 | 1.5 | 3 | 0.94 | 1 | — | — | — | 2.2 | 0.28 (J) | — | — | — | — | — |
| 16-029(a) | 16-01453 | 0316-95-0112 | QBT4 | 3–4 | 0.042 (J) | — | 0.013 (J) | 1.68 | 1.07 | 0.17 (J) | 1.3 | 2 | 3.1 | 1.2 | 1.4 | — | — | — | 2 | 0.39 | — | 0.058 (J) | — | — | — |

**Table 2.3-3 (continued)**

| Consolidated Unit/ SWMU/AOC | Location ID | Sample ID | Media | Depth (ft) | Fluoranthene | Fluorene | HMX | Indeno(1,2,3-cd)pyrene | Methylene Chloride | Methylnaphthalene2- | Methylphenol2- | Methylphenol4- | Naphthalene | Nitroaniline4- | Nitrobenzene | Nitrotoluene3- | Phenanthrene | Pyrene | RDX | Tetryl | Trichloro-1,2,2-trifluoroethane_1,1,2-_ | Trichloroethane1,1,1- | Trichlorofluoromethane | Trinitrobenzene1,3,5- | Trinitrotoluene2,4,6- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-003(d)-99 | 16-01411 | 0316-95-0093 | ALLH | 0.5–1 | 0.27 (J) | — | — | — | 0.004 (J) | — | — | — | — | — | — | — | 0.34 (J) | 0.81 | — | — | — | — | — | — | — |
| 16-003(d)-99 | 16-01411 | 0316-95-0092 | FILL | 0–0.5 | — | — | — | — | — | — | — | — | — | — | — | — | 0.098 (J) | 0.059 (J) | — | — | — | — | — | — | 0.132 |
| 16-003(d)-99 | 16-01411 | 0316-95-0094 | QBT4 | 3.5–5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.139 |
| 16-003(d)-99 | 16-01434 | 0316-95-0096 | SED | 0.33–0.83 | 57 | 7 | 20.7 | 19 | — | 3.3 | 0.12 (J) | 0.38 (J) | 12 | — | — | — | 69 | 110 | 24.5 | 0.514 | — | 0.043 | — | 0.097 | 50.9 |
| 16-003(d)-99 | 16-01434 | 0316-95-0095 | SED | 0–0.5 | 10 | 2.7 (J) | 0.818 | 4.7 (J) | — | 1.2 (J) | — | — | 3.8 (J) | — | — | — | 15 | 25 | 1.1 | 1.13 | — | — | — | 0.262 | 90.1 |
| 16-003(d)-99 | 16-01434 | 0316-95-0097 | QBT4 | 2.5–3.5 | 1.6 | 0.21 (J) | — | 0.37 (J) | — | 0.062 (J) | — | — | 0.14 (J) | — | — | — | 1.4 | 1.6 | — | — | — | — | — | — | 1.71 |
| 16-003(d)-99 | 16-01435 | 0316-95-0101 | SED | 0–0.5 | 0.38 (J) | 0.043 (J) | — | — | — | — | — | — | 0.06 (J) | — | — | — | 0.34 (J) | 0.34 (J) | — | — | — | — | — | — | — |
| 16-003(d)-99 | 16-01436 | 0316-95-0102 | SED | 0–0.5 | 3 | 0.31 (J) | 1.14 | 0.79 | — | 0.086 (J) | — | 0.16 (J) | 0.26 (J) | — | — | — | 2.2 | 2.9 | — | 0.094 | — | — | — | — | 4.49 |
| 16-003(d)-99 | 16-01439 | 0316-95-0105 | SED | 0–0.5 | 2.2 | 0.29 (J) | 1.06 | 0.72 (J) | — | — | 1.7 | — | — | — | — | — | 2 | 4.5 | — | — | — | — | — | — | 2.89 |
| 16-003(d)-99 | 16-01653 | 0316-95-0099 | ALLH | 0.5–1.25 | 4.6 | 0.7 | 0.18 | 1.8 | 0.007 | 0.24 (J) | — | — | 0.74 | — | — | — | 4.7 | 8.5 | — | — | 0.003 (J) | — | 0.014 | — | 1.85 |
| 16-003(d)-99 | 16-01653 | 0316-95-0098 | SED | 0–0.5 | 0.83 | 0.11 (J) | — | 0.36 (J) | — | — | — | — | — | — | — | — | 0.83 | 2 | — | — | — | — | — | — | 1.1 |
| 16-003(d)-99 | 16-01653 | 0316-95-0100 | QBT4 | 4.5–5.5 | 0.066 (J) | — | — | — | 0.005 (J) | — | — | — | — | — | — | — | 0.058 (J) | 0.062 (J) | — | — | — | — | 0.008 | — | 2.04 |
| 16-003(e) | 16-01443 | 0316-95-0107 | ALLH | 3.5–5 | 0.11 (J) | — | 0.341 | — | 0.003 (J) | — | — | — | — | — | — | — | 0.084 (J) | 0.098 (J) | 0.271 | — | — | — | — | — | — |
| 16-003(e) | 16-01647 | 0316-95-0109 | ALLH | 3–4.5 | 0.35 (J) | 0.039 (J) | — | 0.096 (J) | 0.004 (J) | — | — | — | — | — | — | — | 0.29 (J) | 0.29 (J) | — | — | — | — | — | — | — |
| 16-003(f) | 16-01437 | 0316-95-0103 | SED | 0–0.5 | 1.1 | — | — | 0.29 (J) | — | — | — | 0.089 (J) | — | — | — | — | 0.54 (J) | 0.98 | — | — | — | — | — | — | 0.533 |
| 16-003(f) | 16-01438 | 0316-95-0104 | SED | 0–0.5 | 0.13 (J) | — | — | — | — | — | — | — | — | — | — | — | 0.082 (J) | 0.12 (J) | — | — | — | — | — | — | 0.488 |
| 16-026(b) | 16-01454 | 0316-95-0116 | SED | 0–0.5 | 0.086 (J) | — | 0.652 | — | — | — | — | — | — | — | — | — | — | 0.071 (J) | — | — | — | — | — | — | — |
| 16-026(b) | 16-01455 | 0316-95-0117 | SED | 0–0.5 | 0.76 | — | 2.5 | 0.15 (J) | — | — | — | — | — | 0.68 | — | — | 0.34 (J) | 0.68 | — | — | — | — | — | — | — |
| 16-026(b) | 16-01456 | 0316-95-0118 | SED | 0–0.5 | 0.41 | — | — | 0.1 (J) | — | — | — | — | — | — | — | — | 0.15 (J) | 0.38 | — | — | — | — | — | — | — |
| 16-026(b) | 16-01654 | 0316-95-0114 | QBT4 | 0.25–1 | 0.16 (J) | — | 159 | 0.083 (J) | — | — | — | — | — | — | — | — | 0.064 (J) | 0.096 (J) | — | — | — | — | — | — | — |
| 16-026(b) | 16-01654 | 0316-95-0113 | SED | 0–0.5 | 3.5 | 0.18 (J) | 320 | 0.84 | — | — | — | — | — | — | — | — | 1.9 | 2.4 | 0.512 | — | — | — | — | — | 0.312 |
| 16-026(b) | 16-01654 | 0316-95-0115 | QBT4 | 5–6 | 1.1 | — | 66.5 | 0.24 (J) | — | — | — | — | — | — | — | — | 0.55 | 0.63 | — | — | — | — | — | — | — |
| 16-026(b)-99 | 16-01457 | 0316-95-0119 | SED | 0–0.5 | 0.26 (J) | — | 143 | — | — | — | — | — | — | — | — | — | 0.12 (J) | 0.23 (J) | 0.649 | — | — | — | — | — | — |
| 16-026(b)-99 | 16-01458 | 0316-95-0120 | SED | 0–0.5 | 0.25 (J) | 0.04 (J) | — | — | — | — | — | — | — | — | — | — | 0.24 (J) | 0.4 | — | — | — | — | — | — | — |
| 16-026(c) | 16-01459 | 0316-95-0121 | SED | 0–0.5 | 1.6 | 0.11 (J) | — | 0.31 (J) | — | — | — | — | 0.05 (J) | — | — | — | 1.1 | 1.5 | — | — | — | — | — | — | — |
| 16-026(c) | 16-01459 | 0316-95-0122 | QBT4 | 1.75–2.25 | 1.5 (J) | 0.19 (J) | — | 0.36 (J) | — | 0.049 (J) | — | — | 0.067 (J) | — | — | — | 1.2 (J) | 2.2 (J) | — | — | — | — | — | — | — |
| 16-026(c) | 16-01460 | 0316-95-0127 | SED | 0–0.5 | 0.2 (J) | — | — | — | — | — | — | — | — | — | — | — | 0.11 (J) | 0.16 (J) | — | — | — | — | — | — | — |
| 16-026(c) | 16-01461 | 0316-95-0128 | SED | 0–0.5 | 0.051 (J) | — | — | — | — | — | — | — | — | — | — | — | — | 0.048 (J) | — | — | — | — | — | — | — |
| 16-026(c) | 16-01462 | 0316-95-0129 | SED | 0–0.5 | 0.11 (J) | — | — | — | — | — | — | — | — | — | — | — | 0.074 (J) | 0.17 (J) | — | — | — | — | — | — | — |
| 16-026(c) | 16-01463 | 0316-95-0130 | ALLH | 0–0.5 | 0.21 (J) | — | — | 0.068 (J) | — | — | — | — | — | — | — | — | 0.15 (J) | 0.36 (J) | — | — | — | — | — | — | — |
| 16-026(c) | 16-01464 | 0316-95-0131 | SED | 0–0.5 | 0.11 (J) | — | — | — | — | — | — | — | — | — | — | — | 0.071 (J) | 0.19 (J) | — | — | — | — | — | — | — |
| 16-026(c) | 16-01655 | 0316-95-0124 | SED | 0–0.5 | 1 (J) | 0.058 (J) | — | — | — | — | — | — | — | — | — | — | 0.64 (J) | 1.4 | — | — | — | — | — | — | — |
| 16-026(c) | 16-01655 | 0316-95-0125 | QBT4 | 1–1.5 | 0.35 (J) | — | — | 0.078 (J) | — | — | — | — | — | — | — | — | 0.28 (J) | 0.39 (J) | — | — | — | — | — | — | 0.133 |
| 16-026(d) | 16-01465 | 0316-95-0133 | QBT4 | 0.58–1 | 0.82 | 0.079 (J) | — | — | — | — | — | — | 0.058 (J) | — | — | — | 0.65 | 0.97 | — | — | — | — | — | — | 0.24 |

**Table 2.3-3 (continued)**

| Consolidated Unit/ SWMU/AOC | Location ID | Sample ID | Media | Depth (ft) | Fluoranthene | Fluorene | HMX | Indeno(1,2,3-cd)pyrene | Methylene Chloride | Methylnaphthalene2- | Methylphenol2- | Methylphenol4- | Naphthalene | Nitroaniline4- | Nitrobenzene | Nitrotoluene3- | Phenanthrene | Pyrene | RDX | Tetryl | Trichloro-1,2,2-trifluoroethane_1,1,2-_ | Trichloroethane1,1,1- | Trichlorofluoromethane | Trinitrobenzene1,3,5- | Trinitrotoluene2,4,6- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-026(d) | 16-01465 | 0316-95-0132 | SED | 0–0.5 | 0.56 | 0.054 (J) | — | — | — | — | — | — | — | — | — | — | 0.43 | 0.89 | — | — | — | — | — | — | — |
| 16-026(d) | 16-01465 | 0316-95-0134 | QBT4 | 3–5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(d) | 16-01466 | 0316-95-0138 | SED | 0–0.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.037 (J) | — | — | — | — | — | — | — |
| 16-026(d) | 16-01467 | 0316-95-0139 | SED | 0–0.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2.42 | — | — | — | — | — | — |
| 16-026(d) | 16-01468 | 0316-95-0140 | SED | 0–0.5 | 0.1 (J) | — | — | — | — | — | — | — | — | — | — | — | 0.12 (J) | 0.29 (J) | — | — | — | — | — | — | — |
| 16-026(d) | 16-01469 | 0316-95-0141 | SED | 0–0.5 | 0.17 (J) | — | — | — | — | — | — | — | — | — | — | — | 0.11 (J) | 0.23 (J) | — | — | — | — | — | — | — |
| 16-026(d) | 16-01470 | 0316-95-0142 | SED | 0–0.5 | 0.63 | 0.04 (J) | — | 0.12 (J) | — | — | — | — | — | — | — | — | 0.47 | 0.81 | — | — | — | — | — | — | — |
| 16-026(d) | 16-01656 | 0316-95-0136 | QBT4 | 0.5–0.83 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.196 |
| 16-026(d) | 16-01656 | 0316-95-0137 | QBT4 | 5–6.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-026(e) | 16-01471 | 0316-95-0143 | SED | 0–0.5 | 1.1 | 0.059 (J) | — | 0.26 (J) | — | — | — | — | — | — | — | — | 0.72 | 0.89 | — | — | — | — | — | — | — |
| 16-026(e) | 16-01471 | 0316-95-0144 | QBT4 | 1.75–2.25 | — | — | 0.26 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.321 |
| 16-026(e) | 16-01471 | 0316-95-0145 | QBT4 | 5.5–7 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.141 |
| 16-026(e) | 16-01472 | 0316-95-0149 | SED | 0–0.5 | 0.39 (J) | 0.041 (J) | — | 0.1 (J) | — | — | — | — | — | — | — | — | 0.34 (J) | 0.76 | — | — | — | — | — | — | — |
| 16-026(e) | 16-01473 | 0316-95-0150 | SED | 0–0.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.084 (J) | — | — | — | — | — | — | 0.127 |
| 16-026(e) | 16-01474 | 0316-95-0151 | SED | 0–0.5 | 0.1 (J) | — | — | — | — | — | — | — | — | — | — | — | 0.08 (J) | 0.18 (J) | — | — | — | — | — | — | 0.169 |
| 16-026(e) | 16-01475 | 0316-95-0152 | SED | 0–0.5 | 0.13 (J) | — | — | — | — | — | — | — | — | — | — | — | 0.1 (J) | 0.16 (J) | — | — | — | — | — | — | — |
| 16-026(e) | 16-01657 | 0316-95-0147 | QBT4 | 0.75–1.25 | 0.25 (J) | — | — | — | — | — | — | — | — | — | — | — | 0.19 (J) | 0.24 (J) | — | — | — | — | — | — | 0.195 |
| 16-029(a) | 16-01453 | 0316-95-0111 | QBT4 | 0.33–1.33 | 15 | — | 2850 | 13 | — | — | — | — | — | — | 0.165 | 0.264 | 1.2 (J) | 12 | 125 | — | — | — | — | 0.691 | 243 |
| 16-029(a) | 16-01453 | 0316-95-0110 | SED | 0–0.5 | 2.3 | — | 1100 | 1.1 | — | — | — | — | — | — | — | — | 0.71 | 1.9 | 8.45 | — | — | — | — | — | 5.02 |
| 16-029(a) | 16-01453 | 0316-95-0112 | QBT4 | 3–4 | 2 | 0.047 (J) | 1190 | 1.3 | — | — | — | — | — | — | — | — | 0.62 | 1.6 | 13.6 | — | — | — | — | — | 12.2 |

*— = The analysis was not performed or the analyte was not detected.

**Table 2.4-1**
**V-Site Subaggregate: Samples Taken**

| Consolidated Unit/SWMU/ AOC | Sample ID | Location ID | Depth (ft) | Media Code | CN | HEXP[a] | Metals | PCB | PEST | PESTPCB | SVOC | Uranium | VOC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-013-99 | 0316-97-0001 | 16-03008 | 0–0.5 | ALLH | 3241R | 3242R | 3241R | —[b] | — | — | 3240R | 3243R | — |
| 16-013-99 | 0316-97-0002 | 16-03009 | 0–0.5 | SED | 3241R | 3242R | 3241R | — | — | — | 3240R | 3243R | — |
| 16-013-99 | RE16-98-0033 | 16-05813 | 4–5.08 | ALLH | — | 4309R | 4310R, 4308R | — | — | — | 4307R | — | — |
| 16-013-99 | RE16-98-0034 | 16-05813 | 5.08–7 | QBT4 | — | 4309R | 4310R, 4308R | — | — | — | 4307R | — | — |
| 16-013-99 | RE16-98-0037 | 16-05819 | 5.25–5.25 | ALLH | — | 4339R | 4340R, 4338R | — | — | — | 4337R | — | — |
| 16-013-99 | RE16-98-0041 | 16-05820 | 2–4 | ALLH | 4378R | 4379R | 4380R, 4378R | — | — | — | 4377R | — | 4377R |
| 16-013-99 | RE16-98-0042 | 16-05820 | 4–6 | QBT4 | — | 4379R | 4380R, 4378R | — | — | — | 4377R | — | 4377R |
| 16-013-99 | RE16-99-0006 | 16-05820 | 7.6–8 | QBT4 | — | — | 5210R | — | — | — | — | — | — |
| 16-013-99 | RE16-99-0013 | 16-05820 | 0–0.5 | ALLH | — | — | 5211R | — | — | — | — | — | — |
| 16-013-99 | RE16-99-0022 | 16-05820 | 10–11 | QBT4 | — | — | 5461R | — | — | — | — | — | — |
| 16-024(m) | 0316-97-0529 | 16-04041 | 0–1 | ALLH | — | 3353R | 3352R | — | — | — | 3351R | — | — |
| 16-025(x) | 0316-97-0003 | 16-03015 | 0–1 | FILL | — | 3237R | 3239R, 3238R | — | — | — | 3236R | — | 3236R |
| 16-025(x) | 0316-97-0004 | 16-03017 | 0–1 | FILL | — | 3237R | 3239R, 3238R | — | — | — | 3236R | — | 3236R |
| 16-025(x) | 0316-97-0005 | 16-03022 | 0–1 | ALLH | — | 3237R | 3239R, 3238R | — | — | — | 3236R | — | 3236R |
| 16-025(x) | RE16-99-0007 | 16-03409 | 3–3.5 | QBT4 | — | 5199R | 5198R | — | — | — | 5197R | — | 5197R |
| 16-025(x) | RE16-99-0008 | 16-03409 | 4.5–5 | QBT4 | — | 5199R | 5198R | — | — | — | 5197R | — | 5197R |
| 16-025(x) | RE16-99-0016 | 16-03409 | 5.5–6 | QBT4 | — | — | — | — | — | — | — | — | 5221R |
| 16-029(w) | 0316-97-0015 | 16-03077 | 3.5–4 | ALLH | — | 3872R | 3874R, 3873R | — | — | 3871R | 3871R | — | 3871R |
| 16-029(w) | RE16-99-0005 | 16-05987 | 4.3–5.5 | QBT4 | — | 5199R | 5200R, 5198R | — | — | — | — | — | 5197R |
| 16-029(w) | RE16-99-0017 | 16-05985 | 5.5–6 | QBT4 | — | — | — | — | — | — | 5228R | — | — |
| 16-029(w) | RE16-99-0021 | 16-05987 | 7.5–8.5 | QBT4 | — | 5336R | 5337R, 5335R | — | — | — | — | — | 5334R |
| 16-029(x) | 0316-97-0008 | 16-03104 | 1.5–2 | ALLH | — | 3868R | 3870R, 3869R | 3867R | 3867R | — | 3867R | — | 3867R |
| 16-029(x) | 0316-97-0009 | 16-03100 | 3–3.5 | ALLH | — | 3868R | 3870R, 3869R | 3867R | 3867R | — | 3867R | — | 3867R |
| 16-029(x) | 0316-97-0010 | 16-03094 | 4.5–5 | ALLH | — | 3868R | 3870R, 3869R | 3867R | 3867R | — | 3867R | — | 3867R |
| 16-029(x) | 0316-97-0011 | 16-03092 | 4–4.5 | ALLH | — | 3868R | 3870R, 3869R | 3867R | 3867R | — | 3867R | — | 3867R |

