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Refer To: EP2011-0285

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Subject: Submittal of the Phase II Investigation Work Plan for S-Site Aggregate Area

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Phase II Investigation Work Plan for S-Site Aggregate Area.

If you have any questions, please contact John McCann at (505) 665-1091 (jmccann@lanl.gov) or Woody Woodworth at (505) 665-5820 (lance.woodworth@nnsa.doe.gov).

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34772

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Enclosures: Two hard copies with electronic files – Phase II Investigation Work Plan for S-Site Aggregate Area (LA-UR-11-5388)

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September 2011
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Phase II Investigation Work Plan for S-Site Aggregate Area

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Environmental Programs Directorate

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EP2011-0285

Phase II Investigation Work Plan for S-Site Aggregate Area

September 2011

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EXECUTIVE SUMMARY

The S-Site Aggregate Area is located in Technical Area 11 (TA-11), TA-16, TA-25, and former TA-13 (currently within the boundaries of TA-16) of Los Alamos National Laboratory and includes a total of 105 solid waste management units (SWMUs) and areas of concern (AOCs). Sixty-eight of the SWMUs and AOCs were investigated in 2009–2010 and the results were reported in the investigation report for the S-Site Aggregate Area. Sixty-one of these SWMUs and AOCs require additional sampling to define the extent of contamination. This investigation work plan presents the proposed sampling and analyses needed to define the vertical and/or lateral extent of one or more contaminants at each of the 61 SWMUs and AOCs. Sampling and analyses are also proposed to complete the assessment of the off-site migration of contamination within the Liquid Waste Trunk Line and Shared Drainages, which are not SWMUs or AOCs. The results of the Phase II investigation activities will be reported in a Phase II investigation report.

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1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by Los Alamos National Security, LLC. The Laboratory is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory 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 Laboratory 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 Laboratory's efforts is to ensure past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, the Laboratory is currently investigating sites potentially contaminated by past Laboratory operations. These sites are designated as either solid waste management units (SWMUs) or areas of concern (AOCs).

The SWMUs and AOCs addressed in this Phase II investigation work plan are potentially contaminated with both hazardous and radioactive components. The New Mexico Environment Department (NMED), pursuant to the New Mexico Hazardous Waste Act, regulates cleanup of hazardous wastes and hazardous constituents. DOE regulates cleanup of radioactive contamination, pursuant to DOE Order 5400.5, Radiation Protection of the Public and the Environment; DOE Order 435.1, Radioactive Waste Management; and DOE Orders 435.1, 5400.5, and 458.1, Administrative Change 2, Radiation Protection of the Public and the Environment. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

1.1 Work Plan Overview

The S-Site Aggregate Area is located in Technical Area 11 (TA-11), TA-16, TA-25, and former TA-13, (currently within the boundaries of TA-16) at the Laboratory and consists of 105 SWMUs and AOCs (Figure 1.1-1 and Plate 1). Sixty-eight of the SWMUs and AOCs were investigated in 2009–2010, and the results were reported in the approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633). The remaining 37 sites were not investigated because they had previously been approved for no further action, were included in other investigation reports, or investigation is deferred per Table IV-2 of the Compliance Order on Consent. Sixty-one of the 68 SWMUs and AOCs investigated in 2009–2010 require additional sampling to define the extent of contamination. This investigation work plan presents the proposed sampling and analyses needed to define the vertical and/or lateral extent of one or more contaminants at each of the 61 SWMUs and AOCs. Sampling and analyses are also proposed to complete the assessment of off-site contamination migration within the Liquid Waste Trunk Line and Shared Drainages, which are not SWMUs or AOCs. Contaminants to be investigated include selected target analyte list (TAL) metals, total cyanide, selected anions, perchlorate; selected volatile organic compounds (VOCs), selected semivolatile organic compounds (SVOCs); selected explosive compounds; and selected radionuclides. A brief description of the 63 sites and additional sampling requirements for these sites are presented in Table 1.1-1.

The approved investigation report for the S-Site Aggregate Area did not include a review of data downgradient of specific sites to determine if lateral extent was defined and did not compare data against industrial soil screening levels (SSLs) for all sites or against recreational SSLs to represent site visitors for V-Site Courtyard Periphery Area to determine if soil removal is required during the Phase II investigation.

Section 2 presents the background and conceptual site model of the S-Site Aggregate Area. Section 3 presents site conditions, and section 4 summarizes previous investigations and data collected and presents the scope of proposed activities for each site. Section 5 describes investigation methods for proposed field activities. Ongoing monitoring and sampling programs within the aggregate area are summarized in section 6. Section 7 is an overview of the anticipated schedule of the investigation and reporting activities. The references cited in this Phase II work plan and the map data sources are provided in section 8. Appendix A of this work plan includes a list of acronyms and abbreviations, a metric conversion table, and a data qualifier definitions table. Appendix B describes the management of investigation-derived waste (IDW).

1.2 Work Plan Objective

The objective of the Phase II investigation work plan is to complete the activities recommended in the approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) for 61 sites requiring additional sampling to define the extent of contamination.

To accomplish this objective, the Phase II work plan

- presents historical and background information and data from the investigation report for each site,
- describes the rationale for proposed data collection activities,
- identifies and presents appropriate methods for achieving the investigation objectives and managing IDW, and
- presents a schedule for conducting the investigation activities and reporting the investigation results.

2.0 BACKGROUND

2.1 General Site Information and Operational History

Located in the western portion of the Laboratory, the S-Site Aggregate Area includes portions of TA-16, TA-11, TA-25, and former TA-13 (Figure 1.1-1). The S-Site Aggregate Area SWMUs and AOCs are either located in the S-Site Canyon subwatershed or discharge directly to the Water Canyon watershed from the mesa tops. S-Site Canyon is also referred to as Martin Spring Canyon. The latter reference is used throughout the remainder of the document and figures and plates. Topographically, the area consists of roughly east-to-southeast-trending, flat-topped mesas that drain predominantly into the Martin Spring Canyon subwatershed of the Water Canyon watershed.

Subaggregate Areas

SWMUs and AOCs within the S-Site Aggregate Area are subdivided into four subaggregate areas by location and operational history. This Phase II investigation work plan addresses the sites by the subaggregate areas described below.

2.1.1 K-Site Subaggregate Area

The former TA-11 firing sites (formerly known as K-Site) were constructed in 1944 for research on implosion symmetry using x-rays and the magnetic method. K-Site was originally used to house the Betatron Facility and the Cloud Chamber, two devices used during the Manhattan Project (1942–1945). K-Site was also home to photofission experiments, an air gun firing facility, a mortar impact area, a

burning ground, laboratories, storage buildings, sumps, and Material Disposal Area (MDA) S. Until recently, a drop tower and vibration table used for conducting environmental and effects tests on high-explosives (HE) systems and components were in operation. Additional sampling to define the extent of contamination will be conducted at the following 11 SWMUs and AOCs in the K-Site Subaggregate Area during the Phase II investigation (Figure 2.1-1).

- AOC C-11-002
- SWMU 11-005(a)
- SWMU 11-005(b)
- SWMU 11-006(a)
- SWMU 11-006(b)
- SWMU 11-006(c)
- SWMU 11-006(d)
- SWMU 11-005(c)
- SWMU 11-011(a)
- SWMU 11-011(b)
- SWMU 11-011(d)

2.1.2 P-Site Subaggregate Area

The P-Site Subaggregate Area consists of inactive sites at TA-16 and former TA-13. Former TA-13 was used for a wide variety of Laboratory activities dating back to World War II. Former TA-13 was constructed in 1944 to support the HE portion of the Manhattan Project. Manhattan Project activities conducted included counter x-ray diagnostics of HE lens configurations, testing of initiator assemblies, and HE assembly and research in the magnetic method program. Because of its remote location, the area was also used to machine toxic or extremely sensitive explosives. P-Site included a firing site, a firing site debris area, control bunkers, firing bunkers, storage buildings, purported burn pits, and an experiment chamber. The majority of the buildings in the western half of former TA-13 were demolished in the early 1950s to make way for the construction of the TA-16-340 Complex. A wastewater treatment plant (WWTP) was constructed in 1953 and served all of TA-16. The WWTP was decommissioned in 1992 when the sanitary sewer system was connected to the TA-46 Sanitary Wastewater Systems Consolidation plant. Additional sampling to define the extent of contamination will be conducted at the following 18 SWMUs and AOCs in the P-Site Subaggregate Area during the Phase II investigation (Figure 2.1-2).

- SWMU 16-025(d2)
- SWMU 16-031(h)
- AOC 16-024(a)
- AOC 16-024(u)
- AOC C-16-050
- AOC C-16-060
- SWMU 13-001

- SWMU 13-004
- SWMU 16-035
- SWMU 16-036
- SWMU 13-002
- SWMU 16-029(h)
- AOC 16-003(p)
- SWMU 16-004(a)
- SWMU 16-004(b)
- SWMU 16-004(c)
- SWMU 16-004(d)
- SWMU 16-004(f)

2.1.3 300s Line Subaggregate Area

The 300s Line Subaggregate Area consists of HE-processing buildings 16-300, 16-302, 16-304, and 16-306 along with their associated rest houses (structures 16-301, 16-303, 16-305, and 16-307). The HE-processing buildings are located on the east side of the 300s Line, and the rest houses are located on the west side of the 300s Line. Construction of the 300s Line began at the end of 1951 and was completed in 1953. The primary function of this facility was casting HE such as 2,4,6-trinitrotoluene (TNT), Composition B, and Baratol. Additional sampling to define the extent of contamination will be conducted at the following 13 SWMUs and the Liquid Waste Trunk Line and Shared Drainages in the 300s Line Subaggregate Area during the Phase II investigation (Figure 2.1-3).

- SWMU 16-026(z)
- SWMU 16-001(e)
- SWMU 16-003(d)
- SWMU 16-003(e)
- SWMU 16-003(f)
- SWMU 16-003(g)
- SWMU 16-026(b)
- SWMU 16-026(c)
- SWMU 16-026(d)
- SWMU 16-026(e)
- SWMU 16-029(a)
- SWMU 16-029(b)
- SWMU 16-029(c)
- Shared Drainages
- Liquid Waste Trunk Line

2.1.4 V-Site Subaggregate Area

The V-Site Subaggregate Area is a historic site located at the eastern edge of the World War II era complex. V-Site included buildings for HE-processing, machining, and casting; HE magazines; material storage buildings; and the recently restored High Bay assembly building. The V-Site was a critical area during the Manhattan Project, during which operations included handling, loading, and testing of replicas or mockups of the first atomic bomb. This subaggregate area burned during the 2000 Cerro Grande fire, which razed its remaining structures except for buildings 16-516 and 16-517. Building 16-516 [SWMU 16-017(t)-99] is the historic High Bay assembly building, where components of the first atomic bomb were fit-tested before its transport and detonation at the Trinity Site. All V-Site operations have long since ceased; however, the High Bay building has been restored for historical purposes (LANL 2000, 066885, p. 2). Additional sampling to define the extent of contamination will be conducted at the following 19 SWMUs and AOCs in the V-Site Subaggregate Area during the Phase II investigation (Figure 2.1-4).

