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Historical Investigation Report for Lower Pajarito Canyon Aggregate Area

Prepared by the Environmental Programs Directorate

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EXECUTIVE SUMMARY

The Lower Pajarito Canyon Aggregate Area includes Technical Area 18 (TA-18), former TA-27, and TA-54 of Los Alamos National Laboratory and consists of 72 solid waste management units (SWMUs) and areas of concern (AOCs). Of these sites, 11 sites have been previously investigated and/or remediated and have been approved for no further action. Thirty sites have been or will be investigated under separate TA-54 investigations. This historical investigation report provides site descriptions, summarizes previous investigations, and presents analytical results, if available, for the remaining 35 sites under investigation. Of the 35 SWMUs and AOCs in the Lower Pajarito Canyon Aggregate Area that require some additional characterization and/or remediation activities, 29 sites are located within TA-18, and 2 sites are located within former TA-27. These sites include the following:

- septic tanks and outfall;
- sanitary waste lines and sewage treatment facilities;
- industrial waste lines, drains, and outfalls;
- storm drains and outfalls; and
- areas of potential soil contamination from Laboratory operations.

The background information and previous investigations discussed within this report form the basis for the proposed sampling design to complete site investigations as presented in the Lower Pajarito Canyon Aggregate Area investigation work plan.

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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, shown in Figure 1.0-1, is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers 40 mi^2 of the Pajarito Plateau, which consists of a series of fingerlike mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft above mean sea level. The Lower Pajarito Canyon Aggregate Area is shown on Plate 1.

The Laboratory's Environmental Programs (EP) Directorate is participating in a national effort 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 purpose of this historical investigation report (HIR) is to provide supporting information for the activities necessary to complete site investigations. The sites under investigation are designated as solid waste management units (SWMUs) and areas of concern (AOCs).

Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with DOE policy.

1.1 Report Overview

The Lower Pajarito Canyon Aggregate Area consists of 72 SWMUs and AOCs located in TA-18, former TA-27, and TA-54.

Thirty of the Lower Pajarito Canyon Aggregate Area sites are located in TA-54. Of the 30 sites located in TA-54, 9 have been approved for no further action, 9 have been or will be closed under the Resource Conservation and Recovery Act (RCRA), and 9 are included in other Compliance Order on Consent investigations. The remaining three TA-54 sites [AOC 54-012(a), SWMU 54-012(b), and AOC 54-015(b)] are proposed to be included in the final closure activities undertaken for TA-54 Areas G or L. Thus, none of the Lower Pajarito Aggregate Area sites located at TA-54 are proposed for investigation in the work plan and are not discussed in the HIR.

For the remaining 42 sites in the Lower Pajarito Canyon Aggregate Area, 11 have been investigated and/or remediated previously and have been approved for no further action (NFA), and 31 are addressed in this HIR. For the 31 sites discussed in the HIR, investigation activities are proposed using information from previous field investigations to evaluate current conditions at each site. Of these 31 sites, 29 are located within TA-18, and two within former TA-27.

Table 1.1-1 provides a summary of the 72 sites within the Lower Pajarito Canyon Aggregate Area. For the 41 sites not included in the HIR, brief descriptions and summaries of their status are presented in Table 1.1-1, but the sites are not discussed in detail. Plate 1 shows the locations of the sites under investigation in the Lower Pajarito Canyon Aggregate Area, along with monitoring wells, surface water and stormwater runoff monitoring stations, and canyon reaches.

Sections 2 and 3 of this HIR provide site descriptions, summarize previous investigations, and presents analytical results of the 31 sites addressed in this report.

1.2 Data Overview

Data evaluated in this HIR include historical data collected from 1994 to 1998 as part of RCRA facility investigations (RFIs) and other corrective actions. In the Sample Management database, all data records include a vintage code field denoting how and where samples were submitted for analyses.

In the early years, the samples were submitted to the Laboratory's Chemical Science and Technology (CST) Division and were either analyzed at a CST laboratory (on-site) or submitted to one of several off-site contract analytical laboratories. Samples analyzed at a CST laboratory are identified by the vintage codes "CST Onsite." Two vintage codes identify samples CST Division submitted to off-site contract analytical laboratories: "CST Offsite" if validation was not performed and "CSTROUT03" if validation was performed.

From late 1995 until the present, samples have been submitted through the Sample Management Office (SMO) to off-site contract analytical laboratories. Two vintage codes identify samples the SMO submitted to off-site contract analytical laboratories: "AN95" if validation was not performed and "SMO" if validation was performed.

Vintage codes for data presented in this HIR are provided in Appendix B. Data presented in tables and figures in the HIR are decision-level data of "SMO" vintage only. Both decision-level data and screening-level data (vintage codes other than "SMO") are presented in Appendix B.

Decision-level data for inorganic chemicals and radionuclides from previous investigations are compared with background values (BVs) and fallout values (FVs) as applicable (LANL 1998, 059730, p. 2-4). The data tables for inorganic chemicals and radionuclides include only decision-level data where sample concentrations are above the BVs/FVs or detected if no BVs/FVs are available. Data tables for organic chemicals include all detected concentrations of organic chemicals.

Decision-level data will be included, along with all results from samples proposed in the investigation work plan, in the subsequent investigation report and will be used to determine if the nature and extent of contamination are defined. All available decision-level data will be used to determine representative concentrations of site contaminants and to perform human health and ecological risk-screening evaluations as appropriate. Screening-level data are used to identify areas of contamination and to direct sample collection and analyses proposed in the Lower Pajarito Canyon Aggregate Area investigation work plan (LANL 2008, 102243) but will not be used to define the nature and extent of contamination or in risk screening evaluations.

2.0 SITES ASSOCIATED WITH TA-18

TA-18, also known as Pajarito Site, is located at a fork in Pajarito Canyon where Threemile Canyon enters from the southwest. In August 1943, during the Manhattan Project, Group P-5, the Radioactivity Group, developed the site to study rates of spontaneous fission from samples of radioactive materials (LANL 1993, 015310, p. 2-4). During this period, the site was known as Pajarito Canyon Laboratory.

In 1944, TA-18 was enlarged and used as a proving ground to study implosions. Three firing sites were constructed:

- a small site in Pajarito Canyon for experiments involving small explosive charges of a few pounds;
- a medium site in Threemile Canyon for testing charges of several hundred pounds;
- a large site at former TA-27 about a mile to the east of TA-18, at the end of a narrow unimproved road, for testing charges of up to 2 tons.

Originally, the central area at TA-18 consisted primarily of building 18-1, which contained an electronics laboratory, a shop, and a photochemical laboratory (LANL 1993, 015310, p. 2-4).

Explosives testing by G Division ended in late 1945. In April 1946, the site was transferred to Group M-2, the Critical Assemblies Group. Since that time, the history of TA-18 has revolved around critical assembly work (LANL 1993, 015310, p. 2-4).

From 1955 to 1972, fission reactor mockup studies for the Rover Program, a nuclear rocket propulsion program, were also conducted at TA-18 using remotely controlled kivas. Reactor mockups consisted of various geometries and used materials such as deuterium oxide, enriched uranium, graphite, niobium, uranium oxide, and zirconium hydride. Beryllium oxide was also used in some mockups. The Rover Program was terminated in 1973 (LANL 1993, 015310, p. 2-10).

During the 1970s and 1980s, buildings 18-186, 18-187, 18-188, 18-189, 18-227, 18-256, 18-257, and 18-258 were added to the site (LANL 1993, 015310, p. 2-10).

Currently, TA-18 is undergoing decontamination and decommissioning (D&D) (Birdsell 2008, 102779). Operations at TA-18 were stopped in July 2004, and criticality experiments were expected to resume at the Nevada Test Site (NTS). Since July 2004, the nuclear material has been repackaged and moved to NTS or to TA-55. Some material was also disposed of at TA-54, Area G. Equipment has also been removed from TA-18. Most of the machines were disassembled, cleaned, and packaged (during or around 2006) for transfer to NTS. Some obsolete equipment was disposed of at Area G. The buildings at TA-18 were slated to undergo D&D starting in fiscal year 2009.

2.1 Consolidated Unit 18-001(a)-00

Consolidated Unit 18-001(a)-00 consists of SWMU 18-001(a), two former sanitary lagoons and their associated outfall (Figure 2.1-1), and SWMU 18-001(b), a sewer line that discharges into the SWMU 18-001(a) sanitary lagoons (Figure 2.1-2). The consolidated unit is located next to Pajarito Road southeast of the central area of TA-18.

2.1.1 SWMU 18-001(a), Lagoons

SWMU 18-001(a) consists of two former sanitary lagoons, an effluent line, and an outfall. The lagoons were 60 ft wide × 120 ft long × approximately 12 ft deep. These lagoons were located at TA-18 on the south side of Pajarito Road, approximately 1 mi southeast of the central area of TA-18. The side walls and floor of the lagoon were gunite-lined from the floor to approximately one-third up the wall height; the other two-thirds were lined with an asphalt-aggregate mixture. The two lagoons were separated by a berm that contained two concrete distribution boxes directing the sewage flow into the lagoons (LANL 1993, 015310, p. 5-1).

The effluent line consisted of an 8-in. cast-iron pipe that exited between the two lagoons and extended approximately 200 ft in a northeasterly direction. The effluent line discharged through an outfall on the north side of Pajarito Road into the Pajarito Canyon stream channel. Sewage effluent from TA-18 was transported to the lagoons via a now-inactive sanitary sewer line [SWMU 18-001(b)] that served the central area of TA-18. Liquid waste that discharged into the lagoons consisted of sanitary sewage, wash water from industrial drains and sinks in laboratories, and photochemical wastes (LANL 1993, 015310, pp. 5-1–5-3).

The sanitary lagoons, effluent line, and outfall were placed into service in 1969 and discontinued in December 1992, when sanitary sewage waste from TA-18 was redirected to the Sanitary Wastewater

Systems Consolidation (SWSC) plant. The outfall end of the effluent line was plugged with concrete when the lagoons were taken out of service. No discharges have occurred into or from the lagoons since 1992 (LANL 1993, 015310, pp. 5-1–5-3).

2.1.1.1 Previous Investigations for SWMU 18-001(a)

In September 1993, an RFI was conducted at SWMU 18-001(a). Five sediment samples were collected from five locations in each lagoon. The 10 samples collected from the two lagoons were submitted to an off-site contract analytical laboratory for analysis of inorganic chemicals, semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), and radionuclides. Because no water was present in either lagoon, only sediment samples were collected. The sediment was approximately 1 ft thick in each lagoon, and samples were collected 0–1 ft below the surface of the sediment. Industrial hygiene measurements were made at each sampling location using a flame ionization detector. No readings above background levels were observed (LANL 1995, 044014, p. 4-11).

During the same RFI, four sediment samples were collected, one at each of four locations from the area at the end of the effluent line. Sediment samples were collected to a depth of 1 ft below ground surface (bgs) and submitted to an off-site contract analytical laboratory for analysis of inorganic chemicals, SVOCs, VOCs, and radionuclides. Because the sampling locations were within an area possibly affected by former explosive testing at former TA-27, analysis for high explosives (HE) was also performed (LANL 1995, 044014, p. 4-11). As a result of the RFI, the Laboratory concluded that the lagoons needed to be decommissioned via an expedited cleanup (EC) to ensure further reduction of the low risk posed by the materials in the lagoons (LANL 1995, 044014, p. 4-24).

The results of the analyses of samples collected from the lagoons are as follows (LANL 1995, 044014, p. 4-13):

- Cadmium, chromium, lead, mercury, total uranium, and zinc were detected above BVs.
- SVOCs were detected, but VOCs were not detected.
- Plutonium-238 was detected above FV.

The results of the analyses of samples collected in the outfall area are as follows (LANL 1995, 044014, p. 4-20):

- Total uranium was detected above BV.
- VOCs were detected. HE or SVOCs were not detected.
- Plutonium-239/240 was detected above FVs.

A voluntary corrective action (VCA) was carried out in August and September 1995. Because some uncertainty existed regarding groundwater quality near the lagoons, a monitoring well was installed at the northeast corner of the lagoons. The purpose of the VCA was to decommission the site and to eliminate any health or safety hazard from non-RCRA constituents (LANL 1996, 054324, p. 1). The VCA consisted of removing the two concrete distribution boxes and the associated 8-in. cast-iron pipes. The concrete portion of the berm around each lagoon was left intact, and the asphalt-lined portion of the berms was bulldozed into the lagoons as fill material. Clean fill was used to complete filling the lagoons. After all grading was accomplished, the area was seeded with native grasses to match the surrounding terrain (LANL 1996, 054324, p. 4).

Concentrations of all chemicals of potential concern (COPCs) in the sediment in the lagoons are below screening action levels (SALs). Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (LANL 2001, 070246, p. 9).

2.1.1.2 Analytical Results for SWMU 18-001(a)

The data collected during the 1993 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.1.2 SWMU 18-001(b), Drainline

SWMU 18-001(b) consists of an inactive sewer line located on the south side of Pajarito Road. The line runs parallel to Pajarito Road and extends from the central area of TA-18 approximately 5000 ft east to the location of the former sanitary lagoons [SWMU 18-001(a)]. The line is constructed of 4-in.-diameter vitrified-clay pipe and is buried approximately 5–6 ft bgs. Eleven manholes (structures 18-160, 18-161, and 18-169 to 18-177) are associated with this sewer line. The manholes consist of a 3-ft-diameter concrete culvert pipe positioned vertically so the opening is approximately 1 ft aboveground, while the base extends to approximately 5–6 ft bgs. The base of each manhole is lined with concrete. Inlet and outlet ports for the sewer line are located at the bottom of each manhole (LANL 1995, 046092, p. 3).

SWMU 18-001(b) emptied into the two former lagoons [SWMU 18-001(a)]. The sewer line served the central area of TA-18, excluding Kiva 1, Kiva 2, and Kiva 3, which are served by individual septic systems. However, a portion of the sewer system uses plumbing originally connected to a now-inactive septic system, SWMU 18-003(e) (LANL 1995, 046092, p. 3).

The sewer line and manholes were placed into service in 1969, and service was discontinued in 1992 when the sewage from TA-18 was redirected to the SWSC. Although operations in the buildings served by the sewer system do not currently involve radioactive or chemical contaminants, past operations did. Therefore, radionuclide and chemical contaminants may be present in the sewer line (LANL 1995, 044014, p. 4-7).

2.1.2.1 Previous Investigations for SWMU 18-001(b)

In September 1993, an RFI was conducted at SWMU 18-001(b). Sediment or water samples were collected from manholes 18-160, 18-169, 18-170, 18-173, 18-175, 18-176, and 18-177. None of the manholes had both water and sediment in sufficient quantities to allow sampling of both media. Five sediment samples collected from manholes 18-160, 18-169, 18-170, and 18-176 were submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, SVOCs, VOCs, and radionuclides. In manholes 18-161, 18-171, 18-172, and 18-174, neither sediment nor water was present in sufficient quantities to allow sample collection. In those manholes, only swipes from the interior surface were collected; filter swipes were taken around the inside perimeter of each manhole and analyzed for gross-alpha, -beta, and -gamma radioactivity (LANL 1995, 044014, p. 4-11).

Collection of sediment samples generally required removal of nearly all the sediment in the manholes because of the minimal quantity. Water was flowing in small quantities in some manholes. This water was believed to be the result of infiltration of shallow groundwater into the manholes or a connecting sewer line. The outflow from manhole 177 had been plugged when the sewer line was taken out of service to prevent water from entering the lagoons. Manhole 177, located immediately upstream from the lagoon, had accumulated water to a depth of approximately 30 in. No sediment could be retrieved from the bottom of this manhole (LANL 1995, 044014, p. 4-11). As a result of the RFI, the Laboratory concluded

that the sewer line should be decommissioned to ensure further reduction of the low risk posed by the sewer line contents (LANL 1995, 044014, p. 4-24).

The results of the analysis of sediment samples collected from the manholes are as follows (LANL 1995, 044014, p. 4-17):

- Cadmium, chromium, lead, mercury, nickel, total uranium, and zinc were detected above BVs.
- SVOCs and VOCs were detected.
- Plutonium-238/-239 was detected above FV.

An EC plan for SWMU 18-001(b) was submitted as part of a Class Ill permit modification in March 1995 (LANL 1995, 046092). Sampling data indicated that no RCRA-regulated COPCs were present in the water samples at concentrations above cleanup levels (LANL 1996, 054485, p. 1).

The EC for SWMU 18-001(b) began on September 8, 1995, and was completed on September 15, 1995. As proposed in the EC plan, approximately 1 yd^3 of concrete was poured into each manhole to plug the inlet and outlet ports of the sewer line at each manhole. The top portion of each manhole was removed, screened for radionuclides, and disposed of. The open excavations at each manhole were backfilled with soil and graded to blend the backfill with the surrounding natural terrain. Finally, the areas at the manholes were seeded with native grasses as a soil conservation measure (LANL 1996, 054485, p. 1).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (LANL 2001, 070246, p. 11).

2.1.2.2 Analytical Results for SWMU 18-001(b)

The data collected during the 1993 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.2 Consolidated Unit 18-001(c)-00

Consolidated Unit 18-001(c)-00 (Figure 2.2-1) consists of SWMU 18-001(c), a sump located in the basement of building 18-30 and SWMU 18-012(b), an outfall that receives discharge from several sources in buildings 18-30 and 18-31. The consolidated unit is located in the central area of TA-18 near buildings 18-30 and 18-31.

2.2.1 SWMU 18-001(c), Sump

SWMU 18-001(c) consists of a sump, equipped with two sump pumps and a drain, located at TA-18 in the basement of building 18-30. Building 18-30 was an administrative building that housed control systems for remote nuclear criticality research. The sump, which was placed into service in 1969, served primarily to collect groundwater from drains outside the basement walls; however, some sinks and floor drains from offices and machine shops in building 18-30 formerly drained to the sump. In the fall of 1992, the drains associated with the sump were diverted to the TA-18 sanitary sewer line and subsequently to SWSC. By the summer of 1994, all drains associated with building 18-30 were diverted into the sanitary sewer line. No specific data are available on discharges to the sump (LANL 1993, 015310, p. 5-14).

The sump was erroneously grouped with the sanitary lagoons and sewer lines in the Laboratory SWMU report (LANL 1990, 007512). The sump has never been connected to the sanitary sewer system. Discharge from the sump was combined with other discharges from buildings 18-30 and 18-31 and was

released through an outfall [SWMU 18-012(b)] south of building 18-30 (LANL 1995, 044014, p. 4-25). The outfall is within approximately 20 ft of the main drainage channel in Pajarito Canyon (LANL 1993, 015310, p. 5-45).

2.2.1.1 Previous Investigations for SWMU 18-001(c)

In September 1993, an RFI was conducted at SWMU 18-001(c). No sediment or soil was present in the bottom of the sump. Two water samples were collected from the bottom of the sump (LANL 1995, 044014, p. 4-25).

2.2.1.2 Analytical Results for SWMU 18-001(c)

No soil samples were collected at SWMU 18-001(c).

2.2.2 SWMU 18-012(b), Outfall from Buildings 18-30 and 18-31

SWMU 18-012(b) is an outfall that received discharge from several sources in buildings 18-30 and 18-31. The outfall, active since the buildings were constructed in 1950, is located south of building 18-31 approximately 20 ft north of the main drainage channel in Pajarito Canyon (LANL 1993, 015310, p. 5-45). The outfall received discharge from an associated sump [SWMU 18-001(c)], floor drains, sinks, stormwater from the east wing roof of building 18-31, and a welding quench tank in building 18-30. The outfall also received discharge from machine shop floor drains and stormwater from the roof of building 18-31 (LANL 1993, 015310, p. 5-14).

Discharge from buildings 18-30 and 18-31 is transported to the outfall via a series of 4-in. polyethylene pipes connected to sources in the buildings. Currently, this outfall receives only stormwater from the east wing of roof of building 18-30 (LANL 1993, 015310, p. 5-45).

2.2.2.1 Previous Investigations for SWMU 18-012(b)

In September 1993 and May to October 1994, an RFI was conducted at SWMU 18-012(b) (LANL 1995, 052183, p. 1-6). Four surface sediment samples were collected from four locations for field screening at the outfall and analyzed for inorganic chemicals, SVOCs, and gross-alpha, -beta, and -gamma radioactivity. The two samples with the most elevated field-screening levels were submitted to an off-site contract analytical laboratory for analysis of inorganic chemicals, SVOCs, and radionuclides (LANL 1995, 052183, p. 4-71).

The results of the analysis of samples collected from the outfall are as follows (LANL 1995, 052183, p. 4-71):

- Antimony, cadmium, chromium, copper, lead, mercury, silver, and zinc were detected above BVs.
- SVOCs were detected. VOCs were not detected.
- No radionuclides were detected.

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, pp. B 1–B-3).

2.2.2.2 Analytical Results for SWMU 18-012(b)

The data collected during the 1993–1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.3 SWMU 18-002(a), Firing Site

SWMU 18-002(a) (Figure 2.3-1) consists of a small, inactive HE-firing site at TA-18 in Pajarito Canyon south of the present location of building 18-23 (Kiva 1). The firing site was used from 1944 to 1945 and consisted of two structures:

- former structure 18-3, a firing chamber 2 ft wide × 2 ft long × 2.2 ft deep constructed from 1-in.-thick steel
- former structure 18-2, an aboveground armored bunker, commonly called a “battleship,” used to protect shot instrumentation

The firing chamber was open on the top and set flush with the ground west of the bunker, which was designated as storage for HE in the historical TA-18 structure log. Structure 18-3 was removed in 1945, while structure 18-2 is no longer used. The ground surface in the vicinity of the firing chamber was regraded and partially paved in association with the construction of building 18-23 (LANL 1993, 015310, p. 5-52).

2.3.1 Previous Investigations for SWMU 18-002(a)

In September 1993 and from May to October 1994, an RFI was conducted at SWMU 18-002(a). Soil was screened for radioactivity using a Field Instrument for Detection of Low-Energy Radioactivity (FIDLER) every 3 ft (up to 500 ft) on radials extending north, south, east, and west from the center of the firing point. Biased sampling locations were selected for mobile laboratory analysis. No significant radioactivity measurements were recorded. Steep canyon walls and mesa tops in the outer portion of the 500-ft sampling region were not sampled. No subsurface sampling was conducted because shots were fired inside the steel-lined firing chamber (LANL 1995, 052183, pp. 4-93–4-104).

Eight grab samples of surface soil were taken from each of 11 locations for field screening and analyzed using mobile laboratory analysis for inorganic chemicals, HE, SVOCs, and gross-alpha, -beta, and -gamma radioactivity. Four of the grab samples from each location were selected for analytical sampling based on elevated levels of barium, lead, gross alpha, beta and gamma radiation; and uranium. At 8 of the 11 sampling locations, a single composite sample was prepared using material from all four grab samples (eight total composite samples). At the three remaining sampling locations, two composite samples were prepared using material from all four grab samples (six total composite samples).

Fourteen total composite samples were and submitted to an off-site contract analytical laboratory for analysis of inorganic chemicals, HE, organic chemicals, and radionuclides. Five of the composite samples were held beyond the recommended analytical holding time; therefore, the usability of data from these samples was questionable (LANL 1995, 052183, pp. 4-93–4-104).

The results of the analyses of samples collected at the firing site are as follows:

- No inorganic chemicals were detected above BVs (LANL 1995, 052183, p. 4-99).
- HE and SVOCs were detected in all composite samples (LANL 1995, 052183, p. 4-99). VOCs were not detected (LANL 1995, 052183, p. 4-99).

- Thorium-228, thorium-230, and thorium-232 were detected above BVs (LANL 1996, 054919, p. 4-41).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.3.2 Analytical Results for SWMU 18-002(a)

The data collected during the 1993–1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.4 SWMU 18-002(b), Firing Site

SWMU 18-002(b) (Figure 2.4-1) is a medium-size, inactive firing site at TA-18 in Threemile Canyon near building 18-32 (Kiva 2). The firing site was used from 1944 to 1945. The site consisted of a 2 ft long × 2 ft wide × 2 ft deep firing chamber (former structure 18-4) constructed from 1-in.-thick steel and an aboveground armored bunker (structure 18-5), commonly called a "battleship," used to protect shot instrumentation. The top of the firing chamber was open and set flush with the ground west of structure 18-5. A ground-level wooden structure, located east of structure 18-5, was the battery building for the firing site cable conduit system. The building contained racks of lead-acid batteries (LANL 1995, 052183, pp. 4-105–4-114).

Three additional firing points farther to the west are associated with SWMU 18-002(b). Firing Points C and G were used in firing operations using smaller charges than those used at the third firing point, called the Medium Firing Point. Firing Point C (now beneath building 18-32) was 51 ft west of structure 18-5. Firing Point G, located at the southeast corner of current storage building 18-122, was 145 ft west of structure 18-5. The Medium Firing Point was built to handle HE charges of up to 2 tons. It was located 478 ft west of structure 18-5. A flat graded area west of building 18-32 marks the former location of this firing point. The firing points were removed in the late 1940s, before the construction of building 18-32 (LANL 1993, 015310, p. 5-53).

2.4.1 Previous Investigations for SWMU 18-002(b)

In June 1994, an RFI was conducted at SWMU 18-002(b). Sampling was conducted on the canyon floor within two concentric sampling zones that extended a radius of 500 ft from the center of the westernmost site, Medium Firing Point, and 500 ft from the center of the easternmost site, Firing Point C. The sampling locations were also designed to address possible contamination from structure 18-4 and Firing Point G, which are located between the end firing points. The two end firing points were 427 ft apart, and their sets of concentric zones overlapped. Soil was screened for radioactivity using FIDLER every 3 ft (up to 500 ft) on radials extending north, south, east, and west from the center of each firing point to bias sampling locations for field screening using mobile laboratory analysis. Radioactivity measurements were generally uniform and could not be used to bias the field-screening sampling locations (LANL 1995, 052183, pp. 4-105–4-114).

Eight grab samples of surface soil were taken from each of 11 locations for field screening and analyzed using mobile laboratory analysis for inorganic chemicals, HE, SVOCs, and gross-alpha, -beta, and -gamma radioactivity. An HE spot-test kit was used to ensure handling safety and proper transport procedures. Four of the grab samples from each location were selected for analytical sampling based on elevated levels of barium; lead; gross-alpha, -beta and -gamma radiation; and uranium. At 8 of the 11 sampling locations, a single composite sample was prepared using material from all 4 grab samples

(8total composite samples). At the three remaining sampling locations, two composite samples were prepared using material from all four grab samples (six total composite samples).

Fourteen total composite samples were collected and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, HE, organic chemicals, and radionuclides. Seven of the composite samples were held beyond the recommended analytical holding time; therefore, the usability of data from these samples was questionable (LANL 1995, 052183, pp. 4-105–4-114).

Subsurface soil was collected from five boreholes at Medium Firing Point. The drill rig could not access the other firing points located beneath existing buildings. All boreholes were 5 ft deep, and sampling was performed at intervals of 0–1 ft, 2–3 ft, and 4–5 ft below ground surface (bgs). One borehole was centered on the surveyed position of the firing point and the others were positioned 10 ft north, south, east, and west of the first hole. This arrangement was designed to sample the area immediately around the firing point for COPCs driven into the ground by the explosions as well as for any subsurface migration of COPCs (LANL 1995, 052183, pp. 4-105–4-114).

The results of the analyses of samples collected at the firing sites are as follows:

- Cadmium and copper were detected above BVs (LANL 1995, 052183, p. 4-113).
- HE was detected. SVOCs and VOCs were not detected (LANL 1995, 052183, p. 4-113).
- Thorium-228, thorium-232; and uranium-234, uranium-235, and uranium-238 were detected above BVs (LANL 1996, 054919, p. 4-45).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1). No remediation activities were conducted at this site.

2.4.2 Analytical Results for SWMU 18-002(b)

The data collected during the 1993–1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.5 AOC 18-002(c), Former Drop Tower

AOC 18-002(c) (Figure 2.5-1) consists of a former drop tower in Threemile Canyon used in tests involving inert mockups and ballistic objects. The drop tower was used from 1944 to 1945. The tower was located in TA-18 approximately 500 ft west of a structure called a “battleship” at one of the three firing pads identified at SWMU 18-002(b). The drop tower was removed in the late 1940s, before the construction of building 18-32 (LANL 1995, 052183, pp. 4-105–4-114).

2.5.1 Previous Investigations for AOC 18-002(c)

In September 1993 and from May to October 1994, an RFI was conducted at AOC 18-002(c). Because the effects of AOC 18-002(c) are indistinguishable from those of the firing points at SWMU 18-002(b), sampling results from the investigation of SWMU 18-002(b) were used to characterize contamination at AOC 18-002(c) (LANL 1995, 052183, pp. 4-105–4-114).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.5.2 Analytical Results for AOC 18-002(c)

No samples were collected specific to AOC 18-002(c). Section 2.4.1 presents information on investigation results for SWMU 18-002(b).

2.6 Consolidated Unit 18-003(a)-00

Consolidated Unit 18-003(a)-00 (Figure 2.6-1) consists of SWMU 18-003(a), an inactive settling pit, and SWMU 18-003(b), an inactive septic system that received overflow from SWMU 18-003(a). The consolidated unit is located northwest of the central area of TA-18 near building 18-23.

2.6.1 SWMU 18-003(a), Settling Pit

SWMU 18-003(a) is an inactive settling pit that received industrial and radioactive wastewater from building 18-23. The pit is located approximately 50 ft southwest of building 18-23, where uranium mockup tests and critical assembly work was conducted when the pit was in service from 1947 to 1991. The pit measures approximately 5.5 ft long × 5.5 ft wide × 10 ft deep and has reinforced concrete walls and an open gravel floor. The pit contained a removable 120-gal.-capacity steel catch basin mounted on steel rails and measured 2 ft in diameter × 5 ft high. The basin was emptied annually while in operation, and the waste was disposed of off-site. Overflow from the catch basin discharged through an outlet drainline connected to SWMU 18-003(b), which consists of a septic tank, a drainline, and a drain field (LANL 1993, 051310, p. 5-4).

2.6.1.1 Previous Investigations for SWMU 18-003(a)

In 1990, an environmental investigation was conducted in the area surrounding SWMU 18-003(a). Four shallow monitoring wells were drilled at locations surrounding building 18-168, the Los Alamos Critical Experiment Facility (LACEF), to define baseline levels of uranium and/or fission-product contamination in the environment. During well construction, soil samples were collected with a split-spoon sampler at depths of 10 ft, 15 ft, and 20 ft bgs. All soil and groundwater samples were analyzed for a suite of radionuclides that could have been released from building 18-168. In samples collected at the completed wells, radionuclides in soil and groundwater were at or below background levels and drinking water standards, respectively. One borehole penetrated the drainline connecting SWMU 18-003(a) to SWMU 18-003(b). The abandoned hole was sampled directly beneath the drainline, and results showed radionuclides above BVs/FVs (LATA 1991, 012464, p. 3-4).

An RFI was conducted at SWMU 18-003(a) in September 1993 and June to August 1994. Two samples each of sludge and liquid were collected from the catch basin of the settling pit using a special long-handled bailer. Liquid samples were analyzed for total uranium, other inorganic chemicals, and isotopic plutonium. The analyses of sludge samples were the same as for liquid samples, with the addition of SVOCs and VOCs. Two soil samples were collected from the pit using a Teflon core-barrel sampler. The analyses of subsurface soil samples were the same as for sludge samples, with the addition of chloride, nitrate, and gamma-emitting radionuclides.

The results of the analyses of soil samples collected at the pit are as follows:

- Copper was detected above BV (LANL 1995, 052183, p. 4-6).
- VOCs were detected (LANL 1995, 052183, p. 4-17). SVOCs were not detected (LANL 1995, 052183, pp. 4-16–4-17).
- Plutonium-238 was detected (LANL 1996, 054919, p. 4-5).

An interim action (IA) was conducted at SWMU 18-003(a) from March to September 1996. The IA consisted of removing the liquid and sludge contained in the catch basin, pressure-rinsing the interior of the basin, and disposing of the basin's contents and associated decontamination water. To prevent potential release of contamination, the floor drains in building 18-23 were sealed by fastening a gasket and metal plate over the drain opening, water service to the building was shut off, and the overflow line was plugged with an expandable rubber stopper. All waste was moved to TA-54 for temporary storage. One liquid sample and one sludge sample were collected for waste characterization purposes. Two soil samples were also collected from 0–6 in. at the gravel bottom of the pit and submitted to an off-site contract analytical laboratory for analyses of total uranium and other target analyte list (TAL) metals, SVOCs, VOCs, and isotopic plutonium (LANL 1996, 054470, Table A-2).

A voluntary corrective measure (VCM) plan documents that a best management practice effort was conducted in 1997 to eliminate a potential pathway to alluvial groundwater. The effort included removing and disposing of the steel catch basin, plugging the inlet and outlet lines as they entered the vault, and then grouting the interior of the vault with flowcrete to prevent any potential releases to alluvial groundwater. Additional soil samples were collected near the inlet and outlet of the pit to characterize the soil. During remedial activities, a section of the vitrified-clay pipe outlet was inadvertently removed by a backhoe. The pipe section and its contents were submitted for laboratory analysis (LANL 1999, 063647, p. 6).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 2000, 066735).

2.6.1.2 Analytical Results for SWMU 18-003(a)

The data collected during the 1993 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B. Decision-level analytical data, samples collected, and analytes requested from the 1996 IA and 1997 VCM are presented in Tables 2.6-1 to 2.6-4.

The results of the analyses of samples collected during the 1996 IA are as follows (LANL 1996, 055044, pp. A-1–A-11):

- Barium, cadmium, calcium, chromium, cobalt, copper, lead, mercury, nickel, total uranium, and zinc were detected above BVs (Figure 2.6-2).
- PAHs, SVOCs, and VOCs were detected (Figure 2.6-3).
- Plutonium-239/240 was detected above the FV (Figure 2.6-4).

The results of the analyses of samples collected during the 1997 VCM are as follows (LANL 1999, 063647, pp. 8–9):

- Barium, cadmium, calcium, chromium, cobalt, copper, lead, mercury, nickel, total uranium, and zinc (Figure 2.6-2).
- PAHs, SVOCs, and VOCs were detected (Figure 2.6-3).

2.6.2 SWMU 18-003(b), Septic System

SWMU 18-003(b) is an inactive septic system that includes an inlet line, a septic tank, a discharge line, and a drain field (Figure 2.6-1). SWMU 18-003(b) is located at TA-18 approximately 100 ft south of

building 18-23, 20 ft south of building 18-168, and 50 ft southwest of SWMU 18-003(a), a settling tank that discharged overflow through an outlet drainline connected to SWMU 18-003(b). The septic system received sanitary wastes and wash water from building 18-23 from 1947 to 1995. The reinforced concrete septic tank is 7 ft long × 4 ft wide × 5.5 ft high with an approximate capacity of 524 gal. A large wooden baffle is located at each end inside the tank. The inlet line leading to the tank is approximately 100 ft long, and the outlet line is approximately 50 ft long. The drain field consists of four drainlines, each approximately 68 ft long and spaced 10 ft apart (LANL 1995, 052183, p. 4-4).