**Table 2.4-1 (continued)**

| Consolidated Unit/SWMU/ AOC | Sample ID | Location ID | Depth (ft) | Media Code | CN | HEXP[a] | Metals | PCB | PEST | PESTPCB | SVOC | Uranium | VOC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-029(x) | 0316-97-0012 | 16-03088 | 4.5–5 | ALLH | — | 3872R | 3874R, 3873R | — | — | 3871R | 3871R | — | 3871R |
| 16-029(x) | 0316-97-0013 | 16-03088 | 4.5–5 | ALLH | — | 3872R | 3874R, 3873R | — | — | 3871R | 3871R | — | 3871R |
| 16-029(x) | 0316-97-0014 | 16-03082 | 3–3.5 | ALLH | — | 3872R | 3874R, 3873R | — | — | 3871R | 3871R | — | 3871R |
| 16-029(x) | 0316-97-0017 | 16-03071 | 4–4.33 | ALLH | — | 3872R | 3874R, 3873R | — | — | 3871R | 3871R | — | 3871R |
| 16-029(x) | 0316-97-0018 | 16-03042 | 2–2.5 | ALLH | — | 3889R | 3891R, 3890R | 3888R | 3888R | — | 3888R | — | 3888R |
| 16-029(x) | 0316-97-0019 | 16-03051 | 2.5–3 | ALLH | — | 3889R | 3891R, 3890R | 3888R | 3888R | — | 3888R | — | 3888R |
| 16-029(x) | 0316-97-0020 | 16-03066 | 5–5.5 | ALLH | — | 3889R | 3891R, 3890R | 3888R | 3888R | — | 3888R | — | 3888R |
| 16-029(x) | 0316-97-0021 | 16-03058 | 4.75–5 | ALLH | — | 3889R | 3891R, 3890R | 3888R | 3888R | — | 3888R | — | 3888R |
| 16-029(x) | 0316-97-0023 | 16-03153 | 0–2.5 | ALLH | 3150R | 3149R | 3151R, 3150R | — | — | — | 3148R | — | 3148R |
| 16-029(x) | 0316-97-0024 | 16-03153 | 10–10.75 | QBT4 | 3150R | 3149R | 3151R, 3150R | — | — | — | 3148R | — | 3148R |
| 16-029(x) | 0316-97-0025 | 16-03156 | 0–2.5 | QBT4 | 3176R | 3175R | 3176R | — | — | — | 3174R | 3177R | 3174R |
| 16-029(x) | 0316-97-0026 | 16-03156 | 9.7–11.01 | QBT4 | 3186R | 3185R | 3187R, 3186R | — | — | — | 3184R | — | 3184R |
| 16-029(x) | 0316-97-0027 | 16-03148 | 0–1.5 | ALLH | 3241R | 3242R | 3241R | — | — | — | 3240R | 3243R | 3240R |
| 16-029(x) | 0316-97-0028 | 16-03174 | 0–1.5 | FILL | 3241R | 3242R | 3241R | — | — | — | 3240R | 3243R | 3240R |
| 16-029(x) | RE16-98-0016 | 16-05845 | 3.5–4.5 | ALLH | — | 4492R | 4494R, 4493R | — | — | — | 4491R | — | — |
| 16-029(x) | RE16-98-0017 | 16-03054 | 5–6 | QBT4 | — | 4492R | 4494R, 4493R | — | — | — | 4491R | — | 4491R |
| 16-029(x) | RE16-98-0018 | 16-03072 | 3.5–4.5 | QBT4 | — | 4492R | 4494R, 4493R | — | — | — | 4491R | — | — |
| 16-029(x) | RE16-98-0019 | 16-03072 | 5–5.5 | ALLH | — | 4492R | 4494R, 4493R | — | — | — | 4491R | — | 4491R |
| 16-029(x) | RE16-98-0020 | 16-03068 | 3.5–4.5 | ALLH | — | 4492R | 4494R, 4493R | — | — | — | 4491R | — | — |
| 16-029(x) | RE16-98-0021 | 16-03068 | 4.5–5.5 | ALLH | — | 4492R | 4494R, 4493R | — | — | — | 4491R | — | 4491R |
| 16-029(x) | RE16-98-0030 | 16-03043 | 4–4.2 | QBT4 | — | 4497R | 4499R, 4498R | — | — | — | 4496R | — | 4496R |
| 16-029(x) | RE16-98-0046 | 16-03064 | 4.25–4.5 | QBT4 | — | 4497R | 4499R, 4498R | — | — | — | 4496R | — | 4496R |
| 16-029(x) | RE16-98-0047 | 16-03064 | 5.25–5.5 | QBT4 | — | 4507R | 4509R, 4508R | — | — | — | 4506R | — | 4506R |
| 16-029(x) | RE16-98-0050 | 16-03043 | 3–3.5 | QBT4 | — | 4507R | 4509R, 4508R | — | — | — | 4506R | — | 4506R |
| 16-029(x) | RE16-98-0051 | 16-03054 | 3–3.5 | QBT4 | — | 4507R | 4509R, 4508R | — | — | — | 4506R | — | 4506R |

**Table 2.4-1 (continued)**

| Consolidated Unit/SWMU/ AOC | Sample ID | Location ID | Depth (ft) | Media Code | CN | HEXP[a] | Metals | PCB | PEST | PESTPCB | SVOC | Uranium | VOC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-029(x) | RE16-98-0052 | 16-03072 | 3.5–4.5 | QBT4 | — | — | — | — | — | — | — | — | 4506R |
| 16-029(x) | RE16-98-0053 | 16-03068 | 3–3.5 | QBT4 | — | — | — | — | — | — | — | — | 4506R |
| 16-029(x) | RE16-99-0003 | 16-03043 | 6–6.5 | QBT4 | — | — | 5211R, 5210R | — | 5209R | — | — | — | — |
| 16-029(x) | RE16-99-0004 | 16-03051 | 4.2–5.2 | QBT4 | — | — | 5211R, 5210R | — | 5209R | — | — | — | — |
| 16-029(x)-99 | 0316-97-0099 | 16-03357 | 3–3.5 | ALLH | — | 3889R | 3891R, 3890R | — | — | — | 3888R | — | 3888R |
| 16-029(x)-99 | RE16-98-0022 | 16-05829 | 2–2.5 | QBT4 | — | 4473R | 4474R | — | — | — | 4472R | — | 4472R |
| 16-034(m) | 0316-97-0528 | 16-04037 | 0–1 | ALLH | — | 3458R | 3459R | — | — | — | 3457R | — | — |
| 16-034(m) | 0316-97-0578 | 16-04038 | 0–1 | ALLH | — | 3458R | 3459R | — | — | — | 3457R | — | — |
| 16-034(n) | 0316-97-0527 | 16-04029 | 0–1 | ALLH | — | 3353R | 3352R | — | — | — | 3351R | — | — |
| 16-034(n) | 0316-97-0577 | 16-04032 | 0–1 | ALLH | — | 3353R | 3352R | — | — | — | 3351R | — | — |
| C-16-068 | 0316-97-0007 | 16-03028 | 0–0.5 | ALLH | 3086R | 3088R | 3087R, 3086R | — | — | — | 3085R | — | 3085R |
| **Excavated** | | | | | | | | | | | | | |
| 16-006(g) | 0316-98-0100 | 16-03364 | 6–6.5 | ALLH | — | 4099R | 4101R, 4100R | — | — | — | 4098R | — | 4098R |

[a] Analytical data package request number.

[b] — = The analysis was not performed or the result was not above the BV.

**Table 2.4-2**
**V-Site Subaggregate: Historical Analytical Results of Inorganic Chemicals Greater Than BVs in Soil, Sediment, Tuff, and Fill: Decision-Level Data**

| Consolidated Unit/SWMUAOC | Location ID | Sample ID | Media | Depth (ft) | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Cyanide (Total) | Iron | Lead | Magnesium | Manganese | Mercury | Nickel | Selenium | Silver | Thallium | Uranium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Soil BV**[a] | | | | | **29200** | **0.83** | **8.17** | **295** | **1.83** | **n/a** | **0.4** | **6120** | **19.3** | **8.64** | **14.7** | **0.5** | **21500** | **22.3** | **4610** | **671** | **0.1** | **15.4** | **1.52** | **1** | **0.73** | **1.82** | **39.6** | **48.8** |
| **Sediment BV** | | | | | **15400** | **0.83** | **3.98** | **127** | **1.31** | **n/a** | **0.4** | **4420** | **10.5** | **4.73** | **11.2** | **0.82** | **13800** | **19.7** | **2370** | **543** | **0.1** | **9.38** | **0.3** | **1** | **0.73** | **2.22** | **19.7** | **60.2** |
| **QBT 2,3,4 BV** | | | | | **7340** | **0.5** | **2.79** | **46** | **1.21** | **n/a** | **1.63** | **2200** | **7.14** | **3.14** | **4.66** | **0.5** | **14500** | **11.2** | **1690** | **482** | **0.1** | **6.58** | **0.3** | **1** | **1.1** | **2.4** | **17** | **63.5** |
| **Fill BV** | | | | | **29200** | **0.83** | **8.17** | **295** | **1.83** | **n/a** | **0.4** | **6120** | **19.3** | **8.64** | **14.7** | **0.5** | **21500** | **22.3** | **4610** | **671** | **0.1** | **15.4** | **n/a** | **1** | **0.73** | **1.82** | **39.6** | **48.8** |
| 16-013-99 | 16-03008 | 0316-97-0001 | ALLH | 0–0.5 | —[b] | — | — | — | — | — | — | — | — | — | 82.6 | — | — | 49 | — | — | — | — | — | — | 0.84 (U) | 3.21 | — | 58.2 |
| 16-013-99 | 16-03009 | 0316-97-0002 | SED | 0–0.5 | — | — | 4.3 | — | — | — | — | — | — | — | 66.6 | — | — | 36.6 | — | — | — | — | 0.69 (J) | — | 0.81 (U) | — | — | 74 |
| 16-013-99 | 16-05813 | RE16-98-0033 | ALLH | 4–5.08 | — | — | — | — | — | — | 0.51 (J) | — | 24.5 | 79.3 (J+) | 148 (J+) | — | — | — | — | — | — | 40.3 (J+) | — | — | 1.3 (U) | 66.9 | — | 482 |
| 16-013-99 | 16-05813 | RE16-98-0034 | QBT4 | 5.08–7 | — | 0.56 (U) | — | — | — | 0.8 | — | — | 10.8 | — | 22.3 (J+) | — | — | — | — | — | — | 11.1 (J+) | 0.75 (U) | — | — | 30.4 (U) | — | — |
| 16-013-99 | 16-05819 | RE16-98-0037 | ALLH | 5.25–5.25 | — | 19 (J-) | 16 (J-) | — | — | — | 36 | 13000 | 66 | 13 (J-) | 1900 | — | 150000 | 2900 | — | — | 1.4 | 95 (J-) | — | 4.3 | 1.4 (U) | 250 | — | 1700 |
| 16-013-99 | 16-05820 | RE16-98-0041 | ALLH | 2–4 | — | — | — | — | — | — | 0.56 (U) | — | — | — | 20 | 0.56 (U) | — | — | — | — | 0.11 (U) | — | — | 2.2 (UJ) | — | 17.7 (U) | — | — |
| 16-013-99 | 16-05820 | RE16-98-0042 | QBT4 | 4–6 | — | — | — | — | — | — | — | — | 91 | — | 25 | — | — | — | — | — | 0.11 (U) | 22 (J-) | 1.1 (UJ) | 2.1 (UJ) | — | 16.7 (U) | — | — |
| 16-013-99 | 16-05820 | RE16-99-0006 | QBT4 | 7.6–8 | 7900 | — | 2.9 | 70 | — | — | — | — | — | 3.4 | 13 | — | — | 21 | — | — | 0.11 (U) | — | 1.1 (U) | — | — | — | — | — |
| 16-024(m) | 16-04041 | 0316-97-0529 | ALLH | 0–1 | — | — | — | — | — | — | — | — | — | 8.9 (J) | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-025(x) | 16-03015 | 0316-97-0003 | FILL | 0–1 | — | 11 (UJ) | — | — | — | — | 0.55 (U) | — | — | — | — | — | — | — | — | — | 0.11 (UJ) | — | — | 2.2 (U) | 1.4 (U) | 10.3 | — | — |
| 16-025(x) | 16-03017 | 0316-97-0004 | FILL | 0–1 | — | 11 (UJ) | — | — | — | — | 0.54 (U) | — | — | — | — | — | — | 25 | — | — | 0.11 (UJ) | — | — | 2.2 (U) | 1.4 (U) | 5.13 | — | — |
| 16-025(x) | 16-03022 | 0316-97-0005 | ALLH | 0–1 | — | 11 (UJ) | — | — | — | — | 0.55 (U) | — | — | — | — | — | — | — | — | — | 0.11 (UJ) | — | — | 2.2 (U) | 1.4 (U) | — | — | — |
| 16-025(x) | 16-03409 | RE16-99-0007 | QBT4 | 3–3.5 | 23000 | — | 5.7 | 280 (J-) | — | — | — | — | 7.3 | — | — | — | — | 45 | 2600 | — | 0.12 (U) | 8.6 | 1.2 (U) | — | — | — | — | — |
| 16-025(x) | 16-03409 | RE16-99-0008 | QBT4 | 4.5–5 | 33000 | — | 11 | 150 (J-) | 1.6 | — | — | 3600 | 12 | 5.2 | 7.8 | — | 15000 | 110 | 4500 | — | — | 17 | 1.2 (U) | — | — | — | 18 | 78 |
| 16-029(w) | 16-03077 | 0316-97-0015 | ALLH | 3.5–4 | — | — | — | 444 | — | 5.8 | — | — | — | — | 26.3 | — | — | — | — | — | — | — | — | 15.9 (J-) | — | 1.98 | — | — |
| 16-029(x) | 16-03042 | 0316-97-0018 | ALLH | 2–2.5 | — | — | — | — | — | 3.82 | — | — | — | — | — | — | — | — | — | — | — | — | — | 10.8 (J-) | — | — | — | — |
| 16-029(x) | 16-03043 | RE16-98-0050 | QBT4 | 3–3.5 | — | 12 (UJ) | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.12 (UJ) | — | — | 2.3 (U) | — | 29.5 (U) | — | — |
| 16-029(x) | 16-03043 | RE16-98-0030 | QBT4 | 4–4.2 | — | 12 (UJ) | 3.4 | 53 | — | — | — | — | — | — | — | — | — | — | — | — | 0.12 (U) | — | — | 5.1 | — | 29.1 (U) | — | — |
| 16-029(x) | 16-03051 | 0316-97-0019 | ALLH | 2.5–3 | — | 1.1 (J-) | — | — | — | 5.07 | — | — | — | — | — | — | — | — | — | — | — | — | — | 53.9 (J-) | — | 2.12 | — | — |
| 16-029(x) | 16-03051 | RE16-99-0004 | QBT4 | 4.2–5.2 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 8 (U) | — | — | — | — |
| 16-029(x) | 16-03054 | RE16-98-0051 | QBT4 | 3–3.5 | — | 11 (UJ) | — | 61 | — | — | — | — | — | — | — | — | — | — | — | — | 0.11 (UJ) | — | — | 2.2 (U) | — | 28.2 (U) | — | 120 |
| 16-029(x) | 16-03054 | RE16-98-0017 | QBT4 | 5–6 | — | 12 (UJ) | — | 110 (J-) | — | — | — | — | — | — | 6.3 | — | — | — | — | — | 0.12 (U) | — | 0.41 (UJ) | 2.4 (U) | — | 30.2 (U) | — | — |
| 16-029(x) | 16-03058 | 0316-97-0021 | ALLH | 4.75–5 | — | — | — | — | — | 14.1 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03064 | RE16-98-0046 | QBT4 | 4.25–4.5 | — | 12 (UJ) | — | 57 | — | — | — | — | — | — | — | — | — | — | — | — | 0.12 (U) | — | — | 2.4 (U) | — | 30 (U) | — | — |
| 16-029(x) | 16-03064 | RE16-98-0047 | QBT4 | 5.25–5.5 | — | 12 (UJ) | — | 170 | — | — | — | — | — | — | — | — | — | — | — | — | 0.12 (UJ) | — | — | 2.4 (U) | — | 29.8 (U) | — | — |
| 16-029(x) | 16-03066 | 0316-97-0020 | ALLH | 5–5.5 | — | — | — | — | — | 16.8 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03068 | RE16-98-0020 | ALLH | 3.5–4.5 | — | 12 (UJ) | — | — | — | — | 0.59 (U) | — | — | — | — | — | — | — | — | — | 0.12 (U) | — | — | 2.4 (U) | — | 29.2 (U) | — | — |
| 16-029(x) | 16-03068 | RE16-98-0021 | ALLH | 4.5–5.5 | — | 12 (UJ) | — | — | — | — | 0.59 (U) | — | — | — | — | — | — | — | — | — | 0.12 (U) | — | — | 2.4 (U) | 0.88 | 29.2 (U) | — | — |
| 16-029(x) | 16-03071 | 0316-97-0017 | ALLH | 4–4.33 | — | — | — | 355 | — | 9.8 | — | — | — | — | — | — | — | — | — | — | — | — | — | 55.6 (J-) | — | — | — | — |
| 16-029(x) | 16-03072 | RE16-98-0018 | QBT4 | 3.5–4.5 | 12000 | 12 (UJ) | 2.9 (J-) | 590 (J-) | — | — | — | — | — | — | 5.6 | — | — | — | — | — | 0.12 (U) | 6.7 | 0.39 (UJ) | 27 | — | 29.6 (U) | — | — |