- AOC C-16-068
- AOC C-16-074
- SWMU 16-029(x)
- SWMU 16-029(w)
- SWMU 16-025(x)
- SWMU 16-017(w)-99
- SWMU 16-034(m)
- AOC 16-024(n)
- SWMU 16-034(n)
- AOC 16-024(m)
- SWMU 16-017(v)-99
- SWMU 16-006(h)
- SWMU 16-013
- SWMU 16-017(q)-99
- SWMU 16-017(r)-99
- SWMU 16-017(s)-99
- SWMU 16-017(t)-99
- SWMU 16-006(g)
- SWMU 16-031(c)

2.2 Conceptual Site Model

The sampling proposed in this Phase II work plan uses a conceptual site model to predict areas of potential contamination and to allow for adequate characterization of these areas. A conceptual site model describes potential contaminant sources, transport mechanisms, and receptors.

2.2.1 Potential Contaminant Sources

Releases at the sites within the S-Site Aggregate Area may have occurred as a result of firing site activities; former buildings and HE magazines; potential leaks from septic systems, sumps, and associated drainlines; catch basins; discharges from outfalls; and surface disposal areas. Previous sampling results indicate contamination from HE, inorganic chemicals, organic chemicals (VOCs and SVOCs), and radionuclides (LANL 2007, 102216). Additional sampling is needed to define the extent of contamination at 60 sites.

2.2.2 Potential Contaminant Transport Mechanisms

Current potential transport mechanisms that may lead to exposure include

- dissolution and/or particulate transport of surface contaminants during precipitation and runoff events,
- airborne transport of contaminated surface soil,
- continued dissolution and advective/dispersive transport of chemical contaminants contained in subsurface soil and tuff as a result of past operations,
- disturbance of contaminants in shallow soil and subsurface tuff by Laboratory operations, and
- disturbance and uptake of contaminants in shallow soil by plants and animals.

2.2.3 Potential Receptors

Potential receptors at one or more of the sites may include

- Laboratory workers,
- construction workers,
- site visitors, and
- plants and animals both on-site and in areas immediately surrounding the sites.

Laboratory and construction workers could potentially be exposed to contaminants in soil, tuff, and sediment by direct contact, ingestion, or inhalation. Ecological receptors may also be exposed to contaminants in soil and sediment.

2.2.4 Cleanup Levels

NMED SSLs for inorganic and organic chemicals (NMED 2009, 108070) or Laboratory screening action levels for radionuclides will be used as soil cleanup levels unless they are determined to be impractical (Section VIII.B.1 of the Compliance Order on Consent) or unless values do not exist for the current and reasonably foreseeable future land use scenarios (LANL 2010, 108613). If NMED SSLs do not exist, U.S. Environmental Protection Agency (EPA) regional screening values (adjusted to 10^{-5} risk for carcinogens) will be used (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm).

2.3 Data Overview

This investigation work plan summarizes the available decision-level data used to evaluate whether the nature and extent of contamination are defined for each site. In addition, this work plan proposes

sampling and analyses for sites where the extent of contamination has not been defined. The data collected during this investigation, along with existing decision-level data, will be used to define nature and extent and perform risk-screening assessments. To ensure vertical extent is defined, the deepest sample collected at every location shall be from undisturbed soil or unweathered tuff; sample collection depths will be adjusted accordingly in the field and recorded in sample collection logs (SCLs).

The site-specific discussions in section 4.0 include summaries of the evaluations of lateral and vertical extent of contamination presented in the approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633). The approved investigation report for the S-Site Aggregate Area did not include a review of data downgradient of specific sites to determine if lateral extent was defined and did not compare data against industrial SSLs for all sites or against recreational SSLs to represent site visitors to the V-Site Courtyard Periphery Area to determine if soil removal is required during the Phase II investigation. As a result of this review, SWMUs 16-026(b), 16-026(e), and 16-029(a), AOCs C-16-050 and 16-024(u), and the Shared Drainages are proposed for remediation under this investigation work plan.

3.0 SITE CONDITIONS

Surface and subsurface features and geologic characteristics of the S-Site Aggregate Area are described in detail in the approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633). Conditions at the sites included in this Phase II investigation work plan are predominantly influenced by

- a semiarid climate with low precipitation and a high evapotranspiration rate that limits the extent of subsurface moisture percolation and, therefore, the amount of moisture available to transport radionuclides or hazardous waste constituents in the subsurface, and
- a thick, relatively dry, unsaturated (vadose) zone that greatly restricts or prevents downward migration of contaminants to the regional aquifer.

These and other elements of the environmental setting in the S-Site Aggregate Area are considered when the investigation data are evaluated with respect to the fate and transport of contaminants.

4.0 SITE DESCRIPTIONS AND PROPOSED INVESTIGATION ACTIVITIES

4.1 K-Site Subaggregate Area

K-Site (TA-11) is located along the east-central boundary of TA-16 (Figure 2.1-1). It was constructed in 1944 as a firing site for research on implosion symmetry using x-rays and the magnetic method. K-Site was also originally used to house the Betatron Facility and the Cloud Chamber, two devices used during the Manhattan Project (1942–1945). K-Site has also been home to photofission experiments, an air gun firing facility, a mortar impact area, a burning ground, laboratories, storage buildings, sumps, and MDA S. Until recently, a drop tower and vibration table used for conducting environmental and effects tests on HE systems and components were in operation. The drop tower has since been deactivated and removed.

4.1.1 AOC C-11-002—Area of Potential Soil Contamination

4.1.1.1 Site Description and Operational History

AOC C-11-002 is an area of potential soil contamination located at TA-11 approximately 250 ft south of building 11-24 (Figure 4.1-1). This area is associated with former building 11-12, which was of wood-frame construction and measured 7 × 9 ft. Building 11-12 operated from 1944–1957 and possibly

housed a darkroom and laboratory used to support photofission experiments. The building was removed during decontamination and decommissioning (D&D) activities conducted in 1959.

4.1.1.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at AOC C-11-002, except for the following:

- Lateral extent of methylene chloride downgradient of location 11-608721

The sampling locations and results for detected organic chemicals are shown in Figure 4.1-2 for AOC C-11-002.

4.1.1.3 Proposed Activities at AOC C-11-002

The investigation report stated that the lateral extent of methylene chloride is not defined because concentrations increased downgradient and are above the estimated quantitation limit (EQL) (LANL 2011, 111810.32, p. 25). The highest concentration of methylene chloride (0.0077 mg/kg) was detected at the most downgradient sample location 11-608721. However, this detected concentration was actually less than the EQL (0.0093 mg/kg). Therefore, additional sampling for methylene chloride downgradient of sampling location 11-608721 is not required.

4.1.2 SWMU 11-005(a)—Septic System

4.1.2.1 Site Description and Operational History

SWMU 11-005(a) is an active septic system located at TA-11 approximately 70 ft southwest of building 11-24 (Figure 4.1-3). This septic system consists of a septic tank (structure 11-20), associated drainlines from buildings 11-1 and 11-4, and a tile drain field that extends to an outfall on a sloped area to the south of the septic tank. The septic system began operation in 1944. The drainline from building 11-1 has been plugged. Currently, discharge to the septic system comes only from a restroom in building 11-4. Building 11-1 is currently a storage area for electrical equipment but was originally used as a control building for the Betatron Facility (building 11-2) and the Cloud Chamber (building 11-3). Building 11-4 is currently the control building for the Vibration Test Facility (building 11-30), though it was historically used as a machine shop and photo-processing facility. A memorandum from 1950 indicated a mercury spill occurred in building 11-4; however, the location, source, and extent of the spill are unknown (LANL 1993, 020948, p. 5-97).

4.1.2.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 11-005(a), except for the following:

- Vertical extent of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) at location 11-608728
- Lateral extent of americium-241 downgradient of location 11-608734
- Lateral extent of plutonium-239/240 downgradient of location 11-608734

Sampling locations and results for detected organic chemicals are shown in Figure 4.1-4, and radionuclides detected or detected above background values/fallout values (BVs/FVs) are shown in Figure 4.1-5 for SWMU 11-005(a).

4.1.2.3 Proposed Activities at SWMU 11-005(a)

Subsurface samples will be collected at previously sampled location 11-608728, extending the depth to define the vertical extent of contamination. Samples will be collected from depth intervals of 11–12 ft and 16–17 ft below ground surface (bgs) and analyzed for RDX.

Samples will be collected from three new locations (5a-1, 5a-2, and 5a-3) downgradient of existing sampling location 11-608734 to define the lateral extent of americium-241 and plutonium-239/240 for SWMU 11-005(a) and to define the lateral extent of 1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) for SWMU 11-005(b) (see section 4.1.3.3). Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for HMX, americium-241, and isotopic plutonium. If necessary, data from samples downgradient of SWMU 11-006(c) may also be used to define lateral extent.

Proposed sampling locations at SWMU 11-005(a) are shown in Figure 4.1-6. Table 4.1-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.3 SWMU 11-005(b)—Septic System

4.1.3.1 Site Description and Operational History

SWMU 11-005(b) is an active septic system located at TA-11, approximately 70 ft south of building 11-3 (Figure 4.1-7). This septic system consists of a septic tank (structure 11-43), an outlet drainline to an outfall to the south of the septic tank, and a drain field west of the drainline. The septic system serves the restroom added to the exterior of building 11-3 and possibly may have served building 11-24, a former air gun facility that now houses a machine shop.

4.1.3.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 11-005(b), except for the following:

- Vertical extent of aluminum at location 11-608795
- Vertical extent of barium at locations 11-608785, 11-608791, and 11-608793
- Vertical extent of chromium at locations 11-608785 and 11-608791
- Vertical extent of cobalt at location 11-608795
- Vertical extent of copper at location 11-608795
- Lateral extent of HMX downgradient of location 11-608792
- Vertical extent of HMX at locations 11-608789 and 11-608790

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.1-8, and detected organic chemicals are shown in Figure 4.1-9 for SMWU 11-005(b).

4.1.3.3 Proposed Activities at SWMU 11-005(b)

Subsurface samples will be collected at six previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 13–14 ft and 18–19 ft bgs at locations 11-608785, 11-608790, and 11-608791; 14–15 ft and 19–20 ft bgs at location 11-608789; 10–11 ft and 15–16 ft bgs at location 11-608793; and 12–13 ft and 17–18 ft bgs at location 11-608795. Samples will be analyzed as follows:

- Samples collected at location 11-608785 will be analyzed for barium and chromium.
- Samples collected at location 11-608789 will be analyzed for HMX.
- Samples collected at location 11-608790 will be analyzed for HMX.
- Samples collected at location 11-608791 will be analyzed for barium and chromium.
- Samples collected at location 11-608793 will be analyzed for barium.
- Samples collected at location 11-608795 will be analyzed for aluminum, cobalt, and copper.