2.6.2.1 Previous Investigations for SWMU 18-003(b)

In 1990, an environmental investigation was conducted in the area surrounding SWMU 18-003(b). Four shallow monitoring wells were drilled at locations surrounding building 18-168 to define baseline levels of uranium and/or fission-product contamination in the environment. During well construction, soil samples were collected with a split-spoon sampler at depths of 10 ft, 15 ft, and 20 ft bgs. All soil and groundwater samples were analyzed for a suite of radionuclides that could be released from building 18-168. Radionuclides in the soil were at or below background levels and groundwater concentrations were below drinking water standards. One borehole penetrated the drainline connecting SWMU 18-003(a) to SWMU 18-003(b). The abandoned hole was sampled directly beneath the drainline, and results showed radionuclides above BVs/FVs (LATA 1991, 012464, p. 3-4).

An RFI was conducted at SWMU 18-003(b) in September 1993 and from June to August 1994. Two samples each of sludge and liquid were collected from the septic tank with a special long-handled bailer. Liquid and sludge samples were analyzed for total uranium, other inorganic chemicals, and isotopic plutonium.

Three surface soil samples next to the tank and five surface samples above the drain field were collected with a Teflon core barrel sampler. Surface soil analyses were the same as for the liquid and sludge, with the addition of SVOCs and gamma-emitting radionuclides. Three subsurface soil samples next to the drainline connections and seven subsurface samples next to the drain field were collected using a truck-mounted hollow-stem auger and core rig. Subsurface soil analyses were the same as for surface soil, with the addition of chloride, nitrate, and VOCs. Analyses of groundwater samples collected from the building 18-168 wells during the 1993 RFI, independent of SWMU 18-003(b), showed levels of 1,2-dichloroethane (1,2-DCA). Permanent alluvial groundwater monitoring well 18-1135 (M-7) was installed immediately downgradient of the drain field because groundwater contamination from Consolidated Unit 18-003(a)-00 was suspected (LANL 1995, 052183, pp. 4-4–4-22).

The results of the analyses of soil samples collected at the tank are as follows:

- Beryllium was detected above BV (LANL 1995, 052183, pp. 4-19–4-20).
- SVOCs were not detected (LANL 1995, 052183, pp. 4-4–4-22).
- Americium-241, cobalt-60, manganese-54, plutonium-238, thorium-227, thorium-234, and uranium-235 were detected above BVs/FVs (LANL 1996, 054919, pp. 4-6–4-7).

An IA was conducted at SWMU 18-003(b) from March to September 1996. The IA consisted of removing the liquid and sludge contained in the septic tank, pressure-rinsing the interior of the tank, and disposing of the tank's contents and associated decontamination water. To prevent the potential release of contamination, floor drains in building 18-23 were sealed by fastening a gasket and metal plate over the drain opening; water service to the building was shut off (LANL 1996, 055044, p. 3). One liquid sample and one sludge sample were collected for waste characterization purposes (LANL 1996, 055044, p. 3).

A VCM plan documents that the tank was sampled again in 1997 to characterize the tank structure and adjacent soil. Concrete and wood samples were collected from the interior of the tank, and soil samples were collected beneath the inlet and outlet connections. Soil samples were collected next to the tank at the approximate depth of the tank floor and 2 ft deeper (LANL 1999, 063647, p. 10-11).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1999, 065033).

2.6.2.2 Analytical Results for SWMU 18-003(b)

The data collected during the 1993 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B. Decision-level analytical data, samples collected, and analytes requested from the 1997 VCM are presented in Tables 2.6-5 to 2.6-8.

The results of the analyses of samples collected in 1997 are as follows (LANL 1999, 063647, p. 10-11).

- Cadmium, copper, mercury, and thallium were detected above BVs (Figure 2.6-2).
- SVOCs and VOCs were detected (Figure 2.6-3).
- Uranium-234, uranium-235, and uranium-238 were detected above BVs (Figure 2.6-4).

2.7 SWMU 18-003(c), Septic System

SWMU 18-003(c) (Figure 2.7-1) is an inactive septic system at TA-18 that received sanitary waste from building 18-32 from 1952 to 1995. The system includes an inlet line, a reinforced concrete septic tank, a discharge line, a drain field, and an outfall. The septic tank is located approximately 15 ft east of building 18-128 and approximately 90 ft northeast of building 18-32. The tank measures 6 ft in diameter × 5 ft high and has a capacity of 650 gal. The inlet line leading to the tank is approximately 130 ft long, and the total length of the outlet line is approximately 115 ft long. The drain field begins approximately 60 ft east of the septic tank and extends east 55 ft. The drain field consists of four drainlines spaced approximately 10 ft apart. Each line is approximately 75 ft long. An outfall, located at the end of the drain field, discharged into the stream channel in Threemile Canyon (LANL 1993, 015310, p. 5-7). Water service to the restroom has been shut off, and the doors have been locked; however, the sewer lines from building 18-32 have not been plugged (LANL 1999, 063647, p. 13).

2.7.1 Previous Investigations for SWMU 18-003(c)

In September 1993 and June to August 1994, an RFI was conducted at SWMU 18-003(c). Two samples each of sludge and liquid were collected from the septic tank. Sludge and liquid samples were analyzed for total uranium, other metals, and isotopic plutonium. Nine surface soil samples were collected next to the tank and above the drain field. Two sediment samples were collected below the outfall.

The analyses of outfall sediment samples were the same as for the sludge and liquid samples, with the addition of SVOCs. The analyses of surface soil samples were the same as for outfall samples, with the addition of gamma-emitting radionuclides. Eight subsurface soil samples and three groundwater samples were collected next to the tank. Analyses of subsurface soil samples were the same as for surface soil samples, with the addition of chloride, nitrate, and VOCs. Analyses of groundwater samples were the same as for surface soil samples, with the addition of general minerals and VOCs. One permanent well (M-8) was installed for groundwater monitoring.

The results of the analyses of soil samples collected at the tank are as follows:

- No inorganic chemicals were detected above BVs (LANL 1995, 052183, p. 4-30).
- SVOCs or VOCs were not detected (LANL 1995, 052183, p. 4-31).
- Plutonium-238 was detected above FV (LANL 1996, 054919, p. 4-12–4-14).

The results of the analyses of soil samples collected in the drain field are as follows:

- No inorganic chemicals were detected above BVs (LANL 1995, 052183, p. 4-30).
- SVOCs were detected. VOCs were not detected (LANL 1995, 052183, p. 4-31).
- Manganese-54, plutonium-238, and thorium-227 were detected above BVs/FVs (LANL 1996, 054919, p. 4-14).

The results of the analyses of soil samples collected at the outfall are as follows:

- Zinc was detected above BV (LANL 1995, 052183, p. 4-31).
- No SVOCs were detected (LANL 1995, 052183, p. 4-31).
- Plutonium-238 was detected above FV (LANL 1996, 054919, pp. 4-12–4-14).

An IA was conducted at SWMU 18-003(c) from March to September 1996. The IA consisted of removing the liquid and sludge contained in the septic tank, pressure-rinsing the interior of the tank, and disposing of the tank's contents and associated decontamination water. The liquid fraction from the tank was disposed of at the TA-50 treatment facility, and the sludge fraction was solidified using an acrylic anionic polymer and disposed of off-site. To prevent potential release of contamination, the floor drains in building 18-32 were sealed by fastening a gasket and metal plate over the drain opening; water service to the building was shut off (LANL 1996, 055044, p. 3). One liquid sample and one sludge sample were collected for waste characterization purposes (LANL 1996, 054470, Table A-3).

A VCM was conducted for waste characterization and site assessment purposes. Concrete samples were collected from the tank's interior and soil samples were obtained beneath the inlet and outlet lines. Soil samples also were collected adjacent to the tank at the approximate depth of the tank floor and 2 ft deeper. A total of six samples were analyzed for total uranium and other metals, HE, SVOCs, PCBs, VOCs, and isotopic plutonium (LANL 1999, 063647, pp. 11–15).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 2000, 066735).

2.7.2 Analytical Results for SWMU 18-003(c)

The data collected during the 1993 RFI and the 1996 IA do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B. Decision-level analytical data, samples collected, and analytes requested from the 1997 VCM are presented in Tables 2.7-1 to 2.7-4.

The results of the analyses of samples collected during the 1997 VCM are as follows (LANL 1999, 063647, pp. 11–15):

- Cadmium, copper, lead, mercury, and zinc were detected above BVs (Figure 2.7-2).
- HE, PAHs, PCBs, and SVOCs were detected (Figure 2.7-3). VOCs were not detected.
- Plutonium-238, plutonium-239/240, uranium-234, and uranium-235 were detected above BVs/FVs (Figure 2.7-4).

2.8 SWMU 18-003(d), Septic System

SWMU 18-003(d) (Figure 2.8-1) is an inactive septic system at TA-18 that served the sanitary sewer system in building 18-116 (Kiva 3) from 1960 to 1995. The system includes an inlet line, a cylindrical septic tank (structure 18-120), an outlet line, a distribution box (structure 18-135), and a drain field. A manhole for the sewer system, located at the southwest corner of building 18-116, is largely obscured by pavement. The septic tank, located approximately 200 ft north of building 18-116, is constructed of reinforced concrete. The tank is 4 ft in diameter × 6 ft high and has an approximate capacity of 500 gal. The inlet line from building 18-116 to the septic tank is approximately 275 ft long, and the outlet line from the tank to the distribution box is approximately 10 ft long. The drain field is constructed of perforated-clay tile pipe, buried approximately 5 ft bgs, and has four drainlines spaced 10 ft apart from each another. Each drainline is approximately 59 ft long. In 1995, sanitary facilities were removed from building 18-116, and the water supply was disconnected (LANL 1993, 051310, p. 5-7).

2.8.1 Previous Investigations for SWMU 18-003(d)

In September 1993 and June to August 1994, an RFI was conducted at SWMU 18-003(d). Two samples each of sludge and liquid were collected from the septic tank pit. Sludge and liquid samples were analyzed for total uranium, other metals, VOCs, and isotopic plutonium. Nine subsurface soil samples and two groundwater samples were collected for laboratory analyses. Seven surface soil samples next to the tank and above the drain field were collected.

Surface soil samples were submitted for laboratory analyses of total uranium and other metals, SVOCs, gamma-emitting radionuclides, and isotopic plutonium. Analyses of groundwater and subsurface soil samples were the same as for surface soil samples, with the addition of general minerals and VOCs for groundwater and chloride, nitrate, and VOCs for subsurface soil (LANL 1995, 052183, pp. 4-33–4-42).

The results of the analyses of soil samples collected in the drain field are as follows:

- Nitrate was detected (LANL 1995, 052183, pp. 4-39–4-40).
- SVOCs or VOCs were not detected (LANL 1995, 052183, p. 4-40).
- Plutonium-238, plutonium-239/240, and thorium-234 were detected above BVs/FVs (LANL 1996, 054919, p. 4-18).

An IA was conducted at SWMU 18-003(d) from March to September 1996. The IA consisted of removing the liquid and sludge contained in the septic tank, pressure-rinsing the interior of the tank, and disposing of the tank's contents and associated decontamination water. To prevent potential release of contamination, sanitary facilities were removed from building 18-116, and the water supply was disconnected. The liquid fraction was disposed of at TA-50, and the sludge and decontamination waste was disposed of off-site (LANL 1996, 055044, p. 4). One liquid sample and one sludge sample were collected for waste characterization purposes (LANL 1996, 054470, Table A-4).

A VCA was conducted at SWMU 18-003(d) from October 1996 to September 1998. The VCA consisted of constructing five permanent alluvial monitoring wells in and around SWMU 18-003(d) drain field and sampling the groundwater quarterly for 2 yr. Seventeen soil samples were collected during well construction and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, SVOCs, VOCs, and radionuclides (LANL 1997, 057015, pp. 4-1–5-8). Results for the eight quarters of groundwater monitoring did not identify any organic COPCs above their respective New Mexico Water Quality Control Commission standards (LANL 1999, 062884, pp. 3–10).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 2000, 066735).

2.8.2 Analytical Results for SWMU 18-003(d)

The data collected during the 1993 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B. Decision-level analytical data, samples collected, and analytes requested from the 1996 to 1998 corrective action are presented in Tables 2.8-1 to 2.8-3.

The results of the analyses of samples collected during the 1996 to 1998 VCA are as follows (LANL 1997, 057015, pp. 5-3–5-8):

- Manganese, thallium, and zinc were detected above BVs (Figure 2.8-2).
- VOCs were detected (Figure 2.8-3).
- No radionuclides were detected.

2.9 SWMU 18-003(e), Septic System

SWMU 18-003(e) (Figure 2.9-1) is an inactive septic system at TA-18 that includes two inlet lines, a cylindrical septic tank (structure 18-40), an outlet line, a drain field, and a former outfall. The septic tank is located approximately 50 ft southwest of building 18-37 and approximately 50 ft east of building 18-29 (a log cabin). The tank is constructed of reinforced concrete and measures 6 ft in diameter × 6 ft high. The septic system received sanitary waste from building 18-31 (a utility building), building 18-37 (Guard Station 205), and building 18-129 (a reactor subassembly building). While in operation from 1951 to 1969, the septic system may have also received industrial waste from a sink in building 18-28 (a warehouse). Septic tanks associated with SWMUs 18-003(g,h) (structures 18-43 and 18-152) may have discharged to this septic system.

Effluent discharged into a drain field that has four drainlines, each of which is approximately 40 ft long. The drainlines, which are 10 ft apart, merge at the distal end of the drain field and continue an estimated 100 ft to the former outfall. In 1969, sanitary waste from the buildings was connected to the site sewer system that routed effluent to the sanitary sewage lagoons. At that time, the septic tank was backfilled with sand (LANL 1993, 015310, pp. 5-7–5-13).

2.9.1 Previous Investigations for SWMU 18-003(e)

In July 1994, an RFI was conducted at SWMU 18-003(e). Two samples of the tank sand fill were collected from the septic tank. The fill samples were submitted to an off-site contract analytical laboratory for analyses of total uranium, metals, SVOCs, VOCs, and isotopic plutonium. In addition to the fill samples, 21 soil samples were collected from surface soil and boreholes next to the tank, within the drain field, and

near the former outfall. Soil samples were submitted to an off-site contract analytical laboratory for analysis of total uranium and other metals, SVOCs, VOCs, and isotopic plutonium. Two groundwater samples were collected, one from each borehole that encountered shallow groundwater (LANL 1995, 047257, p. 5).

The results of the analyses of fill samples collected inside the tank are as follows (LANL 1995, 047257, p. 5):

- No inorganic chemicals (metals) were detected above BVs.
- VOCs were detected. SVOCs were not detected.
- No radionuclides were detected.

The results of the analyses of soil samples collected are as follows (LANL 1995, 047257, p. 5):

- No inorganic chemicals were detected above BVs.
- Diethylphthalate was detected. VOCs were detected.
- No radionuclides were detected.

An EC conducted at the site consisted of removal and disposal of the sand fill contents of the septic tank, three pressure-steam washes of the tank's interior, and disposal of the wash water. The tank was backfilled with flowable fill concrete to ensure the inlet and outlet ports were properly plugged (LANL 1996, 054488, p. 3).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 2000, 066735).

2.9.2 Analytical Results for SWMU 18-003(e)

The data collected during the 1993 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.10 SWMU 18-003(f), Septic System

SWMU 18-003(f) (Figure 2.10-1) is an inactive septic system at TA-18 that includes an inlet line, a septic tank (structure 18-41), a discharge line, and a drain field. The septic system received sanitary and photochemical laboratory effluent from building 18-30 from 1951 to 1969. In 1969, building 18-30 was connected to the sanitary sewage lagoons, and the septic tank was filled with sand. The septic tank, located 25 ft west of building 18-30, is constructed of reinforced concrete, and has a 1000-gal. capacity. The tank drained west to the distribution box and drain field. The drain field is located beneath asphalt pavement and the grassy area west of building 18-30.

Historical documents indicate that a manhole, a settling pit with associated drainlines, and an outfall may have been associated with SWMU 18-003(f), but they were not located during the 1993 RFI (LANL 1995, 052183, p. 4-44).

2.10.1 Previous Investigations for SWMU 18-003(f)

In August 1994, an RFI was conducted at SWMU 18-003(f). Two samples of sand fill were collected from the septic tank, 3 soil samples were collected next to the inlet and outlet tank connections, 15 soil

samples were collected within the drain field, and 3 groundwater samples were collected beneath the drain field. Tank fill was analyzed for total uranium, other inorganic chemicals, SVOCs, and VOCs. The analyses of subsurface soil samples were the same as for the tank fill, with the addition of chloride and nitrate. The analyses of three groundwater samples, also collected beneath the drain field, were the same as for the tank fill, with the addition of general minerals (LANL 1995, 052183, 4-44–4-51).

The results of the analyses of groundwater samples collected at the drain field are as follows:

- Arsenic, barium, beryllium, chromium, copper, cobalt, lead, manganese, nickel, vanadium, and zinc were detected above BV (LANL 1995, 052183, pp. 4-44–4-51).
- Acetone was detected (LANL 1995, 052183, pp. 4-44–4-51).

The results of the analyses of soil samples collected at the drain field are as follows:

- Antimony was detected above BV (LANL 1995, 052183, pp. 4-44–4-51).
- VOCs were detected. SVOCs were not detected. (LANL 1995, 052183, pp. 4-44–4-51).
- Uranium was detected above BV (LANL 1996, 054919, pp. 4-20–4-22).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 2000, 066735).

2.10.2 Analytical Results for SWMU 18-003(f)

The data collected during the 1993 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.11 SWMU 18-003(g), Septic System

SWMU 18-003(g), (Figure 2.11-1), is an inactive septic system at TA-18 that includes an inlet line, a septic tank (structure 18-43), and a discharge line. The reinforced concrete septic tank is located approximately 25 ft southwest of building 18-1 and 10 ft northeast of building 18-147. The tank is 3 ft wide × 5 ft long × 5 ft deep, and its estimated capacity is 500 gal. From 1944 to the present, the septic system has been receiving sanitary and photochemical laboratory waste from building 18-1. Most of building 18-1 was demolished in 1968, leaving only a high bay, which is currently used as an electronic assembly and storage area. In 1969, SWMU 18-003(g) was connected to the site sewer system that routed effluent to the sanitary sewage lagoons, which changed the function of the tank to a settling pit. Since 1992, the septic system waste has been pumped to the SWSC plant at TA-46. Historical documents indicate the system originally discharged to an outfall near the main drainage channel in Pajarito Canyon and may have been connected to the SWMU 18-003(e) septic system (LANL 1993, 015310, pp. 5-11–5-13).

2.11.1 Previous Investigations for SWMU 18-003(g)

In September 1993 and August 1994, an RFI was conducted at SWMU 18-003(g). Two samples of liquid and one of sludge were collected from the septic tank using a special long-handled bailer. The tank had only enough sludge for one SVOC and VOC analysis. Liquid samples were analyzed for total uranium and other inorganic chemicals, SVOCs, VOCs, and isotopic plutonium. No surface soil samples were collected because asphalt pavement covered the area. Four subsurface soil samples and three groundwater samples were collected from a borehole 10 ft downgradient (southeast) of the tank using a Teflon core barrel sampler.

Analyses of subsurface soil samples were the same as for tank liquid samples, with the addition of chloride, nitrate, and gamma-emitting radionuclides. Analyses of groundwater samples were the same as for tank liquid samples, with the addition of general minerals and gamma-emitting radionuclides. One permanent well (M-11) was installed for groundwater monitoring (LANL 1995, 052183, pp. 4-52–4-57).

The results of the analyses of soil samples collected from the borehole of monitoring well M-11 are as follows:

- No inorganic chemicals were detected above BVs (Gould 1997, 056009, p. 23).
- VOCs were detected. SVOCs were not detected (LANL 1995, 052183, p. 4-57).
- No radionuclides were detected (LANL 1996, 054919, pp. 4-24–4-27).

An IA was conducted at SWMU 18-003(g) from March to September 1996. The IA consisted of removing the liquid and sludge contained in the septic tank, pressure-rinsing the interior of the tank, and disposing of the tank's contents and associated decontamination water. Sludge and liquid waste from the tank was sanitized using calcium hypochlorite because of the high fecal coliform concentration and disposed of at TA-54 (LANL 1996, 055044, p. 3). One liquid sample and one sludge sample were collected for waste characterization purposes (LANL 1996, 054470, Table A-3).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 2000, 066735).

2.11.2 Analytical Results for SWMU 18-003(g)

The data collected during the 1993 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.12 SWMU 18-003(h), Septic System

SWMU 18-003(h) (Figure 2.11-1) is an active septic system at TA-18 that includes an inlet line, a septic tank (structure 18-152), and a discharge line. The septic tank is located approximately 5 ft southeast of building 18-147. This steel tank measures 4.3 ft in diameter × 5 ft deep and has a capacity of 500 gal. SWMU 18-003(h) connects with the outlet drainline of SWMU 18-003(g). From 1967 to the present, the septic system has been receiving sanitary waste from building 18-147. In 1969, SWMU 18-003(h) was connected to the site sewer system that routed effluent to the sanitary sewage lagoons, changing the function of the tank to a settling pit. Since 1992, the septic system waste has been pumped to the SWSC plant at TA-46. Historical documents indicate the system originally discharged to an outfall near the main drainage channel in Pajarito Canyon (LANL 1993, 015310, p. 5-11).

2.12.1 Previous Investigations for SWMU 18-003(h)

In September 1993 and August 1994, an RFI was conducted at SWMU 18-003(h). Two samples of liquid were collected from the septic tank. The tank did not contain sludge. Tank fluid was analyzed for total uranium, SVOCs, VOCs, and isotopic plutonium. No surface soil samples were collected because asphalt pavement covered the area. Two subsurface soil samples were collected from a borehole 10 ft downgradient (southeast) of the tank using a truck-mounted hollow-stem auger and a core rig. Analyses of subsurface soil samples were the same as for the tank liquid, with the addition of chloride and nitrate. Groundwater samples could not be collected because the auger accidentally penetrated the active

sanitary sewer line from structure 18-152. A second borehole could not be drilled because the rig could not access the site (LANL 1995, 052183, pp. 4-58–4-61).

The results of the analyses of soil samples collected near the tank are as follows:

- No inorganic chemicals were detected above BVs (LANL 1995, 052183, pp. 4-58–4-61).
- SVOCs or VOCs were not detected (LANL 1995, 052183, pp. 4-58–4-61).
- Uranium was detected above BV (LANL 1999, 063647, p. 26).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 2000, 066735).

2.12.2 Analytical Results for SWMU 18-003(h)

The data collected during the 1993 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.13 Consolidated Unit 18-004(a)-00

Consolidated Unit 18-004(a)-00 (Figure 2.13-1) consists of SWMU 18-004(a), a stainless-steel industrial waste line, and 18-004(b), a concrete pit containing two stainless-steel tanks that received discharge from SWMU 18-004(a).

2.13.1 SWMU 18-004(a), Waste Line

SWMU 18-004(a) consists of a 3-in.-diameter × approximately 50-ft-long stainless-steel industrial waste line located at TA-18 belowground on the west side of building 18-30. The waste line was connected to sinks that served the west side of building 18-30 and discharged into two associated stainless-steel tanks [SWMU 18-004(b)]. The waste line was designed to receive radioactively contaminated liquid waste from building 18-30 (LANL 1993, 015310, p. 5-13). The 1990 SWMU report (LANL 1990, 007512) states the waste line received radioactively contaminated liquid waste from building 18-30 (LANL 1993, 015310, p. 5-13).

During interviews conducted for the RFI work plan, former personnel from building 18-30 indicated that sealed radioactive sources, detectors, and reactor-fuel elements were the only radioactive materials present in building 18-30, and no radioactive liquids were ever present. The interviews also indicated that while no radioactive waste entered the waste line, some chemical wastes (primarily acids and cleaning solvents) did. The waste line and associated tanks were in service from the 1950s to 1977 when they were decommissioned. At that time, the inlet end of the waste line was capped and remains inactive. Because no information regarding the removal of the waste line was found, it is assumed that the line remains buried in place (LANL 1993, 015310, p. 5-13).

2.13.1.1 Previous Investigations for SWMU 18-004(a)

In June 1994, an RFI was conducted at SWMU 18-004(a). The capped end of the stainless-steel waste line was found in the north wall of room 114 in building 18-30. The inside of the pipe was swiped at the capped end and analyzed for total uranium and for gross-alpha, -beta, and -gamma radioactivity. Radionuclides were not detected in the swipe samples collected from the inside of the pipe. Field

instruments held at the opening of the pipe detected no radioactivity or organic vapors above background levels. No analytical samples were collected at the site (LANL 1995, 052183, p. 4-62).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.13.1.2 Analytical Results for SWMU 18-004(a)

No soil samples were collected for analyses at SWMU 18-004(a).

2.13.2 SWMU 18-004(b), Area of Potential Soil Contamination from Former Tanks and Pit

SWMU 18-004(b) consists of an area of potential soil contamination associated with a subsurface concrete containment pit (structure 18-38) that measures 4 ft wide × 9 ft long × 8 ft high and is located at TA-18 on the west side of building 18-30 (Figure 2.13-1). The pit contained two stainless-steel tanks designed to receive radioactively contaminated liquid waste from building 18-30 through an associated 3-in. stainless-steel industrial waste line [SWMU 18-004(a)]. The waste line was connected to sinks that served the west side of building 18-30. A 9-in.-diameter × 6-in.-high sump was built into the floor of the pit, possibly to catch any overflow from the tanks. Whenever the tanks became full, they were taken out for waste removal and cleaning and then returned to service. The 1990 SWMU report (LANL 1990, 007512) states that the waste line received radioactively contaminated liquid waste from building 18-30.

During interviews conducted for the RFI work plan, former personnel from building 18-30 indicated that sealed radioactive sources, detectors, and reactor-fuel elements were the only radioactive materials present in building 18-30, and no radioactive liquids were ever present. The interviews also indicated that while no radioactive waste entered the tanks, some chemical wastes (primarily acids and cleaning solvents) did. The tanks and associated waste line were in service from the 1950s to 1977 when they were decommissioned. The tanks were removed in 1977, the concrete bottom of the pit was left in place, the walls of the pit were razed, and the pit was backfilled to grade (LANL 1993, 015310, p. 5-13).

2.13.2.1 Previous Investigations for SWMU 18-004(b)

In June 1994, an RFI was conducted at SWMU 18-004(b). Geophysical tests using engineering drawings were conducted to locate the concrete bottom of the pit that had supported the stainless-steel tanks, but the tests failed to find the concrete bottom of the pit. Additionally, underground electrical conduits critical to operations of building 18-23 were located only 1–2 ft away from the presumed position of the former pit. The risk to these conduits precluded any further excavation at the site; no further investigation was conducted at SWMU 18-004(b) (LANL 1995, 052183, p. 4-62).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.13.2.2 Analytical Results for SWMU 18-004(b)

No soil samples were collected for analyses at SWMU 18-004(b).

2.14 SWMU 18-005(a), Area of Potential Soil Contamination from Former Magazine 18-15

SWMU 18-005(a) (Figure 2.14-1) consists of an area of potentially contaminated soil associated with a former magazine (structure 18-15) at TA-18 used from 1945 until it was demolished in 1977. The

magazine was a small, round, dirt-bermed wooden bunker located west of building 18-297. The magazine originally stored HE for firing-site activities conducted at SWMU 18-002(a). Beryllium oxide and uranium were also stored in the magazine for nuclear criticality studies conducted from approximately 1946 to 1955. The former location of structure 18-15 is not currently visible, and the berm surrounding the former location of the magazine is no longer present (LANL 1993, 015310, p. 5-63).

2.14.1 Previous Investigations for SWMU 18-005(a)

In September 1993 and May to October 1994, an RFI was conducted at SWMU 18-005(a) (LANL 1995, 052183, p. 1-6). Five soil samples were collected using a hand auger to collect core to a depth of 1 ft from five equally spaced sampling locations 2 ft outside the estimated perimeter of the dirt berm. This strategy assumed that sampling locations close to the structure would intersect the area of highest residual contamination if any release had occurred. Other than a preliminary radioactivity check, no field-screening surveys were conducted. HE spot testing was performed to ensure sample handling safety and proper transport. The spot tests did not detect HE. Samples were submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, HE, and radionuclides (LANL 1995, 052183 pp. 4-130–4-133).

The results of the analyses of soil samples collected from the former magazine are as follows:

- No inorganic chemicals were detected above BVs (LANL 1995, 052183, pp. 4-130–4-133).
- HE was not detected (LANL 1995, 052183, pp. 4-130–4-133).
- No radionuclides were detected above BVs/FVs (LANL 1996, 054919, p. 4-57).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871).

2.14.2 Analytical Results for SWMU 18-005(a)

The data collected during the 1993–1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.15 AOC 18-006, Former Storage Pipe

AOC 18-006 (Figure 2.15-1) consists of a former 100-ft-long × 6-in.-diameter underground stainless-steel storage pipe at TA-18. AOC 18-006 is located next to and west of structure 18-168 in a graded, fenced, and relatively flat canyon bottom approximately 60 ft north of the stream channel in Pajarito Canyon. The pipe was slightly tilted so its depth ranged from 3 ft at its west end to 5 ft at its east end. Engineering drawings indicate the pipe was welded, schedule-40 stainless steel, 0.25-in. thick, wrapped in electric heating tape, and encased in a 1-in.-thick layer of polyurethane insulating foam. The pipe's west end curved upward and became a vertical pipe protruding from a 4-ft-long × 4-ft-wide × 6-in.-thick concrete slab on the ground surface. The top end of the pipe had a welded flange with a round bolted-on endplate. This aboveground part of the pipe was covered with a cylindrical 2-ft-diameter aluminum can, which was approximately 3 ft tall and rested on the concrete slab.

The underground east end of the pipe terminated at a flat welded endplate. Located at this end were two 0.5-in.-diameter vertical stainless-steel tubes that extended from the bottom inside surface of the fuel storage pipe upward to a point above grade. One tube was a fuel-transfer tube, and the other tube was a refueling tube. The ends of both tubes had screw-on caps (LANL 1997, 056355, pp. 1–3). Engineering

drawings show that the storage pipe's east end terminated 2 ft from structure 18-168. The pipe had no connection to the structure, but it was in close proximity to a buried grounding cable that surrounds the structure's foundation. The west end of the pipe was approximately 5 ft inside the corner fence post of the outer security fence for TA-18. The underground pipe passed beneath the inner security fence surrounding structure 18-168 and nearby structure 18-23, a nuclear criticality facility.

AOC 18-006 served structure 18-168, which was part of LACEF. The liquid stored in the pipe was used in liquid-fueled reactor experiments for the former Kinglet liquid-fuel reactor. The Kinglet fission reactor used a 560-L solution of 93.2% enriched uranium dissolved in 0.5 M sulfuric acid, resulting in uranyl sulfate solution. This solution was stored in a noncritical configuration in the AOC 18-006 underground pipe, completely filling the horizontal part of the pipe and a few inches of the vertical part of the pipe (LANL 1997, 056355, p. 1).

The Kinglet reactor began operation in 1970 and was decommissioned in 1974; the fuel was removed, and the pipe was flushed twice with water, according to a former LACEF employee. No other decontamination effort is known. The eastward slope of the fuel pipe, the position of the fuel transfer tube at the very tip of the pipe's downhill end, and the reported double-rinsing of the pipe indicate that only a very small quantity (perhaps a few tens of milliliters) of extremely dilute uranyl sulfate solution may have remained in the pipe's east end. No information has been located regarding isotopic analysis of the removed fuel. The pipe was removed in 1997 (LANL 1997, 056355, p. 1).

2.15.1 Previous Investigations for AOC 18-006

In 1990, an environmental investigation was conducted in the area surrounding AOC 18-006. During the investigation, four shallow monitoring wells were drilled near structure 18-168: one upgradient of the structure and the other three downgradient of the structure. During well construction, soil samples were collected at depths of 10 ft, 15 ft, and 20 ft bgs. All soil samples were analyzed for a suite of radionuclides that could have been released from adjacent structure 18-168 (LATA 1991, 012464, p. 3-4).

In June 1997, two samples of residual liquid were collected from the pipe via the fuel transfer tube at the eastern end of the pipe for waste characterization purposes. The samples were submitted to an off-site contract analytical laboratory for analyses of toxicity characteristic leaching procedure metals, VOCs, and isotopic uranium. Because an unknown quantity of liquid was still present in the pipe, a second, more extensive, sampling effort was undertaken in July 1997 to thoroughly characterize the liquid. All liquid remaining in the pipe was removed for VOC analyses, preventing the collection of any additional analytical samples. The samples collected from the liquid contents of the pipe were solely for waste characterization (LANL 1998, 062676, pp. 10–11).

The VCA to remove the storage pipe at AOC 18-006 began on August 12, 1997, and concluded on August 18, 1997. Before the pipe and concrete pad were removed from the trench during VCA activities, all soil from the excavation was screened for radiological activity. Before the pipe was removed from the trench, it was cut, swiped, and screened for radiological activity. While the trench was open, three confirmatory soil samples were collected at three different locations directly beneath the pipe. Two confirmatory sampling locations near each end of the pipe trench were selected to address any potential undocumented spills from liquid handling as well as any potential leaks from welds at critical points. The third sampling location was selected at the approximate midpoint of the pipe trench (LANL 1998, 062676, p. 15).

The sampling interval for all three samples was 0–6 in. directly below the excavated pipe, which contained a combination of the original 2 in. of fill material and approximately 4 in. of native alluvial material. After the pipe was removed, the trench was backfilled with excavated materials. The samples

were submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, organic chemicals, and radionuclides (LANL 1998, 062676, p. 15).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site.

2.15.2 Analytical Results for AOC 18-006

Decision-level analytical data, samples collected, and analytes requested from the August 1997 VCA are presented in Tables 2.15-1 to 2.15-3. The results of the analyses of samples collected below the excavated pipe are as follows (LANL 1998, 062676, pp. 18–24):

- Zinc was detected above BV (Figure 2.15-2).
- VOCs were detected (Figure 2.15-3). SVOCs were not detected.
- No radionuclides were detected above BVs/FVs.

2.16 AOC 18-008, Former Underground Tank

AOC 18-008 (Figure 2.16-1) is a former 1000-gal. underground storage tank (UST), structure 18-104, which was located at TA-18 approximately 40 ft northeast of building 18-256 and 45 ft southeast of structure 18-26 (a vault). From approximately 1945 to 1955, the tank stored diesel fuel for a diesel-operated generator or for a boiler in building 18-1, but the tank was never connected to the buildings. The tank was removed in 1996 (LANL 1996, 063045, p. 1).