**Table 2.4-2 (continued)**

| Consolidated Unit/SWMUAOC | Location ID | Sample ID | Media | Depth (ft) | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Cyanide (Total) | Iron | Lead | Magnesium | Manganese | Mercury | Nickel | Selenium | Silver | Thallium | Uranium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Soil BV[a]** | | | | | **29200** | **0.83** | **8.17** | **295** | **1.83** | **n/a** | **0.4** | **6120** | **19.3** | **8.64** | **14.7** | **0.5** | **21500** | **22.3** | **4610** | **671** | **0.1** | **15.4** | **1.52** | **1** | **0.73** | **1.82** | **39.6** | **48.8** |
| **Sediment BV** | | | | | **15400** | **0.83** | **3.98** | **127** | **1.31** | **n/a** | **0.4** | **4420** | **10.5** | **4.73** | **11.2** | **0.82** | **13800** | **19.7** | **2370** | **543** | **0.1** | **9.38** | **0.3** | **1** | **0.73** | **2.22** | **19.7** | **60.2** |
| **QBT 2,3,4 BV** | | | | | **7340** | **0.5** | **2.79** | **46** | **1.21** | **n/a** | **1.63** | **2200** | **7.14** | **3.14** | **4.66** | **0.5** | **14500** | **11.2** | **1690** | **482** | **0.1** | **6.58** | **0.3** | **1** | **1.1** | **2.4** | **17** | **63.5** |
| **Fill BV** | | | | | **29200** | **0.83** | **8.17** | **295** | **1.83** | **n/a** | **0.4** | **6120** | **19.3** | **8.64** | **14.7** | **0.5** | **21500** | **22.3** | **4610** | **671** | **0.1** | **15.4** | **n/a** | **1** | **0.73** | **1.82** | **39.6** | **48.8** |
| 16-029(x) | 16-03072 | RE16-98-0019 | ALLH | 5–5.5 | — | 11 (UJ) | — | 600 (J-) | — | — | 0.57 (U) | — | — | — | — | — | — | — | — | — | 0.11 (U) | — | — | 26 | — | 29.3 (U) | — | — |
| 16-029(x) | 16-03082 | 0316-97-0014 | ALLH | 3–3.5 | — | — | — | — | — | 4.9 | — | — | — | — | — | — | — | — | — | 863 | — | — | — | 3.5 (J-) | — | 2.66 | — | — |
| 16-029(x) | 16-03088 | 0316-97-0012 | ALLH | 4.5–5 | — | — | — | — | — | 7.5 | — | — | — | — | 25.2 | — | — | — | — | — | — | — | — | 26.3 (J-) | — | — | — | — |
| 16-029(x) | 16-03088 | 0316-97-0013 | ALLH | 4.5–5 | — | — | — | — | — | 5.8 | — | — | — | — | 19.2 | — | — | — | — | — | — | — | — | 8.9 (J-) | — | — | — | — |
| 16-029(x) | 16-03092 | 0316-97-0011 | ALLH | 4–4.5 | — | — | — | — | — | 5.2 | — | — | — | — | — | — | — | — | — | — | — | — | — | 10.7 (J-) | — | 2.72 | — | — |
| 16-029(x) | 16-03094 | 0316-97-0010 | ALLH | 4.5–5 | — | — | — | — | — | 6 | — | — | — | — | 37.5 | — | — | — | — | — | — | — | — | 10.1 (J-) | — | 2.04 | — | — |
| 16-029(x) | 16-03100 | 0316-97-0009 | ALLH | 3–3.5 | — | — | — | — | — | 6.6 | — | — | — | — | 18.5 | — | — | — | — | — | — | — | — | 15.6 (J-) | — | 2.41 | — | — |
| 16-029(x) | 16-03104 | 0316-97-0008 | ALLH | 1.5–2 | — | — | — | — | — | 8.6 | — | — | — | — | 15.1 | — | — | — | — | — | — | — | — | 6 (J-) | — | 2.95 | — | — |
| 16-029(x) | 16-03148 | 0316-97-0027 | ALLH | 0–1.5 | — | — | 8.7 | — | — | 4.7 (J) | — | — | — | 9.8 (J) | 27.5 | — | — | 23.5 | — | 961 | — | — | — | 40.2 | 0.85 (U) | 2.5 | 40.1 | — |
| 16-029(x) | 16-03153 | 0316-97-0023 | ALLH | 0–2.5 | — | 1.1 (UJ) | — | — | — | — | 0.57 (U) | — | — | — | — | — | — | — | — | — | 0.11 (U) | — | — | 2.3 (U) | — | — | — | — |
| 16-029(x) | 16-03153 | 0316-97-0024 | QBT4 | 10–10.75 | — | 1.1 (UJ) | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.11 (U) | — | — | 2.1 (U) | — | — | — | — |
| 16-029(x) | 16-03156 | 0316-97-0025 | QBT4 | 0–2.5 | — | — | — | — | — | — | — | — | — | — | — | 0.6 (U) | — | — | — | — | — | — | — | 3.6 | — | — | — | — |
| 16-029(x) | 16-03156 | 0316-97-0026 | QBT4 | 9.7–11.01 | — | 5.34 (U) | — | — | — | — | — | — | — | — | — | 1.1 (U) | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03174 | 0316-97-0028 | FILL | 0–1.5 | — | — | — | — | — | 2.5 (J) | — | — | — | — | 71.2 | — | — | — | — | — | — | — | — | 49.8 | 0.87 (U) | 2.09 | — | — |
| 16-029(x) | 16-05845 | RE16-98-0016 | ALLH | 3.5–4.5 | — | 12 (UJ) | — | 4200 (J-) | — | — | 0.6 (U) | — | — | — | — | — | — | — | — | — | 0.12 (U) | — | — | 68 | — | 29.3 (U) | — | — |
| 16-029(x)-99 | 16-03357 | 0316-97-0099 | ALLH | 3–3.5 | — | — | — | — | — | 4.69 | — | — | — | — | — | — | — | — | — | — | 0.11 (J-) | — | — | — | — | 2.01 | — | — |
| 16-029(x)-99 | 16-05829 | RE16-98-0022 | QBT4 | 2–2.5 | 13300 | — | 4.2 | 114 (J-) | — | — | — | — | 9.1 (J-) | 3.3 | 5.1 | — | — | 11.5 | — | — | — | — | 0.49 | — | — | — | 24.2 (J-) | — |
| 16-034(m) | 16-04037 | 0316-97-0528 | ALLH | 0–1 | — | 9.6 (J-) | — | — | — | — | 0.65 (U) | — | — | — | 71.5 | — | — | 64.5 | — | — | — | — | — | 2.2 | — | — | — | 190 |
| 16-034(m) | 16-04038 | 0316-97-0578 | ALLH | 0–1 | — | 6.7 (UJ) | — | — | — | — | 0.58 (U) | — | — | — | 24 | — | — | — | — | — | — | — | — | — | — | — | — | 57.7 |
| 16-034(n) | 16-04029 | 0316-97-0527 | ALLH | 0–1 | — | — | — | — | — | — | — | — | — | — | — | — | — | 63.6 | — | — | 35 | — | — | — | — | — | — | 104 |
| 16-034(n) | 16-04032 | 0316-97-0577 | ALLH | 0–1 | — | — | — | — | — | — | — | — | — | — | — | — | — | 23.1 | — | — | 3 | — | — | — | — | — | — | — |
| C-16-068 | 16-03028 | 0316-97-0007 | ALLH | 0–0.5 | — | 4.48 (U) | — | — | — | — | 0.448 (U) | — | — | — | 17.8 | 1.26 (U) | — | 43 | — | — | 0.102 (J) | — | — | — | — | 2.66 | — | 58.6 |
| **Excavated** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16-006(g) | 16-03364 | 0316-98-0100 | ALLH | 6–6.5 | — | — | — | — | — | 6.4 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2.24 (J) | — | — |

[a] BVs are from LANL 1998, 059730.

[b] — = The analysis was not performed or the result was not above the BV.

**Table 2.4-3**
**V-Site Subaggregate: Historical Analytical Results of Organic Chemicals Greater Than BVs in Soil, Sediment, Tuff, and Fill: Decision-Level Data**

| Consolidated Unit/SWMUAOC | Location ID | Sample ID | Media | Depth (ft) | Acenaphthene | Acenaphthylene | Acetone | Amino-2,6-dinitrotoluene4- | Amino-4,6-dinitrotoluene2- | Amino-DNTs | Anthracene | Benzo(a)anthracene | Benzo(a)pyrene | Benzo(b)fluoranthene | Benzo(g,h,i)perylene | Benzo(k)fluoranthene | Benzoic Acid | Bis(2-ethylhexyl)phthalate | Butanone2- | Butylbenzene_n- | Chrysene | DDE4,4'- | DDT4,4'- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-013-99 | 16-03009 | 0316-97-0002 | SED | 0–0.5 | —* | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-013-99 | 16-05813 | RE16-98-0033 | ALLH | 4–5.08 | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.026 (J) | — | — | — | — | — |
| 16-013-99 | 16-05813 | RE16-98-0034 | QBT4 | 5.08–7 | — | — | — | — | — | 0.5 | — | — | — | — | — | — | — | 0.14 (J) | — | — | — | — | — |
| 16-013-99 | 16-05820 | RE16-98-0041 | ALLH | 2–4 | — | — | 0.065 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-024(m) | 16-04041 | 0316-97-0529 | ALLH | 0–1 | — | — | — | — | — | — | — | — | — | — | — | — | 0.095 (J) | 0.038 (J) | — | — | — | — | — |
| 16-025(x) | 16-03015 | 0316-97-0003 | FILL | 0–1 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-025(x) | 16-03017 | 0316-97-0004 | FILL | 0–1 | — | — | — | — | — | — | 1.2 (J) | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-025(x) | 16-03409 | RE16-99-0007 | QBT4 | 3–3.5 | — | — | 0.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-025(x) | 16-03409 | RE16-99-0008 | QBT4 | 4.5–5 | — | — | 0.38 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-025(x) | 16-03409 | RE16-99-0016 | QBT4 | 5.5–6 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(w) | 16-03077 | 0316-97-0015 | ALLH | 3.5–4 | — | — | — | 0.576 | 0.879 | — | — | — | — | — | — | — | — | — | — | 0.002 (J) | — | — | — |
| 16-029(w) | 16-05987 | RE16-99-0005 | QBT4 | 4.3–5.5 | — | — | 0.046 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03043 | RE16-98-0050 | QBT4 | 3–3.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03043 | RE16-98-0030 | QBT4 | 4–4.2 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03051 | 0316-97-0019 | ALLH | 2.5–3 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03054 | RE16-98-0051 | QBT4 | 3–3.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03058 | 0316-97-0021 | ALLH | 4.75–5 | — | — | — | 0.553 | 0.431 | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03064 | RE16-98-0046 | QBT4 | 4.25–4.5 | — | — | — | 0.3 | 0.3 | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03064 | RE16-98-0047 | QBT4 | 5.25–5.5 | — | — | — | — | 1.9 | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03066 | 0316-97-0020 | ALLH | 5–5.5 | — | — | — | 0.815 | 1.1 | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.00147 |
| 16-029(x) | 16-03068 | RE16-98-0053 | QBT4 | 3–3.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03071 | 0316-97-0017 | ALLH | 4–4.33 | — | — | — | 0.217 | 0.268 | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03072 | RE16-98-0052 | QBT4 | 3.5–4.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03082 | 0316-97-0014 | ALLH | 3–3.5 | — | — | — | 0.201 | 0.427 | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03088 | 0316-97-0012 | ALLH | 4.5–5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.002 (J) | — | — | — | — |
| 16-029(x) | 16-03088 | 0316-97-0013 | ALLH | 4.5–5 | — | — | — | — | 0.1 | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03092 | 0316-97-0011 | ALLH | 4–4.5 | — | — | — | — | 0.123 | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03094 | 0316-97-0010 | ALLH | 4.5–5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03100 | 0316-97-0009 | ALLH | 3–3.5 | — | — | — | 0.116 | 0.112 | — | — | — | — | — | — | — | — | — | — | — | — | 0.00122 | — |

**Table 2.4-3 (continued)**

| Consolidated Unit/SWMUAOC | Location ID | Sample ID | Media | Depth (ft) | Acenaphthene | Acenaphthylene | Acetone | Amino-2,6-dinitrotoluene4- | Amino-4,6-dinitrotoluene2- | Amino-DNTs | Anthracene | Benzo(a)anthracene | Benzo(a)pyrene | Benzo(b)fluoranthene | Benzo(g,h,i)perylene | Benzo(k)fluoranthene | Benzoic Acid | Bis(2-ethylhexyl)phthalate | Butanone2- | Butylbenzene_n- | Chrysene | DDE4,4'- | DDT4,4'- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-029(x) | 16-03104 | 0316-97-0008 | ALLH | 1.5–2 | — | — | — | 0.501 | 1.15 | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03153 | 0316-97-0023 | ALLH | 0–2.5 | — | — | 0.043 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03153 | 0316-97-0024 | QBT4 | 10–10.75 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03156 | 0316-97-0026 | QBT4 | 9.7–11.01 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x)-99 | 16-03357 | 0316-97-0099 | ALLH | 3–3.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x)-99 | 16-05829 | RE16-98-0022 | QBT4 | 2–2.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-034(m) | 16-04037 | 0316-97-0528 | ALLH | 0–1 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-034(m) | 16-04038 | 0316-97-0578 | ALLH | 0–1 | — | — | — | — | — | — | — | — | — | — | — | — | 0.11 (J) | — | — | — | — | — | — |
| C-16-068 | 16-03028 | 0316-97-0007 | ALLH | 0–0.5 | 0.048 (J) | 0.094 (J) | — | — | — | — | — | 0.12 (J) | 0.27 (J) | 0.3 (J) | 0.18 (J) | 0.12 (J) | — | 0.37 (J) | — | — | 0.21 (J) | — | — |
| **Excavated** | | | | | | | | | | | | | | | | | | | | | | | |
| 16-006(g) | 16-03364 | 0316-98-0100 | ALLH | 6–6.5 | — | — | 0.004 (J) | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

**Table 2.4-3 (continued)**

| Consolidated Unit/SWMUAOC | Location ID | Sample ID | Media | Depth (ft) | Di-n-butylphthalate | Endosulfan II | Fluoranthene | HMX | Indeno(1,2,3-cd)pyrene | Isopropyltoluene4- | Methylene Chloride | Methylnaphthalene2- | Naphthalene | Phenanthrene | Phenol | Pyrene | RDX | Tetrachloroethene | Toluene | Trichloro-1,2,2-trifluoroethane1,1,2- | Trichloroethene | Trinitrotoluene2,4,6- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-013-99 | 16-03009 | 0316-97-0002 | SED | 0–0.5 | 0.97 (J) | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-013-99 | 16-05813 | RE16-98-0033 | ALLH | 4–5.08 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-013-99 | 16-05813 | RE16-98-0034 | QBT4 | 5.08–7 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-013-99 | 16-05820 | RE16-98-0041 | ALLH | 2–4 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-024(m) | 16-04041 | 0316-97-0529 | ALLH | 0–1 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-025(x) | 16-03015 | 0316-97-0003 | FILL | 0–1 | — | — | — | — | — | — | — | 1.1 (J) | 1.8 (J) | — | — | — | — | — | — | — | — | — |
| 16-025(x) | 16-03017 | 0316-97-0004 | FILL | 0–1 | — | — | — | — | — | — | — | — | — | 1.1 (J) | — | — | — | — | — | — | — | — |
| 16-025(x) | 16-03409 | RE16-99-0007 | QBT4 | 3–3.5 | — | — | — | — | — | 0.00057 (J) | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-025(x) | 16-03409 | RE16-99-0008 | QBT4 | 4.5–5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-025(x) | 16-03409 | RE16-99-0016 | QBT4 | 5.5–6 | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.0027 (J) | — | — | — | — |
| 16-029(w) | 16-03077 | 0316-97-0015 | ALLH | 3.5–4 | — | — | — | 1.23 | — | — | — | — | — | — | — | — | 1.04 | — | 0.006 | — | — | 9.11 |
| 16-029(w) | 16-05987 | RE16-99-0005 | QBT4 | 4.3–5.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03043 | RE16-98-0050 | QBT4 | 3–3.5 | — | — | — | — | — | — | 0.0077 | — | — | — | — | — | 5.3 | — | — | — | — | 1.3 |
| 16-029(x) | 16-03043 | RE16-98-0030 | QBT4 | 4–4.2 | — | — | — | — | — | — | — | — | — | — | — | — | 1.7 | — | — | — | — | — |
| 16-029(x) | 16-03051 | 0316-97-0019 | ALLH | 2.5–3 | — | 0.0011 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03054 | RE16-98-0051 | QBT4 | 3–3.5 | — | — | — | — | — | — | 0.0079 | — | — | — | — | — | — | — | — | 0.0063 | — | — |
| 16-029(x) | 16-03058 | 0316-97-0021 | ALLH | 4.75–5 | — | — | 0.079 | 0.253 | — | — | — | — | — | — | — | 0.096 | — | — | — | — | — | 0.972 |
| 16-029(x) | 16-03064 | RE16-98-0046 | QBT4 | 4.25–4.5 | — | — | — | — | — | — | — | — | — | — | — | — | 1.5 | — | — | — | — | 5 |
| 16-029(x) | 16-03064 | RE16-98-0047 | QBT4 | 5.25–5.5 | — | — | — | — | — | — | — | — | — | — | — | — | 5.2 | — | — | — | — | 54 |
| 16-029(x) | 16-03066 | 0316-97-0020 | ALLH | 5–5.5 | — | — | — | 0.799 | — | — | — | — | — | — | — | — | 0.652 | — | — | — | — | 2.54 |
| 16-029(x) | 16-03068 | RE16-98-0053 | QBT4 | 3–3.5 | — | — | — | — | — | — | 0.0075 | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03071 | 0316-97-0017 | ALLH | 4–4.33 | — | — | — | 2.11 | — | — | — | — | — | — | — | — | — | 0.002 (J) | 0.002 (J) | — | — | 0.091 |
| 16-029(x) | 16-03072 | RE16-98-0052 | QBT4 | 3.5–4.5 | — | — | — | — | — | — | 0.0085 | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03082 | 0316-97-0014 | ALLH | 3–3.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.002 (J) | — | — | — | — |
| 16-029(x) | 16-03088 | 0316-97-0012 | ALLH | 4.5–5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.002 (J) | — | — | — |
| 16-029(x) | 16-03088 | 0316-97-0013 | ALLH | 4.5–5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03092 | 0316-97-0011 | ALLH | 4–4.5 | — | — | — | — | — | — | 0.006 | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03094 | 0316-97-0010 | ALLH | 4.5–5 | — | — | — | — | — | — | 0.007 | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03100 | 0316-97-0009 | ALLH | 3–3.5 | — | — | — | — | — | — | 0.01 | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x) | 16-03104 | 0316-97-0008 | ALLH | 1.5–2 | 0.44 | — | — | 0.655 | — | — | — | — | — | — | — | — | 0.508 | — | — | — | — | — |