Lateral extent of HMX downgradient of existing sampling location 11-608792 will be defined using results from samples collected for SWMU 11-005(a) (see section 4.1.2.3). If necessary, samples from downgradient SWMU 11-006(c) may also be used to define lateral extent.

Proposed sampling locations at SWMU 11-005(b) are shown in Figure 4.1-10. Table 4.1-2 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.4 SWMU 11-006(a)—HE Sump

4.1.4.1 Site Description and Operational History

SWMU 11-006(a) is an inactive HE sump (structure 11-39) located at TA-11 on the east side of the drop tower complex (Figure 4.1-11). Installed in 1961, the concrete sump measures 4.5 × 5.3 × 4.25 ft. The sump received wash-down water from the concrete pad at the base of the drop tower when the pad was cleaned using high-pressure water hoses. The sump's upper rim was level with the concrete pad so that the wash-down water flowed directly into the sump. Larger fragments of HE were collected by hand before washing the concrete pad. The HE particles that remained after hand collection were then rinsed into the sump's screening filter. Effluent from the sump flowed across the asphalt apron to SWMU 11-006(c), one of three catch basins that received wash-down water from the asphalt apron surrounding the concrete pad. Waste collected from the concrete pad and sump filter were disposed of at the TA-16 burning ground (LANL 1993, 020948). The sump has been inactive for several years.

The drop tower complex consisted of a drop tower located on a concrete pad (approximately 130 ft in diameter) with a curb. The concrete pad is surrounded by an asphalt apron, also with a curb. The curb around the concrete pad prevented wash-down water from entering the asphalt apron. The curb around the asphalt apron prevented wash-down water from flowing to the surrounding soil. The drop tower was removed in 2008. The concrete pad and asphalt apron remain on-site.

4.1.4.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 11-006(a), except for the following:

- Lateral extent of calcium downgradient of location 11-608776
- Vertical extent of calcium at location 11-608776

- Lateral extent of copper downgradient of location 11-608776
- Lateral extent of lead downgradient of location 11-608776
- Lateral extent of benzo(a)anthracene downgradient of location 11-608776
- Lateral extent of benzo(a)pyrene downgradient of location 11-608776
- Lateral extent of benzo(b)fluoranthene downgradient of location 11-608776
- Lateral extent of benzo(g,h,i)perylene downgradient of location 11-608776
- Lateral extent of chrysene downgradient of location 11-608776
- Lateral extent of fluoranthene downgradient of location 11-608776
- Lateral extent of indeno(1,2,3-cd)pyrene downgradient of location 11-608776
- Lateral extent of phenanthrene downgradient of location 11-608776
- Lateral extent of pyrene downgradient of location 11-608776
- Lateral extent of HMX downgradient of location 11-608776
- Vertical extent of HMX at locations 11-608780, 11-608781, and 11-608782
- Lateral extent of triaminotrinitrobenzene (TATB) downgradient of location 11-608776

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.1-12, and detected organic chemicals are shown in Figure 4.1-13 for SMWU 11-006(a).

4.1.4.3 Proposed Activities at SWMU 11-006(a)

Subsurface samples will be collected at four previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected at depth intervals of 11–12 ft and 16–17 ft bgs at location 11-608776, 15–16 ft and 20–21 ft bgs at location 11-608780, and 9–10 ft to 14–15 ft bgs at locations 11-608781 and 11-608782. Samples will be analyzed as follows:

- Samples collected at location 11-608776 will be analyzed for calcium.
- Samples collected at location 11-608780 will be analyzed for HMX.
- Samples collected at location 11-608781 will be analyzed for HMX.
- Samples collected at location 11-608782 will be analyzed for HMX.

The investigation report stated that the lateral extent of calcium, copper, and lead are not defined because these inorganic chemicals were detected above BV only at the furthest downgradient sampling location, 11-608776 (LANL 2011, 111810.32, pp. 34–35). Calcium, copper, and lead were not detected above BV or the maximum background concentration in the samples collected at SWMU 11-006(c) sampling locations 11-608736, 11-608737, and 11-608738, which are downgradient of sampling location 11-608776 (section 4.1.6.2, Figure 4.1-21) (LANL 2011, 111810.32, p. 492). Therefore, additional sampling for calcium, copper, and lead downgradient of sampling location 11-608776 is not required.

The investigation report stated that the lateral extent of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene is not defined because these organic chemicals were detected only at the furthest downgradient sampling location, 11-608776 (LANL 2011, 111810.32, p. 35). Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene,

fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene were not detected or were detected at lower concentrations in the samples collected at SWMU 11-006(c) sampling locations 11-608736, 11-608737, 11-608738, and 11-608743, which are downgradient of sampling location 11-608776 (section 4.1.6.2, Figure 4.1-22) (LANL 2011, 111810.32, p. 494). Therefore, additional sampling for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene downgradient of sampling location 11-608776 is not required.

The investigation report stated that the lateral extent of HMX and TATB is not defined because the highest concentrations of these organic chemicals were detected in samples at the furthest downgradient sampling location, 11-608776 (LANL 2011, 111810.32, p. 35). Concentrations of HMX and TATB decreased downgradient of sampling location 11-608776 in samples collected at SWMU 11-006(c), and the lateral extent of HMX and TATB is defined for SWMU 11-006(c) (section 4.1.6.2, Figure 4.1-22) (LANL 2011, 111810.32, p. 495). Therefore, additional sampling for HMX and TATB downgradient of sampling location 11-608776 is not required.

Proposed sampling locations at SWMU 11-006(a) are shown in Figure 4.1-14. Table 4.1-3 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.5 SWMU 11-006(b)—Catch Basin

4.1.5.1 Site Description and Operational History

SWMU 11-006(b) is one of three catch basins located at TA-11 near the drop tower complex (Figure 4.1-15). The SWMU 11-006(b) catch basin is located on the north side of the former drop tower and consists of a concrete basin (structure 11–50) measuring 6 × 4 × 2 ft. Historically, this catch basin received wash-down water from the asphalt apron surrounding the concrete pad at the base of the drop tower when the apron was cleaned using high-pressure water hoses. HE particles in the wash-down water were filtered out by the catch basin. Waste collected from the catch basin was disposed of at the TA-16 burning ground (LANL 1993, 020948). After exiting the catch basin, the remaining wash-down water was channeled to a drainage which discharged to a former National Pollutant Discharge Elimination System (NPDES)-permitted outfall (EPA 05A069) located to the northeast (LANL 1993, 020948). This outfall drains into Water Canyon. The outfall was removed from the NPDES permit in May 1998 when it was rerouted to NPDES Outfall 05A097. Currently, the catch basin is capped and sealed; however, the outfall still receives stormwater runoff.

4.1.5.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 11-006(b), except for the following:

- Vertical extent of aluminum at locations 11-608820, 11-608823, and 11-608829
- Lateral extent of antimony downgradient of location 11-608816
- Vertical extent of antimony at location 11-608820
- Vertical extent of barium at location 11-608820
- Vertical extent of beryllium at locations 11-608829 and 11-608832
- Vertical extent of bromide at locations 11-608820, 11-608827, and 11-608829

- Vertical extent of calcium at locations 11-608820, 11-608827, and 11-608832
- Vertical extent of chromium at locations 11-608818 and 11-608822
- Vertical extent of cobalt at location 11-608822
- Vertical extent of copper at locations 11-608816, 11-608818, 11-608822, 11-608823, 11-608827, 11-608829,and 11-608832
- Lateral extent of iron downgradient of location 11-608816
- Vertical extent of iron at locations 11-608816 and 11-608822
- Lateral extent of lead downgradient of location 11-608816
- Vertical extent of lead at location 11-608816
- Vertical extent of nickel at locations 11-608822, 11-608827, and 11-608832
- Vertical extent of perchlorate at locations 11-608820,11-608823, 11-608827, and 11-608829
- Lateral extent of vanadium downgradient of location 11-608816
- Vertical extent of vanadium at locations 11-608816 and 11-608822
- Vertical extent of HMX at location 11-608831
- Vertical extent of RDX at location 11-608832
- Vertical extent of TATB at location 11-608831
- Lateral extent of uranium-238 downgradient of location 11-608817

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.1-16, detected organic chemicals are shown in Figure 4.1-17, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.1-18 for SWMU 11-006(b).

4.1.5.3 Proposed Activities at SWMU 11-006(b)

Subsurface samples will be collected at nine previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected at depth intervals of 6–7 ft and 11–12 ft bgs at locations 11-608816, 11-608818, 11-608820, and 11-608831; 9–10 ft and 14–15 ft bgs at locations 11-608822 and 11-608823; 10–11 ft and 15–16 ft bgs at locations 11-608827 and 11-608829; and 13–14 ft and 18–19 ft bgs at location 11-608832. Samples will be analyzed as follows:

- Samples collected at location 11-608816 will be analyzed for copper, iron, lead, and vanadium.
- Samples collected at location 11-608818 will be analyzed for chromium and copper.
- Samples collected at location 11-608820 will be analyzed for aluminum, antimony, barium, bromide, calcium, and perchlorate.
- Samples collected at location 11-608822 will be analyzed for chromium, cobalt, copper, iron, nickel, and vanadium.
- Samples collected at location 11-608823 will be analyzed for aluminum, copper, and perchlorate.
- Samples collected at location 11-608827 will be analyzed for bromide, calcium, copper, nickel, and perchlorate.

- Samples collected at location 11-608829 will be analyzed for aluminum, beryllium, bromide, copper, and perchlorate.
- Samples collected at location 11-608831 will be analyzed for HMX and TATB.
- Samples collected at location 11-608832 will be analyzed for beryllium, calcium, copper, nickel, and RDX.

The investigation report stated that the lateral extent of antimony, iron, lead, and vanadium is not defined because concentrations of these inorganic chemicals increased at the furthest downgradient sampling location, 11-608816 (LANL 2011, 111810.32, pp. 38–40). Concentrations of antimony, iron, lead, and vanadium were below BVs or maximum background concentrations downgradient of sampling location 11-608816 in samples collected at Extended Drainages sampling locations 16-611204, 16-611205, and 16-611206 (Plate 2). Therefore, additional sampling for antimony, iron, lead, and vanadium downgradient of sampling location 11-608816 is not required.