2.16.1 Previous Investigations for AOC 18-008

In September 1993 and May to October 1994, an RFI was conducted at AOC 18-008 (LANL 1995, 052183, p. 1-6). The tank could not be located by surface inspection. Consequently, ground-penetrating radar (GPR) readings were taken in an attempt to establish the location of the tank. No samples were collected during this RFI because the tank could not be located with GPR or a geophysical survey. Based on a slight GPR indication of a subsurface object, an 8.5-ft-wide × 8.5-ft-long × 4-ft-deep area was excavated in the paved area north of building 18-1; however, it revealed only a gas line. GPR did not find any other indications of a buried tank in the area. A geophysical field survey was also performed, covering the entire area within the TA-18 fence line. The survey failed to locate any metallic object large enough to be interpreted as a fuel tank.

In June 1996, the tank was discovered during the installation of a new gas line at TA-18, and a decision was made to remove the tank as part of a VCA. The New Mexico UST regulations require the removal of abandoned tanks from the ground, sampling efforts, and corrective actions. Before the tank the tank was removed, the New Mexico UST Bureau was informed and concurred with the decision to remove the tank. The removal of the tank was completed under the excavation permit previously approved for the gas line installation (LANL 1996, 063045, p. 1).

On July 3, 1996, the UST was excavated and removed. Decomposed wooden timbers that had provided a base for the tank were observed in the excavation pit. On the same day of the UST removal, two soil samples were collected from the bottom of the excavation pit at 6–7 ft bgs. The two samples were field-screened by a mobile laboratory for gross-alpha, -beta, and -gamma radioactivity and then submitted to an off-site contract analytical laboratory for analysis of TPH-DROs (total petroleum hydrocarbons–diesel range organics).

In accordance with New Mexico UST regulations, the Laboratory also determined that the location lies outside the lateral boundaries of a shallow alluvial aquifer underlying much of TA-18. Borehole SHB-4, which lies 150 ft east and 40 ft downgradient of the UST location, was used to characterize the tank to groundwater pathway. The tank was removed and transferred to a commercial firm specializing in the treatment and reclamation of empty USTs. The excavation was backfilled without further remediation (LANL 1996, 063045, pp. 1-6, F-1–F-3).

On September 4, 1996, as part of the VCA, two boreholes were drilled at the location of the former tank to investigate possible contamination based on the analytical results of two soil samples taken during the excavation. Two soil samples were collected from each of the two boreholes at 6–7 ft and 7–8 ft bgs and submitted to an off-site contract analytical laboratory for analyses of SVOCs, TPH-DROs, and VOCs (LANL 1996, 063045, pp. 1-6, F-1–F-3).

Following the VCA, the New Mexico UST Bureau mandated a 45-d report (LANL 1996, 055174) to determine the extent of diesel-fuel contamination associated with the former UST. The report documented that on November 18 and 19, 1996, four boreholes were drilled near the location of the former tank to a depth of 28 ft bgs to investigate possible contamination based on previous sampling results. Field screening was done by PID and an AMS hydrocarbon (HC) test kit (HC Test) at 5-ft intervals whenever possible. All field-screening results were nondetects. In the first borehole, samples were collected at 7 ft, 12 ft, 17 ft, 22 ft, and 28 ft bgs. At each of the remaining three boreholes, samples were collected at 9 ft, 14 ft, 19 ft, 24 ft, and 28 ft bgs. Twenty samples were collected from the four boreholes and submitted to an off-site contract analytical laboratory for analyses of SVOCs, TPH-DROs, and VOCs (LANL 1996, 055174, pp. 1–6).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site.

2.16.2 Analytical Results for AOC 18-008

Decision-level analytical data, samples collected, and analytes requested from the 1996 VCA and 45-d investigation are presented in Tables 2.16-1 and 2.16-2. No sampling was conducted at AOC 18-008 during the 1993 RFI because the AOC could not be located.

The results of the analyses of samples collected during the VCA from the tank excavation in July 1996 and samples collected from the two boreholes drilled in September 1996 (LANL 1996, 063045) found TPH-DROs and VOCs detected (Figure 2.16-2). SVOCs were not detected.

The results of the analyses of the 20 samples collected from the four boreholes drilled in November 1996 (LANL 1996, 055174) found TPH-DROs detected (Figure 2.16-2). SVOCs or VOCs were not detected.

2.17 AOC 18-010(b), Outfall

AOC 18-010(b) (Figure 2.17-1) is an active outfall at TA-18 that receives stormwater discharge from an asphalt-paved drainage ditch running southward along the west side of the paved area west of building 18-30. The outfall discharges to a flat, grassy area at the fence southwest of building 18-30. The discharge point is approximately 25 ft north of the stream channel in Pajarito Canyon. The discharged stormwater generally infiltrates the ground a short distance from the outfall, although heavy flow may reach the stream channel. The date this outfall became operational is not known, but it is likely the outfall has been operational from the time building 18-30 was constructed in 1951.

The 1993 RFI work plan (LANL 1993, 015310) for AOC 18-010(b) described a 1988 photograph that noted spillage from a refueling platform into the asphalt paved drainage ditch (LANL 1993, 015310, p. 5-64).

2.17.1 Previous Investigations for AOC 18-010(b)

From May to October 1994, an RFI was conducted at AOC 18-010(b) (LANL 1995, 052183, p. 1-6). Ten sediment samples were collected from 10 locations for field screening from the asphalt-paved drainage ditch upstream from the outfall. The samples were screened in the field for inorganic chemicals and SVOCs using a mobile laboratory. Five samples were selected for analytical sampling, based on the presence of elevated concentrations of inorganic chemicals, and submitted to an off-site contract analytical laboratory for analyses of total uranium, other metals, and SVOCs (LANL 1995, 052183, p. 4-137). Two soil samples, one at the outfall and another 12 ft downstream of the outfall, were collected from 0–6-in. bgs and submitted to an off-site contract analytical laboratory for analyses of total uranium, other metals, and SVOCs (LANL 1995, 052183, p. 4-137).

The results of the analyses of samples collected from the outfall and drainage ditch are as follows:

- Total uranium was detected above BV (LANL 1996, 054919, p. 4-61). Manganese and zinc were detected above BVs (LANL 1995, 052183, p. 4-144).
- SVOCs were detected (LANL 1995, 052183, p. 4-144).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.17.2 Analytical Results for AOC 18-010(b)

The data collected during the 1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.18 AOC 18-010(c), Outfall

AOC 18-010(c) (Figure 2.18-1) is an outfall at TA-18 that receives stormwater discharge in the form of sheet flow from the paved area east of building 18-30. The outfall discharges to a grassy depression southeast of building 18-30 and south of building 18-31. The discharge point is approximately 100 ft north of the stream channel in Pajarito Canyon. The date this outfall became operational is not known, but it is likely the outfall has been in operation from the time building 18-30 was constructed in 1951 (LANL 1993, 015310, p. 5-65).

2.18.1 Previous Investigations for AOC 18-010(c)

From May to October 1994, an RFI was conducted at AOC 18-010(c) (LANL 1995, 052183, p. 1-6). Four sediment samples were collected for field screening from four locations at the outfall and the drainage channel below the outfall. The samples were screened in the field for inorganic chemicals and SVOCs using a mobile laboratory. Two samples were selected for analyses, based on the presence of elevated concentrations of inorganic chemicals, and submitted to an off-site contract analytical laboratory for analyses of total uranium, other metals, and SVOCs (LANL 1995, 052183, p. 4-146).

The results of the analyses of samples collected from the outfall and drainage channel below the outfall are as follows:

- Copper and mercury were detected above BVs (LANL 1995, 052183, p. 4-151).
- SVOCs were detected (LANL 1995, 052183, p. 4-151).
- No radionuclides were detected above BVs/FVs (LANL 1996, 054919, p. 4-62).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.18.2 Analytical Results for AOC 18-010(c)

The data collected during the 1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.19 AOC 18-010(d), Outfall

AOC 18-010(d) (Figure 2.18-1) is an outfall at TA-18 that receives discharge in the form of sheet flow from a storm drainage collection area that drains the paved area northeast of building 18-37. The outfall discharges to a flat, graveled, grassy area southeast of building 18-37 and west of building 18-258. The discharge point is approximately 100 ft north of the stream channel in Pajarito Canyon. The date this outfall became operational is not known, but it is likely the outfall has been in operation from the time building 18-37 was constructed in 1951(LANL 1993, 015310, p. 5-65).

2.19.1 Previous Investigations for AOC 18-010(d)

From May to October 1994, an RFI was conducted at AOC 18-010(d) (LANL 1995, 052183, p. 1-6). Four sediment samples were collected for field screening from four locations at the outfall and the drainage below the outfall. The samples were screened in the field for inorganic chemicals and SVOCs using a mobile laboratory. Two samples were selected for analyses, based on the presence of elevated concentrations of inorganic chemicals, and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, SVOCs, and radionuclides (LANL 1995, 052183, p. 4-153).

The results of the analyses of samples collected from the outfall and drainage below the outfall are as follows:

- Lead and zinc were detected above BVs (LANL 1995, 052183, p. 4-156).
- SVOCs were detected (LANL 1995, 052183, p. 4-156).
- No radionuclides were detected above BVs/FVs (LANL 1996, 054919, p. 4-64).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.19.2 Analytical Results for AOC 18-010(d)

The data collected during the 1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.20 AOC 18-010(e), Outfall

AOC 18-010(e) (Figure 2.20-1) is an outfall at TA-18 that receives discharge from a storm sewer drainage that drains the paved area between buildings 18-28 and 18-147. The drainage enters a storm drain that runs southeast under the paved area west of building 18-129 to a grating east of building 18-190 and then turns south. The drain reaches the outfall south of building 18-129, which discharges to a small grassy gully leading to the main stream channel in Pajarito Canyon. The outfall is located approximately 200 ft north of the stream channel. The date this outfall became operational is not known, but it is likely the outfall has been operational from the time building 18-30 was constructed in 1951(LANL 1993, 015310, p. 5-65).

2.20.1 Previous Investigations for AOC 18-010(e)

From May to October 1994, an RFI was conducted at AOC 18-010(e) (LANL 1995, 052183, p. 1-6). Fourteen sediment samples were collected for field screening from 14 locations at the outfall, the drainage below the outfall, and the Pajarito Canyon stream channel. The samples were screened in the field for inorganic chemicals and SVOCs using a mobile laboratory. Seven samples were selected for analyses, based on the presence of elevated concentrations of inorganic chemicals, and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, SVOCs, and radionuclides (LANL 1995, 052183, p. 4-158).

The results of samples collected from the outfall, drainage below the outfall, and the Pajarito Canyon stream channel are as follows:

- Cadmium, lead, mercury, and zinc were detected above BVs (LANL 1995, 052183, p. 4-158).
- SVOCs were detected (LANL 1995, 052183, p. 4-158).
- No radionuclides were detected above BVs/FVs (LANL 1996, 054919, p. 4-66).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.20.2 Analytical Results for AOC 18-010(e)

The data collected during the 1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.21 AOC 18-010(f), Outfall from Building 18-32

AOC 18-010(f), (Figure 2.21-1), is an outfall at TA-18 that received discharge from the roof and floor drains of building 18-32. The roof and floor drains discharge into a storm drain that exits the building under the pavement from the northeast corner of building 18-32. The storm drainline discharges through an outfall approximately 100 ft north of building 18-32, located on a sandy, grassy bank on the south side of the stream channel in Threemile Canyon. Building 18-32 was built in 1951 and used for nuclear critical assembly work. The date this outfall became operational is unknown, but it is likely that the outfall has been in operation from the time building 18-32 was constructed in 1951 (LANL 1993, 015310, p. 5-65).

2.21.1 Previous Investigations for AOC 18-010(f)

From May to October 1994, an RFI was conducted at AOC 18-010(f) (LANL 1995, 052183, p. 1-6). Four sediment samples were collected for field screening from four locations at the outfall and the drainage below the outfall. The samples were screened in the field for inorganic chemicals and SVOCs using a mobile laboratory. Two samples were selected for analyses, based on the presence of elevated concentrations of inorganic chemicals, and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, SVOCs, and radionuclides (LANL 1995, 052183, p. 4-167).

The results of the analyses of the samples are as follows:

- No inorganic chemicals were detected above BVs (LANL 1995, 052183, p. 4-167).
- No organic chemicals were detected (LANL 1995, 052183, p. 4-167).
- No radionuclides were detected above BVs/FVs (LANL 1996, 054919, p. 4-68).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.21.2 Analytical Results for AOC 18-010(f)

The data collected during the 1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.22 AOC 18-011, Area of Potential Soil Contamination from Former Building 18-22

AOC 18-011 (Figure 2.16-1) consists of an area of potential soil contamination at TA-18 beneath a former electrical generator building (former building 18-22) that was potentially contaminated by a mercury spill in the building. Former building 18-22 was located at the north end of the central area of TA-18. The building operated from 1946 until it was removed in 1950. The concrete floor pad was left in place and is covered with approximately 2 ft of fill (LANL 1993, 015310, p. 5-52).

The SWMU 1990 report (LANL 1990, 007512) indicates that mercury was handled in former building 18-22, but according to an interview with a former Laboratory employee, mercury was present only in some of the switches on the generator. The employee indicated that on one occasion, a mercury-containing glass tube on one of the switches broke, spilling 1–2 mL of mercury onto the concrete pad and possibly onto the surrounding soil. Health Division reportedly cleaned up the mercury spill using sulfur powder; however, no historical documentation of the spill or any cleanup effort is available (LANL 1993, 015310, pp. 5-52 to 5-53).

2.22.1 Previous Investigations for AOC 18-011

From May to October 1994, an RFI was conducted at AOC 18-011 (LANL 1995, 052183, p. 1-6). Shortly before the start of sampling, nearby trenching for unrelated utility work exposed a corner of the buried concrete foundation of former building 18-22, allowing determination of its location and orientation. The trenching activities did not interfere with the areas selected for sampling. Five samples were collected: four surface soil samples were collected 2 ft from the perimeter of each side of the square pad, and another surface sample was collected at the center of the pad. HE spot testing and preliminary radioactivity field screening were performed on the samples. HE spot testing of all samples produced negative results. The samples were submitted to an off-site contract analytical laboratory for analysis of mercury. Mercury was not detected above BV (LANL 1995, 052183, p. 4-134).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.22.2 Analytical Results for SWMU 18-011

The data collected during the 1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.23 SWMU 18-012(a), Outfall from Building 18-116

SWMU 18-012(a) (Figure 2.23-1) is an outfall at TA-18 for a combined industrial drain and storm sewer drain for building 18-116 (Kiva 3). Drainlines discharging to this outfall are connected to building 18-116 roof drains, floor drains, and sinks. The outfall, found during 1992 field inspections using a dye-trace test, is located approximately 120 ft northeast of building 18-116 and approximately 150 ft from the stream channel in Pajarito Canyon. Building 18-116, built in 1960, was used for uranium mockup tests for the Rover Program—a nuclear rocket propulsion program conducted from 1955 to 1972 (LANL 1993, 015310, p. 2-10). The date this outfall became operational is not known, but it is likely the outfall has been operational from the time building 18-116 was completed in 1960 (LANL 1993, 015310, p. 5-14).

2.23.1 Previous Investigations for SWMU 18-012(a)

From May to October 1994, an RFI was conducted at SWMU 18-012(a) (LANL 1995, 052183, p. 1-6). Four surface soil samples were collected from four locations for field screening at the outfall and the drainage below the outfall. A mobile laboratory was used in the field to screen the samples for inorganic chemicals, SVOCs, and gross-alpha, -beta, and -gamma radioactivity. Two samples were selected for analyses based on the presence of elevated concentrations of field-screening analytes and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, SVOCs, and radionuclides (LANL 1995, 052183, p. 4-67).

The results of the analyses of the samples are as follows:

- No inorganic chemicals were detected above BVs (LANL 1995, 052183, p. 4-67).
- SVOCs were detected (LANL 1995, 052183, p. 4-67).
- No radionuclides were detected above BVs/FVs (LANL 1996, 054919, p. 4-31).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.23.2 Analytical Results for SWMU 18-012(a)

The data collected during the 1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.24 AOC 18-012(c), Sump and Drainlines

AOC 18-012(c) (Figure 2.11-1) consists of an inactive sump at TA-18 and two drainlines from building 18-141. A 1992 field inspection and engineering drawings of AOC 18-012(c) revealed the location of the sump, drainlines, and outfall. One drainline is a 4-in. cast-iron pipe attached to the floor drain of a sump located in the pit of building 18-141. Building 18-141 housed an ultrasonic cleaner,

located in a pit below the floor that used ethanol and benzene to clean beryllium parts and possibly radioactive materials. The period during which the ultrasonic cleaner was used is not known. This drainline exits the south side of the building and discharges through an outfall that empties into a former drainage ditch approximately 80 ft east of building 18-141. Material spilled in the pit discharged through this drainline (LANL 1993, 015310, p. 5-15).

The second drainline is a 3-in. cast-iron pipe connected to floor drains and sinks in building 18-141. This drainline exits the northeast side of the building and discharges through an outfall that empties into a dry well sump approximately 50 ft east of building 18-141 (LANL 1993, 015310, p. 5-15). The sump and outfall are near a metal post labeled “Drain.” Potable water backflow from a chilled-water cooling system was the only source of wastewater believed to have entered this drain (LANL 1995, 052183, p. 4-82).

2.24.1 Previous Investigations for AOC 18-012(c)

From May to October 1994, an RFI was conducted at AOC 18-012(c) (LANL 1995, 052183, p. 1-6). One surface sample was collected from the outfall of the 4-in. drainline. The discharge area of the 3-in. drainline was not sampled because the drainline received only potable water. The sample collected from the outfall was submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, SVOCs, and radionuclides (LANL 1995, 052183, p. 4-82).

The results of the analyses of the samples are as follows:

- No inorganic chemicals were detected above BVs (LANL 1995, 052183, p. 4-82).
- No organic chemicals were detected (LANL 1995, 052183, p. 4-82).
- No radionuclides were detected above BVs/FVs (LANL 1996, 054919, p. 4-35).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.24.2 Analytical Results for AOC 18-012(c)

The data collected during the 1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

2.25 AOC 18-013, Pit and Catch Tank

AOC 18-013 (Figure 2.15-1) is a small, inactive, pit and catch tank at TA-18. The pit is concrete-walled and open-bottomed and is located beneath the asphalt pavement on the north side of building 18-23. The pit contains a stainless-steel catch tank that reportedly received industrial wastes or radioactive liquids via a pipe from inside building 18-23. Building 18-23, built in 1947, was used for critical assembly operations.

This AOC was not included in the SWMU report (LANL 1990, 007512); it was identified from a 1992 site inspection that found a capped drainpipe leading to the pit. Engineering drawings were also found. Discussions with site personnel and former employees could not establish the purpose of the drainpipe and catch tank or whether this system was ever used (LANL 1995, 052183, p. 4-64).

2.25.1 Previous Investigations for AOC 18-013

From May to October 1994, an RFI was conducted at AOC 18-013 (LANL 1995, 052183, p. 1-6). Initial investigation activities included an excavation to determine whether the pit and tank were present.

Excavation through the asphalt pavement verified that the concrete-walled pit, which contained an 18-in.-diameter × 2.6-ft-high metal catch tank, was still in place. Both the pit and the tank were entirely backfilled with soil. The bottom of the concrete pit was 4.8 ft bgs and covered with gravel open to the soil below. After the excavation was completed, five samples were collected from the backfill at the site: two at the bottom of the catch tank, two beneath the drainline, and one from the gravel in the bottom of the pit.

The samples were screened in the field for radioactivity and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, organic chemicals, and radionuclides (LANL 1995, 052183, p. 4-85).

The results of the analyses of samples collected from the backfill are as follows:

- Lead and zinc were detected above BVs (LANL 1995, 052183, p. 4-89).
- SVOCs were detected (LANL 1995, 052183, p. 4-89).
- Plutonium-238 and plutonium-239/240 were detected above FVs (LANL 1996, 054919, p. 4-37).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

2.25.2 Analytical Results for SWMU 18-013

The data collected during the 1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

3.0 SITES ASSOCIATED WITH TA-27

Former TA-27 is located approximately 1 mi southeast of TA-18. In late 1945, former TA-27 was upgraded with several structures from TA-18 and became known as Gamma Site. Within the present boundaries of TA-18 were two firing sites. From 1945 to 1947, former TA-27 served as TA-18's third firing site, called Far Point. From west to east, the site's structures consisted of two small concrete control bunkers covered by earthen berms, a boardwalk, a series of instrumented manholes, and five round firing pits. During the Manhattan Project, Group G-3 used Far Point for full-scale tests of implosion weapon designs that required larger charges of HE than could be fired at the other two firing sites (LANL 1993, 015310, pp. 2-1–2-3). Shots fired at Gamma Site contained up to 2 tons of HE and used materials such as beryllium, uranium, and thorium.

The 1945 site upgrade included improving the access road from TA-18 with a layer of gravel. In early 1947, the entire site was abandoned and fenced off; since then, no Laboratory operations have been conducted at former TA-27. Gravel was excavated for road material between 1949 and 1962 throughout the length of Pajarito Canyon east of TA-18, including the area within the former TA-27 boundaries (LANL 1993, 015310, p. 2-1).

The former TA-27 area was reopened in March 1960 to begin construction of a road to White Rock. The gravel road from TA-18 was shifted north, bisecting the old firing site. It was widened, paved, and opened to the public as Pajarito Road on July 11, 1962. An incident involving unexploded U.S. Army ordnance from a hillside north of former TA-27 occurred at that time; before the area was refenced, civilians entered the area and removed a dud bazooka round (LANL 1993, 015310, p. 2-3).

During the 1960s, all structures, concrete foundations, and debris were removed and the ground surface was leveled. Around 1969, the sanitary sewage lagoons and sewer line from TA-18 were built. This was

the last major site activity. The sites of all former structures have been located in relation to the current Pajarito Road. Firing Pit 4 and Firing Pit 5 were north of the road; all other structures were south of the road. Only Firing Pit 4 has a surface expression; the other firing pits are buried. The material in and around Firing Pit 5 may have been removed during excavations for road gravel (LANL 1993, 015310, p. 2-3).

3.1 SWMU 27-002, Firing Sites

SWMU 27-002 (Figure 3.1-1) is a large inactive firing site in Pajarito Canyon used between 1944 and 1947 (LANL 1993, 015310, p. 5-53). The site consists of five firing pits situated on each side of Pajarito Road, approximately 0.9 mi southeast of TA-18. Firing Pit 1 is located in the grassy area approximately 100 ft south of the TA-36 fence. Firing Pit 2 and Firing Pit 3 are approximately 200 ft east of Firing Pit 1, between the fence and Pajarito Road. Firing Pit 4 lies underneath Pajarito Road (i.e., it has been destroyed by road construction). Firing Pit 5 is located on a small curve on the north side of Pajarito Road. The firing pits were used for testing HE with materials such as beryllium, thorium, and uranium. A 1946 bullet sensitivity test at Firing Pit 1 caused a block of Composition B explosive to undergo a low-order explosion, scattering unexploded HE over a 250-yd radius (LANL 1995, 052183, p. 4-115).

In a 1962 inspection of former TA-27, fragments of old HE, altered by weathering, were recovered and analyzed. The HE was coated with reddish crystals more sensitive than the original Composition B, similar to research department explosive or hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX). A concern arose that this rendered the fragments more sensitive to impact. The explosive compound's 2,4,6-trinitrotoluene (TNT) component had stained the soil forming a brown ring around partly buried pieces, which made them easier to locate. In the 1960s and 1970s, safety personnel made several surface sweeps to collect fragments of HE; however, in the 1960s when the four firing pits were backfilled during site decommissioning, some pieces could have been hidden by grass, covered by topsoil, or buried (LANL 1993, 015310, p. 5-54).

The 1990 SWMU report (LANL 1990, 007513, p. 27-002) describes radioactivity surveys conducted in 1985 at Firing Pit 2 and Firing Pit 3 that found uranium levels 2 to 10 times greater than background levels. COPCs used during firing site activities include inorganic chemicals, HE, thorium, and uranium (LANL 1993, 015310, p. 5-54).

3.1.1 Previous Investigations for SWMU 27-002

In June 1994, an RFI was conducted at SWMU 27-002. Surface samples were collected from around each firing pit and subsurface samples were collected from boreholes drilled at each firing pit. The surface soil around the firing pits was screened for radioactivity using FIDLER every 3 ft (up to 500 ft) on radials extending north, south, east, and west from the center of each firing point to bias sampling locations for field screening and the mobile laboratory analysis (LANL 1995, 052183, p. 4-115).

Eight grab samples of surface soil were collected for field screening from each of 14 locations and analyzed using mobile laboratory analysis for inorganic chemicals, HE, SVOCs, and gross-alpha, -beta, and -gamma radioactivity. An HE spot-test kit was used to ensure sample handling safety and proper transport procedures. Four samples from each location were selected for analyses based on elevated levels of barium, lead, tritium, and uranium. At 10 of the 14 sampling locations, a single composite sample was prepared using material from all 4 grab samples (10 total composite samples). At the four remaining sampling locations, two composite samples were prepared using material from all four grab samples (eight total composite samples).

Eighteen total composite samples were prepared from the four grab samples at each location and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, HE, VOCs, SVOCs, and radionuclides. This method provided a statistical comparison of the variability of measurements for the average analyte concentration across the composite samples (LANL 1995, 052183, p. 4-115).

Five boreholes were drilled at Firing Pit 1, Firing Pit 2, Firing Pit 3, and Firing Pit 5. One borehole was drilled in the center of each firing pit, and the others were positioned 10 ft north, south, east, and west of the center of each firing pit. After four failed attempts to penetrate deeper, the center boreholes at each firing pit were drilled only to a depth of 1 ft bgs. The remaining four boreholes surrounding each firing pit were successfully drilled to a depth of 5 ft bgs. The borehole arrangement was designed to intersect the pit surface and maximize the chance of finding COPCs forced into the soil by the explosions. All five boreholes could not be drilled at firing Pit 4 because its center lies only 2 ft north of the pavement of heavily traveled Pajarito Road. Instead, two boreholes were drilled in the pit's northern half: 10 ft northeast and 10 ft northwest from its center. The two boreholes were drilled to a depth of 5 ft bgs. For each borehole drilled to 5 ft bgs, samples were collected from sampling intervals of 0–1 ft, 2–3 ft, and 4–5 ft. For the boreholes drilled at the center of the firing pits, samples were collected from one sampling interval of 0–1 ft.

Fifty-eight samples were collected from the boreholes drilled in and around the firing pits and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals, HE, organic chemicals, and radionuclides (LANL 1995, 052183, pp. 4-115–4-117).

The results of the analyses in composite surface soil samples collected from radials around the firing pits are as follows:

- No inorganic chemicals were detected above BVs (LANL 1995, 052183).
- No organic chemicals were detected (LANL 1995, 052183).
- Thorium-230 was detected above BV (LANL 1996, 054919, p. 4-54).

The results of the analyses in subsurface soil samples collected from boreholes at the firing pits are as follows:

- Chromium, copper, lead, and nickel were detected above BVs (LANL 1995, 052183, p. 4-126).
- HE was detected (LANL 1995, 052183, p. 4-126).
- Uranium-234, -235, and -238 were detected above BVs (LANL 1996, 054919, p. 4-54).

Additional investigation is required to demonstrate that the nature and extent of contamination are defined for this site (NMED 1997, 062871, p. A-1).

3.1.2 Analytical Results for SWMU 27-002

The data collected during the 1994 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

3.2 SWMU 27-003, Bazooka Impact Area

SWMU 27-003 (Figure 3.2-1) is a former target practice area used by the U.S. Army between 1944 and 1947. The region, which is 0.5 mi long, has been fenced and has not been used by the Laboratory since

1962. The area is located north of Pajarito Road within Pajarito Canyon, 0.2 mi east of the inactive TA-18 sanitary lagoons and 1.25 mi east of TA-18. Most of SWMU 27-003 lies on the steep slope of the south-facing wall of the canyon below the rim and is visible as a distinct light-colored patch of highly fragmented rock. The footprint of the impact area extends northward onto the top of Mesita del Buey within the TA-54 fence line, extends southward downslope to the canyon floor across the Pajarito Canyon stream channel, and ends near Pajarito Road. Firing took place from a point located south of the curve in the road. Ordnance fired at the cliff face consisted of hundreds of 2.36-in. rocket-propelled bazooka rounds, typically with armor-piercing shaped-charge warheads.

The site has been cleared of unexploded ordnance and other residuals many times by the U.S. Army. A program to periodically sweep all munitions impact areas was conducted in the 1960s through the 1980s to retrieve residuals (LANL 1993, 015310, p. 5-70). Superimposed on the bazooka impact area are metal fragments associated with explosives testing conducted by the Laboratory at the SWMU 27-002 firing pits, which were used from 1946 to 1947, and the Lower Slobbovia firing site, which was still active in 1996. Because these fragments were not related to the ordnance operations, they were not always retrieved from the outer edges of the bazooka impact area. Based on a review of past site operations associated with explosives testing, the RFI work plan identified inorganic chemicals and HE as COPCs for SWMU 27-003 (LANL 1995, 044014, pp. 4-1–4-7).

3.2.1 Previous Investigations for SWMU 27-003

An RFI was conducted at SWMU 27-003 from October 5 to November 2, 1993, and in the summer of 1994. The east-west boundaries of the SWMU were determined by using visual inspection of surface debris and two types of metal detectors to locate subsurface metallic objects to an 18-in. depth. Sequential magnetic sweeps were conducted in 10-ft-wide adjoining lanes parallel to the cliff. Personnel rappelling from the mesa top visually and magnetically checked the cliff's vertical surfaces. Rocks, talus, cracks, and ravines were also checked for ordnance material. Sweeps were continued in the canyon bottom southward toward Pajarito Road until no further ordnance fragments were found. Minor amounts of debris were recovered on the mesa top within the TA-54 fence.

A total of 3200 pieces of ordnance debris were removed, including 646 tail assemblies and 14 unexploded ordnances (UXOs). The UXOs consisted of eight live bazooka rounds and six unexploded booster assemblies; all were detonated in place using C-4 plastic explosive in five separate firing operations. The Laboratory screened nine crates of ordnance debris for radioactive material and sent them to the TA-16 open-burning unit to destroy residual HE. Radioactive aluminum fragments associated with explosive testing at nearby firing sites were disposed of at TA-54. In the summer of 1994, six surface samples were collected from six locations near the base of the cliff and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals and HE. However, results were reported only for five samples (LANL 1995, 044014, pp. 4-1–4-7).

The results of the analysis of the surface samples are as follows (LANL 1995, 044014, pp. 4-1 to 4-7):

- Copper was detected above BV.
- HE was not detected.

The 1995 RFI report recommended NFA for SWMU 27-003 (LANL 1995, 044014, p. 4-7). The Environmental Protection Agency (EPA) reviewed the RFI report, concurred with the Laboratory's recommendation of NFA, and agreed that the Laboratory should request SWMU 27-003 be removed from Module VIII of its Hazardous Waste Facility Permit (DOE 1995, 050058). In September 1996, the Laboratory submitted a request for a Class III permit modification to NMED that included removing

SWMU 27-003 from Module VIII of the Laboratory's Hazardous Waste Facility Permit. The basis for this request was that the site had been characterized in accordance with applicable state and/or federal regulation, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use. The permit modification request presented the results of the ordnance survey and removal activities and soil sampling done during the RFI (LANL 1996, 055036). NMED reviewed the permit modification request and identified deficiencies in the information provided to support the permit modification. NMED requested that the Laboratory provide additional information concerning the results of sampling conducted at SWMU 27-003 (NMED 1997, 056369).

An investigation was conducted in 2001 at SWMU 27-003 to provide supplemental information in support of NMED's request. Additional confirmation sampling locations extended toward the south and southeast, within the drainage area of the site. Four soil and two sediment samples were collected at six locations and submitted to an off-site contract analytical laboratory for analyses of inorganic chemicals and HE. Samples were biased on the downhill side of the SWMU and in stormwater channels that may have transported contaminants from the site (LANL 2001, 071522). The Laboratory submitted the supplemental information requested by NMED, including results of the sampling conducted in 2001 and additional sampling for radioactive contamination conducted outside the boundary of SWMU 27-003 (LANL 2002, 072905). NMED reviewed the supplemental information provided by the Laboratory and stated it "could not concur with NFA determination for SWMU 27-003 because NMED has no mechanism to enforce institutional controls at this time" (NMED 2002, 073362).

3.2.2 Analytical Results for SWMU 27-003

The data analyzed during the 1993 RFI do not meet current data validation standards and are not decision-level data. The screening-level data from the samples are presented in Appendix B.

Decision-level analytical data, samples collected, and analytes requested from the 2001 investigation are presented in Table 3.2-1 and 3.2-2. The results of samples collected during the 2001 investigation found zinc detected above BV (Figure 3.2-2) (LANL 2001, 071522).

4.0 REFERENCES AND MAP DATA SOURCES

4.1 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. This information is also included in text citations. ER IDs 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 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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4.2 Map Data Sources

Sampling location- er_location_ids_pnt; Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2010-0035; 21 January 2010.

SWMU or AOC: er_prs_all_reg, Potential Release Sites; Los Alamos National Laboratory, Waste and Environmental Services Division, Environmental Data and Analysis Group, EP2009-0633; 1:2,500 Scale Data; 25 January 2010.

Structure or Building: ksl_structures_ply; Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Fence: ksl_fences_arc; Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Paved road: ksl_paved_rds_arc; Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Dirt road: ksl_dirt_rds_arc; Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Storm drain: ksl_stormdrn_arc; Storm Drain Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Contours: lanl_contour1991; Hypsography, 2, 10, 20, 100 Foot Contour Interval; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

Communication: ksl_comm_arc; Communication Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 08 August 2002; as published 28 May 2009.

Electric: ksl_electric_arc; Primary Electric Grid; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Gas: ksl_gas_arc; Primary Gas Distribution Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

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Sewer: ksl_sewer_arc; Sewer Line System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Steam: ksl_steam_arc; Steam Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Water: ksl_water_arc; Water Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Inset: LANL Boundary: plan_ownerclip_reg; Ownership Boundaries around LANL Area; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; 19 September 2007; as published 04 December 2008.

Inset: ROADS: lac_streets_arc; Streets; County of Los Alamos, Information Services; as published 16 May 2006.

Landscape: ksl_landscape_arc; Primary Landscape Features; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Former structures: frmr_structures_ply; Former Structures of the Los Alamos Site; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2008-0441; 1:2,500 Scale Data; 08 August 2008.

Technical area boundary: plan_tecareas_ply; Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.