**Table 2.4-3 (continued)**

| Consolidated Unit/SWMUAOC | Location ID | Sample ID | Media | Depth (ft) | Di-n-butylphthalate | Endosulfan II | Fluoranthene | HMX | Indeno(1,2,3-cd)pyrene | Isopropyltoluene4- | Methylene Chloride | Methylnaphthalene2- | Naphthalene | Phenanthrene | Phenol | Pyrene | RDX | Tetrachloroethene | Toluene | Trichloro-1,2,2-trifluoroethane1,1,2- | Trichloroethene | Trinitrotoluene2,4,6- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-029(x) | 16-03153 | 0316-97-0023 | ALLH | 0–2.5 | — | — | — | — | — | 0.012 | — | — | — | — | — | — | — | 0.0072 | — | — | — | — |
| 16-029(x) | 16-03153 | 0316-97-0024 | QBT4 | 10–10.75 | — | — | — | — | — | — | — | — | — | — | — | — | 0.296 | — | — | — | — | — |
| 16-029(x) | 16-03156 | 0316-97-0026 | QBT4 | 9.7–11.01 | — | — | — | — | — | — | — | — | — | — | — | — | 0.24 | — | — | — | — | — |
| 16-029(x)-99 | 16-03357 | 0316-97-0099 | ALLH | 3–3.5 | — | — | — | — | — | — | 0.006 | — | — | — | — | — | — | — | — | — | — | — |
| 16-029(x)-99 | 16-05829 | RE16-98-0022 | QBT4 | 2–2.5 | 0.19 (J) | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 16-034(m) | 16-04037 | 0316-97-0528 | ALLH | 0–1 | — | — | — | — | — | — | — | — | — | — | 0.043 (J) | — | — | — | — | — | — | — |
| 16-034(m) | 16-04038 | 0316-97-0578 | ALLH | 0–1 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| C-16-068 | 16-03028 | 0316-97-0007 | ALLH | 0–0.5 | 0.22 (J) | — | 0.15 (J) | — | 0.15 (J) | — | — | — | — | — | — | 0.19 (J) | — | — | — | — | — | — |
| **Excavated** | | | | | | | | | | | | | | | | | | | | | | |
| 16-006(g) | 16-03364 | 0316-98-0100 | ALLH | 6–6.5 | — | — | — | 0.18 | — | 0.002 (J) | — | — | — | — | — | — | 0.191 | 0.013 (J) | — | — | 0.007 (J) | — |

*— = The analysis was not performed or the result was not above the BV.

**Table 3.0-1**
**Perched Zone Characteristics, Cañon de Valle Wells**

| Well Name | Depth to Groundwater (ft bgs) | Saturated Thickness |
|---|---|---|
| R-25 | 711 ft | 421 ft at the bottom of the Otowi Member/top of the Puye Formation |
| | 1286 ft | >656 ft in the Puye Formation |
| CDV-16-1(i) | 563 ft | >120 ft |
| CDV-16-2(i)r | ~825 ft | Unknown, not fully penetrated |
| CDV-16-3(i) | ~1350 ft | Unknown |
| R-26 | 173 ft | Zones of thin, discontinuous saturation associated with fractures |
| | ~604 ft | Preliminary data suggest high moisture content below 575 ft to the top of the regional aquifer at 954 ft |
| CDV-R-15-3 | 611 ft during drilling<br>(600–620 geophysical) | 611 ft during drilling<br>(600–620 geophysical) |
| | 708 ft during drilling | 708 ft during drilling |
| | 800–820 ft geophysical | 800–820 ft geophysical |
| | 920 ft during drilling | 920 ft during drilling |
| | 960 ft during drilling<br>(965–990 ft geophysical) | 960 ft during drilling<br>(965–990 ft geophysical) |
| | 1242 ft | 1242 ft |

**Table 4.0-1**
**K-Site Subaggregate Sampling Strategy**

| SWMU or AOC | Cyanide | Radionuclides | Uranium | Plutonium | TAL Metals | VOCs | SVOCs | HE | Perchlorate | Nitrate | Boron | Pesticides |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 11-006(a), SWMU 11-006(b), SWMU 11-006(c), and SWMU 11-006(d): former firing site | No, not associated with any near by facility operations | Yes, most likely due to firing point and drop tower experiments | Yes, U and DU most likely spread throughout due to firing point and drop tower experiments | Yes, associated with site operations | Yes, metals associated with drop tower experiments and firing site activities | Yes, likely present due to use of organic solvents | Yes, likely present due to use of organic solvents | Yes, weapon and weapon component testing conducted at the drop tower | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, none detected in previous samples and unlikely used during operations | No, not associated with firing site activities or drop tower experiments |
| SWMU 11-011(a) and SWMU 11-011(b): active outfalls | No, not associated with any near by facility operations | Yes, most likely due to firing point and drop tower experiments | Yes, U and DU most likely spread throughout due to firing point and drop tower experiments | Yes, associated with site operations | Yes, metals associated with drop tower experiments and firing site activities | Yes, likely present due to use of organic solvents | Yes, likely present due to use of organic solvents | Yes, weapon and weapon component testing conducted at the drop tower | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, none detected in previous samples and unlikely used during operations | No, not associated with firing site activities or drop tower experiments |
| SWMU 11-005(a): active septic system | Yes, from photo processing chemicals in building 11-12 | Yes, most likely due to firing point and drop tower experiments | Yes, U and DU most likely spread throughout due to firing point and drop tower experiments | Yes, associated with site operations | Yes, metals associated with drop tower experiments and firing site activities | Yes, due to use of organic cleaning agents and cutting oils | Yes, due to use of organic cleaning agents and cutting oils | Yes, weapon and weapon component testing conducted at the drop tower | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, none detected in previous samples and unlikely used during operations | No, not associated with firing site activities or drop tower experiments |
| SWMU 11-005(b): active septic system | Yes, from photo processing chemicals in building 11-12 | Yes, most likely due to firing point and drop tower experiments | Yes, U and DU most likely spread throughout due to firing point and drop tower experiments | Yes, associated with site operations | Yes, metals associated with drop tower experiments and firing site activities | Yes, due to use of organic cleaning agents and cutting oils | Yes, due to use of organic cleaning agents and cutting oils | Yes, weapon and weapon component testing conducted at the drop tower | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, none detected in previous samples and unlikely used during operations | No, not associated with firing site activities or drop tower experiments |
| SWMU 11-005(c): inactive outfall (capped drainline) | Yes, from photo processing chemicals in building 11-12 | Yes, most likely due to firing point and drop tower experiments | Yes, U and DU most likely spread throughout due to firing point and drop tower experiments | Yes, associated with site operations | Yes, metals associated with drop tower experiments and firing site activities | Yes, likely present due to use of organic solvents | Yes, likely present due to use of organic solvents | Yes, weapon and weapon component testing conducted at the drop tower | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, none detected in previous samples and unlikely used during operations | No, not associated with firing site activities or drop tower experiments |
| SWMU 11-011(d): active outfall associated with a building that houses offices and a light-machine shop | Yes, from photo processing chemicals in building 11-12 | Yes, most likely due to firing point and drop tower experiments | Yes, U and DU most likely spread throughout due to firing point and drop tower experiments | Yes, associated with site operations | Yes, metals associated with drop tower experiments and firing site activities | Yes, due to use of organic cleaning agents and cutting oils | Yes, due to use of organic cleaning agents and cutting oils | Yes, weapon and weapon component testing conducted at the drop tower | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, none detected in previous samples and unlikely used during operations | No, not associated with firing site activities or drop tower experiments |
| AOC C-11-002: area of potential surface-soil contamination associated with a former building | Yes, from photo processing chemicals in building 11-12 | Yes, most likely due to firing point and drop tower experiments | Yes, U and DU most likely spread throughout due to firing point and drop tower experiments | Yes, associated with site operations | Yes, metals associated with drop tower experiments and firing site activities | Yes, due to use of organic cleaning agents and cutting oils | Yes, likely present due to use of organic solvents | Yes, weapon and weapon component testing conducted at the drop tower | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, none detected in previous samples and unlikely used during operations | No, not associated with firing site activities or drop tower experiments |

**Table 4.0-2**
**P-Site Subaggregate Sampling Strategy**

| SWMU or AOC | Cyanide | Radionuclides | Uranium | Plutonium | TAL Metals | VOCs | SVOCs | HE | Perchlorate | Nitrate | Boron | Pesticides |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 13-001 and SWMU 13-002: firing site and associated landfill (debris and shrapnel disposal area) | No, not associated with firing sites | Yes, polonium was a component of the initiator assemblies | Yes, devices tested at firing sites likely contained U and DU | No, not likely | Yes, various metals (Ba, Pb, and Be) associated with explosives, shrapnel and HE residues. | No, VOCs not likely following HE detonation. | No, not associated with explosive components | Yes, explosives contained HE compounds | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with firing site activities |
| SWMU 16-035 and SWMU 16-036: soil contamination associated with former bunkers | No, not associated with explosives machining and assembly | No, only uranium associated with explosives | Yes, U and DU are likely to be present | No, not likely | Yes, explosives contained metals | Yes, solvents, cutting oils possibly used in machining explosives | Yes, possibly used in machining explosives | Yes, explosives contained HE | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with firing site activities |
| AOC 16-003(p) and SWMU 16-029(h): soil contamination at HE sump and drainlines (associated with SWMU 16-036) | No, not associated with HE machining process | No, only uranium associated with sump and drainlines | Yes, U and DU are likely to be present | No, not likely | Yes, received wastes from operations that used metals | Yes, solvents, cutting oils possibly used in machining explosives | Yes, solvents, cutting oils possibly used in machining explosives | Yes, received wastes from operations that machined HE | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with firing site activities |
| SWMU 16-031(h): Soil contamination associated with a utility room outfall (adjacent to SWMU 16-036) | No, not associated with sanitary outfall or HE machining process | No, not expected in sanitary outfall or associated with HE processing | Yes, possible contamination from explosives processing with in building | No, not likely | Yes, metals were present in other areas of building | Yes, possible contamination from explosives processing with in building | Yes, possible halogenated solvents in machining parts cleaning | Yes, possible contamination from explosives processing with in building | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with site operations |
| SWMU 16-004(a), SWMU 16-004(b), SWMU 16-004(c), SWMU 16-004(d), SWMU 16-004(e), and SWMU 16-004(f): former wastewater treatment plant for the TA-16 sanitary sewer system | Yes, associated with site operations | Yes, soil sample screening from NPDES-permitted outfall area detected Cs-137, Pu-329, Pu-240, and Pu-238 | No, not associated with sanitary sewer | Yes, detected in sludge drying beds | Yes, NPDES-permitted outfalls monitored for inorganic chemicals | Yes, likely due to site operations | Yes, no analytical data available to date | Yes, due to operations served at TA-16 | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with site operations |
| SWMU 13-001, AOC 16-003(p), SWMU 16-029(h), and SWMU 16-031(h): sump, drainlines, and outfall associated with former HE-machining building | No, not associated with site operations | No, not associated with site operations | No, not associated with HE machining operations | No, not likely | Yes, metals associated with operations | Yes, possible cleaning solvents used | Yes, possible cleaning solvents used | Yes, consists of an HE sump and associated drainlines and to comply with the Consent Order | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with operations |
| SWMU 13-004: burning pits (unlocated) | No, not associated with open burn/detonation site | Yes, devices at burning sites may have contained radionuclides | Yes, devices at burning sites likely contained U and DU | No, not likely | Yes, metals likely to be components of explosives assemblies (Pb, Be) | Yes, possibly associated with starter fuels or solvents | Yes, PAHs may be present | Yes, HE components likely and to comply with the Consent Order | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, site used to demonstrate explosives, not to burn chemical waste |

**Table 4.0-2 (continued)**

| SWMU or AOC | Cyanide | Radionuclides | Uranium | Plutonium | TAL Metals | VOCs | SVOCs | HE | Perchlorate | Nitrate | Boron | Pesticides |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AOC 16-024(a): area of potentially contaminated soil associated with a former HE magazine (removed) | No, not associated with HE components storage | No, not associated with HE components storage | No, not associated with HE components storage | No, not likely | Yes, barium and metals associated with explosives | No, not associated with HE components storage | No, not associated with HE components storage | Yes, HE component storage and to comply with the Consent Order | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with HE storage |
| AOC 16-024(u): area of potentially contaminated soil associated with a former HE magazine (removed) | No, not associated with HE components storage | No, not associated with HE components storage | No, not associated with HE components storage | No, not likely | Yes, barium and metals associated with explosive | No, not associated with HE components storage | No, not associated with HE components storage | Yes, HE component storage and to comply with the Consent Order | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with HE storage |
| SWMU 16-025(d2): area of potentially contaminated soil associated with a former mockup chamber (removed) | No, not associated with operations | Yes, radioactive components possibly used in experimental equipment at the former structure | Yes, U-238 possibly used at structure | No, not likely | Yes, equipment used at former structure is suspected to have contained Hg. | No, not associated with structure | No, not associated with structure operations | Yes, HE possibly used at structure | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with site operations |
| SWMU 16-031(h): area of potentially contaminated soil associated with the outfall from a utility room adjacent to a machine shop [16-029(h)-99] | No, not associated with HE machining process | No, not associated with operation | No, not associated with HE machining operations | No, not likely | Yes, metals associated with operations | Yes, possible cleaning solvents used | Yes, possible halogenated solvents in machining parts cleaning | Yes, added utility room at HE machining shop and to comply with the Consent Order | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not likely |
| AOC C-16-050: former building | No evidence of management, treatment, storage or disposal of hazardous waste | Yes, because no existing analytical data is available, collect samples for assessment | Yes, because no existing analytical data is available, collect samples for assessment | No, not likely | Yes, because no existing analytical data is available, collect samples for assessment | Yes, because no existing analytical data is available, collect samples for assessment | Yes, because no existing analytical data is available, collect samples for assessment | Yes, because no existing analytical data is available, collect samples for assessment | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not likely |
| AOC C-16-060: area of potentially contaminated soil associated with a former storage building (removed) that possibly housed materials for the former mockup chamber | No, not associated with stored materials | Yes, radioactive components possibly used in experimental equipment | Yes, because no existing analytical data is available, collect samples for assessment | No, not likely | Yes, because no existing analytical data is available, collect samples for assessment | Yes, because no existing analytical data is available, collect samples for assessment | Yes, because no existing analytical data is available, collect samples for assessment | Yes, because no existing analytical data is available, collect samples for assessment | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not likely |