The investigation report stated that the lateral extent of uranium-238 is not defined because the uranium-238 activity increased at downgradient sampling location 11-608817 (LANL 2011, 111810.32, p. 41). Uranium-238 was detected at an activity of 3.09 pCi/g, slightly above the soil BV of 2.29 pCi/g, at location 11-608817. This sampling location is approximately 40 ft from the main channel in Martin Spring Canyon. Similar activities were detected in Extended Drainages samples collected in the Martin Spring Canyon channel upgradient and downgradient of sampling location 11-608817. The highest uranium-238 activity (4.53 pCi/g) was detected in a sample from Extended Drainages location 16-608569, which is upgradient of location 11-608817 (LANL 2011, 111810.32, p. 736). Based on this spatial distribution, it is not clear that the uranium-238 detected at sampling location 11-608817 is associated with SWMU 11-006(b). Based on the criteria in section 10.3.4 of the approved investigation report, no radionuclides required evaluation and detected radionuclides were not presented in a figure or on a plate (LANL 2011, 111810.32, p. 256). Plate 3 depicts sampling locations in Martin Spring Canyon. Tables 10.3-10 through 10.3-13 in the approved investigation report present the results of the radiological analyses in Martin Spring Canyon (LANL 2011, 111810.32, pp. 733–736). Additional sampling downgradient of sampling location 11-608817 is not proposed due to the proximity of this location to the channel and because downgradient samples were already collected in the Extended Drainages investigation. The Extended Drainages sample locations went to the upstream end of Reach SS-3 (Plate 3), which was sampled as part of the Water Canyon/Cañon de Valle investigation. Lateral extent of uranium-238, therefore, will be evaluated in the Phase II investigation report using the data from the Water Canyon/Cañon de Valle investigation.

Proposed sampling locations at SWMU 11-006(b) are shown in Figure 4.1-19. Table 4.1-4 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.6 SWMU 11-006(c)—Catch Basin

4.1.6.1 Site Description and Operational History

SWMU 11-006(c) is one of three catch basins located at TA-11 near the drop tower complex (Figure 4.1-20). The SWMU 11-006(c) catch basin is located on the southeast side of the former drop tower and consists of a concrete basin (structure 11-51) measuring 6 × 4 × 2 ft. Historically, this catch basin received wash-down water from the asphalt apron surrounding the concrete pad at the base of the drop tower when the apron was cleaned using high-pressure water hoses. HE particles in the wash-down water were filtered out by the catch basin. The SWMU 11-006(c) catch basin also historically received wash-down water from cleaning the drop tower's concrete pad. Wash-down water from the concrete pad

flowed to this catch basin via an HE sump [SWMU 11-006(a)]. Any HE particles remaining in the wash-down water after it exited the sump were further filtered out in the catch basin. Waste collected from the sump and catch basin was disposed of at the TA-16 burning ground (LANL 1993, 020948). After exiting the catch basin, the wash-down water flowed through a drainage which discharged to a former NPDES-permitted outfall (EPA096) located to the southeast (LANL 1993, 020948). This outfall drains into Water Canyon. The outfall was removed from the NPDES permit in May 1998 (Madsen 2007, 098271) when it was rerouted to NPDES Outfall 05A097. Currently, the catch basin is capped and sealed; however, the outfall still receives stormwater runoff.

4.1.6.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 11-006(c), except for the following:

- Vertical extent of chromium at location 11-608748 and 11-608749
- Vertical extent of copper at location 11-608748 and 11-608749
- Vertical extent of acenaphthene at location 11-608749
- Vertical extent of HMX at location 11-05902
- Lateral extent of RDX downgradient of location 11-608744
- Lateral extent of plutonium-239/240 downgradient of location 11-608744
- Vertical extent of plutonium-239 at location 11-608746

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.1-21, detected organic chemicals are shown in Figure 4.1-22, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.1-23 for SWMU 11-006(c).

4.1.6.3 Proposed Activities at SMWU 11-006(c)

Subsurface samples will be collected at four previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected at depth intervals of 5–6 ft and 10–11 ft bgs at location 11-05902, 8–9 ft and 13–14 ft bgs at location 11-608746, 6–7 ft and 11–12 ft bgs at location 11-608748, and 7–8 ft and 12–13 ft bgs at location 11-608749. Samples will be analyzed as follows:

- Samples collected at location 11-05902 will be analyzed for HMX.
- Samples collected at location 11-608746 will be analyzed for isotopic plutonium.
- Samples collected at location 11-608748 will be analyzed for chromium and copper.
- Samples collected at location 11-608749 will be analyzed for chromium, copper, and acenaphthene.

The investigation report stated that the lateral extent of RDX is not defined because the highest concentration was detected in a sample at the furthest downgradient sampling location, 11-608744 (LANL 2011, 111810.32, p. 45). Concentrations of RDX decreased downgradient of sampling location 11-608744 in samples collected at Extended Drainages sampling locations 16-611228, 16-611229, and 16-611230, and RDX was not detected further downgradient in samples collected at Extended Drainages

sampling locations 16-611210, 16-611211, and 16-611212 (Plate 4). Therefore, additional sampling for RDX downgradient of sampling location 11-608744 is not required.

The investigation report stated that the lateral extent of plutonium-239/240 is not defined because it was detected above FV in a sample at the furthest downgradient sampling location, 11-608744 (LANL 2011, 111810.32, p. 46). Plutonium-239/240 activities decreased or were below FV downgradient of sampling location 11-608744 in samples collected at Extended Drainages sampling locations 16-611210, 16-611211, 16-611212, 16-611213, 16-611214, and 16-611215 (LANL 2011, 111810.32, p. 736). Therefore, additional sampling for plutonium-239/240 downgradient of sampling location 11-608744 is not required.

Proposed sampling locations at SWMU 11-006(c) are shown in Figure 4.1-24. Table 4.1-5 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.7 SWMU 11-006(d)—Catch Basin

4.1.7.1 Site Description and Operational History

SWMU 11-006(d) is one of three catch basins located at TA-11 near the drop tower complex (Figure 4.1-25). The SWMU 11-006(d) catch basin is located on the south side of the drop tower complex and consists of a concrete basin (structure 11–52) measuring 6 × 4 × 2 ft. Historically, this catch basin received wash-down water from the asphalt apron surrounding the concrete pad at the base of the drop tower when the apron was cleaned using high-pressure water hoses. HE particles in the wash-down water were filtered out by the catch basin. Waste collected from the catch basin was disposed of at the TA-16 burning ground (LANL 1993, 020948). After exiting the catch basin, the remaining wash-down water was channeled to a drainage which discharged to a former NPDES-permitted outfall (EPA 05A097) located to the southeast (LANL 1993, 020948). This outfall drains into Water Canyon. The outfall was removed from the NPDES permit in January 2006. Currently, the catch basin is capped and sealed; however, the outfall still receives stormwater runoff.

4.1.7.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 11-006(d), except for the following:

- Vertical extent of barium at location 11-608767
- Vertical extent of acetone at location 11-608773
- Vertical extent of benzoic acid at location 11-608773
- Lateral extent of total cyanide downgradient of location 11-608769
- Vertical extent of HMX at location 11-608767
- Vertical extent of TATB at location 11-608767
- Lateral extent of uranium-234 downgradient of location 11-608769
- Lateral extent of uranium-238 downgradient of location 11-608769

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.1-26, and detected organic chemicals are shown in Figure 4.1-27 for SWMU 11-006(d).

4.1.7.3 Proposed Activities at SWMU 11-006(d)

Subsurface samples will be collected at two previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected at depth intervals of 13–14 ft and 18–19 ft bgs at location 11-608767 and 9–10 ft and 14–15 ft bgs at location 11-608773. Samples will be analyzed as follows:

- Samples collected at location 11-608767 will be analyzed for barium, HMX, and TATB.
- Samples collected at location 11-608773 will be analyzed for acetone and benzoic acid.

The investigation report stated that the lateral extent of total cyanide is not defined because concentrations increased toward the furthest downgradient sampling location, 11-608769 (LANL 2011, 111810.32, p. 48). Total cyanide was not detected in samples collected at SWMU 11-006(c) sampling locations 11-608745 and 11-608747 (Figure 4.1-21), which are downgradient of sampling location 11-608769 (LANL 2011, 111810.32, p. 496). Therefore, additional sampling for total cyanide downgradient of location 11-608769 is not required.

The investigation report stated that the lateral extent of uranium-234 and uranium-238 is not defined because concentrations increased toward the furthest downgradient sampling location, 11-608769 (LANL 2011, 111810.32, p. 50). Uranium-234 and uranium-238 were not detected above BVs in samples collected at SWMU 11-006(c) sampling locations 11-608745 and 11-608747 (Figure 4.1-23), which are downgradient of sampling location 11-608769 (LANL 2011, 111810.32, p.496). Therefore, additional sampling for uranium-234 and uranium-238 downgradient of location 11-608769 is not required.

Proposed sampling locations at SWMU 11-006(d) are shown in Figure 4.1-28. Table 4.1-6 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.8 SWMU 11-005(c)—Outfall and Drainline

4.1.8.1 Site Description and Operational History

SWMU 11-005(c) is an inactive outfall at TA-11 located approximately 50 ft north of former building 11-2, the Betatron Building (Figure 4.1-29). The outfall received discharges from a drainline in building 11-2. The drainline was installed in 1944 and served a sink, water heater, and floor drain. During construction of the drop tower complex in 1956, the drainline was capped, making the outfall inactive (LANL 1993, 020948, p. 5-260).

4.1.8.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 11-005(c), except for the following:

- Vertical extent of aluminum at location 11-608751
- Vertical extent of barium at location 11-608751
- Vertical extent of chromium at locations 11-608754 and 11-608757
- Vertical extent of copper at locations 11-608757 and 11-611744
- Vertical extent of HMX at location 11-608756
- Vertical extent of uranium-235/236 at location 11-608751

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.1-30, detected organic chemicals are shown in Figure 4.1-31, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.1-32 for SWMU 11-005(c).

4.1.8.3 Proposed Activities at SWMU 11-005(c)

Subsurface samples will be collected at four previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 10–11 ft and 15–16 ft bgs and analyzed as follows:

- Samples collected at location 11-608751 will be analyzed for aluminum, barium, and isotopic uranium.
- Samples collected at location 11-608754 will be analyzed for chromium.
- Samples collected at location 11-608756 will be analyzed for HMX.
- Samples collected at location 11-608757 will be analyzed for chromium and copper.

The investigation report stated that concentrations of copper increased with depth at location 11-611744 (LANL 2011, 111810.32, p. 52). Copper was not detected above BV in the two samples collected at location 11-611744 (LANL 2011, 111810.32, p. 502), and additional sampling for copper at this location is not required.