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

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

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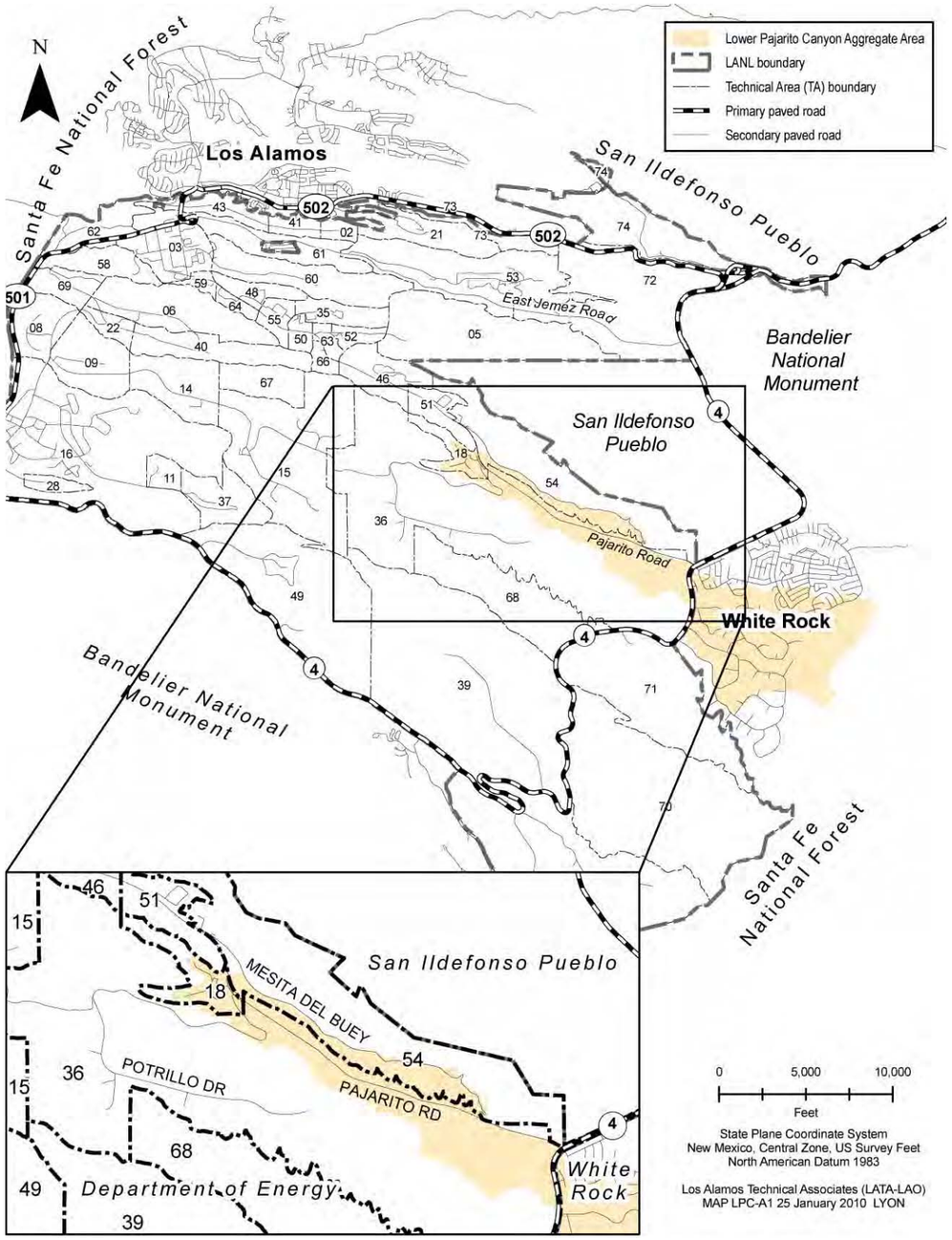

Figure 1.0-1 Location of Lower Pajarito Canyon Aggregate Area with respect to Laboratory technical areas

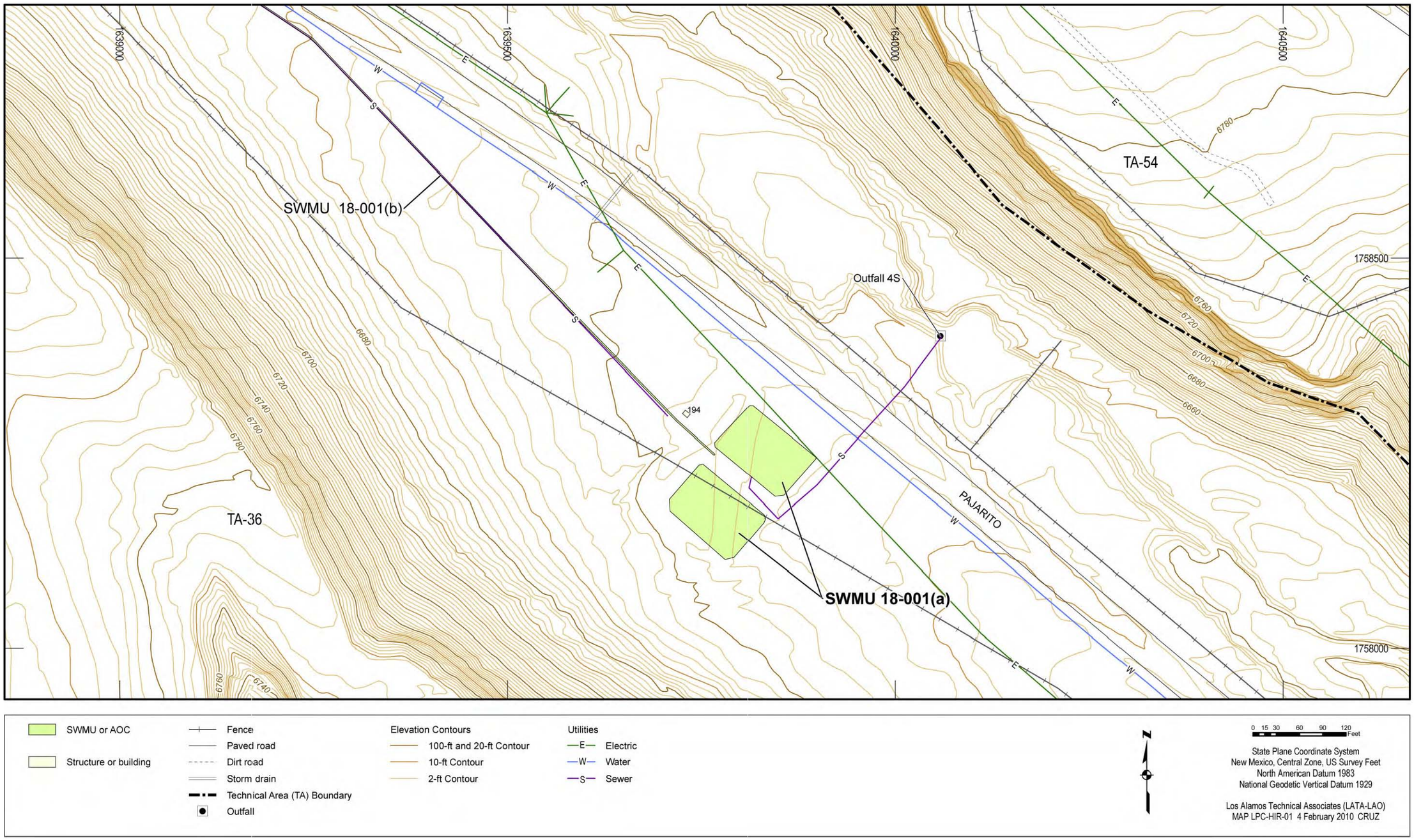

Figure 2.1-1 Site features of Consolidated Unit 18-001(a)-00 [SWMU 18-001(a)]

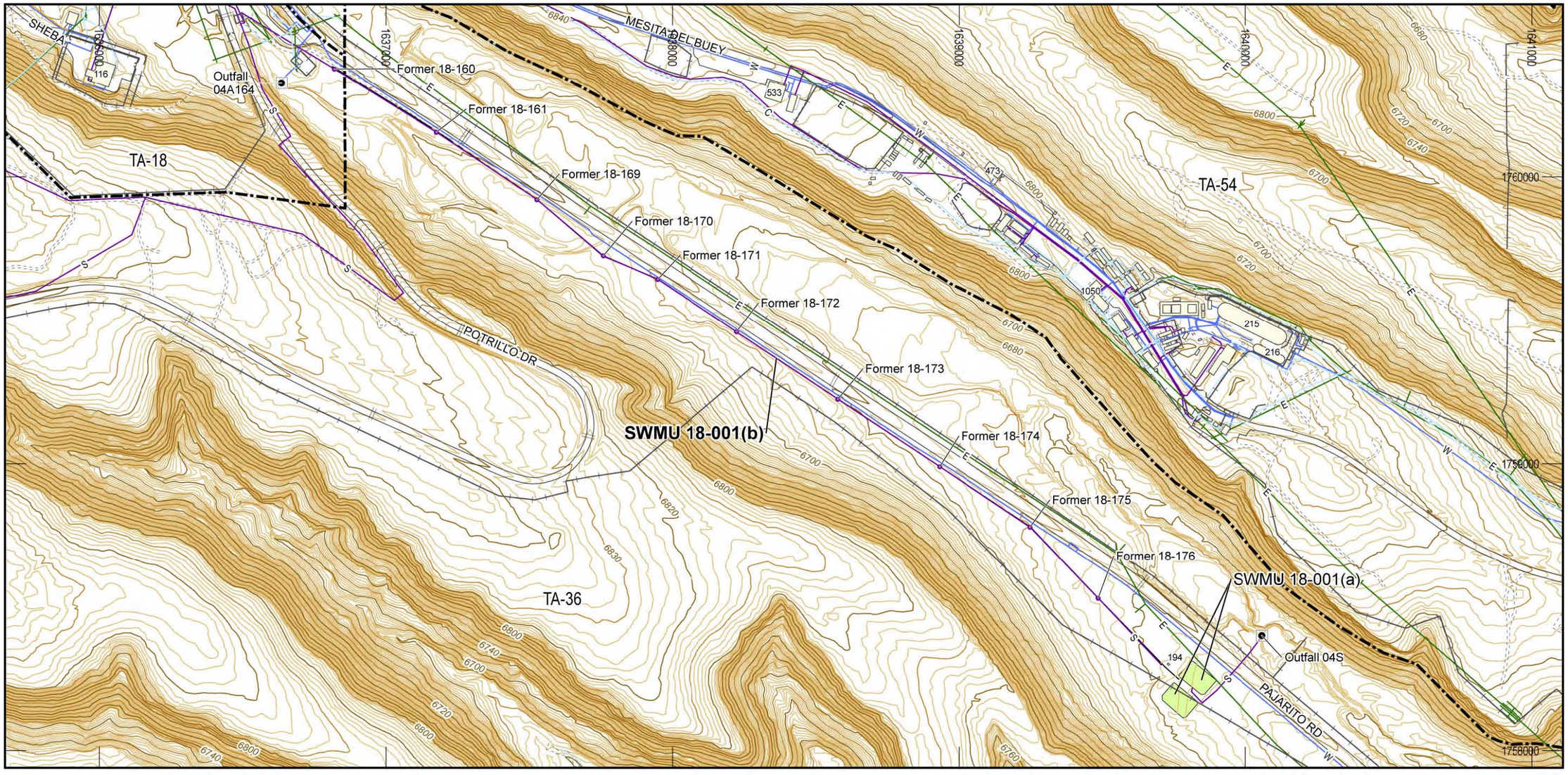

Figure 2.1-2 Site features of Consolidated Unit 18-001(a)-00 [SWMU 18-001(b)]

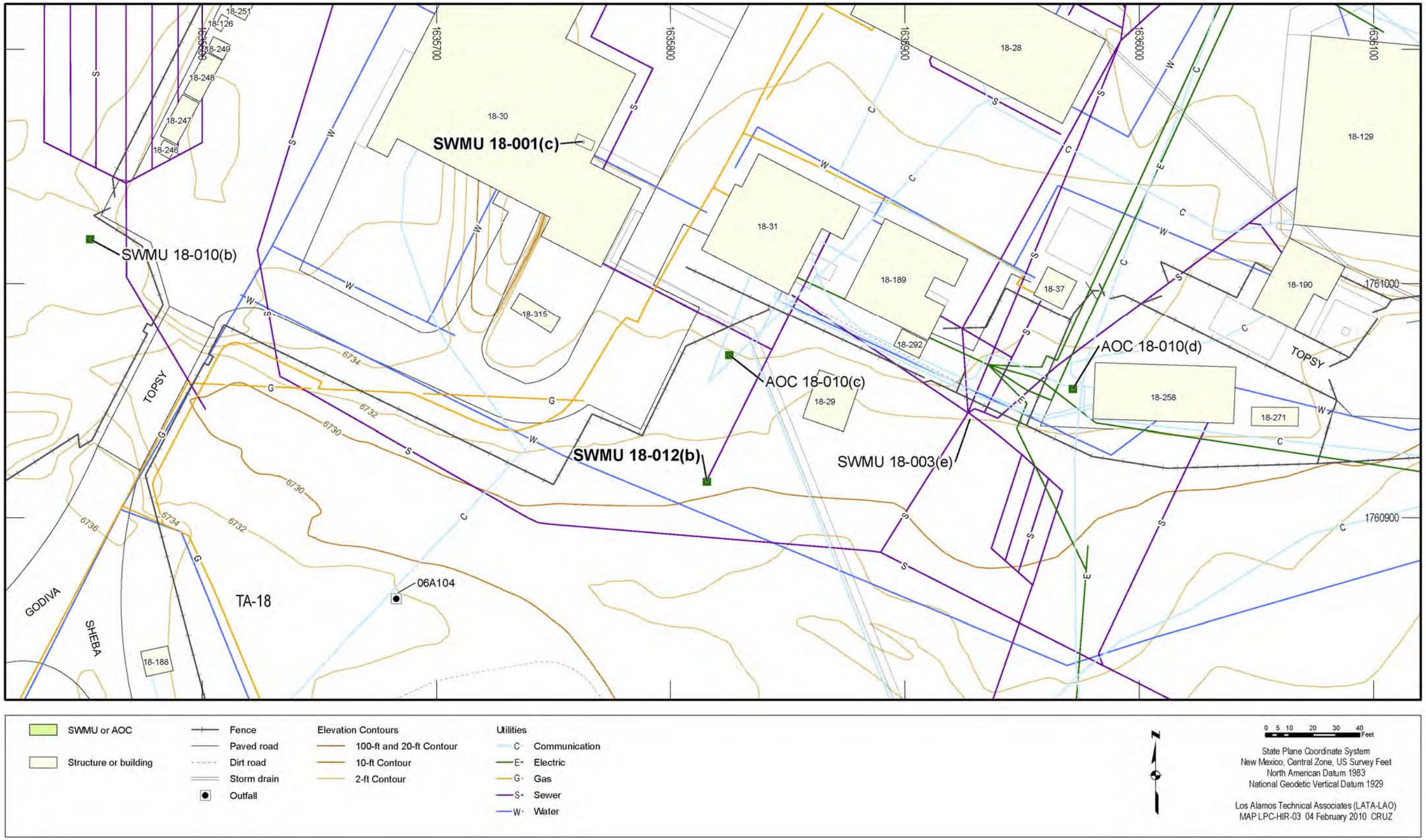

Figure 2.2-1 Site features of Consolidated Unit 18-001(c)-00 [SWMUs 18-001(c) and 18-012(b)]

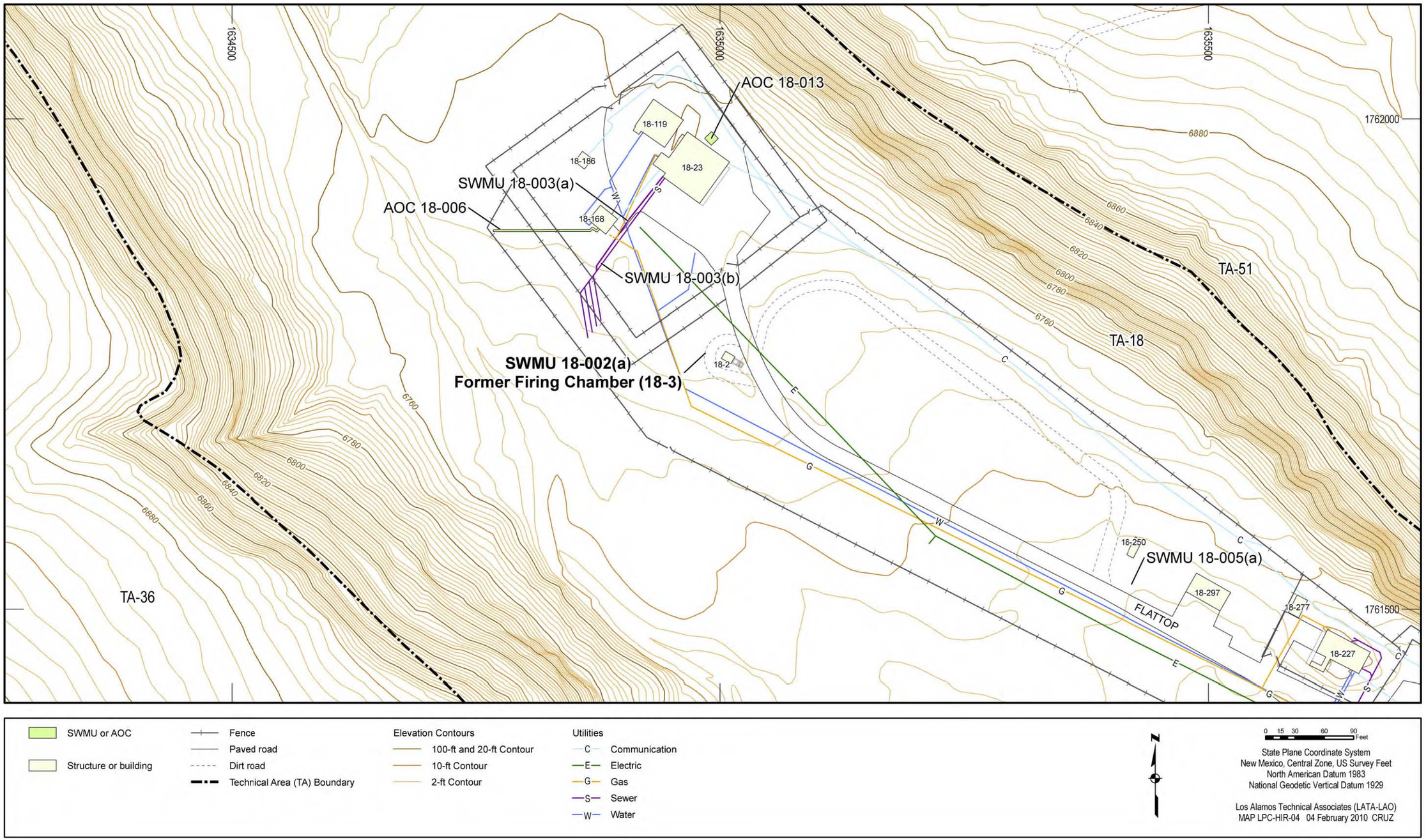

Figure 2.3-1 Site features of SWMU 18-002(a)

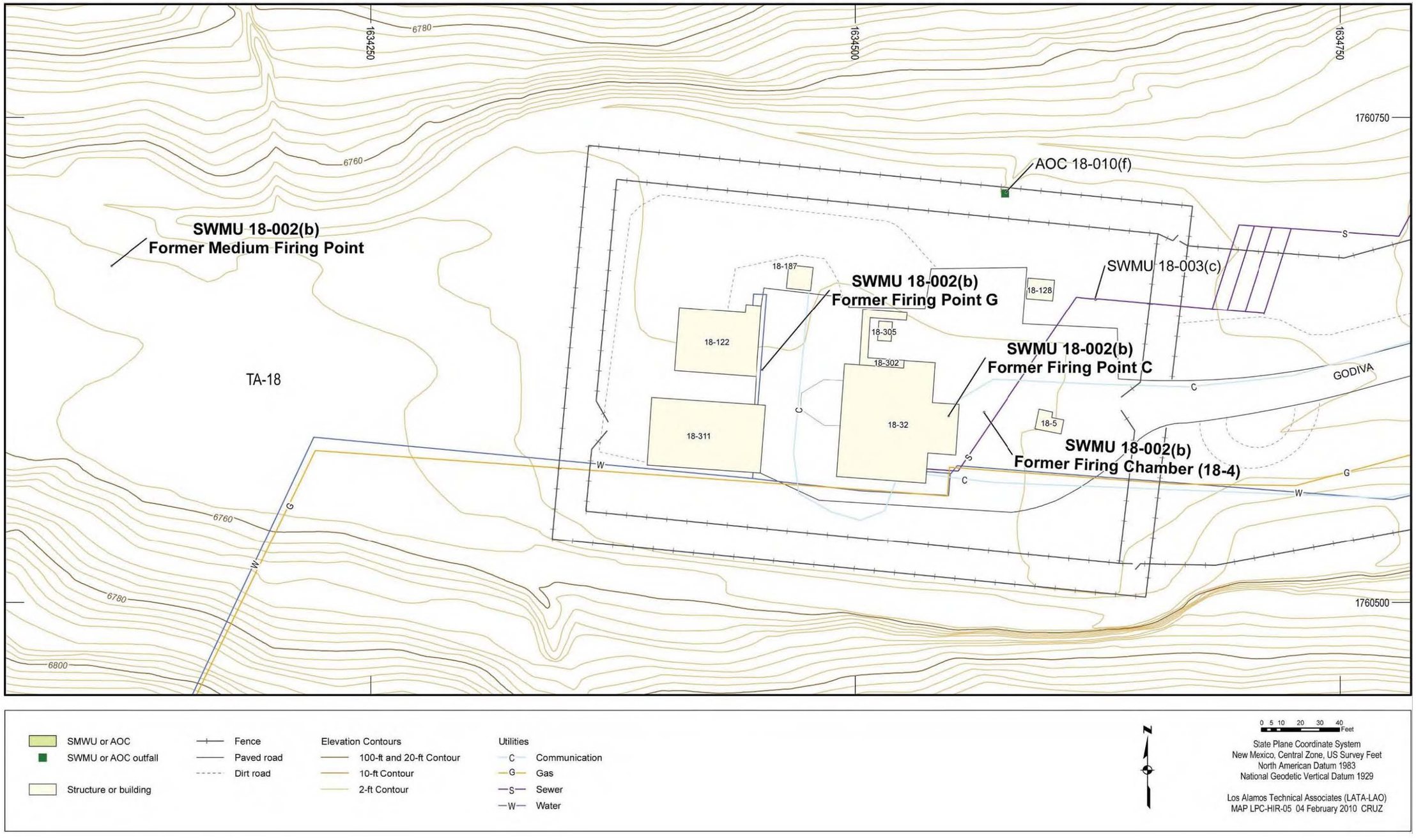

Figure 2.4-1 Site features of SWMU 18-002(b)

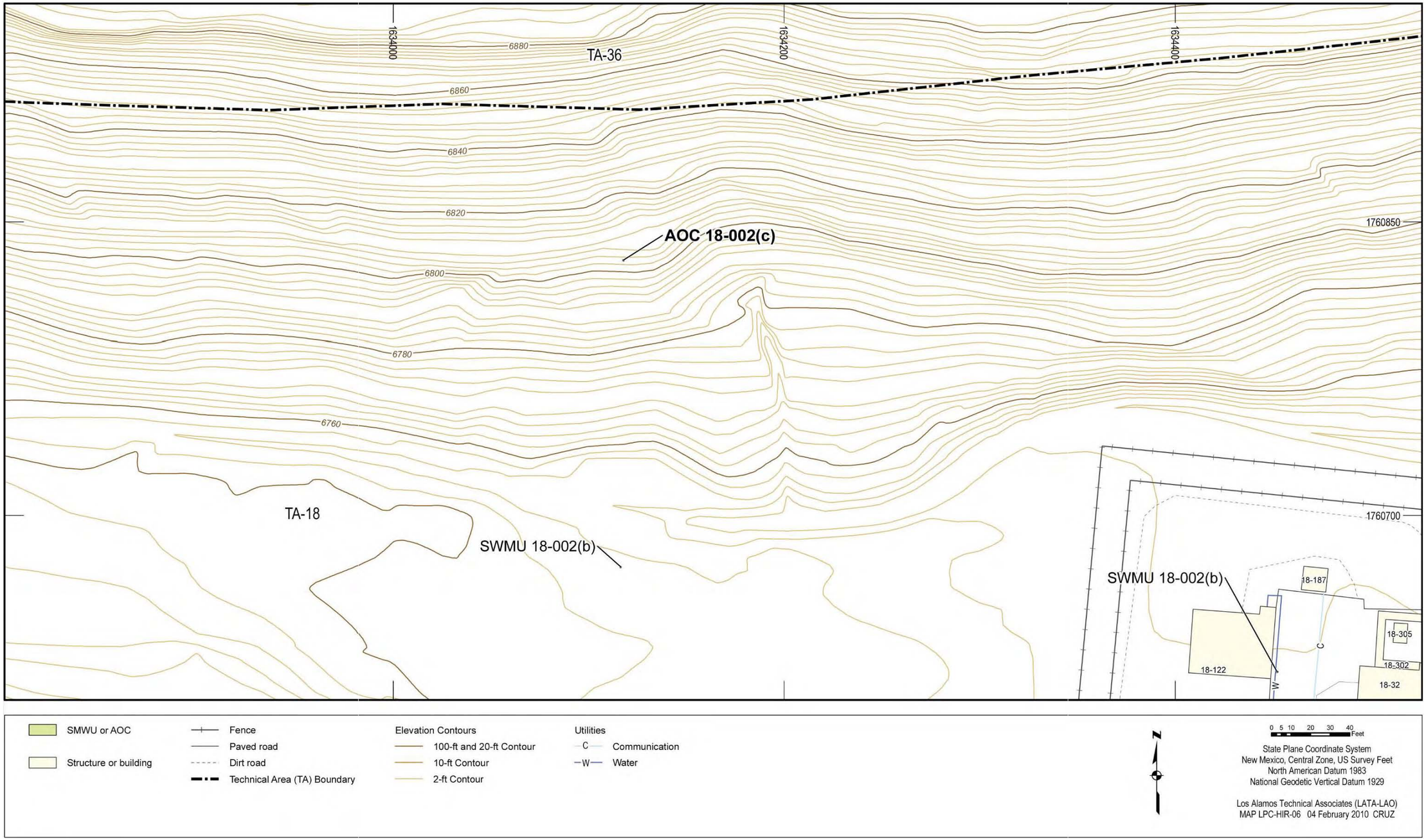

Figure 2.5-1 Site features of AOC 18-002(c)

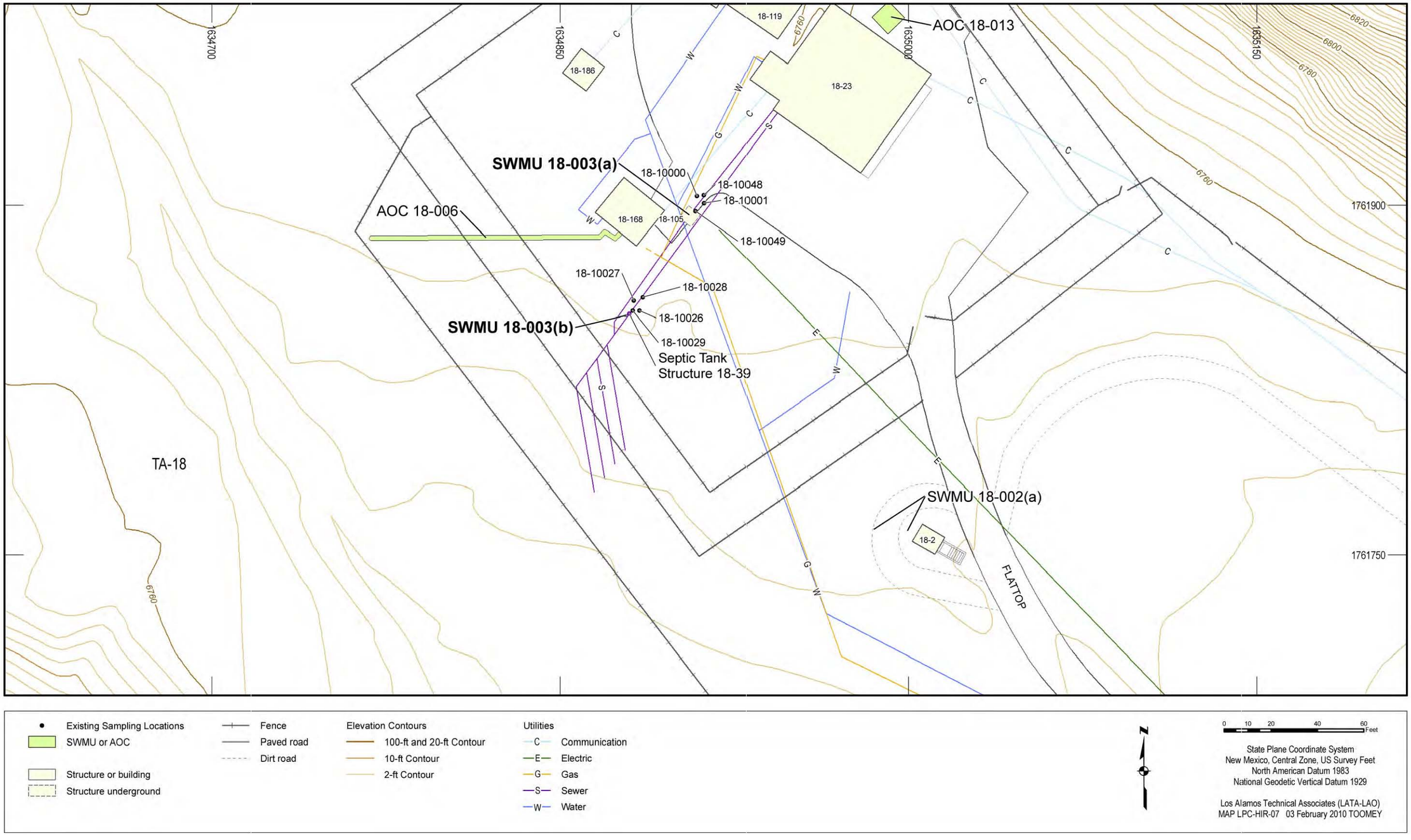

Figure 2.6-1 Site features of Consolidated Unit 18-003(a)-00 [SWMUs 18-003(a) and 18-003(b)]

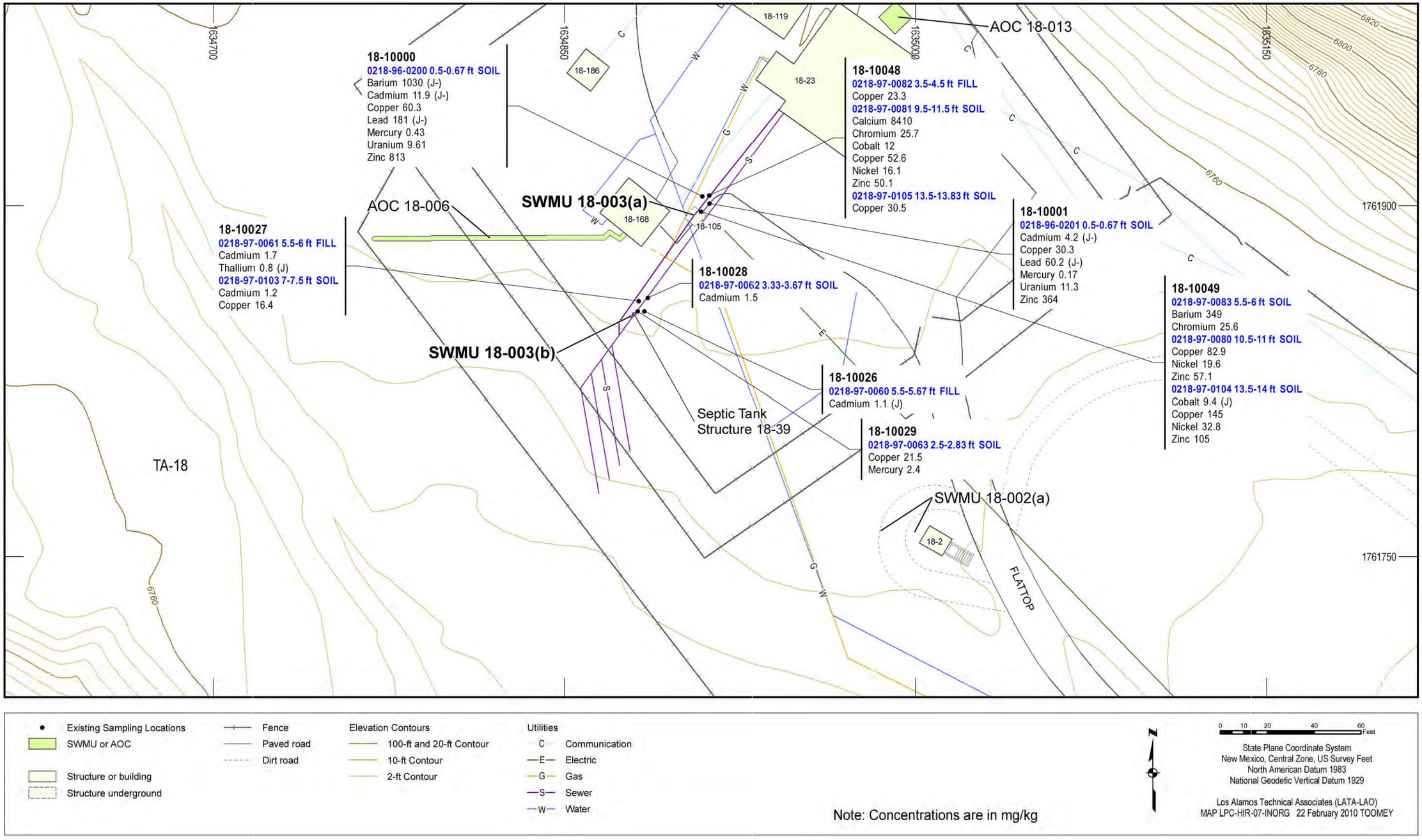

Figure 2.6-2 Inorganic chemicals detected above BVs at Consolidated Unit 18-003(a)-00 [SWMUs 18-003(a) and 18-003(b)]