**Table 4.0-3**
**300s Line Subaggregate Sampling Strategy**

| SWMU or AOC | Cyanide | Radionuclides | Uranium | Plutonium | TAL Metals | VOCs | SVOCs | HE | Perchlorate | Nitrate | Boron | Pesticides |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 16-001(e) associated dry well | No, not likely | Yes, concentrations detected on the west side of 300s Line | Yes, concentrations detected on the west side of 300s Line | No, not likely | Yes, metals associated with explosives development | Yes, solvents were used during processing in buildings 16-300, 16-302, 16-304, and 16-306 | Yes, PAHs are likely and may be associated with HE casting or plastics processing or development | Yes, HE were cast and processed in buildings 16-300, 16-302, 16-304, and 16-306 that drained into this area. | Yes, due to its association with HE | Yes, due to its association with HE | No, none detected in previous samples and unlikely used during operations | No, not associated with HE casting or plastics processing & development |
| SWMU 16-003(d), SWMU 16-003(e), SWMU 16-003(f), SWMU 16-003(g): sumps | No, not likely | No, not likely | No, not likely | No, not likely | Yes, metals associated with explosives development | Yes, solvents were used during processing in buildings 16-300, 16-302, 16-304, and 16-306 | Yes, PAHs are likely and may be associated with HE casting or plastics processing or development | Yes, HE were cast and processed in buildings 16-300, 16-302, 16-304, and 16-306 that drained into this area. | Yes, due to its association with HE | Yes, due to its association with HE | No, none detected in previous samples and unlikely used during operations | No, not associated with HE casting or plastics processing & development |
| SWMU 16-026(z): area of potentially contaminated soil | No, not likely | No, not likely | No, not likely | No, not likely | Yes, metals associated with explosives development | Yes, solvents were used during processing in buildings 16-300, 16-302, 16-304, and 16-306 | Yes, PAHs are likely and may be associated with HE casting or plastics processing or development | Yes, HE were cast and processed in buildings 16-300, 16-302, 16-304, and 16-306 that drained into this area. | Yes, due to its association with HE | Yes, due to its association with HE | No, none detected in previous samples and unlikely used during operations | No, not associated with HE casting or plastics processing & development |
| SWMU 16-026(b), SWMU 16-026(c), SWMU 16-026(d), SWMU 16-026(e): outfalls | No, not associated with HE casting or plastics processing and development | No, none detected above background | Yes, four samples in outfall outside of building 16-307 detected uranium above background | No, not likely | Yes, metals associated with explosives development | Yes, solvents and chemicals were stored in rest houses 16-301, 16-303, 16-305, and 16-307 | Yes, PAHs are likely and may be associated with solvent and chemical storage | Yes, HE were stored in rest houses 16-301, 16-303, 16-305, and dissolved in solvents in 16-307 | Yes, due to its association with HE | Yes, due to its association with HE | No, none detected in previous samples and unlikely used during operations | No, not associated with HE casting or plastics processing and development |
| SWMU 16-029(a), SWMU 16-029(b), SWMU 16-029(c), and SWMU 16-029(d): sumps | No, not associated with HE casting or plastics processing and development | No, none detected above background | Yes, four samples in outfall outside of building 16-307 detected uranium above background | No, not likely | Yes, metals associated with explosives development | Yes, solvents and chemicals were stored in rest houses 16-301, 16-303, 16-305, and 16-307 | Yes, PAHs are likely and may be associated with solvent and chemical storage | Yes, HE were stored in rest houses 16-301, 16-303, 16-305, and dissolved in solvents in 16-307 | Yes, due to its association with HE | Yes, due to its association with HE | No, none detected in previous samples and unlikely used during operations | No, not associated with HE casting or plastics processing and development |
| SWMU 16-026(z): area of potentially contaminated soil associated with an active outfall from building 16-306 | No, not associated with HE casting or plastics processing and development | No, none detected above background | No, concentrations detected but below background | No, not likely | Yes, metals associated with explosives development | Yes, solvents were used during processing in buildings 16,300, 16-302, 16-304, and 16-306 | Yes, PAHs are likely and may be associated with HE casting or plastics processing or development | Yes, HE were cast and processed in buildings 16-300, 16-302, 16-304, and 16-306 that drained into this area. | Yes, due to its association with HE | Yes, due to its association with HE | No, none detected in previous samples and unlikely used during operations | No, not associated with HE casting or plastics processing and development |
| Liquid waste trunk line extending from building 300 to building 306 | No, not associated with HE casting or plastics processing and development | No, none detected above background | No, concentrations detected but below background | No, not likely | Yes, metals associated with explosives development | Yes, solvents were used during processing in buildings 16,300, 16-302, 16-304, and 16-306 | Yes, PAHs are likely and may be associated with HE casting or plastics processing or development | Yes, HE were cast and processed in buildings 16-300, 16-302, 16-304, and 16-306 that drained into this area. | Yes, due to its association with HE | Yes, due to its association with HE | No, none detected in previous samples and unlikely used during operations | No, not associated with HE casting or plastics processing and development |
| Shared drainages | No, not associated with HE casting or plastics processing and development | Yes, concentrations detected on the west side of 300s Line | Yes, four samples in outfall outside of building 16-307 detected uranium above background | No, not likely | Yes, metals associated with explosives development | Yes, solvents were used during processing in buildings 16,300, 16-302, 16-304, and 16-306 | Yes, PAHs are likely and may be associated with HE casting or plastics processing or development | Yes, HE were cast and processed in buildings 16-300, 16-302, 16-304, and 16-306 that drained into this area. | Yes, due to its association with HE | Yes, due to its association with HE | No, none detected in previous samples and unlikely used during operations | No, not associated with HE casting or plastics processing and development |

**Table 4.0-4**
**V-Site Subaggregate Sampling Strategy**

| SWMU or AOC | Cyanide | Radionuclides | Uranium | Plutonium | TAL Metals | VOCs | SVOCs | HE | Perchlorate | Nitrate | Boron | Pesticides |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 16-013: former container storage area | Yes, associated with site operations | No, only uranium suspected or detected in historical samples | Yes, detected in historical samples | No, not likely | Yes, detected in historical samples | Yes, detected in nearby historical samples | Yes, detected in nearby historical samples | Yes, detected in historical samples | Yes, potential residual nitrate species | Yes, potential residual nitrate species | Yes, associated with site operations | No, not associated with site operations |
| SWMU 16-017(r)-99: site of former building used for varnishing operations and storage | Yes, associated with site operations | Only uranium suspected or detected in historical samples | Yes, associated with site operations | No, not likely | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | No, not associated with site operations | No, not associated with site operations |
| SWMU 16-017(s)-99: site of former building used for assembly operations and storage | Yes, associated with site operations | Only uranium suspected or detected in historical samples | Yes, associated with site operations | No, not likely | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, detected in nearby historical samples | No, not associated with site operations |
| AOC C-16-068: area of potentially contaminated soil associated with former building 16-522 | No, not associated with site operations | Only uranium suspected or detected in historical samples | Yes, detected in nearby historical samples | No, not likely | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in nearby historical samples | Yes, potential residual nitrate species | Yes, potential residual nitrate species | Yes, detected in nearby historical samples | No, not associated with site operations |
| AOC C-16-074: former drum storage area, stored HE-contaminated hydraulic oil | No, not associated with site operations | Only uranium suspected or detected in historical samples | Yes, detected in nearby historical samples | No, not likely | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in nearby historical samples | Yes, potential residual nitrate species | Yes, potential residual nitrate species | No, not associated with site operations | No, not associated with site operations |
| SWMU 16-006(h): former steam-heating distribution pump pit | No, not associated with site operations | Only uranium suspected or detected in historical samples | Yes, detected in historical samples | No, not likely | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in nearby historical samples | Yes, potential residual nitrate species | Yes, potential residual nitrate species | Yes, detected in nearby historical samples | No, not associated with site operations |
| SWMU 16-017(q)-99: former storage magazine | Yes, associated with site operations | Only uranium suspected | Yes, detected in nearby historical samples | No, not likely | Yes, detected in nearby historical samples | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations |
| SWMU 16-017(t)-99: building 16-516, originally housed a laboratory; later used for equipment storage | No, not associated with site operations | Only uranium suspected | Yes, detected in nearby historical samples | No, not likely | Yes, detected in nearby historical samples | Yes, associated with site operations | Yes, associated with site operations | Yes, detected in nearby historical samples | Yes, associated with site operations | Yes, associated with site operations | No, not associated with site operations | No, not associated with site operations |
| SWMU 16-029(g2): decommissioned concrete pit used in vibration tests | No, not associated with site operations | Only uranium suspected | Yes, detected in nearby historical samples | No, not likely | Yes, detected in nearby historical samples | Yes, associated with site operations | Yes, associated with site operations | Yes, detected in nearby historical samples | Yes, associated with site operations | Yes, associated with site operations | No, not associated with site operations | No, not associated with site operations |
| SWMU 16-029(x) : area of potentially contaminated soil associated with a former HE-processing building | Yes, associated with building 16-515 | No, only uranium detected in historical samples | Yes, detected in historical samples | No, not likely | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, potential residual nitrate species | Yes, potential residual nitrate species | Yes, detected in historical samples | Yes, detected in historical samples |
| SWMU 16-029(w): area of potentially contaminated soil associated with the former HE-sump, former drainline, and outfall of a former electroplating laboratory | Yes, associated with building 16-100 | Only uranium suspected or detected in historical samples | Yes, detected in historical samples | No, not likely | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, potential residual nitrate species | Yes, potential residual nitrate species | No, not associated with site operations | Yes, associated with site operations |
| SWMU 16-025(x) : area of potentially contaminated soil associated with a former HE-processing building | Yes, associated with building 16-100 | Only uranium suspected or detected in historical samples | Yes, detected in historical samples | No, not likely | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, associated with site operations | Yes, potential residual nitrate species | Yes, potential residual nitrate species | No, not associated with site operations | No, not associated with site operations |

**Table 4.0-4 (continued)**

| SWMU or AOC | Cyanide | Radionuclides | Uranium | Plutonium | TAL Metals | VOCs | SVOCs | HE | Perchlorate | Nitrate | Boron | Pesticides |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 16-006(g): former septic system | Yes, associated with building 16-515 | Only uranium suspected or detected in historical samples | Yes, detected in historical samples | No, not likely | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, associated with site operations | Yes, potential residual nitrate species | Yes, potential residual nitrate species | Yes, detected in historical samples | No, not associated with site operations |
| SWMU 16-031(c): drainline that received sanitary and industrial waste from a former HE-processing building 16-515 | Yes, associated with building 16-515 | Only uranium suspected | Yes, detected in historical samples | No, not likely | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, potential residual nitrate species | Yes, potential residual nitrate species | Yes, detected in historical samples | No, not associated with site operations |
| SWMU 16-017(v)-99: area of potentially contaminated soil associated with a former electroplating laboratory | Yes, associated with building 16-515 | Only uranium suspected | Yes, detected in nearby historical samples | No, not likely | Yes, detected in nearby historical samples | Yes, detected in nearby historical samples | Yes, detected in nearby historical samples | Yes, detected in nearby historical samples | Yes, potential residual nitrate species | Yes, potential residual nitrate species | Yes, detected in nearby historical samples | No, not associated with site operations |
| SWMU 16-017(p)-99: former storage magazine | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations | No, not likely | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, potential residual nitrate species | Yes, potential residual nitrate species | No, not likely | No, not associated with site operations |
| SWMU 16-017(w)-99: former storage magazine | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations | No, not likely | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, potential residual nitrate species | Yes, potential residual nitrate species | No, not likely | No, not associated with site operations |
| AOC 16-024(m): former HE storage magazine | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations | No, not likely | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, associated with site operations | Yes, potential residual nitrate species | No, not likely | No, not likely | No, not associated with site operations |
| AOC 16-024(n): former HE storage magazine | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations | No, not likely | Yes, associated with site operations | No, not detected in historical samples or associated with site operations | No, not detected in historical samples or associated with site operations | Yes, associated with site operations | Yes, potential residual nitrate species | No, not likely | No, not likely | No, not associated with site operations |
| SWMU 16-034(m): area of potentially contaminated soil associated with a former building (16-86) used for experimental HE research and development | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations | No, not likely | Yes, detected in historical samples | Yes, detected in historical samples | Yes, detected in historical samples | Yes, associated with site operations | Yes, potential residual nitrate species | No, not likely | No, not likely | No, not associated with site operations |
| SWMU 16-034(n): area of potentially contaminated soil associated with a former building (16-83) used for experimental HE research and development | No, not associated with site operations | No, not associated with site operations | No, not associated with site operations | No, not likely | Yes, detected in historical samples | Yes, associated with site operations | Yes, associated with site operations | Yes, associated with site operations | Yes, potential residual nitrate species | No, not likely | No, not likely | No, not associated with site operations |
| Drainages associated with the courtyard | Yes, associated with courtyard operations | Yes, associated with courtyard operations | Yes, associated with courtyard operations | No, not associated with courtyard operations | Yes, associated with courtyard operations | Yes, associated with courtyard operations | Yes, associated with courtyard operations | Yes, associated with courtyard operations | Yes, associated with HE | Yes, associated with HE | Yes, associated with courtyard operations | No, not associated with courtyard operations |

**Table 4.0-5**
**Extended Drainages Sampling Strategy**

| Drainage | Cyanide | Radionuclides | Uranium | Plutonium | TAL Metals | VOCs | SVOCs | HE | Perchlorate | Nitrate | Boron | Pesticides |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East from P-Site toward reach FL-1 | No, not associated with firing sites | Yes, polonium was a component of the initiator assemblies | Yes, devices tested at firing sites likely contained U and DU | No, not likely | Yes, various metals (Ba, Pb, and Be) associated with explosives, shrapnel and HE residues. | No, VOCs not likely following HE detonation. | No, not associated with explosive components | Yes, explosives contained HE compounds | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with firing site activities |
| South from P-Site toward reach SS-2 | Yes, associated with the WWTP | Yes, soil sample screening from NPDES-permitted outfall area detected Cs-137, Pu-329, Pu-240, and Pu-238 | No, not associated with sanitary sewer | Yes, detected in sludge drying beds | Yes, NPDES-permitted outfalls monitored for inorganic chemicals | Yes, likely due to operations at TA-16 | Yes, likely due to operations at TA-16 | Yes, likely due to operations at TA-16 | Yes, due to its association with explosives and TA-16 | Yes, due to its association with explosives and TA-16 | No, not likely | No, not associated with operations at TA-16 |

**Table 4.1-1**
**K-Site Subaggregate Proposed Sampling Description and Analyses**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA SW-846: 300) | Perchlorate (EPA SW-846: 6850) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 11-006(a):HE sump | Two sample below the bottom of the sump to determine the nature of potential contamination<br>Two samples in the drainage to determine if contaminants are present | 5.0–5.5[b]<br>10.0–10.5<br>0.0–0.5<br>5.5–6.0 | Soil, Tuff Sed | —[c] | x | x | x | x | x | x | x |
| SWMU 11-006(b): catch basin and associated outfall | Two sample below the bottom of the sump to determine the nature of potential contamination<br>Four samples in the drainage to determine if contaminants are present | 5.0–5.5<br>10.0–10.5<br>0.0–0.5<br>5.5–6.0 | Soil, Tuff Sed | — | x | x | x | x | x | x | x |
| SWMU 11-006(c): catch basin and associated outfall | Two sample below the bottom of the sump to determine the nature of potential contamination<br>Six samples in the drainage to determine if contaminants are present | 5.0–5.5<br>10.0–10.5<br>0.0–0.5<br>5.5–6.0 | Soil, Tuff Sed | — | x | x | x | x | x | x | x |
| SWMU 11-006(d): catch basin and associated outfall | Two sample below the bottom of the sump to determine the nature of potential contamination<br>Two samples in the drainage to determine if contaminants are present | 5.0–5.5<br>10.0–10.5<br>0.0–0.5<br>5.5–6.0 | Soil, Tuff Sed | — | x | x | x | x | x | x | x |
| SWMU 11-011(a) and SWMU 11-011(b): active outfalls | Two samples at each SWMU to determine the nature of potential contamination<br>Four samples downgradient of each SWMU within the drainage to determine if contaminants are present | 0.0–0.5<br>5.5–6.0 | Soil, Tuff Sed | — | x | x | x | x | x | x | x |

**Table 4.1-1 (continued)**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA SW-846: 300) | Perchlorate (EPA SW-846: 6850) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 11-005(a): active septic system | Two samples at the SWMU to determine the nature of potential contamination<br>Two samples downgradient of the SWMU within the drainage to determine if contaminants are present | 0.0–0.5<br>5.5–6.0 | Soil, Tuff Sed | x | x | x | x | x | x | x | x |
| SWMU 11-005(b): active septic system | Two samples at the SWMU to determine the nature of potential contamination<br>Two samples downgradient of the SWMU within the drainage to determine if contaminants are present | 0.0–0.5<br>5.5–6.0 | Soil, Tuff Sed | x | x | x | x | x | x | x | x |
| SWMU 11-005(c): inactive outfall (capped drainline) | Two samples at the SWMU to determine the nature of potential contamination<br>Four samples downgradient of the SWMU within the drainage to determine if contaminants are present | 0.0–0.5<br>5.5–6.0 | Soil, Tuff Sed | x | x | x | x | x | x | x | x |
| SWMU 11-011(d): active outfall associated with a building that houses offices and a light-machine shop | Two samples at the SWMU to determine the nature of potential contamination | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | x | x | x | x | x | x | x | x |
| AOC C-11-002: area of potential surface-soil contamination associated with a former building | Two samples at the SWMU to determine the nature of potential contamination<br>Four samples downgradient of the SWMU within the drainage to determine if contaminants are present | 0.0–0.5<br>5.5–6.0 | Soil, Tuff Sed | x | x | x | x | x | x | x | x |

[a] VOCs will not be included for surface samples.

[b] If contaminants are detected in the field-screening samples, then additional field-screening samples will be collected as described in section 4.0.

[c] — = Analysis is not required.

**Table 4.2-1**
**P-Site Subaggregate Proposed Sampling Description and Analyses**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Gamma-emitting Radionuclides (EPA 901.1) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA SW-846: 300) | Perchlorate (EPA SW-846: 6850) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 13-001 and SWMU 13-002: inactive firing site and “landfill” (debris disposal area) | "Bullseye" sampling grid to determine if contaminants are present and if a release has occurred | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | —[c] | — | — | x | x | x | x | x | x |
| SWMU 16-035: area of potential contamination associated with a control bunker | Located within the firing site bullseye sampling grid | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | — | — | x | — | — | x | x | x |
| SWMU 16-036: area of potential soil contamination associated with two bunkers | Located within the bullseye sampling grid | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | — | — | x | — | — | x | x | x |
| SWMU 16-004(a), SWMU 16-004(b), SWMU 16-004(c), SWMU 16-004(d), SWMU 16-004(e), and SWMU 16-004(f): former wastewater treatment plant | Biased sampling to determine if contaminants are present and if a release has occurred in the vicinity and/or downgradient of the structures | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | x | — | x | x | x | x | x | x |
| AOC 16-003(p) and SWMU 16-029(h): sump, drainlines, and outfall | Biased sampling to determine if contaminants are present and if a release has occurred and also included in the firing site bullseye sampling grid | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | — | x | x | x | x | x | x | x |
| SWMU 13-004: burning pits (unlocated) | Included in the firing site bullseye sampling grid to determine if contaminants are present and a release has occurred | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | x | x | x | x | x | x | x | x |

**Table 4.2-1 (continued)**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Gamma-emitting Radionuclides (EPA 901.1) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA SW-846: 300) | Perchlorate (EPA SW-846: 6850) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AOC 16-024(a) and AOC 16-024(u): areas of potentially contaminated soil associated with former HE magazines (removed) | Sampling around building footprint to determine if contaminants are present and if a release has occurred | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | — | — | x | — | — | x | x | x |
| SWMU 16-025(d2): area of potentially contaminated soil associated with a former mockup chamber (removed) | Sampling around former structure footprint to determine if contaminants are present and if a release has occurred | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | x | x | x | — | — | x | x | x |
| SWMU 16-031(h): area of potentially contaminated soil associated with the outfall from a utility room adjacent to a machine shop | Biased sampling to determine if contaminants are present and if a release has occurred and located within the firing site bullseye grid sampling | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | — | — | x | x | x | x | x | x |
| AOC C-16-050: former building | Sampling around building footprint to determine if contaminants are present and if a release has occurred | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | x | x | x | x | x | x | x | x |
| AOC C-16-060: area of potentially contaminated soil associated with a former storage building (removed) | Sampling around building footprint to determine if contaminants are present and if a release has occurred | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | x | x | x | x | x | x | x | x |

[a] VOCs will not be included for surface samples.