Proposed sampling locations at SWMU 11-005(c) are shown in Figure 4.1-33. Table 4.1-7 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.9 SWMU 11-011(a)—Outfall and Drainline

4.1.9.1 Site Description and Operational History

SWMU 11-011(a) is an active NPDES-permitted outfall (EPA-03A130) located at TA-11 north of the K-Site complex and approximately 6 ft northeast of the Electrodynamics Vibration Test Facility (building 11-30) (Figure 4.1-34). The outfall consists of a 2-in. pipe that discharges to a drainage channel. The outfall receives untreated cooling tower blow-down and discharges from floor drains in building 11-30A (an adjunct of building 11-30).

4.1.9.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 11-011(a), except for the following:

- Vertical extent of aluminum at location 11-608803
- Vertical extent of barium at location 11-608803
- Vertical extent of calcium at location 11-608803
- Vertical extent of chromium at locations 11-608797, 11-608803, and 11-608804
- Vertical extent of copper at location 11-608797
- Vertical extent of nickel at location 11-608803

- Vertical extent of uranium-234 at location 11-608798
- Vertical extent of uranium-238 at location 11-608798

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.1-35, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.1-36 for SWMU 11-011(a).

4.1.9.3 Proposed Activities at SWMU 11-011(a)

Subsurface samples will be collected at four previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected at depth intervals of 8–9 ft and 13–14 ft bgs at locations 11-608797, 11-608803, and 11-608804 and 10–11 ft and 15–16 ft bgs at location 11-608798. Samples will be analyzed as follows:

- Samples collected at location 11-608797 will be analyzed for chromium and copper.
- Samples collected at location 11-608798 will be analyzed for isotopic uranium.
- Samples collected at location 11-608803 will be analyzed for aluminum, barium, calcium, chromium, and nickel.
- Samples collected at location 11-608804 will be analyzed for chromium.

Proposed sampling locations at SWMU 11-011(a) are shown in Figure 4.1-37. Table 4.1-8 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.10 SWMU 11-011(b)—Outfall and Drainline

4.1.10.1 Site Description and Operational History

SWMU 11-011(b) is an outfall located at TA-11 north of the Electrodynamics Vibration Test Facility (building 11-30) (Figure 4.1-38). The outfall consists of a 3-in. pipe that extends about 10 in. beyond the side of a hill. The outfall receives discharges from floor drains in building 11-30. A sink drain that formerly discharged to the outfall has been removed.

4.1.10.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 11-011(b), except for the following:

- Vertical extent of barium at location 16-608808
- Vertical extent of chromium at location 11-608808
- Vertical extent of copper at location 11-608808
- Vertical extent of acetone at location 11-608812
- Vertical extent of 4-isopropyltoluene at location 11-608812
- Lateral extent of toluene downgradient of location 11-608812
- Vertical extent of toluene at location 11-608812

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.1-39, and detected organic chemicals are shown in Figure 4.1-40 for SWMU 11-011(b).

4.1.10.3 Proposed Activities at SWMU 11-011(b)

Subsurface samples will be collected at two previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected at depth intervals of 10–11 ft and 15–16 ft bgs at location 11-608808 and 6–7 ft and 11–12 ft bgs at location 11-608812. Samples will be analyzed as follows:

- Samples collected at location 11-608808 will be analyzed for barium, chromium, and copper.
- Samples collected at location 11-608812 will be analyzed for acetone, 4-isopropyltoluene, and toluene.

The investigation report stated that the lateral extent of toluene is not defined because toluene was detected only at the furthest downgradient sampling location, 11-608808 (LANL 2011, 111810.32, p. 61). Toluene was not detected, however, in samples collected at SWMU 11-011(a) sampling location 11-608802, which is downgradient of sampling location 11-608812 (LANL 2011, 111810.32, p. 508). Therefore, additional sampling for toluene downgradient of sampling location 11-608812 is not required.

Proposed sampling locations at SWMU 11-011(b) are shown in Figure 4.1-41. Table 4.1-9 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.11 SWMU 11-011(d)—Outfall

4.1.11.1 Site Description and Operational History

SWMU 11-011(d) is an outfall located at TA-11 south of building 11-24, the air gun facility (Figure 4.1-42). The outfall consisted of a 4-in. steel pipe and serviced the air gun facility. Originally, operations at building 11-24 consisted of acceleration and impact tests on full-scale warhead mockups. After World War II, building 11-24 was converted to an office and light machine shop.

4.1.11.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 11-011(d), except for the following:

- Lateral extent of chromium downgradient of location 11-608764
- Vertical extent of chromium at location 11-608764
- Lateral extent of copper west of location 11-608761
- Lateral extent of copper east of location 11-608762
- Lateral extent of nickel downgradient of location 11-608764
- Vertical extent of nickel at location 11-608764
- Lateral extent of selenium downgradient of location 11-608764
- Vertical extent of selenium at location 11-608764

- Lateral extent of uranium-234 west of location 11-608761
- Lateral extent of uranium-235/236 east of location 11-608762
- Lateral extent of uranium-238 west of location 11-608761

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.1-43, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.1-44 for SWMU 11-011(d).

4.1.11.3 Proposed Activities at SWMU 11-011(d)

Subsurface samples will be collected at previously sampled location 11-608764, extending the depth to define the vertical extent of contamination. Samples will be collected from depth intervals of 8–9 ft and 13–14 ft bgs and analyzed for chromium, nickel, and selenium.

Samples will be collected from two new locations (11d-1 and 11d-2) west of existing sampling location 11-608761 to define the lateral extent of copper, uranium-234, and uranium-238. Samples will be collected from depth intervals of 0–1 ft and 6–7 ft bgs and will be analyzed for copper and isotopic uranium.

Samples will be collected from two new locations (11d-3 and 11d-4) east of existing sampling location 11-608762 to define the lateral extent of copper and uranium-235/236. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for copper and isotopic uranium.

The investigation report stated that the lateral extent of chromium, nickel, and selenium is not defined because these inorganic chemicals were detected above BVs only at the most downgradient sampling location, 11-608764 (LANL 2011, 111810.32, pp. 63–64). Chromium, nickel, and selenium were not detected above BVs or maximum background concentrations, however, in samples collected at SWMU 11-005(b) sampling locations 11-608786 and 11-608789, which are downgradient of sampling location 11-608764 (Figure 4.1-8) (LANL 2011, 111810.32, p. 479). Therefore, additional sampling for chromium, nickel, and selenium downgradient of location 11-608764 is not required.

Proposed sampling locations at SWMU 11-011(d) are shown in Figure 4.1-45. Table 4.1-10 summarizes the proposed sampling locations, depths, and analytical suites.

4.2 P-Site Subaggregate Area

The P-Site Subaggregate Area consists of inactive sites at TA-16 and former TA-13 (Figure 2.1-2). Former TA-13 was used for a wide variety of Laboratory activities dating back to World War II. Former TA-13 was constructed in 1944 to support the HE portion of the Manhattan Project. Manhattan Project activities conducted included counter x-ray diagnostics of HE lens configurations, testing of initiator assemblies, and HE assembly and research in the magnetic method program. Because of its remote location, the area was also used to machine toxic or extremely sensitive explosives. P-Site included a firing site, a firing site debris area, control bunkers, firing bunkers, storage buildings, purported burn pits, and an experiment chamber. The majority of the buildings in the western half of former TA-13 were demolished in the early 1950s to make way for the construction of the TA-16-340 Complex. A WWTP was constructed in 1953 and served all of TA-16. The WWTP was disconnected in 1992 when the sanitary sewer system was connected to a Laboratory-wide system.

4.2.1 SWMU 16-025(d2)—Potential Soil Contamination Associated with Former Building 16-480

4.2.1.1 Site Description and Operational History

SWMU 16-025(d2) is an area of potential soil contamination located approximately 125 ft southwest of former building 16-340 (Figure 4.2-1). The soil contamination is associated with a former mockup chamber (former building 16-480). Built in 1947, the mockup chamber was an octagonal structure, measuring 16 ft in diameter and constructed of logs on a concrete floor. The mockup building simulated explosives testing chambers used elsewhere at the Laboratory. Detonation never occurred in the mockup chamber itself (LASL 1947, 005581; LANL 1995, 057225, pp. 5-26-6–5-26-9). In addition to radioactive components, equipment used at the structure is believed to have contained mercury (Morgan 1994, 054782.75) as well as HE and uranium-238 (Blackwell 1983, 005823; LANL 1995, 057225, pp. 5-26-6–5-26-9). The mockup chamber was dismantled in 1951. It is likely that SWMU 16-025(d2) was disturbed during construction of the former TA-16-340 Complex, which was built after the chamber was dismantled. Drainage from the site tends to flow east, north, and south due to the higher elevation of the site in relation to the current roadbed as well as construction of berms, roads, and walkways.

4.2.1.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 16-025(d2), except for the following:

- Vertical extent of acenaphthene at location 16-608954
- Vertical extent of anthracene at location 16-608954
- Vertical extent of benzo(a)anthracene at location 16-608954
- Vertical extent of fluoranthene at location 16-608954
- Vertical extent of fluorene at location 16-608954
- Vertical extent of 2-methylnaphthalene at location 16-608954
- Vertical extent of naphthalene at location 16-608954
- Vertical extent of phenanthrene at location 16-608954
- Vertical extent of pyrene at location 16-608954
- Vertical extent of cesium-137 at location 16-608952

Sampling locations and results for detected organic chemicals are shown in Figure 4.2-2, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.2-3 for SWMU 16-025(d2).

4.2.1.3 Proposed Activities at SWMU 16-025(d2)

Subsurface samples will be collected at two previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected at depth intervals of 10–11 ft and 15–16 ft bgs and analyzed as follows:

- Samples collected at location 16-608952 will be analyzed for cesium-137.
- Samples collected at location 16-608954 will be analyzed for polycyclic aromatic hydrocarbons (PAHs).

Proposed sampling locations at SWMU 16-025(d2) are shown in Figure 4.2-4. Table 4.2-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.2 SWMU 16-031(h)—Outfall

4.2.2.1 Site Description and Operational History

SWMU 16-031(h) is an outfall located approximately 300 ft northeast of former building 16-340 (Figure 4.2-5). The outfall was formerly NPDES permitted (EPA04A134) and received discharge from the sink, vacuum pump, and floor drain of a utility room within former building 16-478. Initially, former building 16-478 was used for photographing explosives testing and was later used for testing the effects of machining on HE products. A water-sealed/water-cooled vacuum pump was located in the utility room and served a vacuum system in another area of the building. The vacuum system held HE pieces in place for machining. The vacuum line contained a water filter to prevent HE from reaching the vacuum pump lines (LANL 1998, 059685, pp. 6-8–6-9).