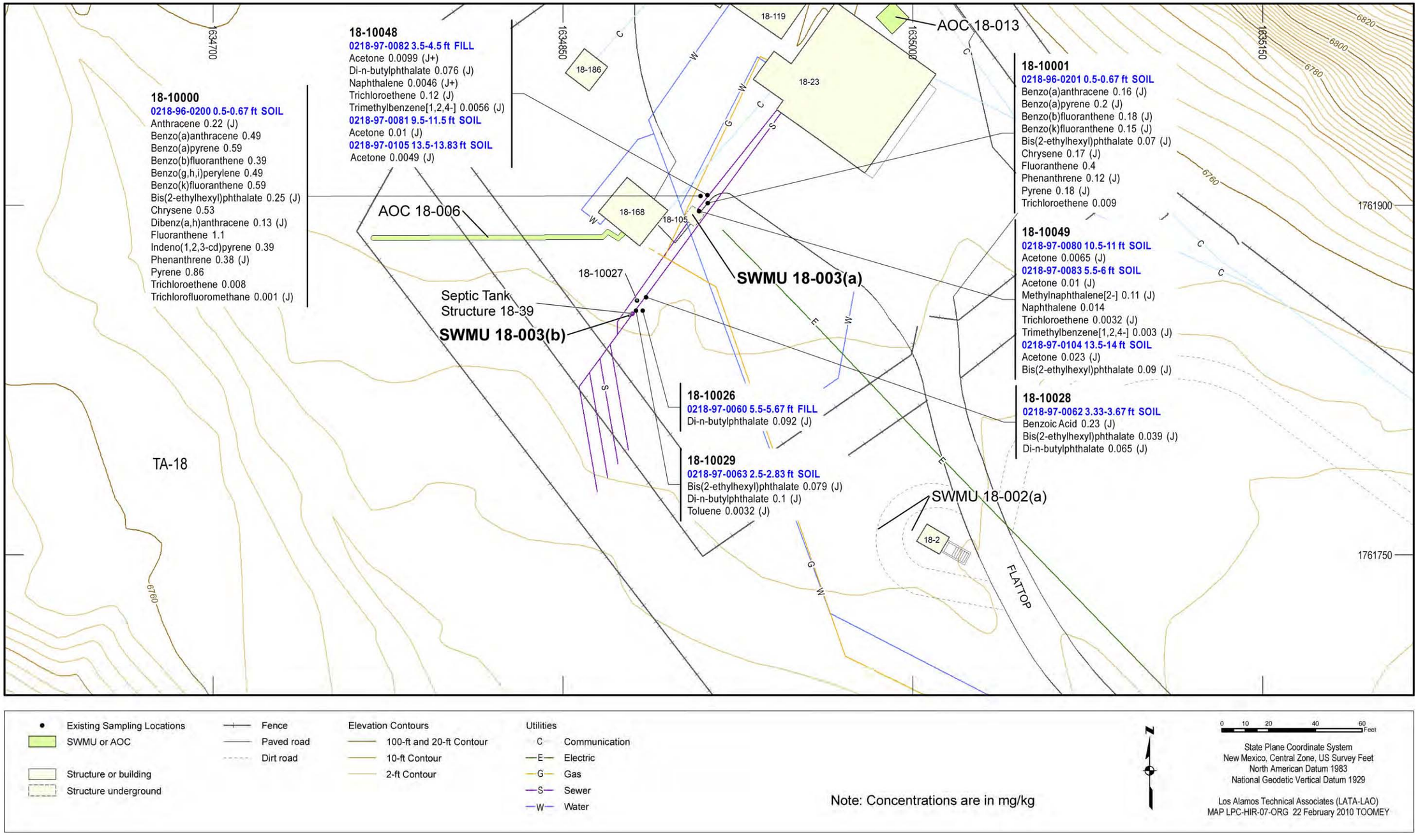

Figure 2.6-3 Organic chemicals detected at Consolidated Unit 18-003(a)-00 [SWMUs 18-003(a) and 18-003(b)]

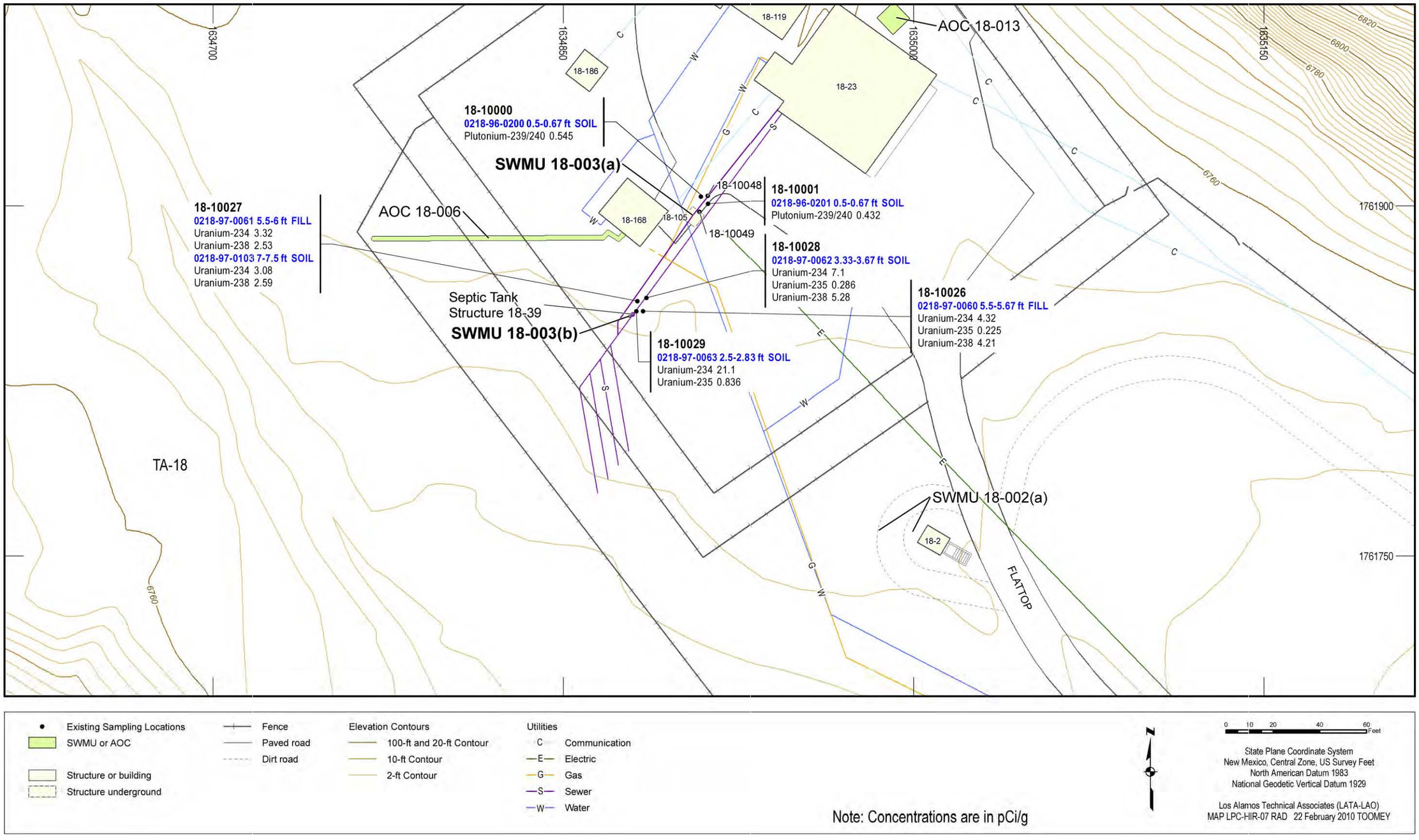

Figure 2.6-4 Radionuclides detected or detected above BVs/FVs at Consolidated Unit 18-003(a)-00 [SWMUs 18-003(a) and 18-003(b)]

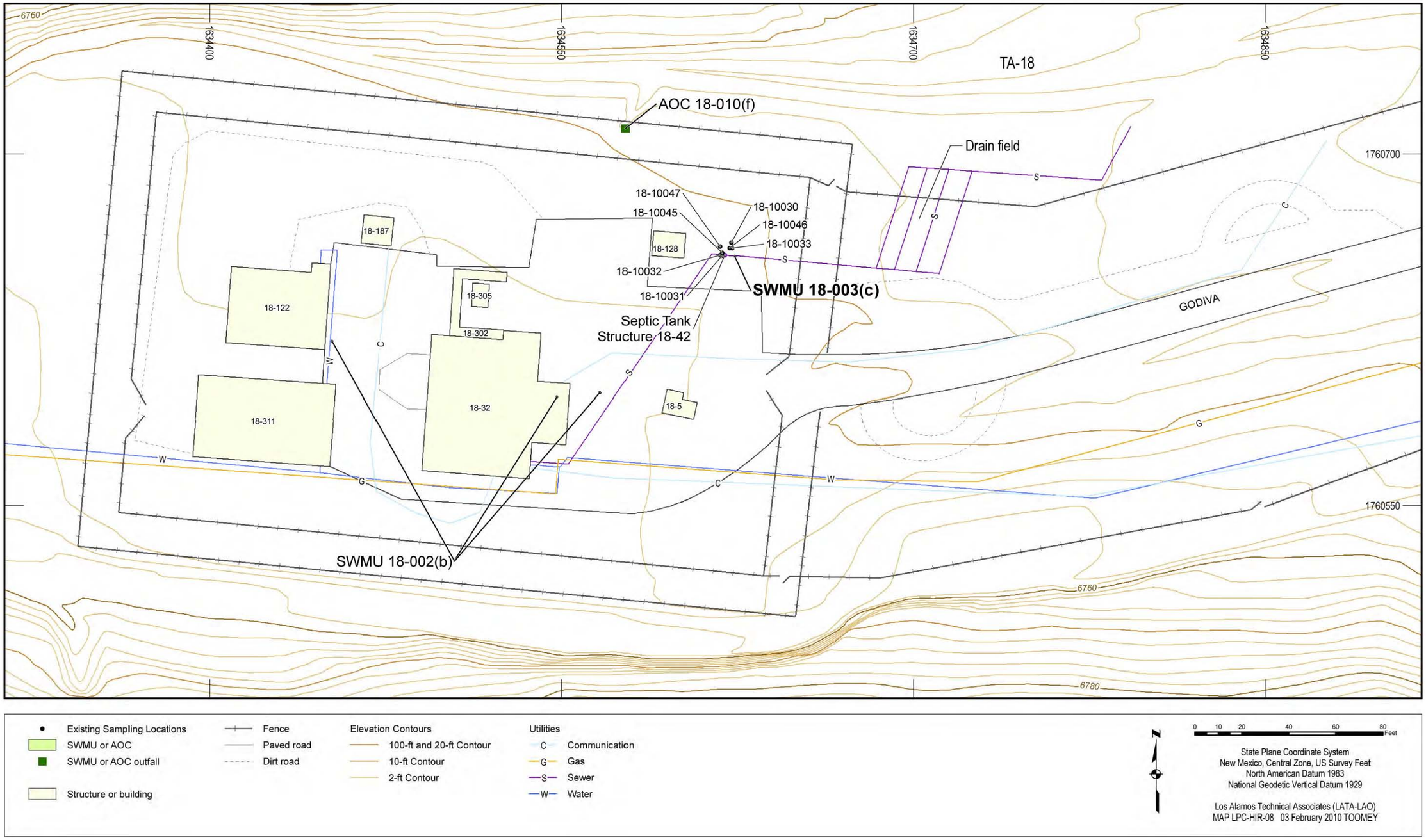

Figure 2.7-1 Site features of SWMU 18-003(c)

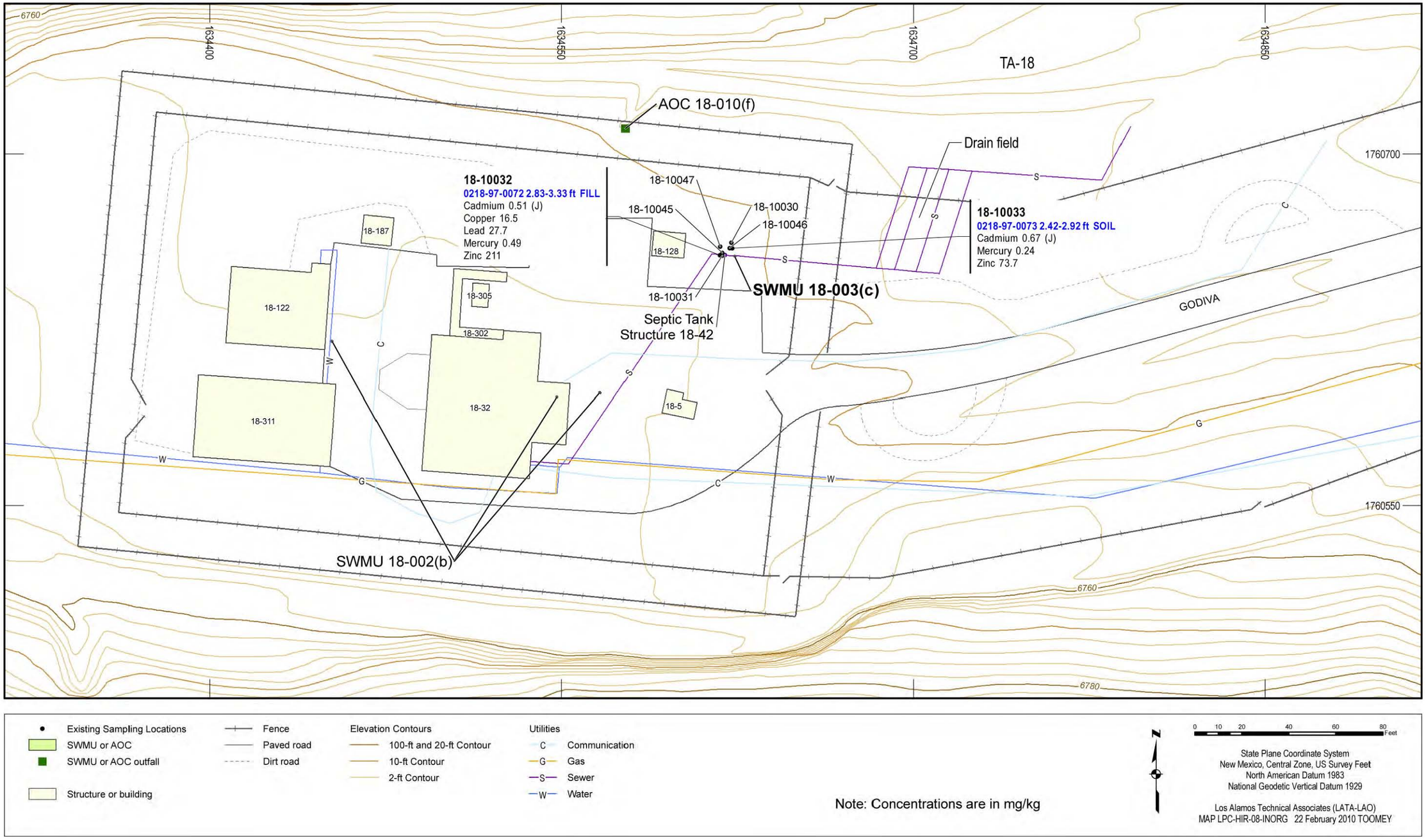

Figure 2.7-2 Inorganic chemicals detected above BVs at SWMU 18-003(c)

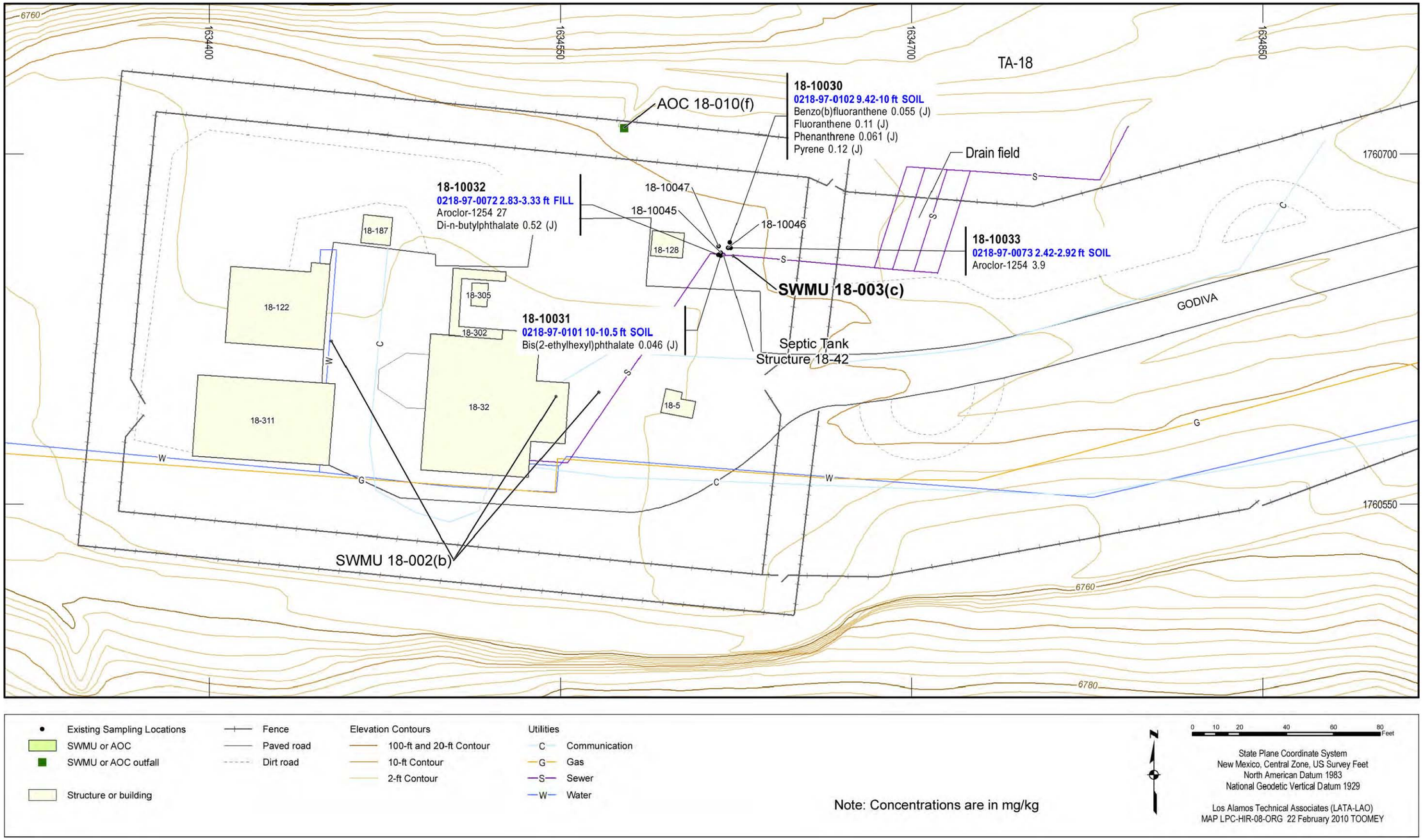

Figure 2.7-3 Organic chemicals detected at SWMU 18-003(c)

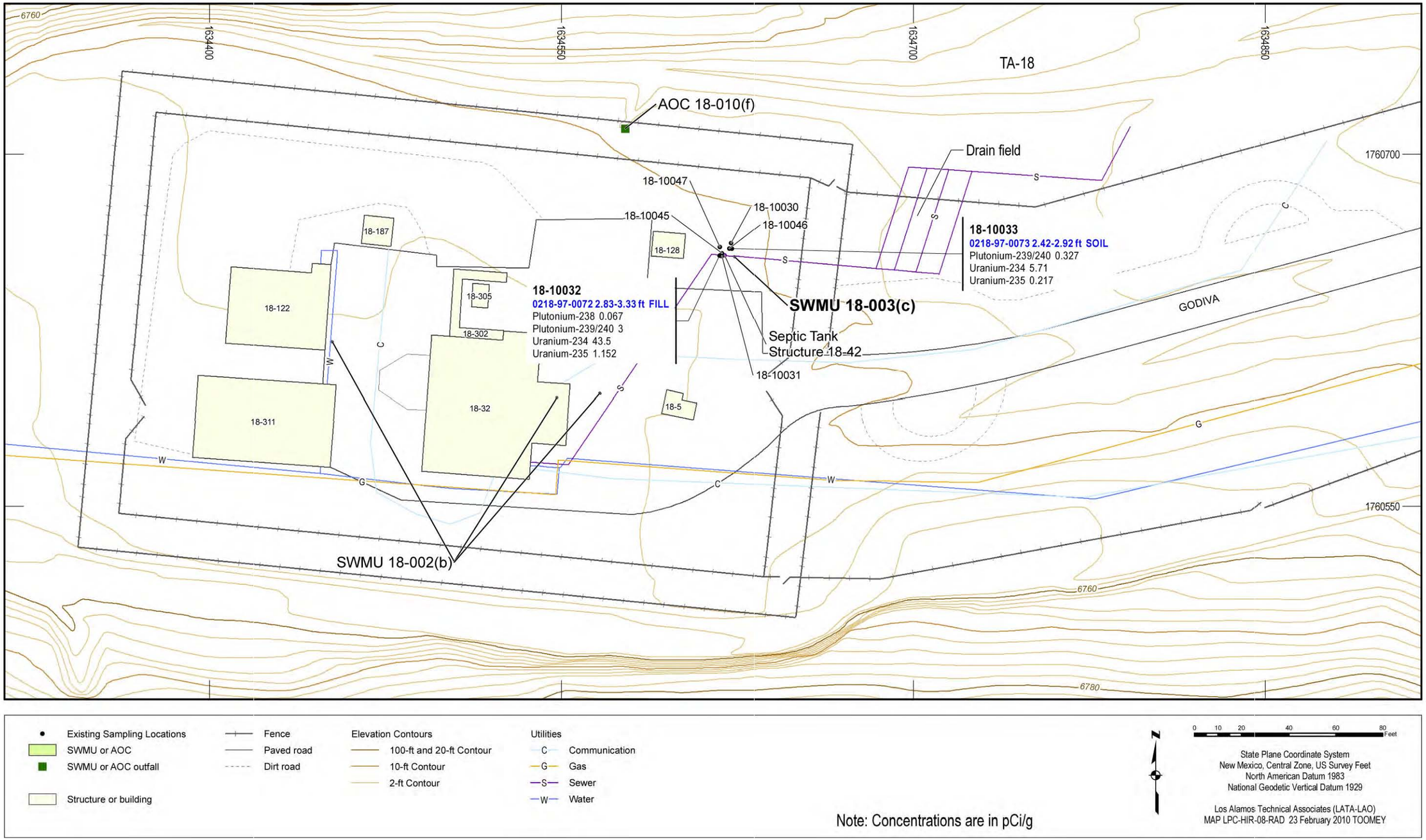

Figure 2.7-4 Radionuclides detected or detected above BVs/FVs at SWMU 18-003(c)

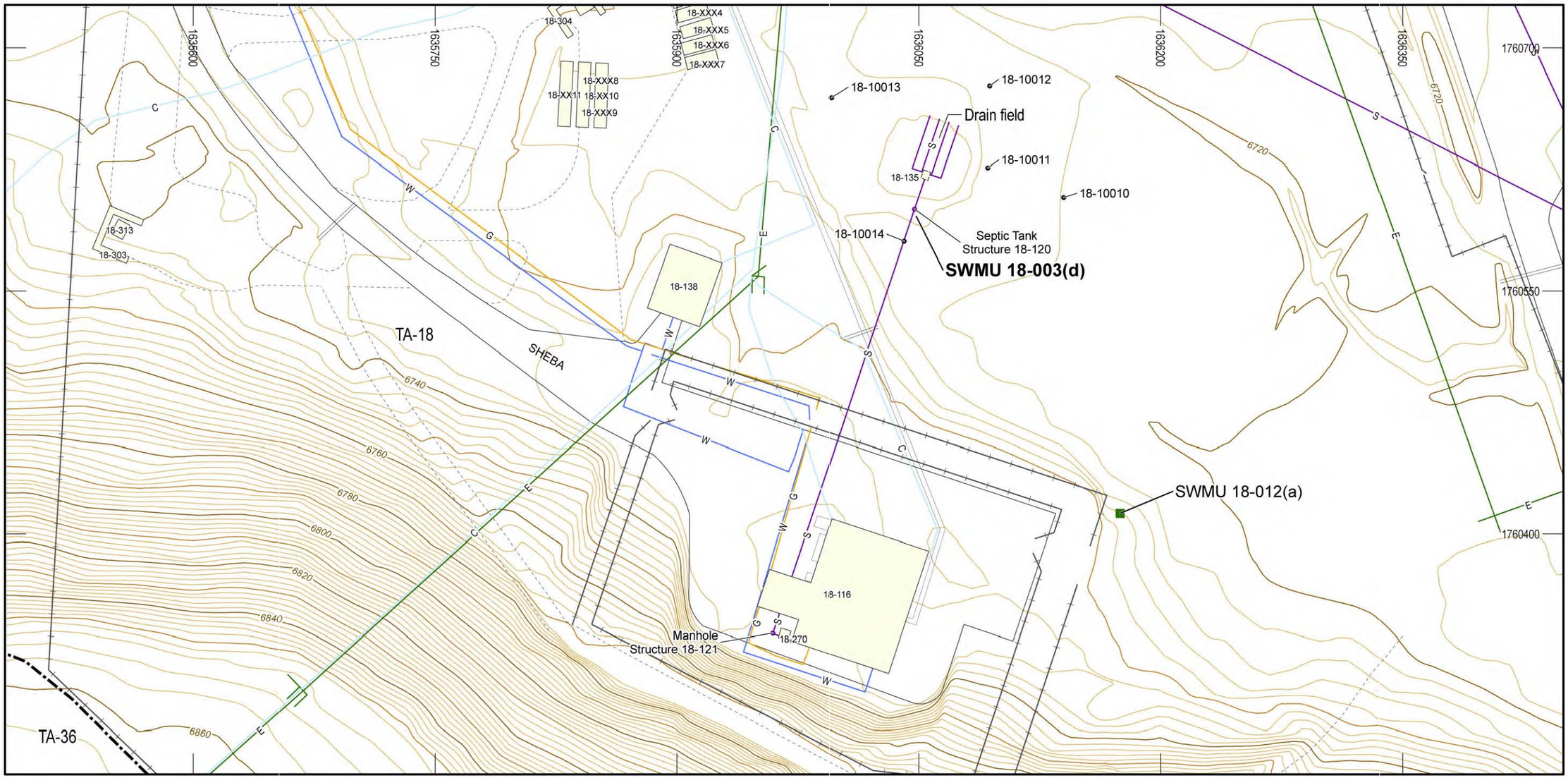

Figure 2.8-1 Site features of SWMUs 18-003(d)

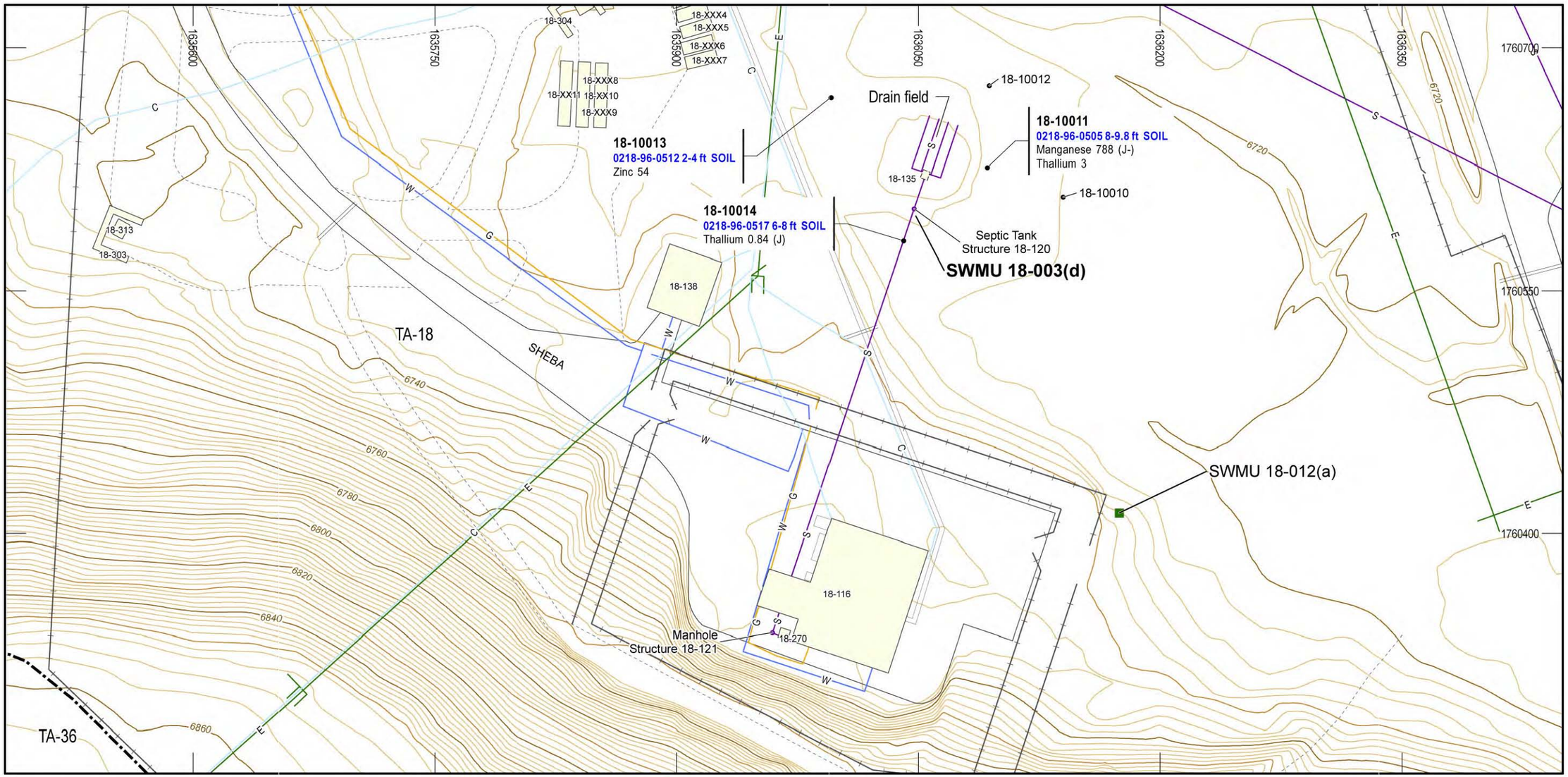

Figure 2.8-2 Inorganic chemicals detected above BVs at SWMU 18-003(d)

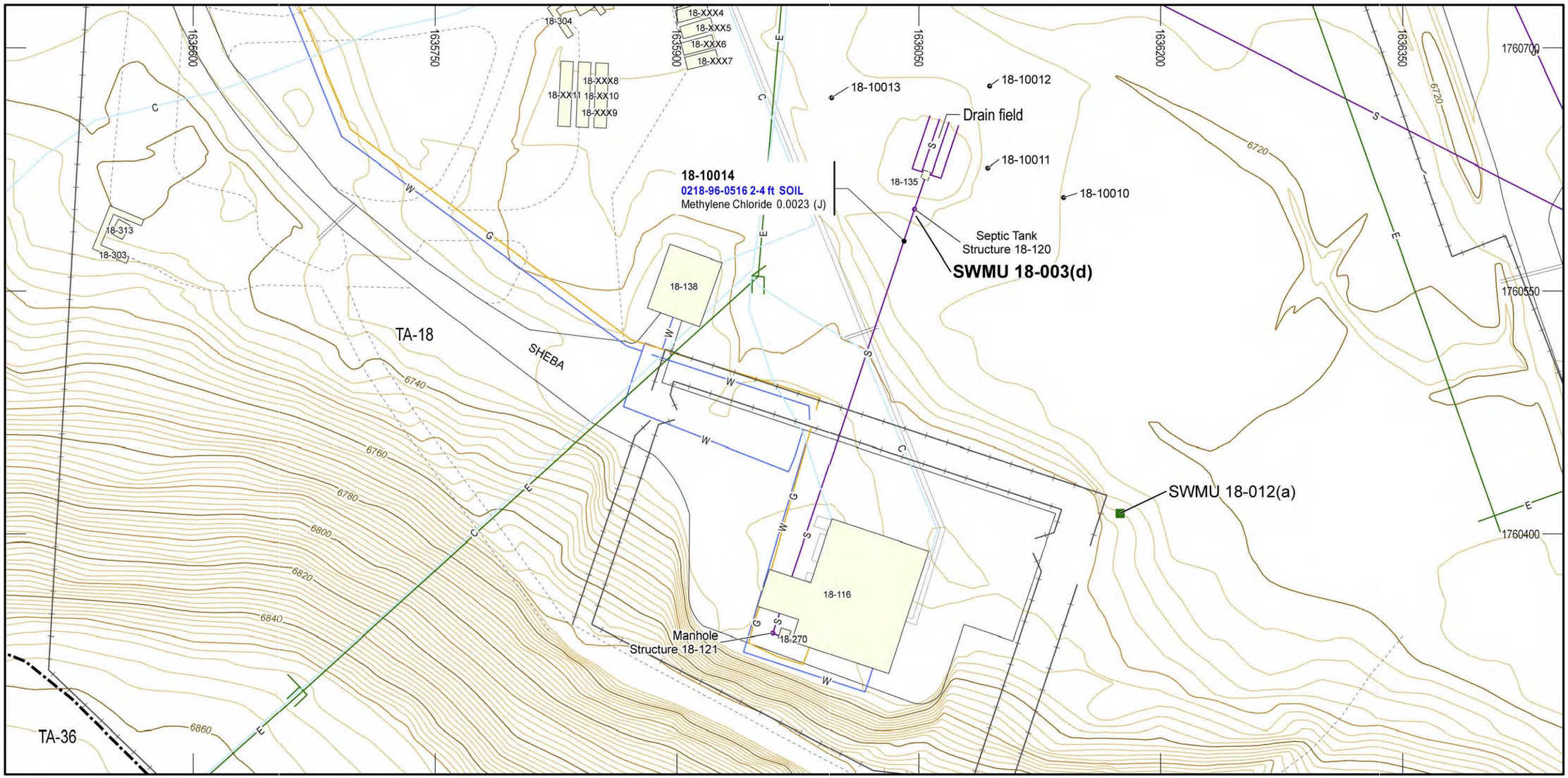

Figure 2.8-3 Organic chemicals detected at SWMU 18-003(d)