[b] If contaminants are detected in the field-screening samples, then additional field-screening samples will be collected as described in section 4.0.

[c] — = Analysis is not required.

**Table 4.3-1**
**300s Line Subaggregate Proposed Sampling Description and Analyses**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA SW-846: 300) | Perchlorate (EPA SW-846: 6850) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 16-001(e): associated dry well | Ten samples inside and around the perimeter of the dry well to define nature and extent of contamination | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | —[c] | x | x | x | x | x | x | x |
| SWMU 16-003(d), SWMU 16-003(e), SWMU 16-003(f), and SWMU 16-003(g): sumps | Two subsurface samples below each sump to define the nature of contamination and to determine if contaminants are migrating vertically | 5.0–5.5<br>10.5–11.0[b] | Soil, Tuff | — | — | x | x | x | x | x | x |
| SWMU 16-026(b), SWMU 16-026(c), SWMU 16-026(d), SWMU 16-026(e): outfalls | Twenty-two samples within the outfall areas to define nature and extent of contamination<br>Two 20-ft borings west of HE Road to determine the extent of contamination in the low-lying area | 0.0–0.5<br>5.5–6.0[b]<br>0.0–0.5<br>5.5–6.0<br>11.0–11.5<br>19.5–20.0[b] | Soil, Tuff | — | x | x | x | x | x | x | x |
| SWMU 16-029(a), SWMU 16-029(b), SWMU 16-029(c), and SWMU 16-029(e): sumps | Two subsurface samples below each sump to define the nature of contamination and to determine if contaminants are migrating vertically | 5.5–6.0<br>10.5–11.0[b] | Soil, Tuff | — | — | x | x | x | x | x | x |
| SWMU 16-026(z): area of potentially contaminated soil associated with an active outfall from building 16-306 | Eight samples in and around the SWMU to define nature and extent of contamination within the area of soil contamination and associated asphalt drainage | 0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | — | x | x | x | x | x | x |
| Liquid Waste Trunk Line | Twenty samples to define the nature of contamination along the line which runs from building 300 to building 306 west of HE Road | 0–0.5<br>5.5–6.0[b] | Soil, Tuff | — | — | x | x | x | x | x | x |

**Table 4.3-1 (continued)**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA SW-846: 300) | Perchlorate (EPA SW-846: 6850) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Shared drainages | Fourteen samples to define the nature of contamination in the drainages<br>One 20-ft boring east of HE Road below SWMU 16-001(e) to determine the nature and extent of contamination in the drainage | 0–0.5<br>5.5–6.0[b]<br>0.0–0.5<br>5.5–6.0<br>11.0–11.5<br>19.5–20.0[b] | Sed<br>Soil,<br>Tuff | — | x | x | x | x | x | x | x |

[a] VOCs will not be included for surface samples.

[b] If contaminants are detected in the field-screening samples, then additional field-screening samples will be collected as described in section 4.0.

[c] — = Analysis is not required.

**Table 4.4-1**
**V-Site Subaggregate Proposed Sampling Description and Analyses**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Gamma-emitting Radionuclides (EPA 901.1) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA Method 300) | Perchlorate (EPA SW-846: 6850) | Boron (EPA 212.3) | Pesticides (EPA SW-846: 8081A) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AOC C-16-068: potential soil contamination associated with former building 16-522 | Eight samples to define nature and extent of contamination | 0.0–0.5<br>5.5–6.0[b] | Soil, Tuff | —[c] | — | x | x | x | x | x | x | x | x | — |
| SWMU 16-006(h): former pit which contained a steam-heating distribution pump | Six samples to define nature and extent of contamination | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | — | — | x | x | x | x | x | x | x | x | — |
| SWMU 16-013: former container storage area, the courtyard | Twenty-eight samples | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | x | — | x | x | x | x | x | x | x | x | — |
| SWMU 16-017(q)-99: originally a laboratory, then equipment storage building | Six samples, one shared with SWMU 16-017(t) | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | x | — | x | x | — | — | — | — | — | — | — |
| SWMU 16-017(r)-99: former building used for varnishing operations and storage | Ten samples, two shared with SWMU 16-017(s) | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | x | — | x | x | x | x | x | x | x | — | — |
| SWMU 16-017(s)-99: former building used for assembly operations and storage | Ten samples, two shared with SWMU 16-017(r) | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | x | — | x | x | x | x | x | x | x | x | — |

**Table 4.4-1 (continued)**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Gamma-emitting Radionuclides (EPA 901.1) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA Method 300) | Perchlorate (EPA SW-846: 6850) | Boron (EPA 212.3) | Pesticides (EPA SW-846: 8081A) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 16-017(t)-99: building 16-516, originally a laboratory, then equipment storage, the historic high bay assembly building | Six samples, one shared with SWMU 16-017(q) and borehole to south | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | — | — | x | x | x | x | x | x | x | — | — |
| SWMU 16-029(g2) and AOC C-16-074: collocated decommissioned vibration pit and former drum storage area | 4 boreholes, one on either side of the structures | 5.5–6.0,<br>10.5–11.0,<br>15.5–16.0,<br>19.5–20.0 | Soil, Tuff | — | — | x | x | x | x | x | x | x | — | — |
| SWMU 16-017(v)-99: building 16-515, an HE processing building and electroplating laboratory | Eight samples will be collected around the concrete pad of building 16-515 | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | x | — | x | x | x | x | x | x | x | x | — |
| SWMU 16-025(x): building 16-100, an HE processing building and electroplating laboratory | Six samples will be collected around the building footprint to define extent of contamination | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | x | — | x | x | x | x | x | x | x | — | — |
| 16-029(x): former HE sumps, troughs, drainline, outfall and associated pond from building 16-515 and drainline from 16-100 | Thirty-four subsurface samples approximately every 100 ft along the former drainline to define extent of contamination | 11.5–12.0<br>16.5–17.0 | Soil, Tuff | x | — | x | x | x | x | x | x | x | X | x |
| SWMU 16-006(g): former sanitary septic system and drainline from building 16-515 | Four subsurface samples will be collected adjacent to the former drainline to define vertical and horizontal extent | 8.5–9.0<br>13.5–14.0 | Soil, Tuff | x | — | x | x | x | x | x | x | x | X | — |

**Table 4.4-1 (continued)**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Gamma-emitting Radionuclides (EPA 901.1) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA Method 300) | Perchlorate (EPA SW-846: 6850) | Boron (EPA 212.3) | Pesticides (EPA SW-846: 8081A) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 16-031(c): former sanitary and industrial drainline from building 16-515 | Eight samples adjacent to the former line to define the vertical and horizontal extent | 9.5–10.0<br>14.5–15.0 | Soil, Tuff | x | — | x | x | x | x | x | x | x | x | — |
| SWMU 16-029(w): former HE drainline from building 16-100 | Four subsurface samples adjacent to the former drainline [in the vicinity of the former building] to define vertical and horizontal extent | 7.5–8.0<br>12.5–13.0 | Soil, Tuff | x | — | x | x | x | x | x | x | x | — | x |
| | Four samples adjacent to the drainline [just prior to its connection to 16-029(x] to define vertical and horizontal extent | 11.0–11.5<br>16.5–17.0 | | | | | | | | | | | | |
| SWMU 16-017(p)-99 and SWMU 16-017(w)-99: former HE storage magazines | Ten samples at each site to further define extent of contamination | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | — | — | — | x | x | x | x | x | x | — | — |
| AOC 16-024(m): former HE storage magazine (previously sampled) | Eight samples around building footprint to further define extent | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | — | — | — | x | x | x | x | x | x | — | — |
| AOC 16-024(n): former HE storage magazine | Ten samples at site to further define extent of contamination | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | — | — | — | x | — | — | x | x | x | | — |

**Table 4.4-1 (continued)**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Gamma-emitting Radionuclides (EPA 901.1) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA Method 300) | Perchlorate (EPA SW-846: 6850) | Boron (EPA 212.3) | Pesticides (EPA SW-846: 8081A) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWMU 16-034(m) and SWMU 16-034(n): areas of potentially contaminated soil associated with former HE R&D buildings | Eight samples at each site to further define extent of contamination around building footprints | 0.0–0.5<br>5.5–6.0 | Soil, Tuff | — | — | — | x | x | x | x | x | x | — | — |
| Drainage north of the courtyard | Eight samples along a possible lower lying area adjacent to the courtyard to determine if a release has occurred | 0.0–0.5<br>5.5–6.0 | Soil | x | — | x | x | x | x | x | x | x | x | — |

[a] VOCs will not be included for surface samples.

[b] If contaminants are detected in the field-screening samples, then additional field-screening samples will be collected as described in section 4.0.

[c] — = Analysis is not required.

**Table 4.5-1**
**Extended Drainages Proposed Sampling Description and Analyses**

| Location Description | Sampling Justification | Depth (ft) | Media | Cyanide (EPA SW-846:9012A) | Uranium, Plutonium, or Americium (HASL-300) | TAL Metals (EPA SW-846: 6010B/6020) | VOCs (EPA SW-846: 8260B)[a] | SVOCs (EPA SW-846: 8270C) | HE (EPA SW-846: 8321A) | Anions Including Nitrate (EPA SW-846: 300) | Perchlorate (EPA SW-846: 6850) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| East from P-Site toward reach FL-1 | Three surface and three subsurface samples at three locations across two transects of the drainage to determine the nature and extent of potential contamination | 0.0–0.5<br>1.0–1.5 | Sed[b] | x | x | x | —[c] | — | x | x | x |
| South from P-Site toward reach SS-2 | Three surface and three subsurface samples at three locations across five transects of the drainage to determine the nature and extent of potential contamination | 0.0–0.5<br>1.0–1.5 | Sed | x | — | x | x | x | x | x | x |

[a] VOCs will not be included for surface samples.

[b] Sed = Sediment.

[c] — = Analysis is not required.

**Table 5.0-1**
**Summary of Investigation Methods**

| Method | Summary |
|---|---|
| Spade and Scoop Collection of Soil Samples | This method is typically used to collect shallow (e.g., approximately 0–12 in.) soil or sediment samples. The "spade-and-scoop" method involves digging a hole to the desired depth, as prescribed in the sampling and analysis plan, and collecting a discrete grab sample. The sample is typically placed in a clean, stainless-steel bowl for transfer into various sample containers. |
| Hand Auger Sampling | This method is typically used for sampling soil or sediment at depths of less than 10–15 ft but may in some cases be used for collecting samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4-in. inner diameter), creating a vertical hole which can be advanced to the desired sample depth. When the desired depth is reached, the auger is decontaminated before advancing the hole through the sample depth. The sample material is transferred from the auger bucket to a stainless-steel sampling bowl before filling the various required sample containers. |
| Split-Spoon Core-Barrel Sampling | In this method, a stainless-steel core barrel (typically 4-in. inner diameter, 2.5 ft long) is advanced using a powered drilling rig. The core barrel extracts a continuous length of soil and/or rock that can be examined as a unit. The split-spoon core barrel is a cylindrical barrel split lengthwise so that the two halves can be separated to expose the core sample. Once extracted, the section of core is typically screened for radioactivity and organic vapors, photographed, and described in a geologic log. A portion of the core may then be collected as a discrete sample from the desired depth. |
| Headspace Vapor Screening | Individual soil, rock, or sediment samples may be field-screened for VOCs by placing a portion of the sample in a plastic sample bag or in a glass container with a foil-sealed cover. The container is sealed and gently shaken and allowed to equilibrate for 5 minutes. The sample is then screened by inserting a PID probe into the container and measuring and recording any detected vapors. Photoionization detectors must use lamps with voltage of 10.6 eV or higher. |
| Handling, Packaging, and Shipping of Samples | Field team member seal and label samples before packing and ensure that the sample containers and the containers used for transport are free of external contamination. Field team members package all samples so as to minimize the possibility of breakage during transportation. After all environmental samples are collected, packaged, and preserved; a field team member transports the samples to either the SMO or an SMO-approved radiation screening laboratory under chain of custody. The SMO arranges for shipping of samples to analytical laboratories. The field team member must inform the SMO and/or the radiation screening laboratory coordinator when levels of radioactivity are in the action-level or limited-quantity ranges. |
| Sample Control and Field Documentation | The collection, screening, and transport of samples are documented on standard forms generated by the SMO. These include sample collection logs, chain-of-custody forms, and sample container labels. Collection logs are completed at the time of sample collection and are signed by the sampler and a reviewer who verifies the logs for completeness and accuracy. Corresponding labels are initialed and applied to each sample container, and custody seals are placed around container lids or openings. Chain-of-custody forms are completed and assigned to verify that the samples are not left unattended. Site attributes (e.g., former and proposed soil sampling locations, sediment sampling locations) are located by using a global positioning system. Horizontal locations will be measured to the nearest 0.5 ft. The survey results for this field event will be presented as part of the investigation report. Sample coordinates will be uploaded into the Environmental Restoration Database. |

**Table 5.0-1 (continued)**

| Method | Summary |
|---|---|
| Field Quality Control Samples | Field quality control samples are collected as directed in the Order on Consent as follows:<br>*Field Duplicate*: At a frequency 10%; collected at the same time as a regular sample and submitted for the same analyses.<br>*Equipment Rinsate Blank*: At a frequency of 10%; collected by rinsing sampling equipment with deionized water, which is collected in a sample container and submitted for laboratory analysis.<br>*Trip Blanks*: Required for all field events that include the collection of samples for VOC analysis. Trip blanks containers of certified clean sand that are opened and kept with the other sample containers during the sampling process. |
| Field Decontamination of Drilling and Sampling Equipment | Dry decontamination is the preferred method to minimize generating liquid waste. Dry decontamination may include the use of a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by use of a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes. Dry decontamination may be followed by wet decontamination if necessary. Wet decontamination may include washing with a nonphosphate detergent and water, followed by a water rinse and a second rinse with deionized water. Alternatively, steam cleaning may be used. |
| Containers and Preservation of Samples | Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample are printed on the sample collection logs provided by the sample management office (size and type of container (glass, amber glass, polyethylene, preservative, etc.). All samples are preserved by placing in insulated containers with ice to maintain a temperature of 4˚C. Other requirements such as nitric acid or other preservatives may apply to different media or analytical requests. |
| Management, Characterization, and Storage of Investigation-Derived Waste | Investigation-derived waste is managed, characterized, and stored in accordance with an approved waste characterization strategy form that documents site history, field activities, and the characterization approach for each waste stream managed. Waste characterization shall be adequate to comply with on-site or off-site waste acceptance criteria. All stored IDW will be marked with appropriate signage and labels, as appropriate. Drummed IDW will be stored on pallets to prevent the containers from deterioration. Generators are required to reduce the volume of waste generated as much as technically and economically feasible. Means to store, control, and transport each potential waste type and classification shall be determined before field operations that generate waste begin A waste storage area shall be established before generating waste. Waste storage areas located in controlled areas of the laboratory shall be controlled as needed to prevent inadvertent addition or management of wastes by unauthorized personnel. Each container of waste generated shall be individually labeled as to waste classification, item identification number, and radioactivity (if applicable), immediately following containerization. All waste shall be segregated by classification and compatibility to prevent cross-contamination. See Appendix B for additional information. |
| Geodetic Surveys | This method describes the methodology for coordinating and evaluating geodetic surveys and establishing QA and QC for geodetic survey data. The procedure covers evaluating geodetic survey requirements, preparing to perform a geodetic survey, performing geodetic survey field activities, preparing geodetic survey data for QA review, performing QA review of geodetic survey data, and submitting geodetic survey data. |
| Hollow Stem Auger Drilling Methods | In this method, hollow-stem augers (sections of seamless pipe with auger flights welded to the pipe) act as a screw conveyor to bring cuttings of sediment, soil, and/or rock to the surface. Auger sections are typically 5 ft in length and have outside diameters of 4.25 to 14 in. Drill rods, split-spoon core barrels, Shelby tubes, and other samplers can pass through the center of the hollow-stem auger sections for collection of discrete samples from desired depths. Hollow-stem augers are used as temporary casings when setting wells to prevent cave-ins of the borehole walls. |

**Table 5.0-1 (continued)**

| Method | Summary |
|---|---|
| Field-Portable X-Ray Fluorescence Instrumentation | This method describes the process for operating and using the Spectrace 9000 field-portable XRF analyzer to screen for hazardous or potentially hazardous inorganic materials. The data that are generated allow for rapid evaluation of the extent of contamination. Samples are analyzed for elements of atomic number 13 (aluminum) through 92 (uranium), with proper x-ray source selection and instrument calibration. Environmental applications include measuring elemental metals in soil and on filters and measuring lead in paint. |
| Gross Gamma Radiation Scoping Surveys | This method describes the process for performing and documenting gross gamma radiation scoping surveys in buildings and soil. Scoping surveys are conducted after an assessment of the site history is completed and consist of judgmental measurements based on historical site information and data. If the scoping survey locates contamination, a characterization survey is typically performed. |

**Table 5.3-1**
**Analytical Methods for Chemical Analyses**

| Analytical Method | Analytical Description | Analytical Suite |
|---|---|---|
| **Inorganic Methods** | | |
| EPA Method 300 | Ion chromatography | Anions (nitrates) |
| EPA SW-846: 6850 | Liquid chromatography/mass spectrometry | Perchlorate |
| EPA SW-846: 9012A | Colorimetric | Cyanide |
| EPA SW-846: 6010B/6020 | Inductively coupled plasma emission spectrometry—atomic emission spectroscopy | Aluminum, antimony, arsenic, barium, beryllium, boron, calcium, cadmium, cobalt, chromium, copper, iron, lead, lithium, magnesium, manganese, nickel, potassium, selenium, silicon, sodium, silver, thallium, titanium, uranium, vanadium, and zinc |
| EPA 212.3 | Colorimetric | Boron |
| EPA SW-846:7471A | Cold vapor atomic absorption | Mercury |
| **Organic Methods** | | |
| EPA SW-846:8330 | High performance liquid chromatography | Explosives |
| EPA SW-846:8270C | Gas chromatograph/ mass spectrometry | SVOCs |
| EPA SW-846:8260B | Gas chromatograph/ mass spectrometry | VOCs |
| EPA SW-846:8081A | Gas chromatograph | Organochlorinated pesticides |
| **Radionuclide Methods** | | |
| EPA 901.1 | Gamma spectroscopy | Gamma-emitting radionuclides (e.g., cesium-137) |
| HASL-300 | Chemical separation/alpha spectroscopy | Isotopic plutonium, isotopic uranium, americium-241 |