4.2.2.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 16-031(h), except for the following:

- Lateral extent of aluminum downgradient of location 16-608696
- Vertical extent of aluminum at location 16-608696
- Lateral extent of antimony east of location 16-611905
- Lateral extent of antimony west of location 16-611906
- Vertical extent of antimony at location 16-611906
- Lateral extent of barium downgradient of location 16-608696
- Lateral extent of barium west of location 16-611906
- Vertical extent of barium at location 16-608697
- Lateral extent of mercury downgradient of location 16-608696
- Lateral extent of selenium east of location 16-611905
- Lateral extent of selenium west of location 16-611906
- Vertical extent of selenium at location 16-611905
- Vertical extent of selenium at location 16-611906
- Lateral extent of TATB downgradient of location 16-608696

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.2-6, and detected organic chemicals are shown in Figure 4.2-7 for SWMU 16-031(h).

4.2.2.3 Proposed Activities at SWMU 16-031(h)

Subsurface samples will be collected at four previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected at depth intervals of 10–11 ft and 15–16 ft bgs and analyzed as follows:

- Samples collected at location 16-608696 will be analyzed for aluminum.
- Samples collected at location 16-608697 will be analyzed for barium.
- Samples collected at location 16-611905 will be analyzed for selenium.
- Samples collected at location 16-611906 will be analyzed for antimony and selenium.

Samples will be collected from four new locations (31h-1, 31h-2, 31h-3, and 31h-4) downgradient of existing sampling location 16-608696 to define the lateral extent aluminum, barium, mercury, and TATB. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for aluminum, barium, mercury, and TATB.

Samples will be collected from two new locations (31h-5 and 31h-6) to define the lateral extent of antimony and selenium east of location 16-611905. Samples will be collected from depth intervals of 0-1 ft and 5–6 ft bgs and will be analyzed for antimony and selenium.

Samples will be collected at two new locations (31h-7 and 31h-8) to define lateral extent of antimony, barium, and selenium west of location 16-611906. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for antimony, barium, and selenium.

Proposed sampling locations at SWMU 16-031(h) are shown in Figure 4.2-8. Table 4.2-2 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.3 AOC 16-024(a)—Potential Soil Contamination Associated with Former Magazine 16-488

4.2.3.1 Site Description and Operational History

AOC 16-024(a) is an area of potential soil contamination located approximately 250 ft southwest of former building 16-343 (Figure 4.2-9). The soil contamination is associated with a former HE magazine (former building 16-488) built in 1944 to support the Manhattan Project. The former magazine stored HE and was decommissioned and removed in 1951 to make way for the construction of former building 16-340.

4.2.3.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at AOC 16-024(a), except for the following:

- Lateral extent of aluminum northwest of location 16-608909
- Vertical extent of aluminum at location 16-608909
- Lateral extent of barium northwest of location 16-608909
- Lateral extent of barium southwest of location 16-608910
- Vertical extent of barium at location 16-608909
- Vertical extent of barium at location 16-608910

- Vertical extent of bromide at location 16-608906
- Lateral extent of calcium northwest of location 16-608909
- Vertical extent of calcium at location 16-608909
- Lateral extent of cobalt northwest of location 16-608909
- Lateral extent of cobalt southwest of location 16-608910
- Vertical extent of cobalt at location 16-608909
- Lateral extent of copper northwest of location 16-608909
- Lateral extent of copper southwest of location 16-608910
- Vertical extent of copper at location 16-608909
- Lateral extent of nickel southwest of location 16-608910
- Vertical extent of nickel at location 16-608910
- Vertical extent of perchlorate at location 16-608906
- Vertical extent of perchlorate at location 16-608907
- Vertical extent of perchlorate at location 16-608908
- Vertical extent of perchlorate at location 16-608909
- Vertical extent of perchlorate at location 16-608910
- Vertical extent of sulfate at location 16-608906
- Lateral extent of vanadium northwest of location 16-608909
- Lateral extent of cesium-137 northeast of location 16-608908
- Lateral extent of plutonium-239 northeast of location 16-608908

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.2-10, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.2-11 for AOC 16-024(a).

4.2.3.3 Proposed Activities at AOC 16-024(a)

Subsurface samples will be collected at five previously sampled locations, extending the depths at each location to define the vertical extent of contamination. Samples will be collected at depth intervals of 10–11 ft and 15–16 ft bgs and analyzed as follows:

- Samples collected at location 16-608906 will be analyzed for bromide, perchlorate, and sulfate.
- Samples collected at location 16-608907 will be analyzed for perchlorate.
- Samples collected at location 16-608908 will be analyzed for perchlorate.
- Samples collected at location 16-608909 will be analyzed for aluminum, barium, calcium, cobalt, copper, and perchlorate.
- Samples collected at location 16-608910 will be analyzed for barium, nickel, and perchlorate.

Samples will be collected from two new locations (24a-1 and 24a-2) northeast of existing sampling location 16-608908 to define the lateral extent of cesium-137 and plutonium-239/240. Samples will be

collected from depth intervals of 0–1 ft, 5–6 ft, 10–11 ft, and 15–16 ft bgs and will be analyzed for cesium-137 and isotopic plutonium.

Samples will be collected from two new locations (24a-3 and 24a-4) northwest of existing sampling location 16-608909 to define the lateral extent of aluminum, barium, calcium, cobalt, copper, and vanadium. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, 10–11 ft, and 15–16 ft bgs and will be analyzed for aluminum, barium, calcium, cobalt, copper, and vanadium.

Samples will be collected from two new locations (24a-5 and 24a-6) southwest of existing sampling location 16-608910 to define the lateral extent of barium, cobalt, copper, and nickel. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, 10–11 ft, and 15–16 ft bgs and will be analyzed for barium, cobalt, copper, and nickel.

Proposed sampling locations at AOC 16-024(a) are shown in Figure 4.2-12. Table 4.2-3 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.4 AOC 16-024(u)—Potential Soil Contamination Associated with Former Magazine 16-481

4.2.4.1 Site Description and Operational History

AOC 16-024(u) is an area of potential soil contamination located approximately 15 ft west of former building 16-341 (Figure 4.2-13). The soil contamination is associated with a former HE storage magazine (former building 16-481) built in 1944 to support the Manhattan Project. The former magazine was decommissioned and removed in 1951 to make way for the construction of former building 16-340.

4.2.4.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at AOC 16-024(u), except for the following:

- Lateral extent of acenaphthene northeast of location 16-608920
- Lateral extent of anthracene northeast of location 16-608920
- Vertical extent of benzo(a)anthracene at location 16-608917
- Lateral extent of benzo(a)anthracene northeast of location 16-608920
- Lateral extent of benzo(a)pyrene northeast of location 16-608920
- Vertical extent of benzo(a)pyrene at location 16-608917
- Lateral extent of benzo(b)fluoranthene northeast of location 16-608920
- Vertical extent of benzo(b)fluoranthene at location 16-608917
- Lateral extent of benzo(g,h,i)perylene northeast of location 16-608920
- Vertical extent of benzo(g,h,i)perylene at location 16-608917
- Lateral extent of benzo(k)fluoranthene northeast of location 16-608920
- Vertical extent of benzo(k)fluoranthene at location 16-608917
- Lateral extent of chrysene northeast of location 16-608920
- Vertical extent of chrysene downgradient at location 16-608917

- Lateral extent of dibenz(a,h)anthracene northeast of location 16-608920
- Lateral extent of dibenzofuran northeast of location 16-608920
- Lateral extent of fluoranthene northeast of location 16-608920
- Vertical extent of fluoranthene at location 16-608917
- Lateral extent of fluorene northeast of location 16-608920
- Lateral extent of indeno(1,2,3-cd)pyrene northeast of location 16-608920
- Vertical extent of indeno(1,2,3-cd)pyrene at location 16-608917
- Lateral extent of 2-methylnaphthalene northeast of location 16-608920
- Lateral extent of naphthalene northeast of location 16-608920
- Lateral extent of phenanthrene northeast of location 16-608920
- Vertical extent of phenanthrene at location 16-608917
- Lateral extent of pyrene northeast of location 16-608920
- Vertical extent of pyrene at location 16-608917

Sampling locations and results for detected organic chemicals are shown in Figure 4.2-14 for AOC 16-024(u).

4.2.4.3 Proposed Activities at AOC 16-024(u)

Subsurface samples will be collected at previously sampled location 16-608917, extending the depth to define the vertical extent of contamination. Samples will be collected at depth intervals of 10–11 ft and 15–16 ft bgs and analyzed for PAHs.

Samples will be collected from three new locations (24u-1, 24u-2, and 24u-3) northeast of existing sampling location 16-608920 to define the lateral extent of acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for PAHs.

The results of the previous sampling at location 16-608920 showed benzo(a)pyrene to be present at 4.08 mg/kg in the sample from 0.0–0.5 ft bgs and at 0.1 mg/kg in the sample from 5.5–6.0 ft bgs. Based on the decrease in concentrations with depth, vertical extent is defined at this location. However, benzo(a)pyrene was detected above the industrial SSL (2.34 mg/kg) in the surface soil, and the top 5.5 ft of soil will be removed from a 5-ft radius around location 16-608920. Results from nearby locations 16-608918 and 16-608919 were below the industrial SSL and will be used to confirm cleanup to the west and south of the excavation. Additional confirmation samples will be collected east of the location 16-608920 excavation at new location 24u-4 at depths of 0–1 ft and 5–6 ft bgs and analyzed for benzo(a)pyrene. Data from new locations 24u-1, 24u-2, and 24u-3 will confirm cleanup to the north and northeast of the location 16-608920 excavation.

Proposed sampling locations at AOC 16-024(u) are shown in Figure 4.2-15. Table 4.2-4 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.5 AOC C-16-050—Former Building 16-482

4.2.5.1 Site Description and Operational History

AOC C-16-050 is the footprint of former building 16-482 located approximately 75 ft southeast of former building 16-343 (Figure 4.2-16). Former building 16-482 was of wood-frame construction and measured 16 ft square. The building was used for storage; however, no archival records describe what was stored. In July 1949, the storage building was relocated to TA-11 and renumbered as building 11-09.

4.2.5.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at AOC C-16-050, except for the following:

- Lateral extent of calcium northwest of location 16-609514
- Lateral extent of calcium northeast of location 16-609515
- Lateral extent of perchlorate northeast of location 16-609515
- Lateral extent of perchlorate east of location 16-609518
- Lateral extent of selenium southeast of location 16-609519
- Vertical extent of selenium at location 16-609518
- Vertical extent of selenium at location 16-609519

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.2-17 for AOC C-16-050.

4.2.5.3 Proposed Activities at AOC C-16-050

Subsurface samples will be collected at previously sampled location 16-609518, extending the depth to define the vertical extent of contamination. Samples will be collected at depth intervals of 13–14 ft and 18–19 ft bgs and analyzed for selenium.

Samples will be collected from two new locations (C50-1 and C50-2) north and northwest of existing sampling location 16-609514 to define the lateral extent of calcium. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for calcium.