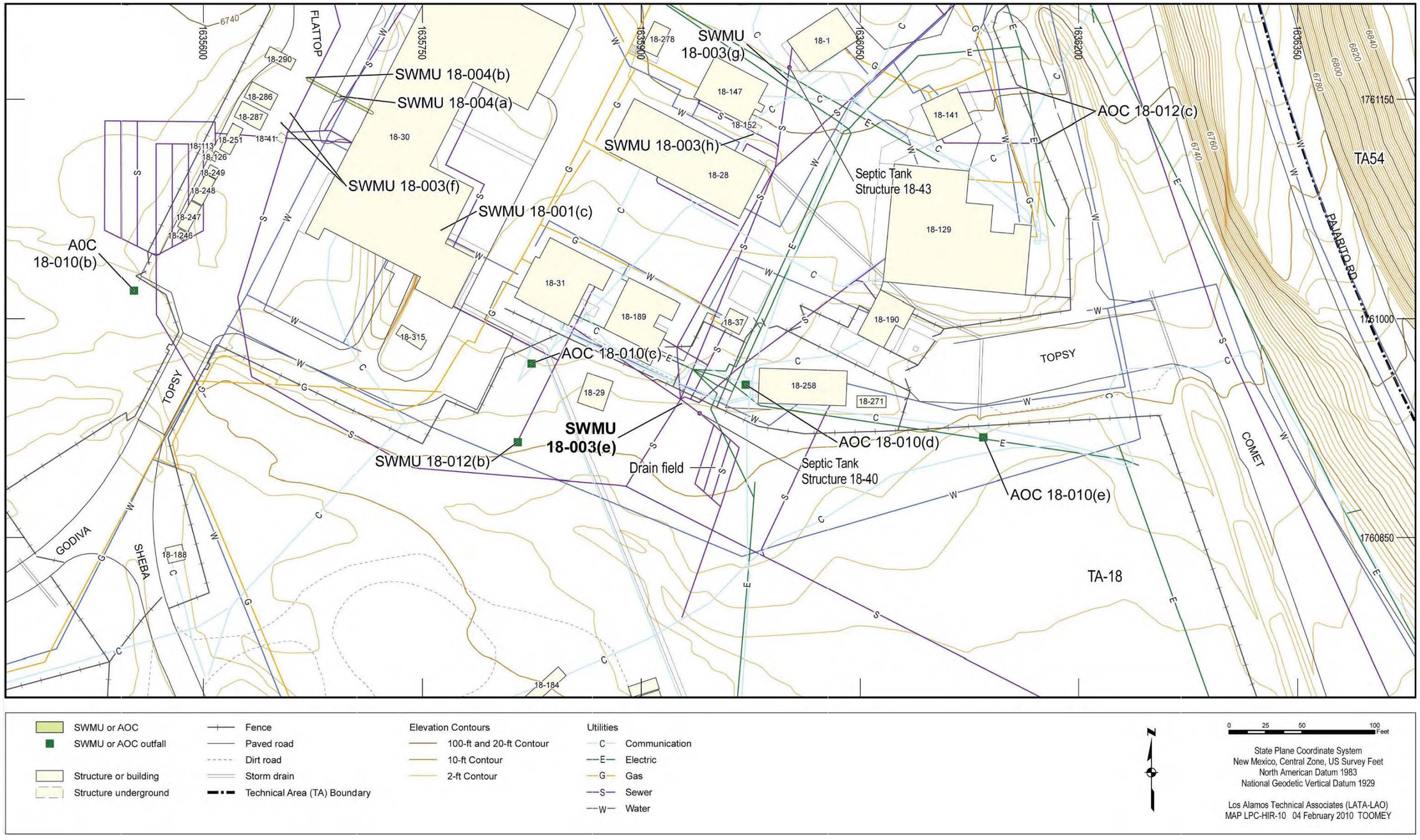

Figure 2.9-1 Site features of SWMU 18-003(e)

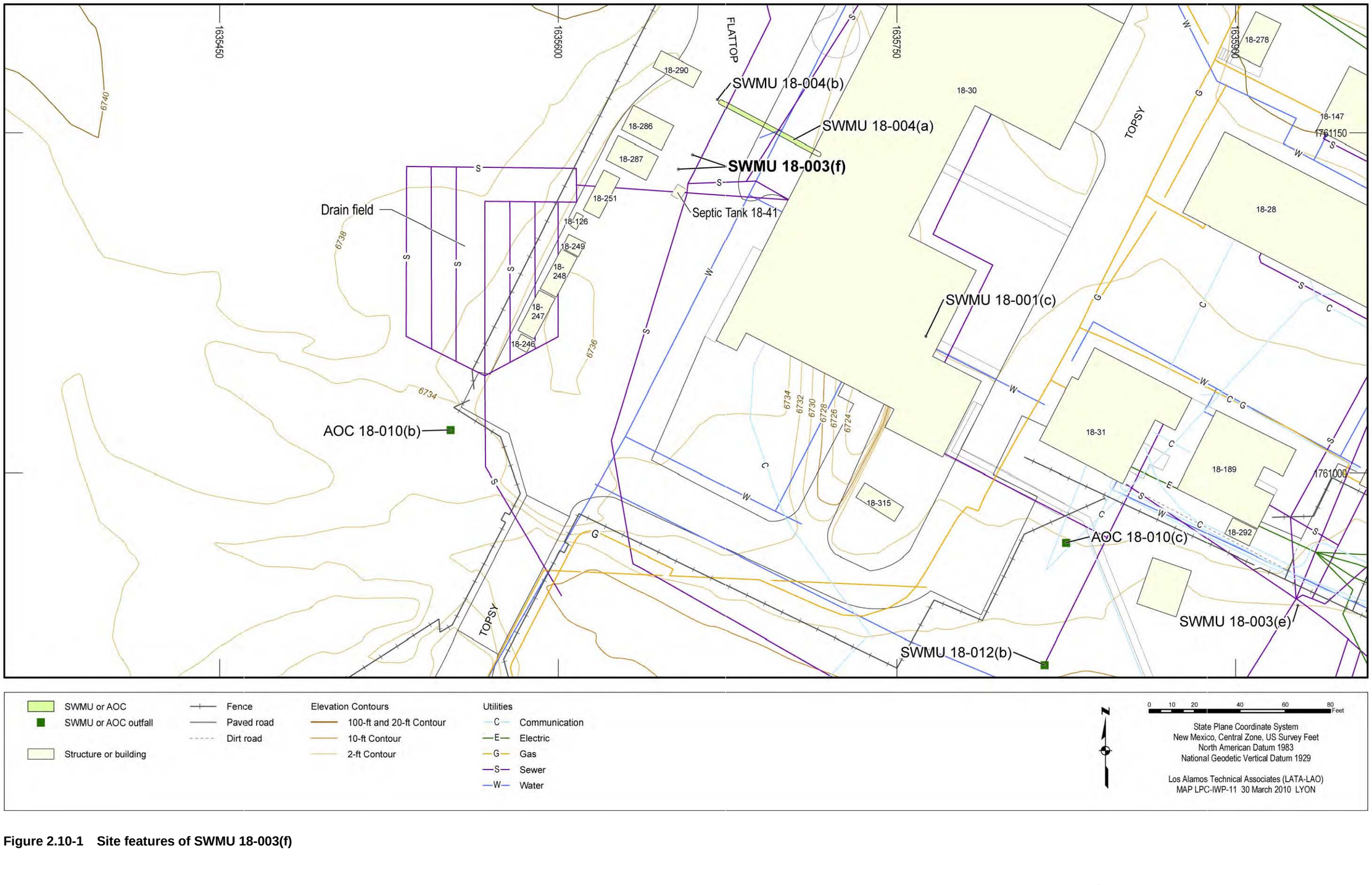

Figure 2.10-1 Site features of SWMU 18-003(f)

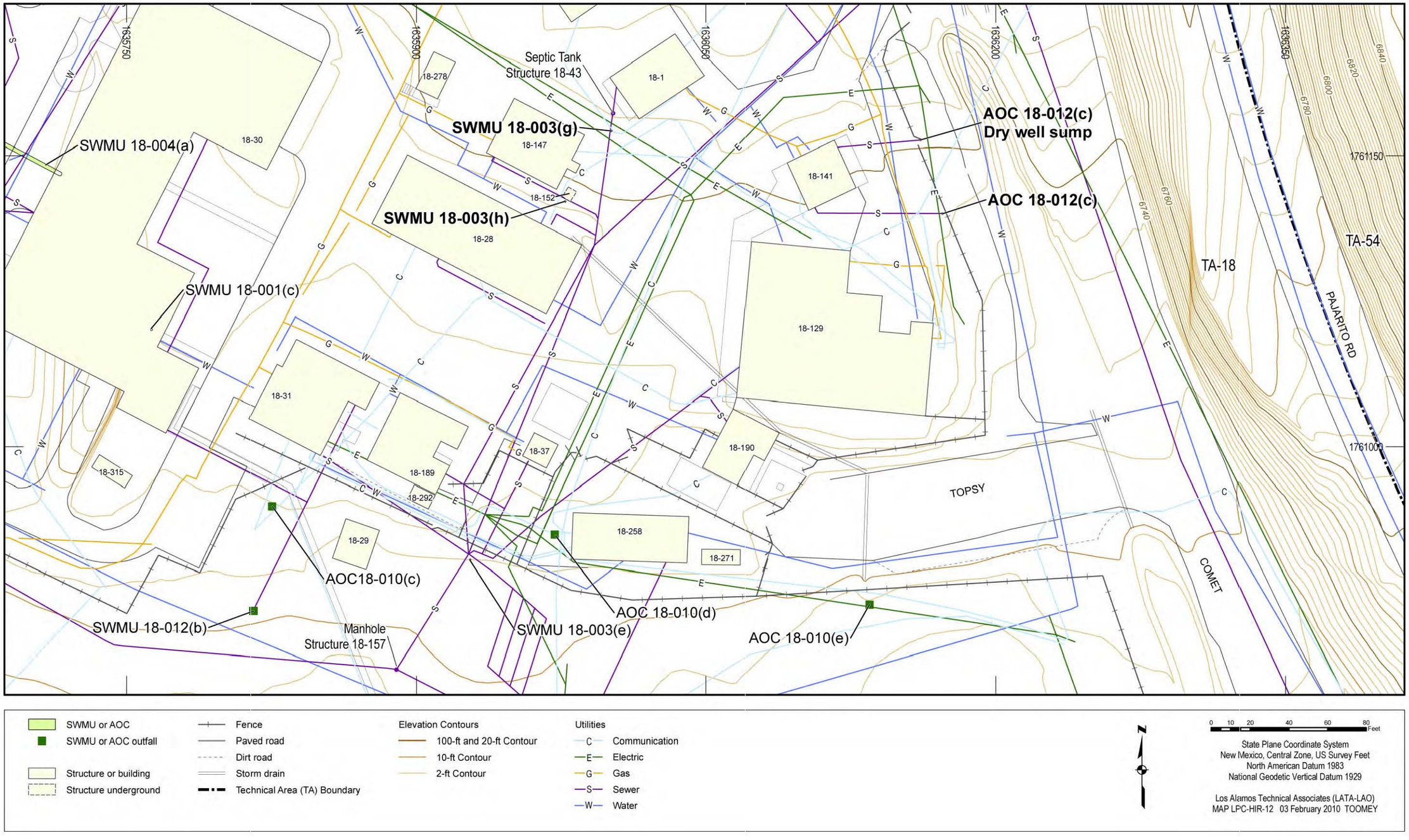

Figure 2.11-1 Site features of SWMU 18-003(g), SWMU 18-003(h), and AOC 18-012(c)

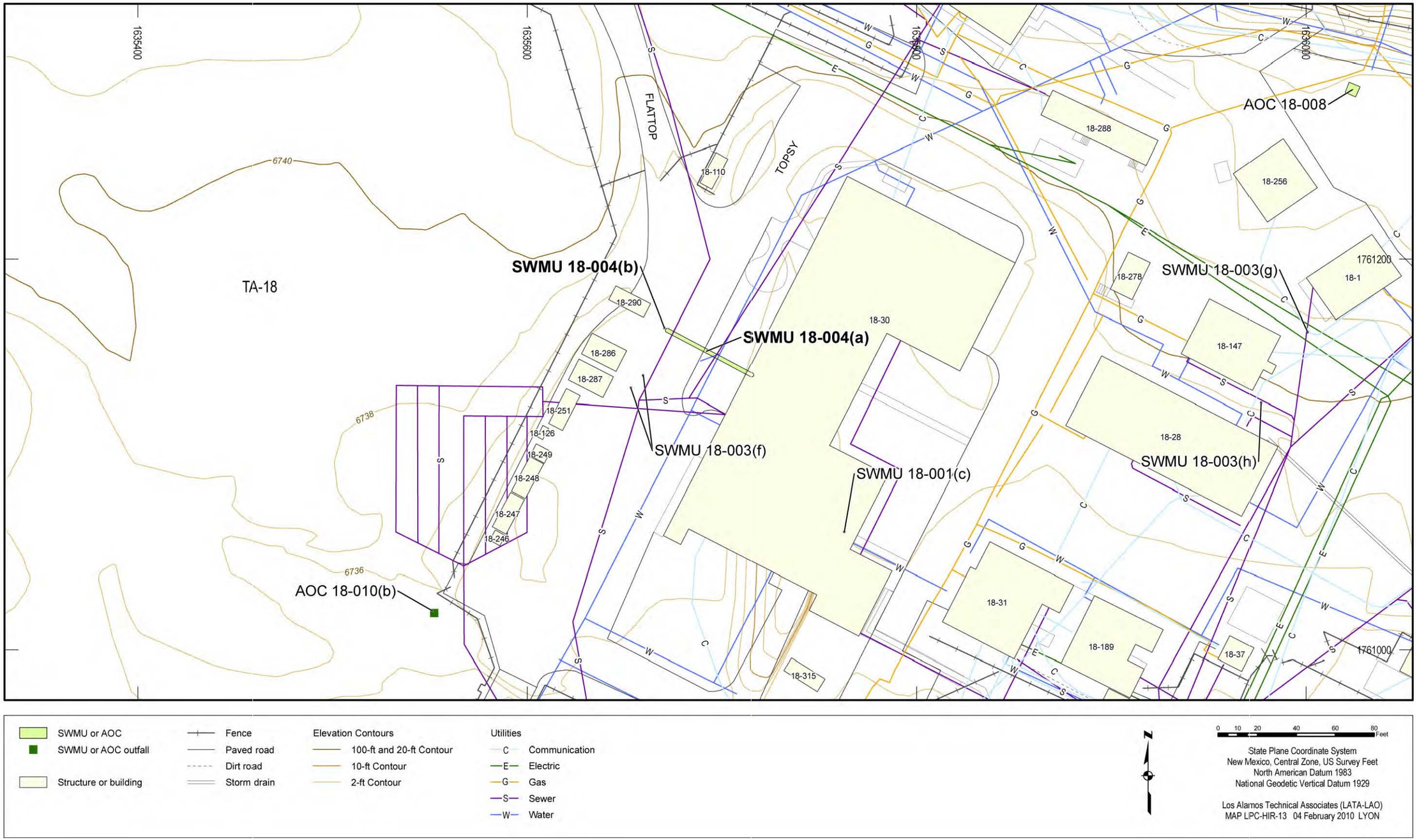

Figure 2.13-1 Site features of Consolidated Unit 18-004(a)-00 [SWMUs 18-004(a)-and 18-004(b)]

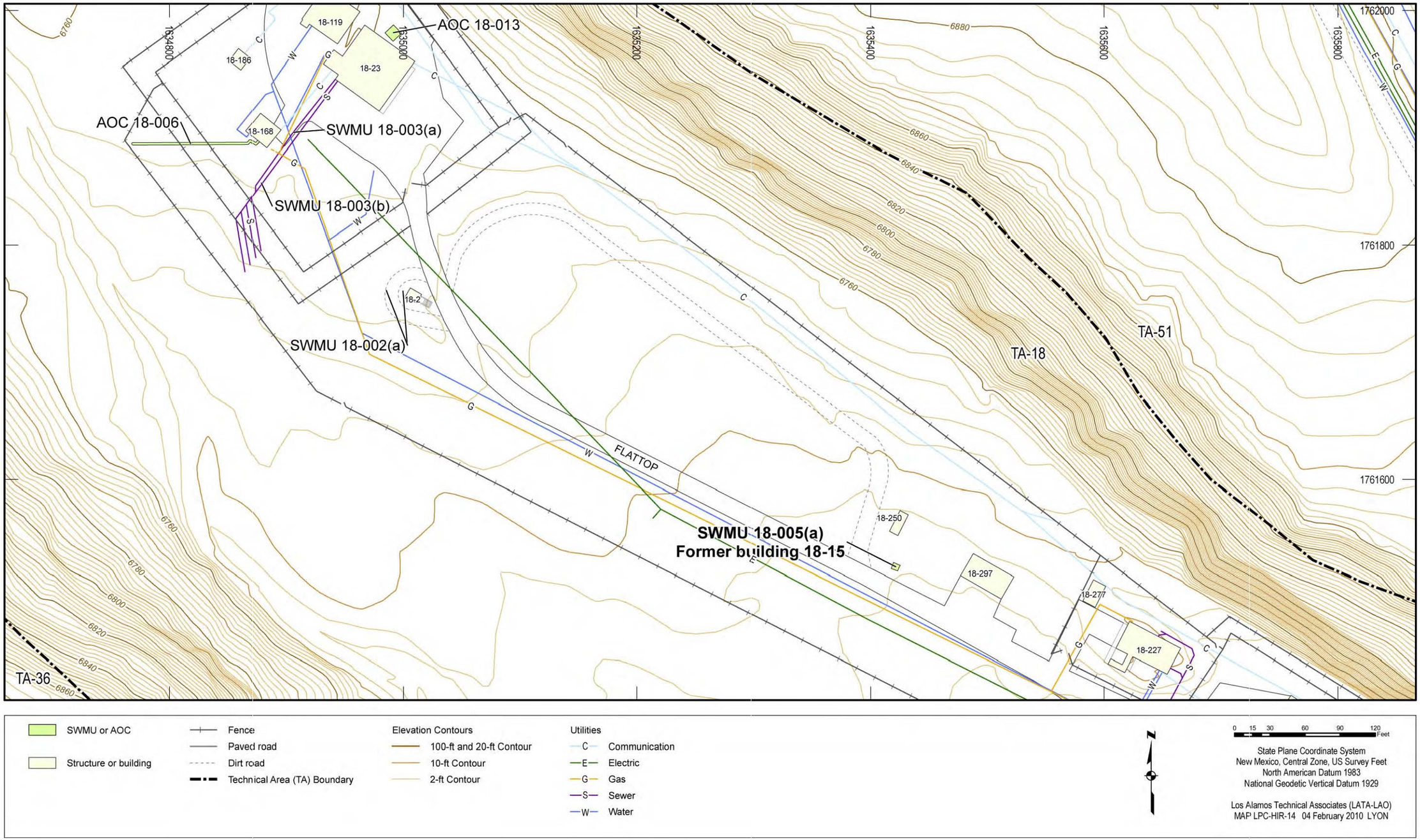

Figure 2.14-1 Site features of SWMU 18-005(a)

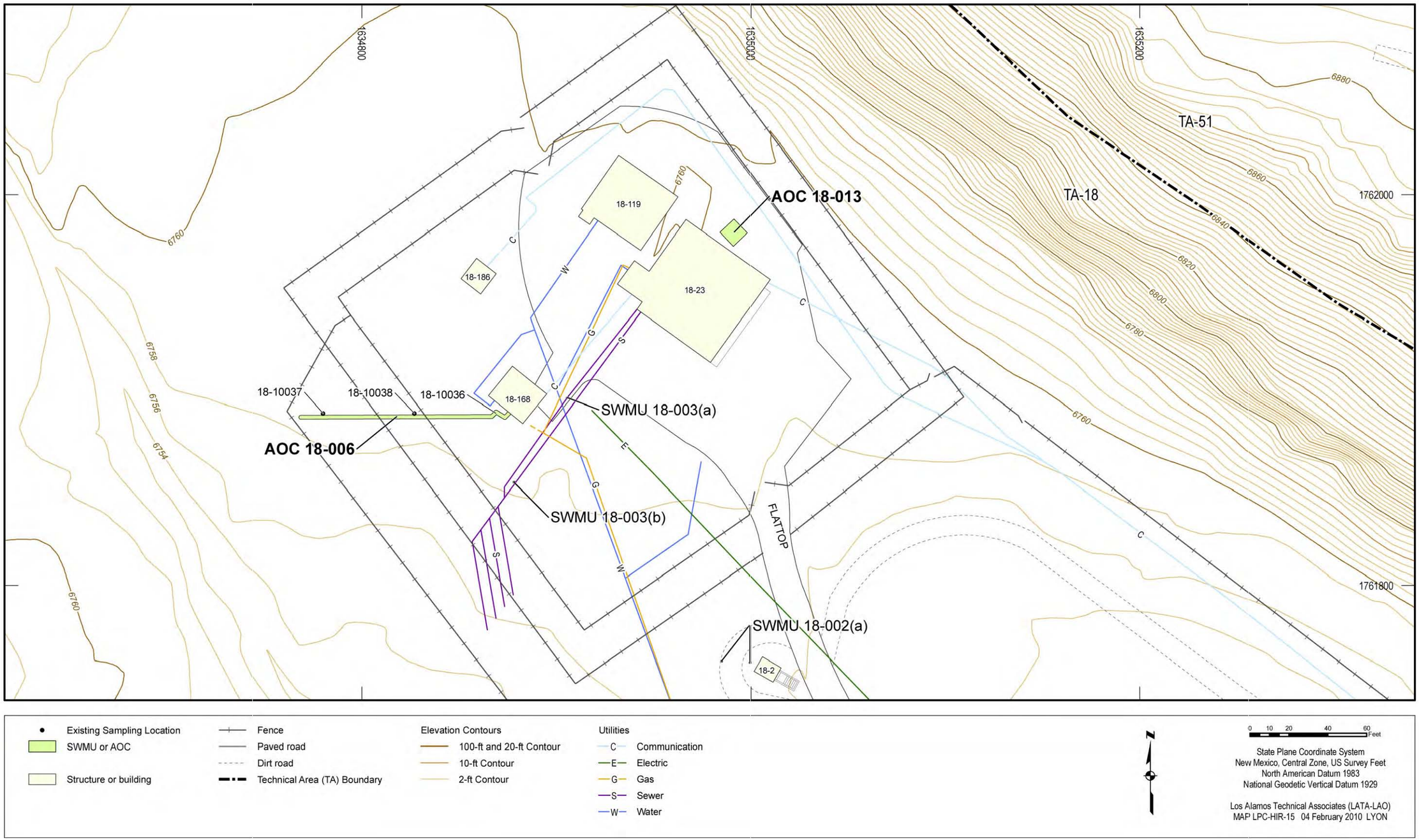

Figure 2.15-1 Site features of AOCs 18-006 and 18-013

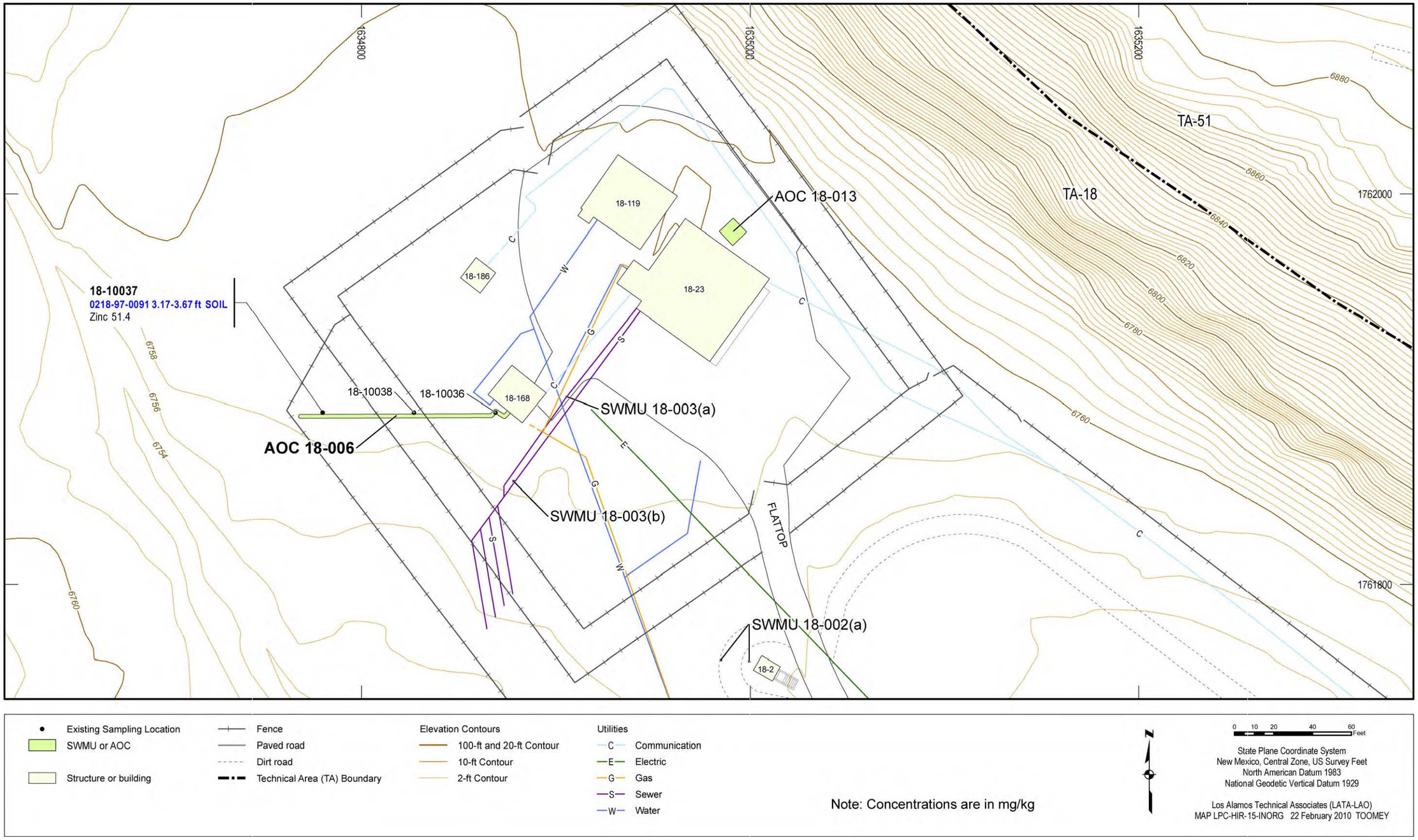

Figure 2.15-2 Inorganic chemicals detected above BVs at AOC 18-006

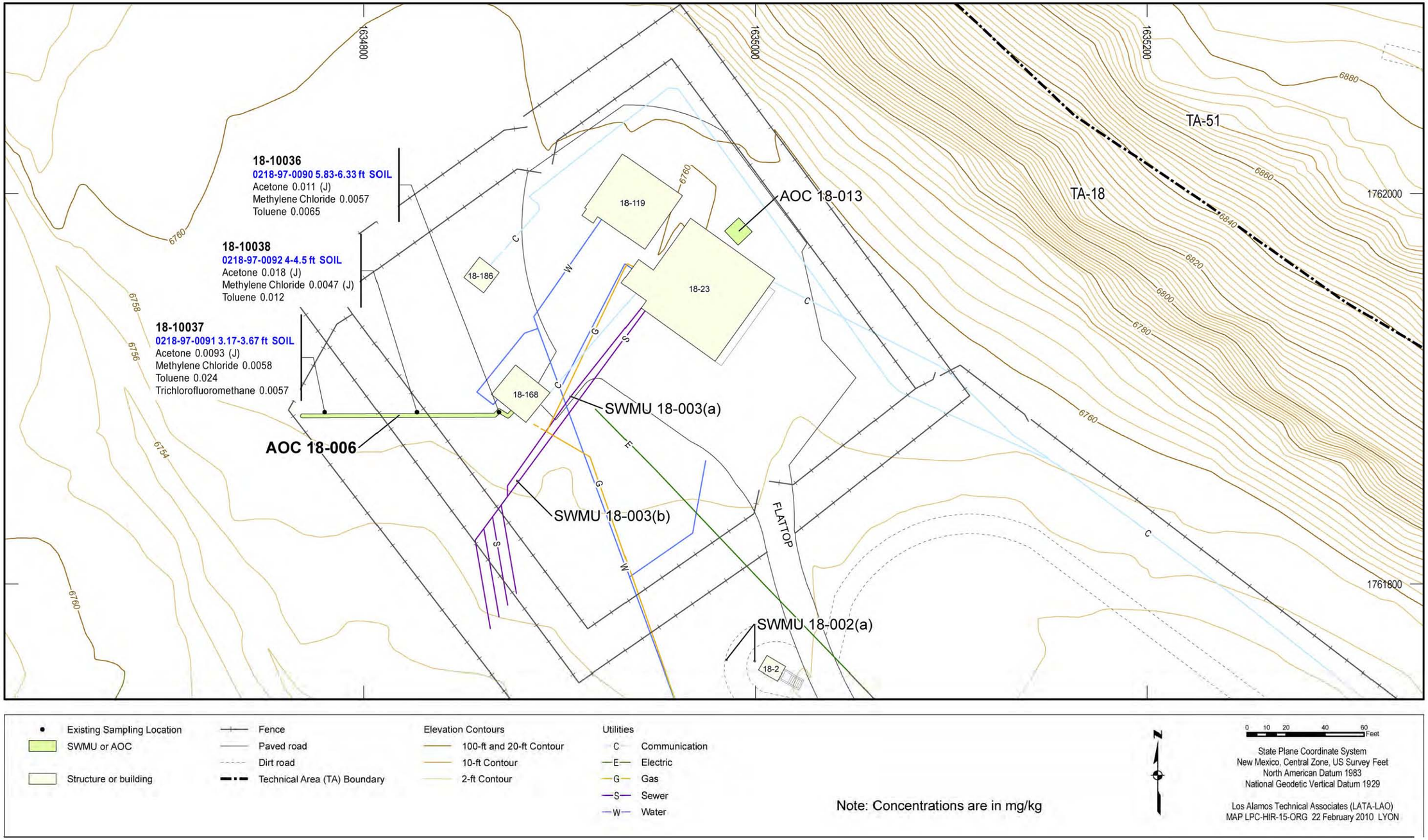

Figure 2.15-3 Organic chemicals detected at AOC 18-006

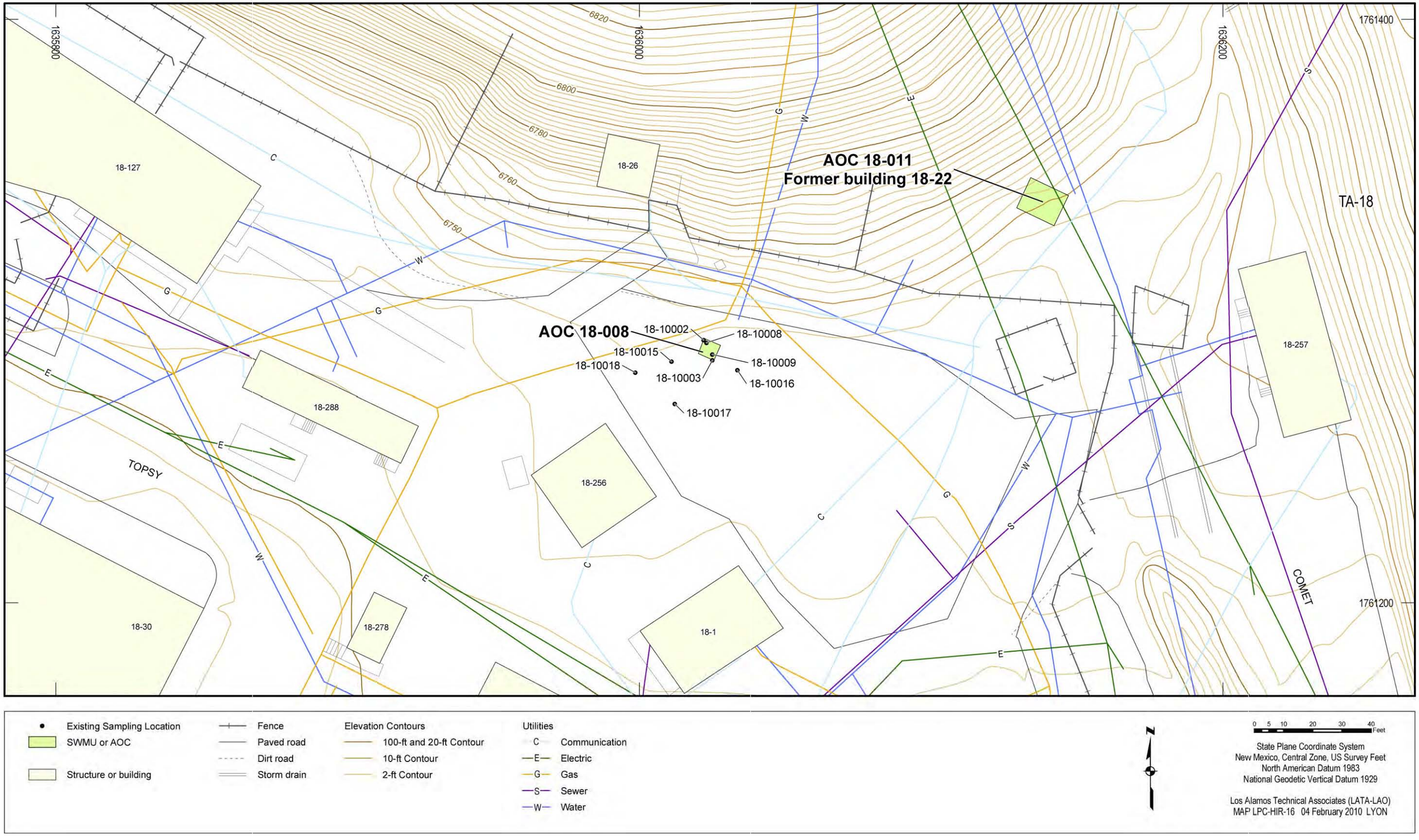

Figure 2.16-1 Site features of AOCs 18-008 and 18-011

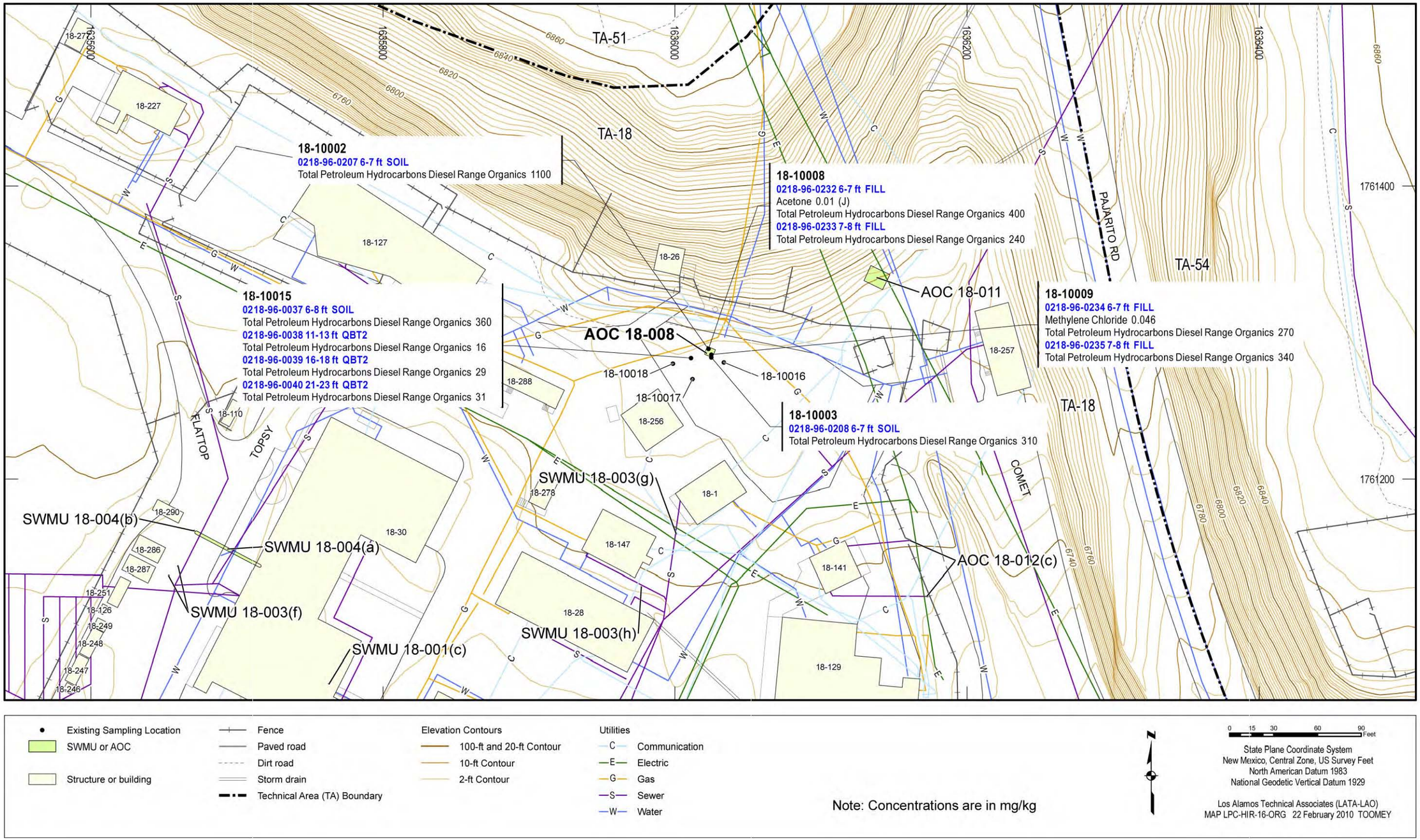

Figure 2.16-2 Organic chemicals detected at SWMU 18-008

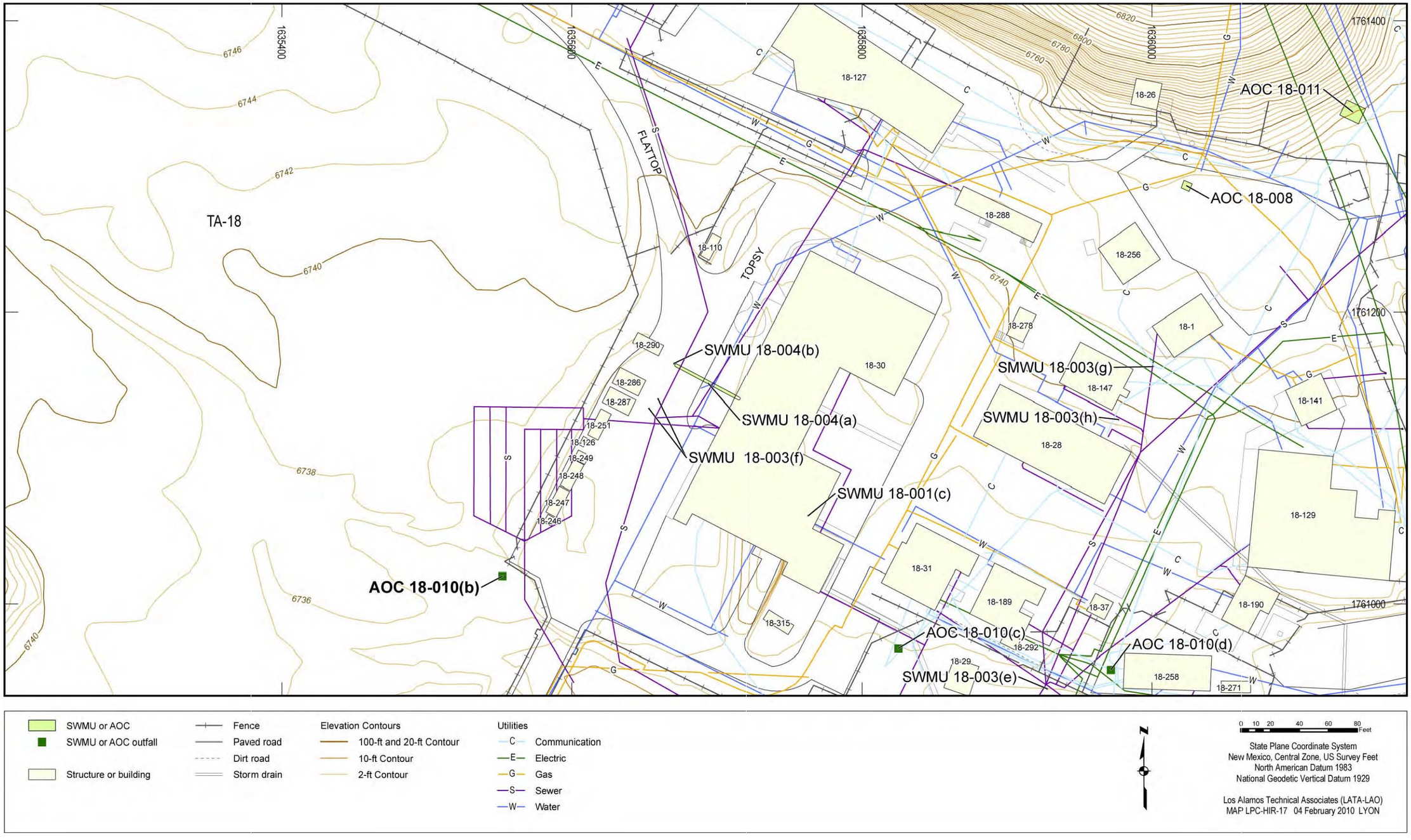

Figure 2.17-1 Site features of AOC 18-010(b)