# Appendix A

*Acronyms and Abbreviations, Glossary,*
*Metric Conversion Table, and Data Qualifier Definitions*

## A-1.0 ACRONYMS

| | |
|---|---|
| AK | acceptable knowledge |
| AOC | area of concern |
| bgs | below ground surface |
| BV | background value |
| D&D | decontamination and decommissioning |
| DDT | dichlorodiphenyltrichloroethane |
| DNT | dinitrotoluene |
| DOE | Department of Energy [U.S.] |
| DOT | Department of Transportation [U.S.] |
| dpm | disintegration(s) per minute |
| DU | depleted uranium |
| EP | Environmental Programs |
| EPA | Environmental Protection Agency [U.S.] |
| HE | high explosives |
| HIR | historical investigation report |
| HMX | high-melting explosive [also 1,3,5,7-tetranitro-1,3,5,7-tetrazocine] |
| HWFP | Hazardous Waste Facility Permit |
| LANL | Los Alamos National Laboratory |
| LASL | Los Alamos Scientific Laboratory (Laboratory's name before January 1, 1981) |
| LIR | Laboratory implementation requirements |
| MDA | material disposal area |
| NFA | no further action |
| NMED | New Mexico Environment Department [before 1991: New Mexico Environmental Improvement (NMEID) Division] |
| NPDES | National Pollutant Discharge Elimination System |
| PAH | polycyclic aromatic hydrocarbon |
| PCB | polychlorinated biphenyl |
| PCE | perchloroethylene |
| PID | photoionization detector |
| PPE | personal protective equipment |
| ppm | part per million |
| QA | quality assurance |

| | |
|---|---|
| QC | quality control |
| RCRA | Resource Conservation and Recovery Act |
| RDX | research department explosive [also hexahydro-1,3,5-trinitro-1,3,5-triazine] |
| RFI | RCRA facility investigation |
| SMO | Sample Management Office |
| SOP | standard operating procedure |
| SSL | soil screening level |
| SVOC | semivolatile organic compound |
| SWMU | solid waste management unit |
| SWSC | Sanitary Wastewater Systems Consolidation |
| TA | technical area |
| TAL | target analyte list [EPA] |
| TCE | trichloroethylene |
| TCLP | toxicity characteristic leaching procedure |
| TDS | total dissolved solids |
| TNT | 2,4,6-trinitrotoluene |
| VCM | voluntary corrective measure |
| VCP | vitrified clay pipe |
| VOC | volatile organic compound |
| WAC | waste acceptance criteria |
| WCSF | waste characterization strategy form |
| WWTP | wastewater treatment plant |
| XRF | x-ray fluorescence |

## A-2.0 GLOSSARY

**aggregate**—At the Los Alamos National Laboratory, an area within a *watershed* containing solid waste management units (SWMUs) and/or areas of concern (AOCs), and the media affected or potentially affected by releases from those SWMUs and/or AOCs. Aggregates are designated to promote efficient and effective corrective action activities.

**aquifer**—An underground geological formation (or group of formations) containing water that is the source of groundwater for wells and springs.

**area of concern—**(1) A release that may warrant investigation or remediation and is not a solid waste management unit (SWMU). (2) An area at Los Alamos National Laboratory that may have had a release of a hazardous waste or a hazardous constituent but is not a SWMU.

**analysis**—A critical evaluation, usually made by breaking a subject (either material or intellectual) down into its constituent parts, then describing the parts and their relationship to the whole. Analyses may

include physical analysis, chemical analysis, toxicological analysis, and knowledge-of-process determinations.

**analyte**—The element, nuclide, or ion a chemical analysis seeks to identify and/or quantify; the chemical constituent of interest.

**analytical method**—A procedure or technique for systematically performing an activity.

**background level**—(1) The concentration of a substance in an environmental medium (air, water, or soil) that occurs naturally or is not the result of human activities. (2) In exposure assessment, the concentration of a substance in a defined control area over a fixed period of time before, during, or after a data-gathering operation.

**background value (BV)**—A statistically derived concentration (i.e., the upper tolerance limit [UTL]) of a chemical used to represent the background data set. If a UTL cannot be derived, either the detection limit or maximum reported value in the background data set is used.

**canyon**—A stream-cut chasm or gorge, the sides of which are composed of cliffs or a series of cliffs rising from the chasm's bed. Canyons are characteristic of arid or semiarid regions where downcutting by streams greatly exceeds weathering.

**catchment**—(1) A structure, such as a basin or reservoir, used for collecting or draining water. (2) The amount of water collected in such a structure. (3) A catching or collecting of water, especially rainwater.

**chemical**—Any naturally occurring or human-made substance characterized by a definite molecular composition.

**chemical of potential concern (COPC)**—A detected chemical compound or element that has the potential to adversely affect human receptors as a result of its concentration, distribution, and toxicity.

**cleanup**—A series of actions taken to deal with the release, or threat of a release, of a hazardous substance that could affect humans and/or the environment. The term cleanup is sometimes used interchangeably with the terms remedial action, removal action, or corrective action.

**Compliance Order on Consent (Consent Order)**—For the Environmental Remediation and Surveillance Program, an enforcement document signed by the New Mexico Environment Department, the U.S. Department of Energy, and the Regents of the University of California on March 1, 2005, which prescribes the requirements for corrective action at Los Alamos National Laboratory. The purposes of the Consent Order are (1) to define the nature and extent of releases of contaminants at, or from, the facility; (2) to identify and evaluate, where needed, alternatives for corrective measures to clean up contaminants in the environment and prevent or mitigate the migration of contaminants at, or from, the facility; and (3) to implement such corrective measures. The Consent Order supersedes the corrective action requirements previously specified in Module VIII of the Laboratory's Hazardous Waste Facility Permit.

**Consent Order**—See Compliance Order on Consent.

**consolidated unit**—A group of solid waste management units (SWMUs), or SWMUs and areas of concern, which generally are geographically proximate and have been combined for the purposes of investigation, reporting, or remediation.

**contaminant**—(1) Chemicals and radionuclides present in environmental media or on debris above background levels. (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any hazardous waste listed or identified as characteristic in 40 Code of Federal Regulations (CFR) 261 (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]); any hazardous

constituent listed in 40 CFR 261 Appendix VIII (incorporated by 20.4.1.200 NMAC) or 40 CFR 264 Appendix IX (incorporated by 20.4.1.500 NMAC); any groundwater contaminant listed in the Water Quality Control Commission (WQCC) Regulations at 20.6.3.3103 NMAC; any toxic pollutant listed in the WQCC Regulations at 20.6.2.7 NMAC; explosive compounds; nitrate; and perchlorate. (Note: Under the Consent Order, the term "contaminant" does not include radionuclides or the radioactive portion of mixed waste.)

**corrective action**—(1) In the Resource Conservation and Recovery Act, an action taken to rectify conditions potentially adverse to human health or the environment. (2) In the quality assurance field, the process of rectifying and preventing nonconformances.

**data validation**—A systematic process that applies a defined set of performance-based criteria to a body of data and that may result in the qualification of the data. The data-validation process is performed independently of the analytical laboratory that generates the data set and occurs before conclusions are drawn from the data. The process may include a standardized data review (routine data validation) and/or a problem-specific data review (focused data validation).

**decommissioning**—The permanent removal of facilities and their components from service after the discontinued use of structures or buildings that are deemed no longer useful. Decommissioning must take place in accordance with regulatory requirements and applicable environmental policies.

**decontamination**—The removal of unwanted material from the surface of, or from within, another material.

**detect (detection)**—An analytical result, as reported by an analytical laboratory, that denotes a chemical or radionuclide to be present in a sample at a given concentration.

**detection limit**—The minimum concentration that can be determined by a single measurement of an instrument. A detection limit implies a specified statistical confidence that the analytical concentration is greater than zero.

**discharge**—The accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of hazardous waste into, or on, any land or water.

**disposal**—The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into, or on, any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.

**effluent**—Wastewater (treated or untreated) that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters.

**Environmental Restoration (ER) Project**—A Los Alamos National Laboratory project established in 1989 as part of a U.S. Department of Energy nationwide program, and precursor of today's Environmental Remediation and Surveillance (ERS) Program. This program is designed (1) to investigate hazardous and/or radioactive materials that may be present in the environment as a result of past Laboratory operations, (2) to determine if the materials currently pose an unacceptable risk to human health or the environment, and (3) to remediate (clean up, stabilize, or restore) those sites where unacceptable risk is still present.

**facility**—All contiguous land (and structures, other appurtenances, and improvements on the land) used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units. For the purpose of implementing a corrective action, a facility is all the contiguous property that is under the control of the owner or operator seeking a permit under Subtitle C of the Resource Conservation and Recovery Act.

**groundwater**—Interstitial water that occurs in saturated earth material and is capable of entering a well in sufficient amounts to be used as a water supply.

**Hazardous and Solid Waste Amendments (HSWA)**—Public Law No. 98-616, 98 Stat. 3221, enacted in 1984, which amended the Resource Conservation and Recovery Act of 1976 (42 United States Code § 6901 et seq).

**hazardous constituent (hazardous waste constituent)**—According to the March 1, 2005, Compliance Order of Consent (Consent Order), any constituent identified in Appendix VIII of Part 261, Title 40 Code of Federal Regulations (CFR) (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]) or any constituent identified in 40 CFR 264, Appendix IX (incorporated by 20.4.1.500 NMAC).

**Hazardous Waste Facility Permit**—The authorization issued to Los Alamos National Laboratory (the Laboratory) by the New Mexico Environment Department that allows the Laboratory to operate as a hazardous waste treatment, storage, and disposal facility.

**HSWA module**—See Module VIII.

**infiltration**—(1) The penetration of water through the ground surface into subsurface soil. (2) The technique of applying large volumes of wastewater to land to penetrate the surface and percolate through the underlying soil.

**intermittent stream**—A stream that flows only in certain reaches as a result of the channel bed's losing and gaining characteristics.

**laboratory control sample (LCS)**—A known matrix that has been spiked with compound(s) representative of target analytes. LCSs are used to document laboratory performance, and the acceptance criteria for LCSs are method-specific.

**LANL (Los Alamos National Laboratory) data validation qualifiers**—The Los Alamos National Laboratory data qualifiers which are defined by, and used, in the Environmental Remediation and Surveillance (ERS) Program validation process. The qualifiers describe the general usability (or quality) of data. For a complete list of data qualifiers applicable to any particular analytical suite, consult the appropriate ERS standard operating procedure.

**material disposal area (MDA)**—A subset of the solid waste management units at Los Alamos National Laboratory (the Laboratory) that include disposal units such as trenches, pits, and shafts. Historically, various disposal areas (but not all) were designated by the Laboratory as MDAs.

**matrix spike**—An aliquot of a sample to which a known concentration of target analyte has been added. Matrix spike samples are used to measure the ability to recover prescribed analytes from a native sample matrix. The spiking typically occurs before sample preparation and analysis.

**medium (environmental)**—Any material capable of absorbing or transporting constituents. Examples of media include tuffs, soils and sediments derived from these tuffs, surface water, soil water, groundwater, air, structural surfaces, and debris.

**method detection limit (MDL)**—The minimum concentration of a substance that can be measured and reported with a known statistical confidence that the analyte concentration is greater than zero. After subjecting samples to the usual preparation, the MDL is determined by analyzing those samples of a given matrix type that contain the analyte. The MDL is used to establish detection status.

**migration**—The movement of inorganic and organic chemical species through unsaturated or saturated materials.

**migration pathway**—A route (e.g., a stream or subsurface flow path) for the potential movement of contaminants to environmental receptors (plants, humans, or other animals).

**model**—A schematic description of a physical, biological, or social system, theory, or phenomenon that accounts for its known or inferred properties and may be used for the further study of its characteristics.

**Module VIII**—Module VIII of the Los Alamos National Laboratory (the Laboratory) Hazardous Waste Facility Permit. This permit allows the Laboratory to operate as a hazardous-waste treatment, storage, and disposal facility. From 1990 to 2005, Module VIII included requirements from the Hazardous and Solid Waste Amendments. These requirements have been superceded by the March 1, 2005, Compliance Order on Consent (Consent Order).

**National Pollutant Discharge Elimination System**—The national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits to discharge wastewater or storm water, and for imposing and enforcing pretreatment requirements under the Clean Water Act.

**no further action**—Under the Resource Conservation and Recovery Act, a corrective-action determination whereby, based on evidence or risk, no further investigation or remediation is warranted.

**operable units (OUs)**—At Los Alamos National Laboratory, 24 areas originally established for administering the Environmental Remediation and Surveillance Program. Set up as groups of potential release sites, the OUs were aggregated according to geographic proximity for the purposes of planning and conducting Resource Conservation and Recovery Act (RCRA) facility assessments and RCRA facility investigations. As the project matured, it became apparent that there were too many areas to allow efficient communication and to ensure consistency in approach. In 1994, the 24 OUs were reduced to 6 administrative field units.

**outfall**—A place where effluent is discharged into receiving waters.

**permit**—An authorization, license, or equivalent control document issued by the U.S. Environmental Protection Agency or an approved state agency to implement the requirements of an environmental regulation.

**polychlorinated biphenyls (PCBs)**—Any chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees, or any combination that contains such substances. PCBs are colorless, odorless compounds that are chemically, electrically, and thermally stable and have proven to be toxic to both humans and other animals.

**quality assurance/quality control**—A system of procedures, checks, audits, and corrective actions set up to ensure that all U.S. Environmental Protection Agency research design and performance, environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality.

**radiation**—A stream of particles or electromagnetic waves emitted by atoms and molecules of a radioactive substance as a result of nuclear decay. The particles or waves emitted can consist of neutrons, positrons, alpha particles, beta particles, or gamma radiation.

**radioactive material**—For purposes of complying with U.S. Department of Transportation regulations, any material having a specific activity (activity per unit mass of the material) greater than 2 nanocuries per gram (nCi/g) and in which the radioactivity is evenly distributed.

**radionuclide**—Radioactive particle (human-made or natural) with a distinct atomic weight number.

**RCRA facility investigation (RFI)**—A Resource Conservation and Recovery Act (RCRA) investigation that determines if a release has occurred and characterizes the nature and extent of contamination at a hazardous waste facility. The RFI is generally equivalent to the remedial investigation portion of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

**regional aquifer**—Geologic material(s) or unit(s) of regional extent whose saturated portion yields significant quantities of water to wells, contains the regional zone of saturation, and is characterized by the regional water table or potentiometric surface.

**release**—Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of hazardous waste or hazardous constituents into the environment.

**Resource Conservation and Recovery Act**—The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (Public Law [PL] 94-580, as amended by PL 95-609 and PL 96-482, United States Code 6901 et seq.).

**runoff**—The portion of the precipitation on a drainage area that is discharged from the area.

**run-on**—Surface water that flows onto an area as a result of runoff occurring higher up on a slope.

**sample**—A portion of a material (e.g., rock, soil, water, or air), which, alone or in combination with other portions, is expected to be representative of the material or area from which it is taken. Samples are typically either sent to a laboratory for analysis or inspection or are analyzed in the field. When referring to samples of environmental media, the term field sample may be used.

**sediment**—(1) A mass of fragmented inorganic solid that comes from the weathering of rock and is carried or dropped by air, water, gravity, or ice. (2) A mass that is accumulated by any other natural agent and that forms in layers on the earth's surface (e.g., sand, gravel, silt, mud, fill, or loess). (3) A solid material that is not in solution and is either distributed through the liquid or has settled out of the liquid.

**site characterization**—Defining the pathways and methods of migration of hazardous waste or constituents, including the media affected; the extent, direction and speed of the contaminants; complicating factors influencing movement; or concentration profiles.

**soil**—(1) A material that overlies bedrock and has been subject to soil-forming processes. (2) A sample media group that includes naturally occurring and artificial fill materials.

**solid waste management unit (SWMU)**—(1) Any discernible site at which solid wastes have been placed at any time, whether or not the site use was intended to be the management of solid or hazardous waste. SWMUs include any site at a facility at which solid wastes have been routinely and systematically released. This definition includes regulated sites (i.e., landfills, surface impoundments, waste piles, and land treatment sites), but does not include passive leakage or one-time spills from production areas and sites in which wastes have not been managed (e.g., product storage areas). (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any discernible site at which solid waste has been placed at any time, and from which the New Mexico Environment Department determines there may be a risk of a release of hazardous waste or hazardous waste constituents (hazardous constituents), whether or not the site use was intended to be the management of solid or hazardous waste. Such sites include any area in Los Alamos National Laboratory at which solid wastes have been routinely and systematically released; they do not include one-time spills.

**split-spoon sampler**—A hollow, tubular sampling device below a drill stem that is driven by a weight to retrieve soil samples. The core barrel can be opened to remove samples. This is a sampling method commonly used with auger drilling. The split-spoon sampler can be driven into the ground or can be advanced inside hollow-stem augers.

**standard operating procedure**—A document that details the officially approved method(s) for an operation, analysis, or action, with thoroughly prescribed techniques and steps.

**surface sample**—A sample taken at a collection depth that is (or was) representative of the medium's surface during the period of investigative interest. A typical depth interval for a surface sample is 0 to

6 in. for mesa-top locations, but may be up to several feet in sediment-deposition areas within canyons.

**target analyte**—A chemical or parameter, the concentration, mass, or magnitude of which is designed to be quantified by a particular test method.

**technical area (TA)**—At Los Alamos National Laboratory, an administrative unit of operational organization (e.g., TA-21).

**topography**—The physical or natural features of an object or entity and their structural relationships.

**transport (transportation)**—(1) The movement of a hazardous waste by air, rail, highway, or water. (2) The movement of a contaminant from a source through a medium to a receptor.

**tuff**—Consolidated volcanic ash, composed largely of fragments produced by volcanic eruptions.

**U.S. Department of Energy**—The federal agency that sponsors energy research and regulates nuclear materials for weapons production.

**U.S. Environmental Protection Agency (EPA)**—The federal agency responsible for enforcing environmental laws. Although state regulatory agencies may be authorized to administer some of this responsibility, EPA retains oversight authority to ensure the protection of human health and the environment.