Samples will be collected from two new locations (C50-3 and C50-4) northeast and east of existing sampling location 16-609515 to define the lateral extent of calcium. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, and 8–9 ft bgs and will be analyzed for calcium.

Samples will be collected from two new locations (C50-5 and C50-6) southeast of existing sampling location 16-609519 to define the lateral extent of selenium. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, and 8–9 ft bgs and will be analyzed for selenium.

The investigation report stated that the lateral extent of perchlorate is not defined at locations 16-609515 and 16-609518 (LANL 2011, 111810.32, p. 83). Perchlorate was detected in surface samples at both sampling locations below EQLs (0.0025 mg/kg and 0.0022 mg/kg, respectively). Therefore, additional sampling for perchlorate is not required.

The investigation report stated that the vertical extent of selenium is not defined because concentrations increased with depth at both locations where selenium was detected above BV (LANL 2011, 111810.32, p. 83). At sampling location 16-609519, selenium was detected at 0.85 mg/kg (below the soil BV of 1.52 mg/kg) at 0–0.5 ft bgs, 1.2 mg/kg at 5.5–6 ft bgs, and 1.1 mg/kg at 8.5–9 ft bgs. Because concentrations were decreasing with depth at this location, additional sampling at deeper depth intervals is not required.

The results of the previous sampling at locations 16-609514 and 16-609515 showed benzo(a)pyrene to be present at 7.08 and 6.57 mg/kg, respectively, in the samples collected from 0–0.5 ft bgs at both locations. Benzo(a)pyrene was detected at 0.10 and 0.40 mg/kg in the samples collected from 5.5-6 ft bgs at locations 16-609514 and 16-609515, respectively. Based on the decrease in concentration with depth, vertical extent is defined at both locations. Benzo(a)pyrene was detected above the industrial SSL (2.34 mg/kg) in the surface soil, and the top 5.5 ft of soil will be removed from a 5-ft radius around locations 16-609514 and 16-609515. Results from the samples collected at nearby location 16-609516 were below the industrial SSL and will be used to confirm cleanup to the south of locations 16-609514 and 16-609515. Data from new locations C50-1, C50-7, and C50-8 will be used to confirm removal to the north, west, and east of location 16-609514. Data from new locations C50-3, C50-4, and C50-7 will be used to confirm removal to the north, west, and east of location 16-609515. Confirmation samples at new locations C50-1, C50-3, C50-4, C50-7, and C50-8 will be collected at depths of 0–1 ft and 5–6 ft bgs and analyzed for benzo(a)pyrene.

Proposed sampling locations at AOC C-16-050 are shown in Figure 4.2-18. Table 4.2-5 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.6 AOC C-16-060—Former Building 16-479

4.2.6.1 Site Description and Operational History

AOC C-16-060 is the footprint of former building 16-479, located approximately 180 ft southwest of former building 16-340 (Figure 4.2-19). Former building 16-479 was 16 ft square with a wooden floor. The building was constructed in 1945 and used as a receiving magazine for the storage of finished HE product and packaged, raw HE (LANL 1995, 057225, p. 5-26-6). Building 16-479 was moved to TA-33 in 1949.

4.2.6.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at AOC C-16-060, except for the following:

- Lateral extent of acenaphthene northeast of location 16-609503
- Lateral extent of anthracene northeast of location 16-609503
- Lateral extent of benzo(a)anthracene northeast of location 16-609503
- Lateral extent of benzo(a)pyrene northeast of location 16-609503
- Lateral extent of benzo(b)fluoranthene northeast of location 16-609503
- Lateral extent of benzo(g,h,i)perylene northeast of location 16-609503
- Lateral extent of benzoic acid northeast of location 16-609503

- Lateral extent of benzo(k)fluoranthene northeast of location 16-609503
- Lateral extent of chrysene northeast of location 16-609503
- Lateral extent of dibenzofuran northeast of location 16-609503
- Lateral extent of fluoranthene northeast of location 16-609503
- Lateral extent of fluorene northeast of location 16-609503
- Lateral extent of indeno(1,2,3-cd)pyrene northeast of location 16-609503
- Lateral extent of 2-methylnaphthalene northeast of location 16-609503
- Lateral extent of naphthalene northeast of location 16-609503
- Lateral extent of phenanthrene northeast of location 16-609503
- Lateral extent of pyrene northeast of location 16-609503

Sampling locations and results for detected organic chemicals are shown in Figure 4.2-20 for AOC C-16-060.

4.2.6.3 Proposed Activities at AOC C-16-060

Samples will be collected from two new locations (C60-1 and C60-2) northeast of existing sampling location 16-609503 to define the lateral extent of acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzoic acid, chrysene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene. Samples will be collected from depth intervals of 0–1 ft and 6–7 ft bgs and will be analyzed for PAHs.

Proposed sampling locations at AOC C-16-060 are shown in Figure 4.2-21. Table 4.2-6 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.7 SWMUs 13-001, 13-004, 16-035, and 16-036—Firing Site, Burning Pits, and Potential Soil Contamination

4.2.7.1 Site Description and Operational History

SWMU 13-001 is an inactive firing site located east of former building 16-340 (Figure 4.2-22). The former firing site is associated with firing activities conducted at P-Site (former TA-13). The area contains shrapnel and debris, including firing cables, lead balls, and chunks of steel and copper (LANL 1993, 020948, pp. 5-228–5-229).

SWMU 13-004 consists of an unknown number of burning pits located at former TA-13. The pit locations are also unknown. The pits are not depicted on engineering drawings of former TA-13 or in aerial photographs dated 1948. Constructed in 1944, former TA-13 was a small area, occupying about 12 acres. In 1951, the TA-16-340 Complex was constructed over the western and central portions of former TA-13, disturbing three-quarters of the TA. This area was further disturbed when the TA-16-340 Complex was removed during D&D activities in 2005. The undisturbed eastern portion of former TA-13 extended approximately 360 ft to the east of former building 16-340.

SWMU 16-035 is an area of potential soil contamination located approximately 200 ft east of former building 16-340 (Figure 4.2-22). The soil contamination is associated with a former control bunker (former

structure 13-2 renumbered to 16-476) (LANL 1993, 020948, p. 5-229). The control bunker was one of several buildings constructed at TA-13 in 1944 to support the Manhattan Project (Kistiakowsky 1944, 004680). The control bunker was removed during D&D activities in 2005.

SWMU 16-036 is an area of potential soil contamination located approximately 270 ft east of former building 16-340 (Figure 4.2-22). The soil contamination is associated with two former bunkers (former structures 13-3 and 13-4 renumbered to 16-477 and 16-478). Bunker 16-477 contained x-ray and magnetic equipment (LANL 1993, 020948, p. 5-226). Bunker 16-478 was used for photographing explosives testing and was later modified for testing the effects of machining HE (LANL 1998, 059685, p. 6-8). After 1959, bunker 16-478 was used for remote HE-machining tests as well as machining tuballoy/nubium laminates. Both bunkers were removed during D&D activities in 2005.

4.2.7.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides at SWMU 13-001, except for the following:

- Vertical extent of aluminum at location 16-608607
- Vertical extent of antimony at location 16-608608
- Vertical extent of arsenic at locations 16-608607, 16-608609, and 16-608612
- Lateral extent of barium southeast of location 16-608628
- Vertical extent of calcium at location 16-608608
- Lateral extent of chromium southeast of location 16-608620
- Vertical extent of chromium at location 16-608620
- Vertical extent of copper at locations 16-608608, 16-608624, and 16-608628
- Vertical extent of lead at location 16-608608
- Vertical extent of mercury at location 16-608608
- Vertical extent of perchlorate at location 16-608622
- Vertical extent of zinc at locations 16-608608 and 116-608624
- Vertical extent of acenaphthene at location 16-608615
- Vertical extent of acetone at locations 16-608608 and 116-608624
- Vertical extent of fluoranthene at location 16-608615
- Vertical extent of indeno(1,2,3-cd)pyrene at location 16-608633
- Vertical extent of phenanthrene at location 16-608615
- Vertical extent of pyrene at locations 16-608615 and 16-608621
- Vertical extent of TATB at location 16-608621

As explained in the approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633), SWMUs 13-004, 16-035, and 16-036 are located within the footprint of SWMU 13-001 and the sampling for SWMU 13-001 also characterized nature and extent for these sites. Sampling locations and results for

inorganic chemicals detected above BVs are shown on Plate 5, and detected organic chemicals are shown on Plate 6 for SWMUs 13-001, 13-004, 16-035, and 16-036.

4.2.7.3 Proposed Activities at SWMUs 13-001, 13-004, 16-035, and 16-036

Subsurface samples will be collected at previously sampled locations 16-608607, 16-608608, 16-608609, 16-608615, 16-608620, 16-608621, 16-608622, 16-608624, 16-608628, and 16-608633 extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 11–12 ft and 17–18 ft bgs at locations 16-608607, 16-608609, 16-609615, 16-608622, 16-608624, and 16-608633; 7–8 ft and 13–14 ft bgs at location 16-608608; 9–10 ft and 15–16 ft bgs at location 16-608620; 5–6 ft and 11–12 ft bgs at location16-608621; and 8–9 ft and 14–15 ft bgs at location 16-608628.

Samples will be analyzed as follows:

- Samples collected at location 16-608607 will be analyzed for aluminum and arsenic.
- Samples collected at location 16-608608 will be analyzed for antimony, calcium, copper, lead, mercury, zinc, and acetone.
- Samples collected at location 16-608609 will be analyzed for arsenic.
- Samples collected at location 16-608615 will be analyzed for acenaphthene, fluoranthene, phenanthrene, and pyrene.
- Samples collected at location 16-608620 will be analyzed for chromium.
- Samples collected at location 16-608621 will be analyzed for pyrene and TATB.
- Samples collected at location 16-608622 will be analyzed for perchlorate.
- Samples collected at location 16-608624 will be analyzed for copper, zinc, and acetone.
- Samples collected at location 16-608628 will be analyzed for copper.
- Samples collected at location 16-608633 will be analyzed for indeno(1,2,3-cd)pyrene.

The investigation report stated that the vertical extent of arsenic is not defined at location 16-608612 because concentrations increased with depth (LANL 2011, 111810.32, p, 88). The concentration of arsenic in the deeper sample at location 16-608613 (3.31 mg/kg at 5.5–6 ft bgs) is less than the maximum background concentration for Qbt 2, 3, 4 (5mg/kg). Therefore, additional sampling is not required at location 16-608613.