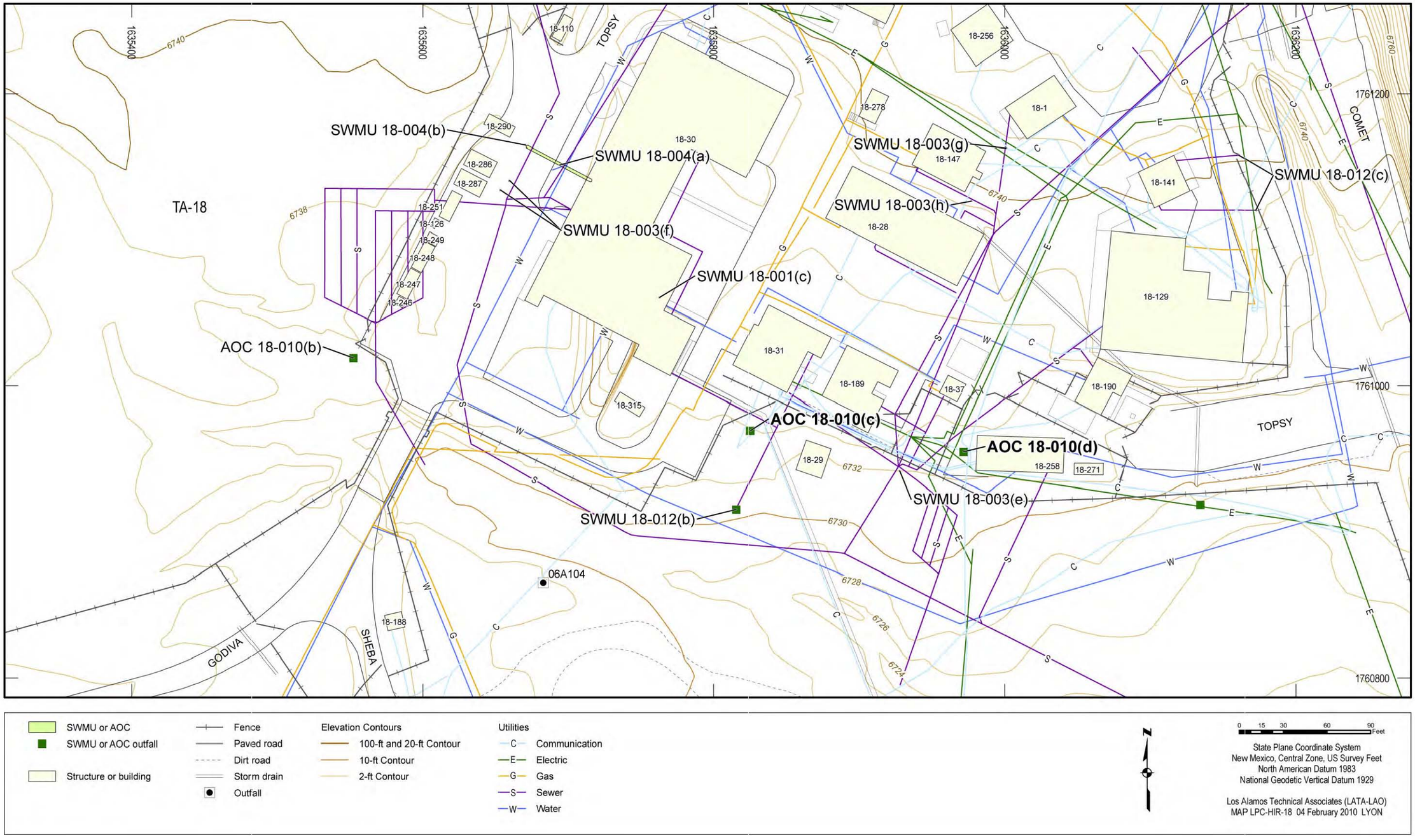

Figure 2.18-1 Site features of AOCs 18-010(c) and 18-010(d)

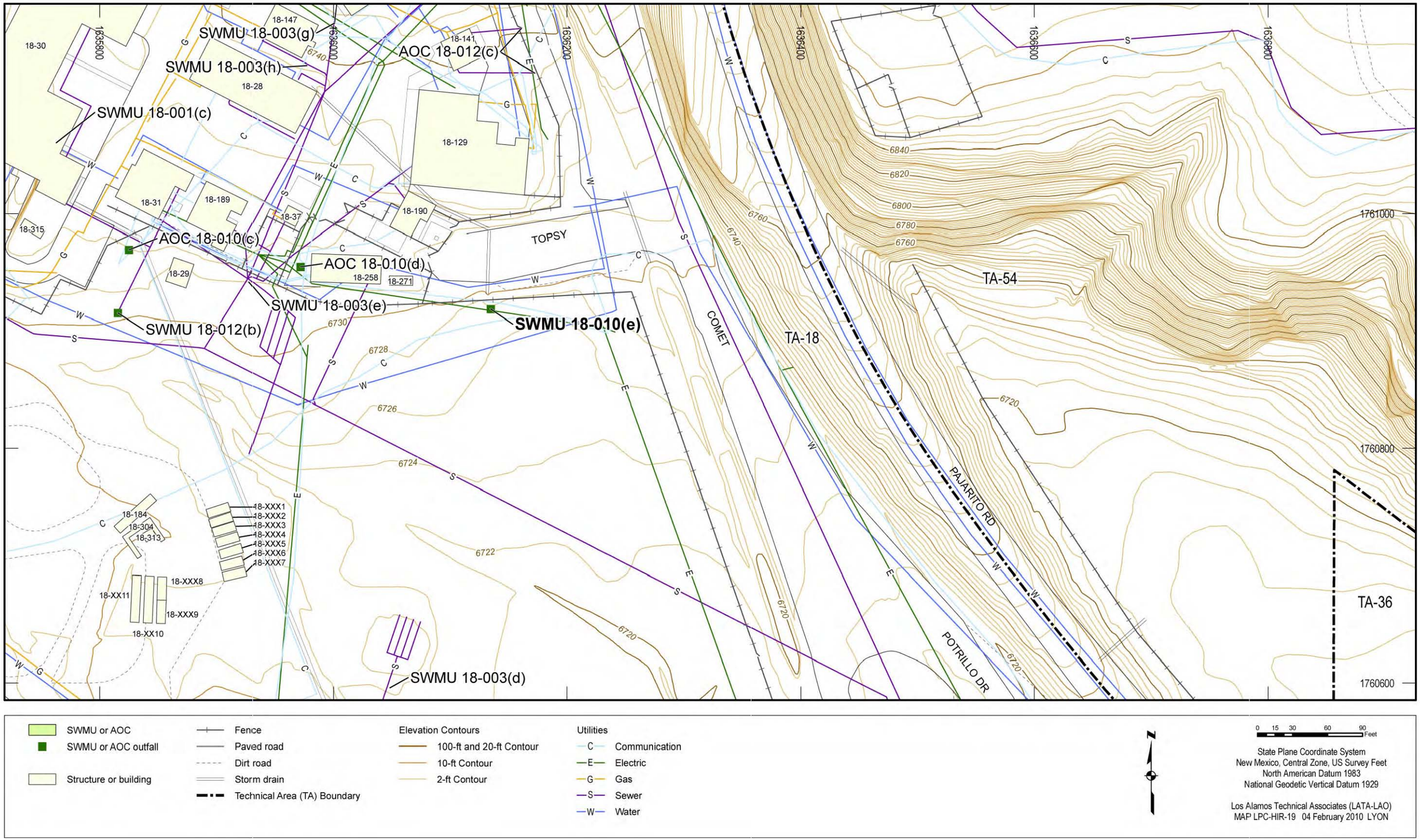

Figure 2.20-1 Site features of AOC 18-010(e)

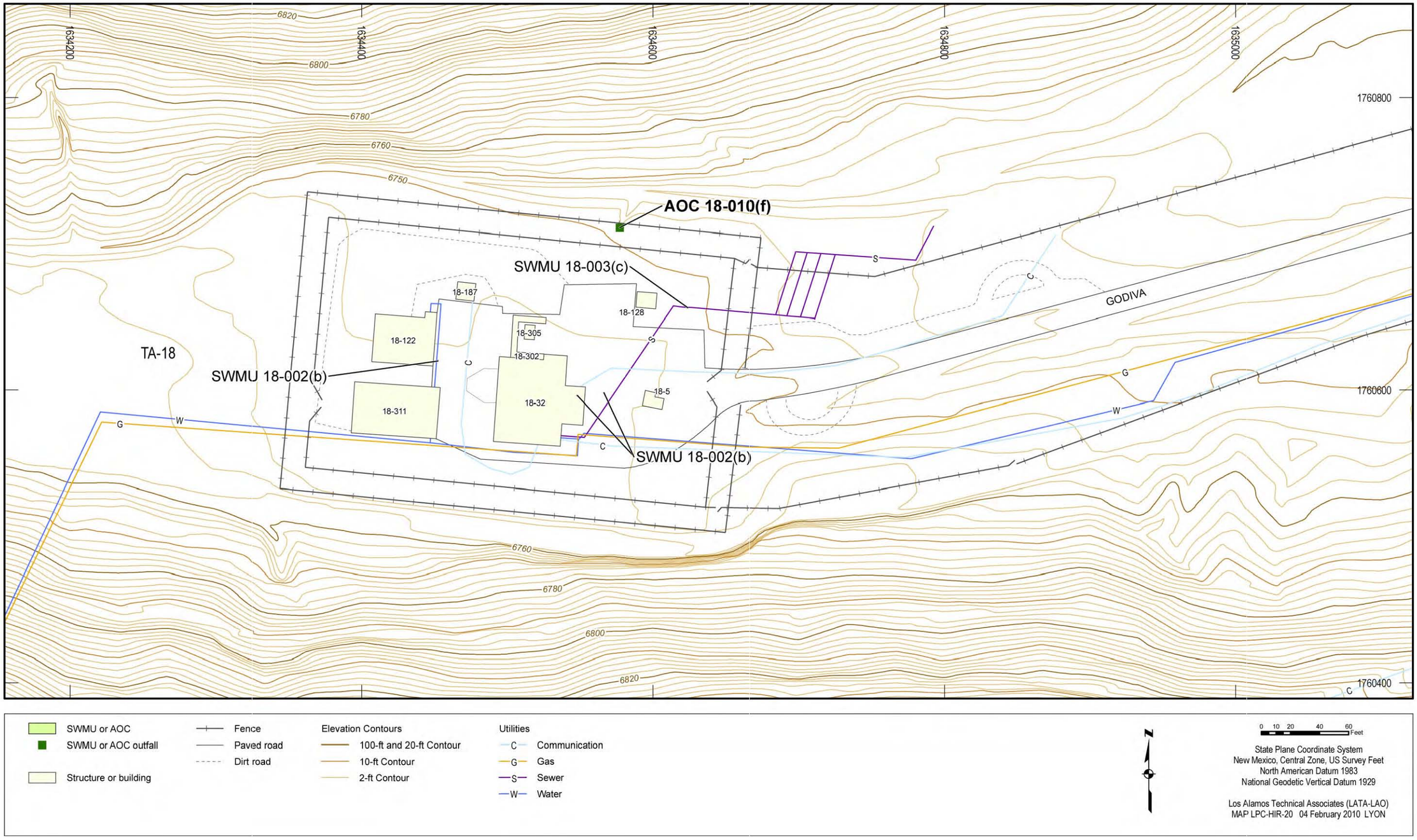

Figure 2.21-1 Site features of AOC 18-010(f)

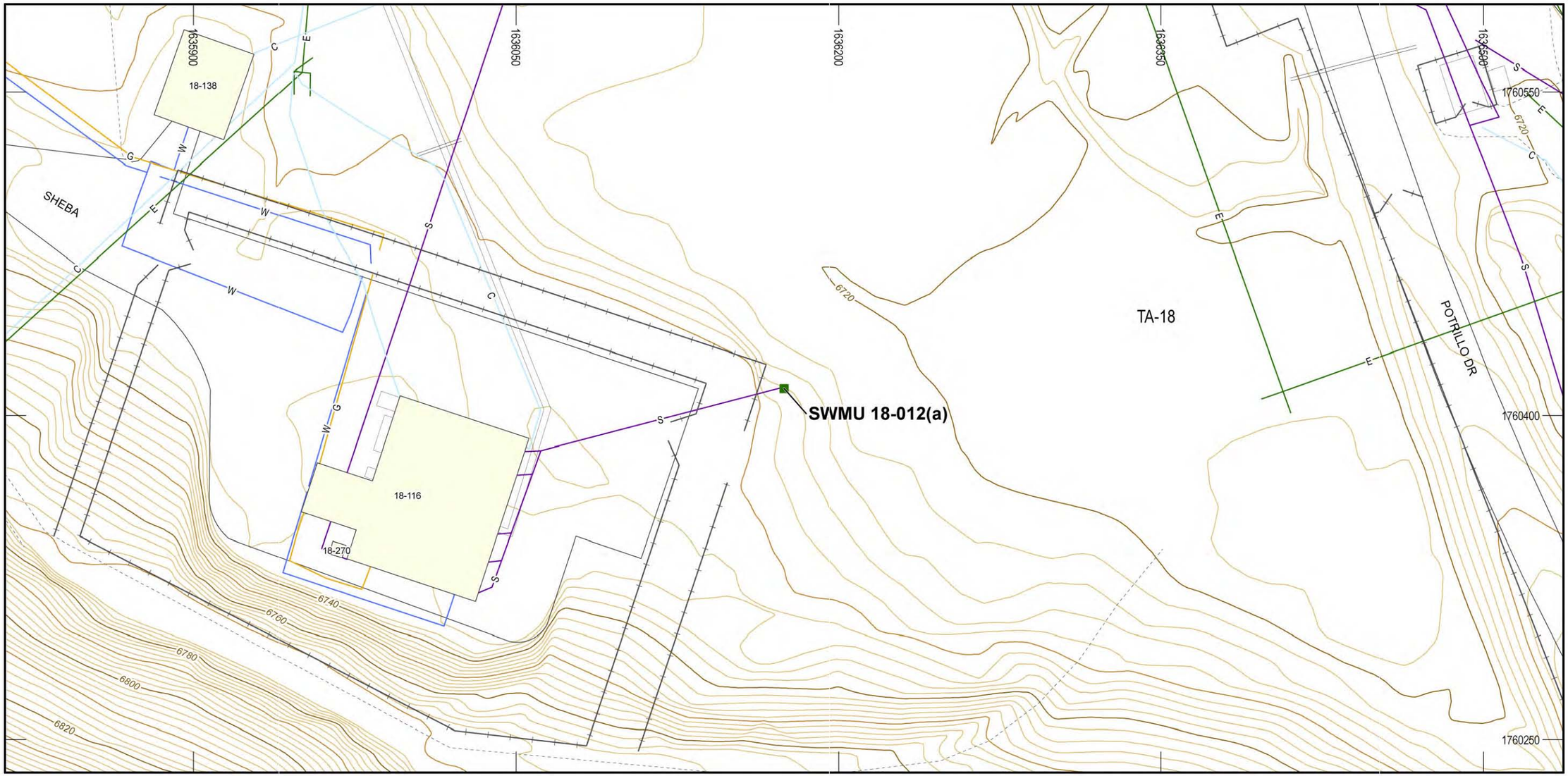

Figure 2.23-1 Site features of SWMU 18-012(a)

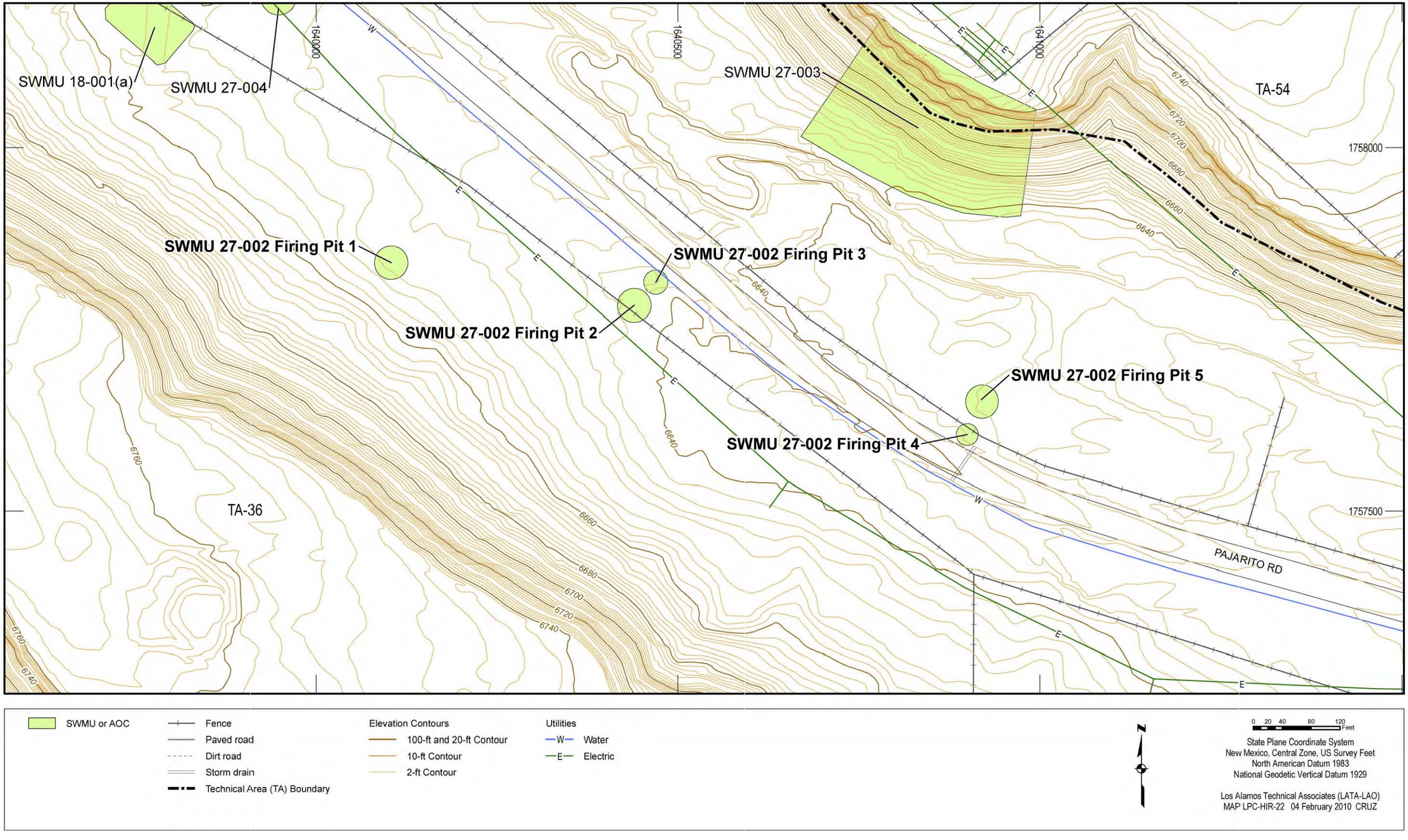

Figure 3.1-1 Site features of SWMU 27-002

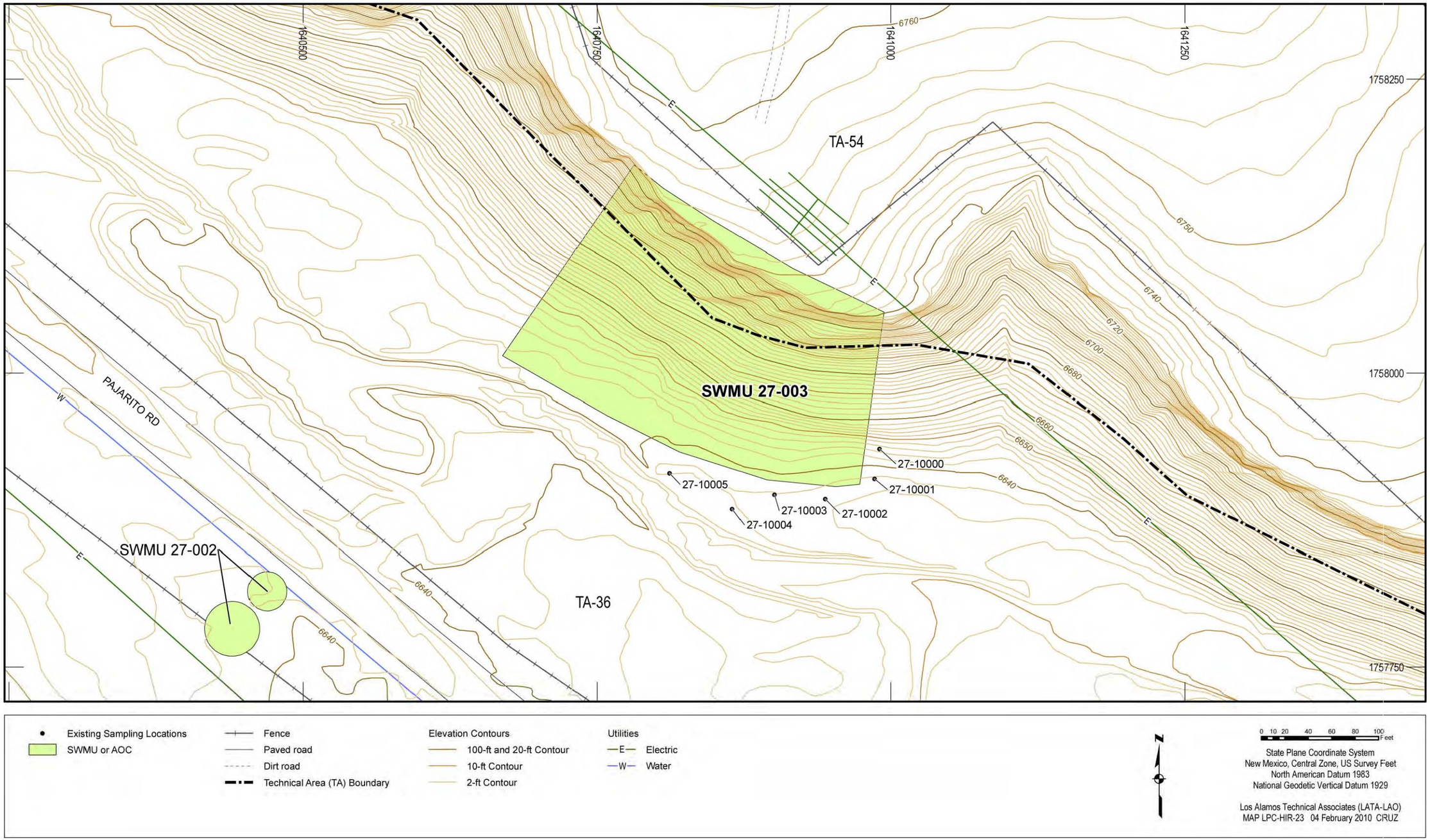

Figure 3.2-1 Site features of SWMU 27-003

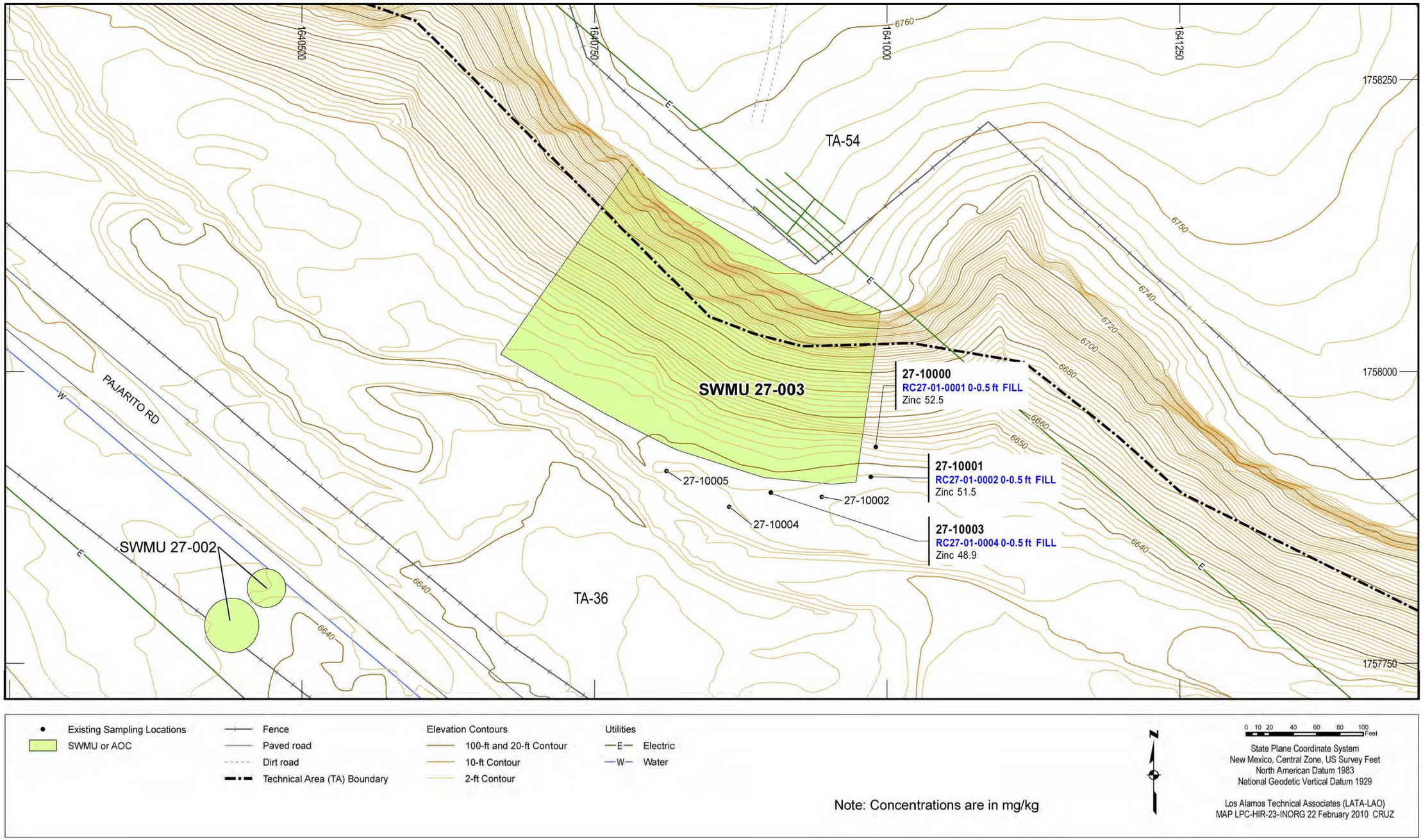

Figure 3.2-2 Inorganic chemicals detected above BVs at SWMU 27-003

Table 1.1-1
SWMUs and AOCs within the Lower Pajarito Canyon Aggregate Area

Consolidated Unit	Site ID	Brief Description	Site Status	Reference/Report Section
TA-18				
18-001(a)-00	SWMU 18-001(a)	Lagoons	Investigation in progress	Section 2.1
	SWMU 18-001(b)	Drainline	Investigation in progress	Section 2.1
18-001(c)-00	SWMU 18-001(c)	Sump	Investigation in progress	Section 2.2
	SWMU 18-012(b)	Outfall	Investigation in progress	Section 2.2
	SWMU 18-002(a)	Firing site	Investigation in progress	Section 2.3
	SWMU 18-002(b)	Firing site	Investigation in progress	Section 2.4
	AOC 18-002(c)	Former drop tower	Investigation in progress	Section 2.5
18-003(a)-00	SWMU 18-003(a)	Settling pit	Investigation in progress	Section 2.6
	SWMU 18-003(b)	Septic system	Investigation in progress	Section 2.6
	SWMU 18-003(c)	Septic system	Investigation in progress	Section 2.7
	SWMU 18-003(d)	Septic system	Investigation in progress	Section 2.8
	SWMU 18-003(e)	Septic system	Investigation in progress	Section 2.9
	SWMU 18-003(f)	Septic system	Investigation in progress	Section 2.10
	SWMU 18-003(g)	Septic system	Investigation in progress	Section 2.11
	SWMU 18-003(h)	Septic system	Investigation in progress	Section 2.12
18-004(a)-00	SWMU 18-004(a)	Waste line	Investigation in progress	Section 2.13
	SWMU 18-004(b)	Area of potential soil contamination	Investigation in progress	Section 2.13
	SWMU 18-005(a)	Area of potential soil contamination	Investigation in progress	Section 2.14
	AOC 18-006	Former storage pipe	Investigation in progress	Section 2.15
	AOC 18-008	Former underground tank	Investigation in progress	Section 2.16
	AOC 18-009(a)	Transformer	NFA approved	EPA 2005, 088464
	AOC 18-009(b)	Transformer	NFA approved	EPA 2005, 088464
	AOC 18-009(c)	Transformer	NFA approved	EPA 2005, 088464
	AOC 18-009(d)	Transformer	NFA approved	EPA 2005, 088464
	AOC 18-009(e)	Transformer	NFA approved	EPA 2005, 088464
	AOC 18-010(a)	Outfall	NFA approved	EPA 2005, 088464
	AOC 18-010(b)	Outfall	Investigation in progress	Section 2.17
	AOC 18-010(c)	Outfall	Investigation in progress	Section 2.18
	AOC 18-010(d)	Outfall	Investigation in progress	Section 2.19
	AOC 18-010(e)	Outfall	Investigation in progress	Section 2.20
	AOC 18-010(f)	Outfall	Investigation in progress	Section 2.21
	AOC 18-011	Area of potential soil contamination	Investigation in progress	Section 2.22
	SWMU 18-012(a)	Outfall	Investigation in progress	Section 2.23
	AOC 18-012(c)	Sump and drainlines	Investigation in progress	Section 2.24

Table 1.1-1 (continued)

Consolidated Unit	Site ID	Brief Description	Site Status	Reference/Report Section
	AOC 18-012(d)	Drainline	NFA approved	EPA 2005, 088464
	AOC 18-013	Pit and catch tank	Investigation in progress	Section 2.25
	AOC C-18-001	Former photoprocessing laboratory	NFA approved	EPA 2005, 088464
	AOC C-18-003	Storage area	NFA approved	EPA 2005, 088464
TA-27				
	SWMU 27-001	Buried naval guns	Removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit, 5/02/01	NMED 2001, 070010
	SWMU 27-002	Firing sites	Investigation in progress	Section 3.1
	SWMU 27-003	Bazooka impact area	Investigation in progress	Section 3.2
	AOC 27-004	Former control building	NFA approved	EPA 2005, 088464
TA-54				
	AOC 54-001(f)	Storage area	NFA approved	EPA 2005, 088464
	SWMU 54-007(a)	Former septic system	Certificate of Completion Received 5/29/2007	NMED 2007, 096477
	SWMU 54-007(b)	Septic system (inactive)	Removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit, 5/02/01	NMED 2001, 070010
	AOC 54-008	Underground tank	NFA approved	EPA 2005, 088464
	AOC 54-009	Former aboveground tanks	Investigation complete; closed under RCRA. Pending final NMED approval	LANL 2003, 094315
	AOC 54-010	Underground tank	NFA approved	EPA 2005, 088464
	AOC 54-012(a)	Former drum compactor	Delayed until TA-54 closure	Not applicable
	SWMU 54-012(b)	Drum compactor	Delayed until TA-54 closure	Not applicable
54-013(b)-99	SWMU 54-013(b)	Vehicle monitoring/decontamination area (MDA G)	Included under MDA G Investigations	LANL 2005, 090513; LANL 2007, 096110.
	SWMU 54-014(b)	Retrievable transuranic waste storage pit (MDA G)	Included under MDA G Investigations	LANL 2005, 090513; LANL 2007, 096110.
	SWMU 54-014(c)	Retrievable transuranic waste storage shafts (MDA G)	Included under MDA G Investigations	LANL 2005, 090513; LANL 2007, 096110.