**vadose zone**—The zone between the land surface and the water table within which the moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric. Soil pore space also typically contains air or other gases. The capillary fringe is included in the vadose zone.

## A-3.0 METRIC CONVERSION TABLE

| Multiply SI (Metric) Unit | by | To Obtain U.S. Customary Unit |
|---|---|---|
| kilometers (km) | 0.622 | miles (mi) |
| kilometers (km) | 3281 | feet (ft) |
| meters (m) | 3.281 | feet (ft) |
| meters (m) | 39.37 | inches (in.) |
| centimeters (cm) | 0.03281 | feet (ft) |
| centimeters (cm) | 0.394 | inches (in.) |
| millimeters (mm) | 0.0394 | inches (in.) |
| micrometers or microns (µm) | 0.0000394 | inches (in.) |
| square kilometers ($km^2$) | 0.3861 | square miles ($mi^2$) |
| hectares (ha) | 2.5 | acres |
| square meters ($m^2$) | 10.764 | square feet ($ft^2$) |
| cubic meters ($m^3$) | 35.31 | cubic feet ($ft^3$) |
| kilograms (kg) | 2.2046 | pounds (lb) |
| grams (g) | 0.0353 | ounces (oz) |
| grams per cubic centimeter ($g/cm^3$) | 62.422 | pounds per cubic foot ($lb/ft^3$) |
| milligrams per kilogram (mg/kg) | 1 | parts per million (ppm) |
| micrograms per gram (µg/g) | 1 | parts per million (ppm) |
| liters (L) | 0.26 | gallons (gal.) |
| milligrams per liter (mg/L) | 1 | parts per million (ppm) |
| degrees Celsius (°C) | 9/5 + 32 | degrees Fahrenheit (°F) |

## A-4.0 DATA QUALIFIER DEFINITIONS

| Qualifier | Explanation |
|---|---|
| U | The analyte was analyzed for but not detected. Reported value is the sample-specific EQL or detection limit. |
| J | The reported value should be regarded as estimated. |
| J+ | The reported value should be regarded as estimated and biased high. |
| J- | The reported value should be regarded as estimated and biased low. |
| UJ | The analyte was analyzed for but not detected. Reported value is an estimate of the sample-specific quantitation limit or detection limit. |
| R | The sample results were rejected because of serious deficiencies in the ability to analyze the sample and meet quality control criteria; presence or absence cannot be verified. |

# Appendix B

*Management Plan for Investigation-Derived Waste*

## B-1.0 INTRODUCTION

This appendix describes the management of investigation-derived waste (IDW) generated during the investigation and remediation of sites comprising the S-Site Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). The waste generated during field-investigation activities may include, but is not limited to, drill cuttings; contaminated soil; contaminated personal protective equipment (PPE), sampling supplies, and plastic; fluids from the decontamination of PPE and sampling equipment; and all other waste that has potentially come into contact with contaminants.

## B-2.0 INVESTIGATION-DERIVED WASTE

All IDW generated during the S-Site Aggregate Area field-investigation activities will also be managed in accordance with applicable standard operating procedures (SOPs). These SOPs incorporate the requirements of all applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy (DOE) orders, and Laboratory implementation requirements (LIRs). Two SOPs are applicable to the characterization and management of IDW:

- SOP-01.06, Management of Environmental Restoration Project Waste, and
- SOP-01.10, Waste Characterization.

These SOPs are available at http://www.lanl.gov/environment/all/qa.shtml.

All IDW wastes will be placed in a hazardous waste accumulation area until they are characterized and found not be hazardous.

Investigation activities will be conducted in a manner that minimizes the generation of waste. Waste minimization will be accomplished by implementing the requirements of the Environmental Programs Directorate's portion of the "Los Alamos National Laboratory Hazardous Waste Minimization Report" (LANL 2006, 096015). This report is updated annually to meet a requirement of Module VIII of the Laboratory's Hazardous Waste Facility Permit, which was issued by the EPA on May 23, 1990, and modified on May 19, 1994 (EPA 1990, 001585; EPA 1994, 044146).

The waste streams that will be generated and managed during the field investigation at the S-Site Aggregate Area sites are described below.

### B-2.1 Drill Cuttings

The drill cuttings waste stream will consist of cuttings from boreholes that will be drilled in, and around, S-Site Aggregate Area sites. Drill cuttings will be collected and placed in containers at a hazardous waste accumulation area until they are characterized and found not be hazardous. The drill cuttings waste stream will be characterized using analytical results from core samples and augmented by direct sampling of the containerized cuttings, if necessary. Potential contaminants of concern include radionuclides, inorganic chemicals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and high explosives (HE). The maximum detected concentrations of radionuclides will be compared with the background or fallout values. If the maximum concentrations exceed these values, the drill cuttings will be designated as low-level radioactive waste. Maximum concentrations of toxicity characteristic leaching procedure (TCLP) constituents will be compared with 20 times the TCLP regulatory level. If the concentrations are less than 20 times the regulatory level, the drill cuttings will be designated as

nontoxicity characteristic nonhazardous waste. If the concentrations exceed 20 times the regulatory level, the drill cuttings will be sampled and analyzed using the TCLP to determine whether it is a toxicity characteristic hazardous (or mixed) waste. Based on the results of previous investigations, the Laboratory expects the majority of these drill cuttings to be designated as nonhazardous, nonradioactive waste that will be either used for cover material at Technical Area (TA) 54 or disposed of at an off-site disposal facility permitted for the disposal of industrial waste. Potentially, some drill cuttings may be designated as low-level radioactive or mixed waste at several of the sites because of the presence of depleted uranium, metals, and/or HE. Low-level waste will be disposed of on-site at TA-54 or off-site at a licensed facility. Mixed waste will be sent to an off-site facility permitted for treating and/or disposing of mixed waste. If the concentration of HE in the waste characterizes it as detonable, the waste would be treated by open burning or open detonation on-site to remove the reactivity characteristic of HE. It will then be sent to an off-site facility for further treatment, if needed, or disposal.

### B-2.2 Soil

Soil will be placed into containers appropriate to the waste volume generated (drums and/or rolloff containers), secured, and temporarily stored at a hazardous waste accumulation area until it is characterized and found not be hazardous. Potential contaminants of concern include radionuclides, inorganic chemicals, VOCs, SVOCs, and HE. The maximum detected concentrations of radionuclides will be compared with the background or fallout values. If the maximum concentrations exceed these values, the soil will be designated as low-level radioactive waste. Maximum concentrations of TCLP constituents will be compared with 20 times the TCLP regulatory level. If the concentrations are less than 20 times the regulatory level, the soil will be designated as nontoxicity characteristic nonhazardous waste. If the concentrations exceed 20 times the regulatory level, the soil will be sampled and analyzed using the TCLP to determine whether it is a toxicity characteristic hazardous (or mixed) waste. Based on the results of previous investigations, the Laboratory expects this waste to be designated as nonhazardous, nonradioactive waste that will be either used for cover material at TA-54 or disposed of at an off-site disposal facility permitted for the disposal of industrial waste. Potentially, some soil may be designated as low-level radioactive or mixed waste at several sites because of the presence of depleted uranium, metals, and/or HE. Low-level waste will be disposed of on-site at TA-54 or off-site at a licensed facility. Mixed waste will be sent to an off-site facility permitted for the treatment and/or disposal of mixed waste. If the concentration of HE in the waste characterizes it as detonable, the waste would be treated by open burning or open detonation on-site to remove the reactivity characteristic of HE. It would then be sent to an off-site facility for further treatment, if needed, or disposal.

### B-2.3 Purge Water

Purge water will be managed and characterized in accordance with the method described in the interim facility-wide groundwater monitoring plan (LANL 2005, 088789).

### B-2.4 Spent Personal Protective Equipment and Disposable Sampling Supplies

The spent PPE waste stream will consist of PPE that has come into contact with contaminated environmental media (e.g., core and/or drill cuttings) and cannot be decontaminated. The bulk of this waste stream will consist of protective clothing such as coveralls, gloves, shoe covers, and (if required) respirator cartridges. Spent PPE will be collected in containers at personnel decontamination stations, secured, and temporarily stored at a hazardous waste accumulation area until it is characterized and found not be hazardous. Characterization of this waste stream will be performed through acceptable knowledge (AK) of the waste materials, the methods of generation, and the levels of contamination observed in the associated environmental media. The Laboratory expects spent PPE to be designated as

nonhazardous, nonradioactive waste that will be disposed of at an off-site disposal facility permitted for the disposal of industrial waste.

The disposable sampling supplies waste stream will consist of all equipment and materials that are necessary for collecting samples and that have come into direct contact with contaminated environmental media and cannot be decontaminated. This waste stream also includes residues associated with field test kits and wastes associated with dry decontamination activities. The latter will consist primarily of paper and plastic items collected in bags at a hazardous waste accumulation area until it is characterized and found not to be hazardous. Characterization of this waste stream will be performed through AK of the waste materials, the methods of generation, and the levels of contamination observed in the associated environmental media. The Laboratory expects disposable sampling supplies to be designated as nonhazardous, nonradioactive waste, with the exception of residues from some field test kits, which will be deemed hazardous. Nonhazardous wastes will be disposed of at an off-site disposal facility permitted for the disposal of industrial waste; hazardous wastes will be sent to an off-site facility permitted for the treatment and/or disposal of hazardous waste.

### B-2.5 Decontamination Fluids

The decontamination fluids waste stream will consist of liquid wastes from decontamination activities (e.g., decontamination solutions and rinse waters). Following waste-minimization practices, the Laboratory employs dry decontamination methods to the extent possible. If dry decontamination cannot be performed, liquid decontamination wastes will be collected in containers at the point of generation and transferred to accumulation drums. Decontamination fluids will be accumulated in drums and temporarily stored at a hazardous waste accumulation area until it is characterized and found not to be hazardous. The Laboratory expects that the majority of decontamination fluids will be designated as nonhazardous, nonradioactive liquid waste. A potential exists for some decontamination rinsate to be designated as low-level radioactive or mixed waste at several of the sites because of presence of radionuclides, metals, and/or HE. Nonhazardous and radioactive liquid wastes may be treated and discharged by several Clean Water Act-permitted on-site treatment facilities, provided the waste meets the facility's waste acceptance criteria (WAC). Mixed waste and waste that do not meet the WAC of Laboratory treatment facilities will be sent to permitted off-site treatment facilities.

### B-2.6 Returned or Excess Samples

Soil samples either returned from or obtained but not submitted to the analytical laboratory will be containerized in a 5-gal. bucket or 55-gal. drum and stored at a hazardous waste accumulation area until it is characterized and found not to be hazardous. Returned soil samples will be managed in a manner consistent with analytical results, and it is anticipated that the returned soil samples will be classified as nonhazardous, nonradioactive solid waste. The returned soil samples will be disposed of at a Laboratory-approved off-site industrial waste facility.

The selection of waste containers will be based on the appropriate U.S. Department of Transportation (DOT) requirements and the type and amount of IDW planned to be generated. Immediately following containerization, each waste container will be individually labeled by waste classification, item identification number, radioactivity (if applicable), and date generated. Waste containers will be managed in clearly marked and appropriately constructed waste accumulation areas. Waste accumulation area posting, regulated storage duration, and inspection requirements will be based on the type of IDW and its classification. Container and storage requirements will be detailed in the waste characterization strategy form (WCSF) and approved before waste is generated.

### B-2.7 Spent Immunoassay Test Kits (D-TECH)

Sampling containers and materials from used test kits include glass ampules, soil, and miscellaneous plastic/Teflon. Because of the solvents present, this waste stream is assumed to be hazardous based on its ignitability. This waste will be stored in a 55-gal. drum at a waste accumulation area until a final waste determination is made. Nonhazardous wastes will be disposed of at an off-site disposal facility permitted for the disposal of industrial waste; hazardous wastes will be sent to an off-site facility permitted for the treatment and/or disposal of hazardous waste.

## B-3.0 WASTE MANAGEMENT

All wastes will be managed in accordance with applicable Federal, State, DOE, and Laboratory requirements. The IDW waste streams, expected waste types, estimated waste volumes, and other data are listed in Table B-3.0-1. Table B-3.0-2 presents the estimated waste volumes for each subaggregate.

All waste drums and containers (roll-off bins) will remain at a hazardous waste accumulation area until analytical results have been received and waste characterization has been completed.

Before field-investigation activities begin, a WCSF will be prepared and approved as required by the current version of SOP-01.10. The WCSF will provide detailed information about IDW characterization, management, containerization, and potential volume generation for each subaggregate.

The IDW will be characterized through existing data and/or documentation, direct sampling of the IDW, or sampling of the media being investigated (e.g., surface soil, subsurface soil). If sampling is necessary, the procedures will be described in a sampling and analysis plan that will be developed in conjunction with the WCSF.

Some wastes will be characterized on the basis of AK rather than direct waste analysis. The AK characterization will consist of the results of analyzing the environmental media associated with each waste stream. For example, spent PPE and disposable sampling supplies that have potentially come into contact with contaminated media will be characterized based on the analytical results for samples of that media. Similarly, borehole drill cuttings will be characterized by the analytical results for the core samples from that borehole. If decontamination fluids are to be sent off-site for disposal, they will be sampled to demonstrate compliance with the WAC of the receiving facility.

## B-4.0 WASTE CONTAINERS AND TRANSPORTATION

The selection of waste containers will be based on both the appropriate (DOT requirements and the type and amount of IDW anticipated to be generated. Immediately following containerization, each waste container will be individually labeled to identify the waste classification, the item identification number, its radioactivity (if applicable), and the date of generation. Waste containers will be managed in clearly marked and appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on IDW type and classification. The wastes will be stored in accordance with Laboratory hazardous and mixed waste requirements documents.

Transportation of IDW will comply with appropriate DOT requirements. Transportation and disposal requirements will be detailed in the WCSF and approved before the waste is generated.

## B-5.0 REFERENCES

*The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.*

*Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.*

EPA (U.S. Environmental Protection Agency), April 10, 1990. "Module VIII of RCRA Permit No. NM0890010515, issued to Los Alamos National Laboratory, Los Alamos, New Mexico," EPA Region VI, Hazardous Waste Management Division, Dallas, Texas. (EPA 1990, 001585)

EPA (U.S. Environmental Protection Agency), April 19, 1994. "Module VIII of RCRA Permit No. NM0890010515, EPA, Region 6, New Requirements Issued to Los Alamos National Laboratory, Los Alamos, New Mexico," EPA Region 6, Hazardous Waste Management Division, Dallas, Texas. (EPA 1994, 044146)

LANL (Los Alamos National Laboratory), May 2005. "Interim Facility-Wide Groundwater Monitoring Plan," Los Alamos National Laboratory document LA-UR-05-3443, Los Alamos, New Mexico. (LANL 2005, 088789)

LANL (Los Alamos National Laboratory), November 2006. "Los Alamos National Laboratory Hazardous Waste Minimization Report," Los Alamos National Laboratory document LA-UR-06-8175, Los Alamos, New Mexico. (LANL 2006, 096015)

**Table B-3.0-1**
**Generation and Management of the Estimated**
**Investigation-Derived Waste for S-Site Aggregate Area**

| Waste Stream | Expected Waste Type | Estimated Volume* | Characterization Method | On-Site Management | Expected Disposition |
|---|---|---|---|---|---|
| Drill Cuttings | Industrial waste, nonhazardous, nonradioactive | 1 $yd^3$ | Analytical results from waste samples and core samples | Accumulation in 55-gal. drums, covered roll-off containers, or cubic-yard soft-sided containers | Permitted off-site industrial waste facility |
| Soil* | Industrial waste, nonhazardous, nonradioactive | 0.75 $yd^3$ | Analytical results from waste samples | Accumulation in covered roll-off containers | Permitted off-site industrial waste facility |
| Purge Water | Liquid waste, nonhazardous or low-level radioactive | 25 gal. | Analytical results from waste samples | Accumulation in 55-gal. drums | On-site Clean Water Act-permitted off-site treatment facility for which waste meets acceptance criteria |
| Spent PPE and Disposable Sampling Supplies | Industrial waste, nonhazardous, nonradioactive | 3 $yd^3$ | AK | Accumulation in 55-gal. drums | Permitted off-site industrial waste facility |
| Decontamination Fluids | Liquid waste, nonhazardous or low-level radioactive | 120 gal. | Analytical results from waste samples | Accumulation in 55-gal. drums | On-site Clean Water Act-permitted treatment facility for which waste meets acceptance criteria |
| Returned or Excess Samples | Industrial waste, nonhazardous, nonradioactive | 0.5 $yd^3$ | AK from sample analytical data and method of generation | Accumulation in a 5-gal. bucket or 55-gal. drum, stored on Laboratory property | Permitted off-site industrial waste facility |
| Spent Immunoassay Test Kits (D-TECH) | Liquid waste, hazardous, nonradioactive | 10 gal. | AK–spent soil and acetone | Accumulation in a 55-gal. drum | Permitted off-site industrial waste facility for which waste meets acceptance criteria |
| | Liquid waste, nonhazardous, nonradioactive | 150 gal. | AK–glass ampules, miscellaneous plastic/Teflon | Accumulation in 55-gal. drums | Permitted off-site industrial waste facility |

*Sample depths, numbers, and/or locations are yet to be determined.

**Table B-3.0-2**
**Estimated Investigation-Derived Waste for S-Site Aggregate Area**

| Waste Stream | | S-Site Subaggregate Area or Extended Drainage | | | | |
|---|---|---|---|---|---|---|
| | | K-Site | P-Site | 300s Line | V-Site | Extended Drainages |
| | | Number of Proposed Samples | | | | |
| | | 56 | 332 | 118 | 248 | 42 |
| Industrial Waste ($yd^3$) | Drill cuttings, soil, spent PPE, disposable sampling supplies, and returned or excess samples (nonhazardous, nonradioactive) | 0.25 | 1.5 | 0.5 | 2.75 | 0.25 |
| Liquid Waste (gal.) | Purge water (nonhazardous or low-level radioactive) | n/a* | n/a | 10.5 | 14.5 | n/a |
| | Immunoassay test kit (nonhazardous, nonradioactive) | 15 | 45 | 30 | 45 | 15 |
| | Immunoassay test kit (hazardous, nonradioactive) | 1 | 3 | 2 | 3 | 1 |
| | Decontamination fluids (nonhazardous or low-level radioactive) | 10 | 50 | 20 | 30 | 10 |

*n/a = Not applicable.