Table 1.1-1 (continued)

Consolidated Unit	Site ID	Brief Description	Site Status	Reference/Report Section
	SWMU 54-014(d)	Retrievable transuranic waste storage trenches (MDA G)	Included under MDA G Investigations	LANL 2005, 090513; LANL 2007, 096110.
	SWMU 54-015(k)	Subsurface retrievable transuranic waste storage (MDA G)	Included under MDA G Investigations	LANL 2005, 090513; LANL 2007, 096110.
	SWMU 54-017	Disposal pits (MDA G)	Included under MDA G Investigations	LANL 2005, 090513; LANL 2007, 096110.
	SWMU 54-018	Disposal pits (MDA G)	Included under MDA G Investigations	LANL 2005, 090513; LANL 2007, 096110.
	SWMU 54-019	Disposal shafts (MDA G)	Included under MDA G Investigations	LANL 2005, 090513; LANL 2007, 096110.
	SWMU 54-020	Disposal shafts (MDA G)	Included under MDA G Investigations	LANL 2005, 090513; LANL 2007, 096110.
	AOC 54-014(a)	Storage shafts at Area L	Investigation complete; closed under RCRA. Pending final NMED approval	LANL 2006, 098199
	AOC 54-015(a)	Mixed waste storage area	In progress; active RCRA unit to be closed under RCRA closure requirements	DOE 2009, 109234
	AOC 54-015(b)	Transuranic waste storage area	Delayed until TA-54 closure	Not applicable
	AOC 54-015(c)	Transuranic waste storage area	In progress; active RCRA unit to be closed under RCRA closure requirements	DOE 2009, 109234
	AOC 54-015(d)	Transuranic waste storage area	In progress; active RCRA unit to be closed under RCRA closure requirements	DOE 2009, 109234
	AOC 54-015(e)	Transuranic waste storage area	In progress; active RCRA unit to be closed under RCRA closure requirements	DOE 2009, 109234
	AOC 54-015(f)	Transuranic waste storage area	In progress; active RCRA unit to be closed under RCRA closure requirements	DOE 2009, 109234
	AOC 54-015(g)	Storage area	NFA approved	EPA 2005, 088464
	AOC 54-015(i)	Storage area	NFA approved	EPA 2005, 088464
	AOC 54-015(j)	Mixed waste storage area	In progress; active RCRA unit to be closed under RCRA closure requirements	DOE 2009, 109234

Table 1.1-1 (continued)

Consolidated Unit	Site ID	Brief Description	Site Status	Reference/Report Section
	AOC 54-016(b)	Sump	In progress; active RCRA unit to be closed under RCRA closure requirements	DOE 2009, 109234
	AOC 54-021	Aboveground oil storage tanks (6)	NFA approved	EPA 2005, 088464
	AOC 54-022	Transformer spill site	NFA approved	EPA 2005, 088464

Note: Shading denotes NFA approved.

Table 2.6-1
Samples Collected and Analyses Requested at SWMU 18-003(a)

Sample ID	Location ID	Depth (ft)	Media	HE	Isotopic Plutonium	Isotopic Uranium	TAL Metals	SVOCs	VOCs
0218-96-0200	18-10000	0.50–0.67	SOIL	—*	2163	—	2162, 2163	2161	2161
0218-96-0201	18-10001	0.50–0.67	SOIL	—	2163	—	2162, 2163	2161	2161
0218-97-0082	18-10048	3.50–4.50	FILL	3679R	3681R	3681R	3680R	3678R	3678R
0218-97-0081	18-10048	9.50–11.50	SOIL	3679R	3681R	3681R	3680R	3678R	3678R
0218-97-0105	18-10048	13.50–13.83	SOIL	3679R	3681R	3681R	3680R	3678R	3678R
0218-97-0083	18-10049	5.50–6.00	SOIL	3668R	3670R	3670R	3669R	3667R	3667R
0218-97-0080	18-10049	10.50–11.00	SOIL	3668R	3670R	3670R	3669R	3667R	3667R
0218-97-0104	18-10049	13.50–14.00	SOIL	3668R	3670R	3670R	3669R	3667R	3667R

Note: Numbers in the analyte columns are analytical request numbers.
* — = Analysis not requested.

Table 2.6-2
Inorganic Chemicals above BVs at SWMU 18-003(a)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Silver	Uranium	Zinc
Soil BV[a]				**0.83**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**22.3**	**0.1**	**15.4**	**1**	**1.82**	**48.8**
Construction Worker SSL[b]				**124**	**4350**	**309**	**na**[c]	**449**	**34.6**[d]	**12400**	**800**	**92.9**[d]	**6190**	**1550**	**929**	**92900**
Industrial SSL[b]				**454**	**224000**	**1120**	**na**	**2920**	**300**[d]	**45400**	**800**	**310**[d]	**22700**	**5680**	**3410**	**341000**
Recreational SSL[e]				**317**	**158000**	**784**	**na**	**1910**	**238**	**31700**	**560**	**238**	**15800**	**3960**	**2380**	**238000**
Residential SSL[b]				**31.3**	**15600**	**77.9**	**na**	**219**	**23**[d]	**3130**	**400**	**23d**	**1560**	**391**	**235**	**23500**
0218-96-0200	18-10000	0.50–0.67	SOIL	6.8 (U)	1030 (J-)	11.9 (J-)	—[f]	—	—	60.3	181 (J-)	0.43	—	1.2 (U)	9.61	813
0218-96-0201	18-10001	0.50–0.67	SOIL	7.1 (U)	—	4.2 (J-)	—	—	—	30.3	60.2 (J-)	0.17	—	1.3 (U)	11.3	364
0218-97-0082	18-10048	3.50–4.50	FILL	—	—	—	—	—	—	23.3	—	—	—	—	NA[g]	—
0218-97-0081	18-10048	9.50–11.50	SOIL	—	—	—	8410	25.7	12	52.6	—	—	16.1	—	NA	50.1
0218-97-0105	18-10048	13.50–13.83	SOIL	—	—	—	—	—	—	30.5	—	—	—	—	NA	—
0218-97-0083	18-10049	5.50–6.00	SOIL	—	349	—	—	25.6	—	—	—	—	—	—	NA	—
0218-97-0080	18-10049	10.50–11.00	SOIL	—	—	—	—	—	—	82.9	—	—	19.6	—	NA	57.1
0218-97-0104	18-10049	13.50–14.00	SOIL	—	—	—	—	—	9.4 (J)	145	—	—	32.8	—	NA	105

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs are from LANL 1998, 059730.

[b] SSLs from NMED 2009, 108070, unless otherwise noted.

[c] na = Not available.

[d] EPA regional screening level (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm).

[e] SSLs from LANL 2010, 108613.

[f] — = Not detected or not detected above BV.

[g] NA = Not analyzed.

Table 2.6-3
Organic Chemicals Detected at SWMU 18-003(a)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Methylnaphthalene[2-]	Naphthalene	Phenanthrene	Pyrene	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]
Construction Worker SSL[a]				**263000**	**66800**	**213**	**21.3**	**213**	**6680[b]**	**2060**	**4760**	**20600**	**23800**	**21.3**	**8910**	**213**	**1240[c]**	**702**	**7150**	**6680**	**4600**	**5820**	**688[c]**
Industrial SSL[a]				**851000**	**183000**	**23.4**	**2.34**	**23.4**	**18300[b]**	**234**	**1370**	**2340**	**68400**	**2.34**	**24400**	**23.4**	**4100[c]**	**252**	**20500**	**18300**	**253**	**6760**	**260[c]**
Recreational SSL[d]				**702000**	**104000**	**30.1**	**3.01**	**30.1**	**10400[b]**	**301**	**1830**	**3010**	**39900**	**3.01**	**13900**	**30.1**	**3170**	**1950**	**12000**	**10400**	**1450**	**49800**	**6880**
Residential SSL[a]				**67500**	**17200**	**6.21**	**0.621**	**6.21**	**1720[b]**	**62.1**	**347**	**621**	**6110**	**0.621**	**2290**	**6.21**	**310[c]**	**45**	**1830**	**1720**	**45.7**	**2010**	**62[c]**
0218-96-0200	18-10000	0.50–0.67	SOIL	—[e]	0.22 (J)	0.49	0.59	0.39	0.49	0.59	0.25 (J)	0.53	—	0.13 (J)	1.1	0.39	—	—	0.38 (J)	0.86	0.008	0.001 (J)	—
0218-96-0201	18-10001	0.50–0.67	SOIL	—	—	0.16 (J)	0.2 (J)	0.18 (J)	—	0.15 (J)	0.07 (J)	0.17 (J)	—	—	0.4	—	—	—	0.12 (J)	0.18 (J)	0.009	—	—
0218-97-0082	18-10048	3.50–4.50	FILL	0.0099 (J+)	—	—	—	—	—	NA[f]	—	—	0.076 (J)	—	—	—	—	0.0046 (J+)	—	—	0.12 (J)	—	0.0056 (J)
0218-97-0081	18-10048	9.50–11.50	SOIL	0.01 (J)	—	—	—	—	—	NA	—	—	—	—	—	—	—	—	—	—	—	—	—
0218-97-0105	18-10048	13.50–13.83	SOIL	0.0049 (J)	—	—	—	—	—	NA	—	—	—	—	—	—	—	—	—	—	—	—	—
0218-97-0083	18-10049	5.50–6.00	SOIL	0.01 (J)	—	—	—	—	—	NA	—	—	—	—	—	—	0.11 (J)	0.014	—	—	0.0032 (J)	—	0.003 (J)
0218-97-0080	18-10049	10.50–11.00	SOIL	0.0065 (J)	—	—	—	—	—	NA	—	—	—	—	—	—	—	—	—	—	—	—	—
0218-97-0104	18-10049	13.50–14.00	SOIL	0.023 (J)	—	—	—	—	—	NA	0.09 (J)	—	—	—	—	—	—	—	—	—	—	—	—

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.
[a] SSLs from NMED 2009, 108070, unless otherwise noted.
[b] Pyrene used as a surrogate.
[c] EPA regional screening level (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm).
[d] SSLs from LANL 2010, 108613.
[e] — = Not detected.
[f] NA = Not analyzed.

Table 2.6-4
Radionuclides Detected or
Detected above BVs/FVs at SWMU 18-003(a)

Sample ID	Location ID	Depth (ft)	Media	Plutonium-239/240
Soil BV[a]				**0.054**[b]
Construction Worker SAL[c]				**36**
Industrial SAL[c]				**210**
Recreational SAL[c]				**300**
Residential SAL[c]				**33**
0218-96-0200	18-10000	0.50–0.67	SOIL	0.545
0218-96-0201	18-10001	0.50–0.67	SOIL	0.432

Note: Results are in pCi/g.

[a] BVs/FVs are from LANL 1998, 059730.

[b] BV applies only to samples collected from 0–1 ft.

[c] SALs from LANL 2009, 107655.

Table 2.6-5
Samples Collected and Analyses Requested at SWMU 18-003(b)

Sample ID	Location ID	Depth (ft)	Media	HE	Isotopic Plutonium	Isotopic Uranium	TAL Metals	SVOCs	VOCs
0218-97-0060	18-10026	5.50–5.67	FILL	3684R	3686R	3686R	3685R	3683R	3683R
0218-97-0100	18-10026	7.17–7.50	FILL	3684R	3686R	3686R	3685R	3683R	3683R
0218-97-0061	18-10027	5.50–6.00	FILL	3684R	3686R	3686R	3685R	3683R	3683R
0218-97-0103	18-10027	7.00–7.50	SOIL	3684R	3686R	3686R	3685R	3683R	3683R
0218-97-0062	18-10028	3.33–3.67	SOIL	3672R	3674R	3674R	3673R	3671R	3671R
0218-97-0063	18-10029	2.50–2.83	SOIL	3672R	3674R	3674R	3673R	3671R	3671R

Note: Numbers in the analyte columns are analytical request numbers.

Table 2.6-6
Inorganic Chemicals above BVs at SWMU 18-003(b)

Sample ID	Location ID	Depth (ft)	Media	Cadmium	Copper	Mercury	Thallium
Soil BV[a]				**0.4**	**14.7**	**0.1**	**0.73**
Construction Worker SSL[b]				**309**	**12400**	**92.9**[c]	**20.4**
Industrial SSL[b]				**1120**	**45400**	**310**[c]	**74.9**
Recreational SSL[d]				**784**	**31700**	**238**	**52.3**
Residential SSL[b]				**77.9**	**3130**	**23**[c]	**5.16**
0218-97-0060	18-10026	5.50–5.67	FILL	1.1 (J)	—[e]	—	—
0218-97-0061	18-10027	5.50–6.00	FILL	1.7	—	—	0.8 (J)
0218-97-0103	18-10027	7.00–7.50	SOIL	1.2	16.4	—	—
0218-97-0062	18-10028	3.33–3.67	SOIL	1.5	—	—	—
0218-97-0063	18-10029	2.50–2.83	SOIL	—	21.5	2.4	—

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs are from LANL 1998, 059730.

[b] SSLs from NMED 2009, 108070, unless otherwise noted.

[c] EPA regional screening level (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm).

[d] SSLs from LANL 2010, 108613.

[e] — = Not detected or not detected above BV.

Table 2.6-7
Organic Chemicals Detected at SWMU 18-003(b)

Sample ID	Location ID	Depth (ft)	Media	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Di-n-butylphthalate	Toluene
Construction Worker SSL[a]				**952000**	**4760**	**23800**	**21100**
Industrial SSL[a]				**2500000**	**1370**	**68400**	**57900**
Recreational SSL[b]				**1590000**	**1830**	**39900**	**60800**
Residential SSL[a]				**245000**	**347**	**6110**	**5570**
0218-97-0060	18-10026	5.50–5.67	FILL	—[c]	—	0.092 (J)	—
0218-97-0062	18-10028	3.33–3.67	SOIL	0.23 (J)	0.039 (J)	0.065 (J)	—
0218-97-0063	18-10029	2.50–2.83	SOIL	—	0.079 (J)	0.1 (J)	0.0032 (J)

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] SSLs from NMED 2009, 108070, unless otherwise noted.

[b] SSLs from LANL 2010, 108613.

[c] — = Not detected.

Table 2.6-8
Radionuclides Detected or Detected above BVs/FVs at SWMU 18-003(b)

Sample ID	Location ID	Depth (ft)	Media	Uranium-234	Uranium-235	Uranium-238
Soil BV[a]				**2.59**	**0.2**	**2.29**
Construction Worker SAL[b]				**220**	**43**	**160**
Industrial SAL[b]				**1500**	**87**	**430**
Recreational SAL[b]				**3200**	**520**	**2100**
Residential SAL[b]				**170**	**17**	**87**
0218-97-0060	18-10026	5.50–5.67	FILL	4.32	0.225	4.21
0218-97-0061	18-10027	5.50–6.00	FILL	3.32	—[c]	2.53
0218-97-0103	18-10027	7.00–7.50	SOIL	3.08	—	2.59
0218-97-0062	18-10028	3.33–3.67	SOIL	7.1	0.286	5.28
0218-97-0063	18-10029	2.50–2.83	SOIL	21.1	0.836	—

Note: Results are in pCi/g.

[a] BVs/FVs are from LANL 1998, 059730.

[b] SALs from LANL 2009, 107655.

[c] — = Not detected or not above BV.

Table 2.7-1
Samples Collected and Analyses Requested at SWMU 18-003(c)

Sample ID	Location ID	Depth (ft)	Media	HE	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	SVOCs	VOCs
0218-97-0070	18-10030	7.00–8.42	SOIL	3659R	3661R	3661R	3660R	3658R	3658R	3658R
0218-97-0102	18-10030	9.42–10.00	SOIL	3659R	3661R	3661R	3660R	3658R	3658R	3658R
0218-97-0071	18-10031	7.00–7.50	SOIL	3659R	3661R	3661R	3660R	3658R	3658R	3658R
0218-97-0101	18-10031	10.00–10.50	SOIL	3659R	3661R	3661R	3660R	3658R	3658R	3658R
0218-97-0072	18-10032	2.83–3.33	FILL	3659R	3661R	3661R	3660R	3658R	3658R	3658R
0218-97-0073	18-10033	2.42–2.92	SOIL	3659R	3661R	3661R	3660R	3658R	3658R	3658R

Note: Numbers in the analyte columns are analytical request numbers.

Table 2.7-2
Inorganic Chemicals above BVs at SWMU 18-003(c)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Cadmium	Copper	Lead	Mercury	Zinc
Soil BV[a]				**0.83**	**0.4**	**14.7**	**22.3**	**0.1**	**48.8**
Construction Worker SSL[b]				**124**	**309**	**12400**	**800**	**92.9**[c]	**92900**
Industrial SSL[b]				**454**	**1120**	**45400**	**800**	**310c**	**341000**
Recreational SSL[d]				**317**	**784**	**31700**	**560**	**238**	**238000**
Residential SSL[b]				**31.3**	**77.9**	**3130**	**400**	**23c**	**23500**
0218-97-0102	18-10030	9.42–10.00	SOIL	0.87 (U)	—[e]	—	—	—	—
0218-97-0101	18-10031	10.00–10.50	SOIL	0.87 (U)	—	—	—	—	—
0218-97-0072	18-10032	2.83–3.33	FILL	—	0.51 (J)	16.5	27.7	0.49	211
0218-97-0073	18-10033	2.42–2.92	SOIL	—	0.67 (J)	—	—	0.24	73.7

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs are from LANL 1998, 059730.

[b] SSLs from NMED 2009, 108070, unless otherwise noted.

[c] EPA regional screening level (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm).

[d] SSLs from LANL 2010, 108613.

[e] — = Not detected or not detected above BV.

Table 2.7-3
Organic Chemicals Detected at SWMU 18-003(c)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Benzo(b)fluoranthene	Bis(2-ethylhexyl)phthalate	Di-n-butylphthalate	Fluoranthene	Phenanthrene	Pyrene
Construction Worker SSL[a]				**4.36**	**213**	**4760**	**23800**	**8910**	**7150**	**6680**
Industrial SSL[a]				**8.26**	**23.4**	**1370**	**68400**	**24400**	**20500**	**18300**
Recreational SSL[b]				**6.65**	**30.1**	**1830**	**39900**	**13900**	**12000**	**10400**
Residential SSL[a]				**1.12**	**6.21**	**347**	**6110**	**2290**	**1830**	**1720**
0218-97-0102	18-10030	9.42–10.00	SOIL	—[c]	0.055 (J)	—	—	0.11 (J)	0.061 (J)	0.12 (J)
0218-97-0101	18-10031	10.00–10.50	SOIL	—	—	0.046 (J)	—	—	—	—
0218-97-0072	18-10032	2.83–3.33	FILL	27	—	—	0.52 (J)	—	—	—
0218-97-0073	18-10033	2.42–2.92	SOIL	3.9	—	—	—	—	—	—

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] SSLs from NMED 2009, 108070, unless otherwise noted.

[b] SSLs from LANL 2010, 108613.

[c] — = Not detected.

Table 2.7-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 18-003(c)

Sample ID	Location ID	Depth (ft)	Media	Plutonium-238	Plutonium-239/240	Uranium-234	Uranium-235
Soil BV[a]				**0.023**[b]	**0.054**[b]	**2.59**	**0.2**
Construction Worker SAL[c]				**40**	**36**	**220**	**43**
Industrial SAL[c]				**240**	**210**	**1500**	**87**
Recreational SAL[c]				**330**	**300**	**3200**	**520**
Residential SAL[c]				**37**	**33**	**170**	**17**
0218-97-0072	18-10032	2.83–3.33	FILL	0.067	3	43.5	1.152
0218-97-0073	18-10033	2.42–2.92	SOIL	—[d]	0.327	5.71	0.217

Note: Results are in pCi/g.

[a] BVs/FVs are from LANL 1998, 059730.

[b] BV applies only to samples collected from 0–1 ft.

[c] SALs from LANL 2009, 107655.

[d] — = Not detected or not above BV.

Table 2.8-1
Samples Collected and Analyses Requested at SWMU 18-003(d)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	SVOCs	VOCs
0218-96-0500	18-10010	2.00–4.00	SOIL	2756	2756	2756
0218-96-0501	18-10010	6.00–8.00	SOIL	2756	2756	2756
0218-96-0504	18-10011	2.00–4.00	SOIL	2772	2772	2772
0218-96-0505	18-10011	8.00–9.80	SOIL	2772	2772	2772
0218-96-0506	18-10011	37.50–38.50	SOIL	—*	—	2772
0218-96-0508	18-10012	2.00–4.00	SOIL	2765	2765	2765
0218-96-0509	18-10012	6.00–8.00	SOIL	2765	2765	2765
0218-96-0510	18-10012	42.00–42.50	QBT2	—	—	2765
0218-96-0512	18-10013	2.00–4.00	SOIL	2769	2769	2769
0218-96-0513	18-10013	8.00–9.00	SOIL	2769	2769	2769
0218-96-0514	18-10013	38.00–38.50	QAL	—	—	2769
0218-96-0516	18-10014	2.00–4.00	SOIL	2755	2755	2755
0218-96-0517	18-10014	6.00–8.00	SOIL	2755	2755	2755
0218-96-0518	18-10014	30.00–30.50	QBT2	—	—	2755

Note: Numbers in the analyte columns are analytical request numbers.

* — = Analysis not requested.

Table 2.8-2
Inorganic Chemicals above BVs at SWMU 18-003(d)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Cadmium	Manganese	Mercury	Silver	Thallium	Zinc
Soil BV[a]				**0.83**	**0.4**	**671**	**0.1**	**1**	**0.73**	**48.8**
Construction Worker SSL[b]				**124**	**309**	**463**	**92.9**[c]	**1550**	**20.4**	**92900**
Industrial SSL[b]				**454**	**1120**	**145000**	**310**[c]	**5680**	**74.9**	**341000**
Recreational SSL[d]				**317**	**784**	**110000**	**238**	**3960**	**52.3**	**238000**
Residential SSL[b]				**31.3**	**77.9**	**10700**	**23**[c]	**391**	**5.16**	**23500**
0218-96-0500	18-10010	2.00–4.00	SOIL	11 (U)	0.57 (U)	—[e]	0.11 (U)	2.3 (U)	—	—
0218-96-0501	18-10010	6.00–8.00	SOIL	11 (U)	0.56 (U)	—	0.11 (U)	2.2 (U)	—	—
0218-96-0504	18-10011	2.00–4.00	SOIL	1 (UJ)	—	—	—	—	0.77 (U)	—
0218-96-0505	18-10011	8.00–9.80	SOIL	0.94 (UJ)	—	788 (J-)	—	—	3	—
0218-96-0508	18-10012	2.00–4.00	SOIL	11 (U)	0.53 (U)	—	0.11 (U)	2.1 (U)	—	—
0218-96-0509	18-10012	6.00–8.00	SOIL	11 (U)	0.53 (U)	—	0.11 (U)	2.1 (U)	—	—
0218-96-0512	18-10013	2.00–4.00	SOIL	11 (UJ)	0.57 (U)	—	0.11 (U)	2.3 (U)	—	54
0218-96-0513	18-10013	8.00–9.00	SOIL	11 (UJ)	0.56 (U)	—	0.11 (U)	2.2 (U)	—	—
0218-96-0516	18-10014	2.00–4.00	SOIL	0.96 (U)	—	—	—	—	—	—
0218-96-0517	18-10014	6.00–8.00	SOIL	0.94 (U)	—	—	—	—	0.84 (J)	—

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs are from LANL 1998, 059730.

[b] SSLs from NMED 2009, 108070, unless otherwise noted.

[c] EPA regional screening level (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm).

[d] SSLs from LANL 2010, 108613.

[e] — = Not detected or not above BV.

Table 2.8-3
Organic Chemicals Detected at SWMU 18-003(d)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride
Construction Worker SSL[a]				**10600**
Industrial SSL[a]				**1090**
Recreational SSL[b]				**4520**
Residential SSL[a]				**199**
0218-96-0516	18-10014	2.00–4.00	SOIL	0.0023 (J)

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] SSLs from NMED 2009, 108070.

[b] SSLs from LANL 2010, 108613.

Table 2.15-1
Samples Collected and Analyses Requested at AOC 18-006

Sample ID	Location ID	Depth (ft)	Media	Tritium	Isotopic Uranium	TAL Metals	SVOCs	VOCs
0218-97-0090	18-10036	5.83–6.33	SOIL	3573R	3573R	3572R	3571R	3571R
0218-97-0091	18-10037	3.17–3.67	SOIL	3573R	3573R	3572R	3571R	3571R
0218-97-0092	18-10038	4.00–4.50	SOIL	3573R	3573R	3572R	3571R	3571R

Note: Numbers in the analyte columns are analytical request numbers.

Table 2.15-2
Inorganic Chemicals above BVs at AOC 18-006

Sample ID	Location ID	Depth (ft)	Media	Thallium	Zinc
Soil BV[a]				**0.73**	**48.8**
Construction Worker SSL[b]				**20.4**	**92900**
Industrial SSL[b]				**74.9**	**341000**
Recreational SSL[c]				**52.3**	**238000**
Residential SSL[b]				**5.16**	**23500**
0218-97-0090	18-10036	5.83–6.33	SOIL	1.8 (U)	—[d]
0218-97-0091	18-10037	3.17–3.67	SOIL	—	51.4
0218-97-0092	18-10038	4.00–4.50	SOIL	0.85 (U)	—

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs are from LANL 1998, 059730.

[b] SSLs from NMED 2009, 108070.

[c] SSLs from LANL 2010, 108613.

[d] — = Not detected or not detected above BV.

Table 2.15-3
Organic Chemicals Detected at AOC 18-006

Sample ID	Location ID	Depth (ft)	Media	Acetone	Methylene Chloride	Toluene	Trichlorofluoromethane
Construction Worker SSL[a]				**263000**	**10600**	**21100**	**5820**
Industrial SSL[a]				**851000**	**1090**	**57900**	**6760**
Recreational SSL[b]				**702000**	**4520**	**60800**	**49800**
Residential SSL[a]				**67500**	**199**	**5570**	**2010**
0218-97-0090	18-10036	5.83–6.33	SOIL	0.011 (J)	0.0057	0.0065	—[c]
0218-97-0091	18-10037	3.17–3.67	SOIL	0.0093 (J)	0.0058	0.024	0.0057
0218-97-0092	18-10038	4.00–4.50	SOIL	0.018 (J)	0.0047 (J)	0.012	—

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] SSLs from NMED 2009, 108070.

[b] SSLs from LANL 2010, 108613.

[c] — = Not detected.

Table 2.16-1
Samples Collected and Analyses Requested at AOC 18-008

Sample ID	Location ID	Depth (ft)	Media	SVOCs	TPH-DRO	VOCs
0218-96-0207	18-10002	6.00–7.00	SOIL	—*	2388	—
0218-96-0208	18-10003	6.00–7.00	SOIL	—	2388	—
0218-96-0232	18-10008	6.00–7.00	FILL	2587	2587	2587
0218-96-0233	18-10008	7.00–8.00	FILL	2587	2587	2587
0218-96-0234	18-10009	6.00–7.00	FILL	2587	2587	2587
0218-96-0235	18-10009	7.00–8.00	FILL	2587	2587	2587
0218-96-0037	18-10015	6.00–8.00	SOIL	—	2781	—
0218-96-0038	18-10015	11.00–13.00	QBT2	—	2781	—
0218-96-0039	18-10015	16.00–18.00	QBT2	—	2781	—
0218-96-0040	18-10015	21.00–23.00	QBT2	—	2781	—
0218-96-0053	18-10015	26.00–28.00	QBT2	—	2781	—
0218-96-0042	18-10016	13.00–15.00	QBT2	—	2782	—
0218-96-0043	18-10016	18.00–20.00	QBT2	—	2782	—
0218-96-0044	18-10016	23.00–25.00	QBT2	—	2782	—
0218-96-0055	18-10016	26.00–28.00	QBT2	—	2782	—
0218-96-0045	18-10017	8.00–10.00	SOIL	—	2781	—
0218-96-0046	18-10017	13.00–15.00	QBT2	—	2781	—
0218-96-0047	18-10017	18.00–20.00	QBT2	—	2781	—
0218-96-0048	18-10017	23.00–25.00	QBT2	—	2781	—
0218-96-0054	18-10017	26.00–28.00	QBT2	—	2781	—
0218-96-0049	18-10018	8.00–10.00	SOIL	—	2782	—
0218-96-0050	18-10018	13.00–15.00	QBT2	—	2782	—
0218-96-0051	18-10018	18.00–20.00	QBT2	—	2782	—
0218-96-0052	18-10018	23.00–25.00	QBT2	—	2782	—
0218-96-0056	18-10018	26.00–28.00	QBT2	—	2782	—

Note: Numbers in the analyte columns are analytical request numbers.
* — = Analysis not requested.

Table 2.16-2
Organic Chemicals Detected at AOC 18-008

Sample ID	Location ID	Depth (ft)	Media	Acetone	Methylene Chloride	TPH-DRO
Construction Worker SSL[a]				**263000**	**10600**	**na**[b]
Industrial SSL[a]				**851000**	**1090**	**na**
Recreational SSL[c]				**702000**	**4520**	**na**
Residential SSL[a]				**67500**	**199**	**na**
0218-96-0207	18-10002	6.00–7.00	SOIL	NA[d]	NA	1100
0218-96-0208	18-10003	6.00–7.00	SOIL	NA	NA	310
0218-96-0232	18-10008	6.00–7.00	FILL	0.01 (J)	—[e]	400
0218-96-0233	18-10008	7.00–8.00	FILL	—	—	240
0218-96-0234	18-10009	6.00–7.00	FILL	—	0.046	270
0218-96-0235	18-10009	7.00–8.00	FILL	—	—	340
0218-96-0037	18-10015	6.00–8.00	SOIL	NA	NA	360
0218-96-0038	18-10015	11.00–13.00	QBT2	NA	NA	16
0218-96-0039	18-10015	16.00–18.00	QBT2	NA	NA	29
0218-96-0040	18-10015	21.00–23.00	QBT2	NA	NA	31

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] SSLs from NMED 2009, 108070.

[b] na = Not available.

[c] SSLs from LANL 2010, 108613.

[d] NA = Not analyzed.

[e] — = Not detected.

Table 3.2-1
Samples Collected and Analyses Requested at SWMU 27-003

Sample ID	Location ID	Depth (ft)	Media	HE	TAL Metals
RC27-01-0001	27-10000	0.00–0.50	FILL	9418R	9419R
RC27-01-0002	27-10001	0.00–0.50	FILL	9418R	9419R
RC27-01-0003	27-10002	0.00–0.50	FILL	9418R	9419R
RC27-01-0004	27-10003	0.00–0.50	FILL	9418R	9419R
RC27-01-0005	27-10004	0.00–0.50	FILL	9418R	9419R
RC27-01-0006	27-10005	0.00–0.50	FILL	9418R	9419R

Note: Numbers in the analyte columns are analytical request numbers.

Table 3.2-2
Inorganic Chemicals above BVs at SWMU 27-003

Sample ID	Location ID	Depth (ft)	Media	Zinc
Soil BV[a]				**48.8**
Construction Worker SSL[b]				**92900**
Industrial SSL[b]				**341000**
Recreational SSL[c]				**238000**
Residential SSL[b]				**23500**
RC27-01-0001	27-10000	0.00–0.50	FILL	52.5
RC27-01-0002	27-10001	0.00–0.50	FILL	51.5
RC27-01-0004	27-10003	0.00–0.50	FILL	48.9

Note: Results are in mg/kg.

[a] BVs are from LANL 1998, 059730.

[b] SSLs from NMED 2009, 108070.

[c] SSLs from LANL 2010, 108613.

Appendix A

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

A-1.0 ACRONYMS AND ABBREVIATIONS

AOC	area of concern
bgs	below ground surface
BV	background value
Consent Order	Compliance Order on Consent
COPC	chemical of potential concern
CST	Chemical Science and Technology Division
D&D	decontamination and decommissioning
DCA	dichloroethane
DOE	Department of Energy (U.S.)
DOT	Department of Transportation (U.S.)
DRO	diesel range organics
EC	expedited cleanup
EP	Environmental Programs Directorate
EPA	Environmental Protection Agency (U.S.)
FIDLER	Field Instrument for Detection of Low-Energy Radiation
FV	fallout value
GPR	ground-penetrating radar
HC	hydrocarbon
HE	high explosives
HIR	historical investigation report
IA	interim action
IDW	investigation-derived waste
LANL	Los Alamos National Laboratory
MDA	material disposal area
NFA	no further action
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
NOD	notice of disapproval
NTS	Nevada Test Site
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
pH	potential of hydrogen

PID	photoionization detector
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RFI	RCRA facility investigation
RPF	Records Processing Facility
SAL	screening action level
SMO	Sample Management Office
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
SWSC	Sanitary Wastewater Systems Consolidation (plant)
TA	technical area
TAL	target analyte list
TNT	trinitrotoluene
TPH	total petroleum hydrocarbons
TRU	transuranic
UST	underground storage tank
UTL	upper tolerance level
UXO	unexploded ordnance
VCA	voluntary corrective action
VCM	voluntary corrective measure
VOC	volatile organic compound

A-2.0 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-3.0 DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The analyte was analyzed for but not detected.
J	The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
J+	The analyte was positively identified, and the result is likely to be biased high.
J-	The analyte was positively identified, and the result is likely to be biased low.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

Appendix B

Analytical Suites and Results
(on CD included with this document)