The investigation report stated that the lateral extent of barium is not defined southeast of location 16-608628 (LANL 2011, 111810.32, pp. 88–90). Concentrations of barium were below BVs or maximum background concentrations downgradient of sampling location 11-608628 in samples collected at Extended Drainages sampling locations 16-611204, 16-611205, 16-611206, 16-611207, 16-611208, and 16-611209 (Plate 2). Therefore, additional sampling for barium downgradient of sampling location 16-608628 is not required.

The investigation report indicated that the lateral extent of chromium is not defined southeast of location 16-608620. However, detected concentrations of chromium decrease downgradient at locations 16-608607 and 16-608630 (7.93 and 7.76 mg/kg in Qbt 4, respectively). Detected chromium concentrations at locations 16-608607 and 16-608630 were below the maximum background

concentration for Qbt 4 and soil (13.0 mg/kg). Therefore additional sampling for chromium downgradient of location 16-608620 is not required.

Proposed sampling locations at SWMU 13-001 are shown in Figure 4.2-23. Table 4.2-7 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.8 SWMU 13-002—Surface Disposal Area

4.2.8.1 Site Description and Operational History

SWMU 13-002 is a surface disposal area located east of former building 16-340 (Figure 4.2-24). The disposal area contains debris and shrapnel associated with firing activities conducted at P-Site (former TA-13) (LANL 1993, 020948, pp. 5-228–5-229). A portion of the TA-16 WWTP [Consolidated Unit 16-004(a)-99] is located on the mesa top at the southern tip of the surface disposal area.

4.2.8.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 13-002, except for the following:

- Vertical extent of barium at location 16-608659
- Lateral extent of chromium at locations 16-608658 and 16-608661
- Vertical extent of chromium at locations 16-608658 and 16-608661
- Lateral extent of mercury at location 16-608661
- Lateral extent of trichloroethene at location 16-608661

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.2-25, and detected organic chemicals are shown in Figure 4.2-26 for SWMU 13-002.

4.2.8.3 Proposed Activities at SWMU 13-002

Subsurface samples will be collected at previously sampled locations16-608658, 16-608659, and 16-608661 extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 10–11 ft and 16–17 ft bgs.

Samples will be analyzed as follows:

- Samples collected at locations 16-608658 and 16-608661 will be analyzed for chromium.
- Samples collected at location 16-608659 will be analyzed for barium.

The investigation report stated that the lateral extent of chromium is not defined at locations 16-608658 and 16-608661 (LANL 2011, 111810.32, pp. 94–95). Concentrations of chromium were below BVs or maximum background concentrations downgradient of both sampling locations in samples collected at Extended Drainages sampling locations 16-611204, 16-611205, and 16-611206 (Plate 2). Therefore, additional sampling for chromium downgradient of sampling locations 16-608658 and 16-608661 is not required.

The investigation report stated that the lateral extent of mercury is not defined at location 16-608661 (LANL 2011, 111810.32, pp. 94–95). Concentrations of mercury were below BVs or maximum background concentrations downgradient of sampling location 16-608661 in samples collected at Extended Drainages sampling locations 16-611213, 16-611214, and 16-611215 (Plate 2). Therefore, additional sampling for mercury downgradient of sampling location 16-608661 is not required.

The investigation report stated that the lateral extent of trichloroethene is not defined at location 16-608661 (LANL 2011, 111810.32, p. 95). Trichloroethene was not detected downgradient of sampling location 16-608661 in samples collected at Extended Drainages sampling locations 16-611565, 16-611566, and 16-611567 (Plate 4). Therefore, additional sampling for trichloroethene downgradient of sampling location 16-608661 is not required.

Proposed sampling locations at SWMU 13-002 are shown in Figure 4.2-27. Table 4.2-8 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.9 SWMU 16-029(h)—Outfall and Drainlines

4.2.9.1 Site Description and Operational History

SWMU 16-029(h) consists of an outfall and two inactive drainlines from the HE sump [AOC 16-003(p)] located on the south side of former building 16-478 (Figure 4.2-28). The known drainline exits the southeast corner of the sump and extends 80 ft east of the sump to the rim of Cañon de Valle. This drainline discharged directly into Cañon de Valle before the drainline was plugged in 1987. A second drainline is alleged to be present and is reportedly a French drain that extends south of the sump. Former building 16-478 was used as a bunker, utility room, control room, and high-speed machining room for tests on experimental HE. When the building was removed in 2005, the sump was left in place. During the investigation activities conducted in 2009–2010, no evidence of the French drain was found. Review of engineering drawings for former building 16-478 show no evidence of a French drain but do show floor "trench" drains inside the former building (LASL 1949, 206311; LASL 1962, 206312; LASL 1962, 206313; LASL 1966, 206314).

Note that SWMU 16-029(h) was identified as an HE sump in the 1990 SWMU report (LANL 1990, 007512). The SWMU report identified this sump twice: once as an inactive HE sump designated as SWMU 16-029(h) and also as an active HE sump designated as AOC 16-003(p). Addendum 2 to the Operable Unit 1082 Work Plan (LANL 1995, 057225) redefined SWMU 16-029(h) to be the drainlines and outfall associated with the sump adjacent to former building 16-478.

4.2.9.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-029(h), except for the following:

- Vertical extent of aluminum at locations 16-608703 and 16-608708
- Vertical extent of antimony at location 16-608712
- Vertical extent of arsenic at locations 16-608703, 16-608705, 16-608706, 16-608707, and 16-608708
- Vertical extent of barium at locations 16-608701, 16-608703, 16-608706, 16-608707, and 16-608708

- Lateral extent of chromium at location 16-608712
- Vertical extent of chromium at location 16-608712
- Vertical extent of copper at location 16-608712
- Vertical extent of iron at location 16-608703
- Lateral extent of lead downgradient of location 16-608701
- Vertical extent of nickel at location 16-608708
- Vertical extent of acetone at location 16-608703
- Vertical extent of 2-butanone at location 16-608703
- Lateral extent of amercium-241 downgradient of locations 16-608711, 16-608712, and 16-608713
- Vertical extent of cesium-137 at location 16-608710

Sampling locations and results for inorganic chemicals detected above BVs are shown on Plate 7, detected organic chemicals are shown on Plate 8, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.2-29 for SWMU 16-029(h).

4.2.9.3 Proposed Activities at SWMU 16-029(h)

Subsurface samples will be collected at previously sampled locations 16-608701, 16-608703, 16-608706, 16-608707, 16-608708, 16-608710, and 16-608712 extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 11–12 ft and 17–18 ft bgs at locations 16-608701, 16-608703, 16-608706, 16-608707, and 16-608708; and 4–5 ft and 5–6 ft bgs at locations 16-608710 and 16-608712. Note that the steep slope at locations 16-608710 and 16-608712 prevents access by a drill rig; therefore sample collection depths are limited.

Samples will be analyzed as follows:

- Samples collected at location 16-608701 will be analyzed for barium.
- Samples collected at location 16-608703 will be analyzed for aluminum, arsenic, barium, iron, acetone, and 2-butanone.
- Samples collected at location 16-608706 will be analyzed for barium.
- Samples collected at location 16-608707 will be analyzed for barium.
- Samples collected at location 16-608708 will be analyzed for aluminum, arsenic, barium, and nickel.
- Samples collected at location 16-608710 will be analyzed for cesium-137.
- Samples collected at location 16-608712 will be analyzed for antimony, chromium, and copper.

The investigation report stated that the vertical extent of aluminum is not defined at location 16-608708 (LANL 2011, 111810.32, pp. 97–99). However, concentrations of aluminum were below the Qbt 2, 3, 4 maximum background concentration (8370 mg/kg). Therefore, additional sampling for aluminum at location 16-608708 is not required.

The investigation report stated that the vertical extent of arsenic is not defined at locations 16-608705, 16-608706, and 16-608707 (LANL 2011, 111810.32, pp. 97–99). However, concentrations of arsenic

were below the Qbt 2, 3, 4 maximum background concentration (5 mg/kg). Therefore, additional sampling for arsenic at locations 16-608705, 16-608706, and 16-608707 is not required.

The investigation report stated that the lateral extent of chromium is not defined at location 16-608712 (LANL 2011, 111810.32, pp. 97–99). Concentrations of chromium were below BVs or maximum background concentrations downgradient of sampling location 16-608712 in samples collected at Extended Drainages sampling locations 16-611204, 16-611205, and 16-611206 (Plate 2). Therefore, additional sampling for chromium downgradient of sampling location 16-608712 is not required.

The investigation report stated that the lateral extent of lead is not defined downgradient of location 16-608701 (LANL 2011, 111810.32, pp. 97–99). Concentrations of lead were below BVs or maximum background concentrations downgradient of sampling location 16-608701 in samples collected at Extended Drainages sampling locations 16-611207, 16-611208, and 16-611209 (Plate 2). Therefore, additional sampling for lead downgradient of sampling location 16-608701 is not required.

The investigation report indicated that the lateral extent of americium-241 is not defined downgradient of locations 16-608711, 16-608712, and 16-608713 (LANL 2011, 111810.32, p. 101). Detected concentrations of americium-241 increased in the most downgradient Extended Drainages samples; therefore lateral extent of americium-241 will be evaluated in the Phase II report using the Canyons reach sampling data.

Proposed sampling locations at SWMU 16-029(h) are shown in Figure 4.2-30. Table 4.2-9 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.10 AOC 16-003(p)—Sump

4.2.10.1 Site Description and Operational History

AOC 16-003(p) is an inactive HE sump located on the south side of the footprint of former building 16-478 (Figure 4.2-31). The outlet drainline of the sump was plugged in 1987. Before its removal in 2005, building 16-478 was used as a bunker, utility room, control room, and high-speed machining room for tests on experimental HE.

4.2.10.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-003(p), except for the following:

- Vertical extent of barium at location 16-608667
- Vertical extent of cobalt at location 16-608667
- Lateral extent of nickel at location 16-611909
- Lateral extent of acetone at location 16-611909
- Vertical extent of acetone at location 16-611909
- Lateral extent of 2-butanone at location 16-611909
- Vertical extent of 2-butanone at location 16-611909

- Vertical extent of HMX at location 16-608667
- Vertical extent of RDX at location 16-608667

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.2-32, and detected organic chemicals are shown in Figure 4.2-33 for AOC 16-003(p).

4.2.10.3 Proposed Activities at AOC 16-003(p)

Subsurface samples will be collected at previously sampled locations 16-608667 and 16-611909, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 11–12 ft and 17–18 ft bgs.

Samples will be analyzed as follows:

- Samples collected at location 16-608667 will be analyzed for barium, cobalt, HMX, and RDX.
- Samples collected at location 16-611909 will be analyzed for nickel, acetone, and 2-butanone.

Samples will be collected from one new location (3p-1) west of existing sampling location 11-611909 to define the lateral extent of nickel, acetone, and 2-butanone. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for nickel, acetone, and 2-butanone.

Proposed sampling locations at AOC 16-003(p) are shown in Figure 4.2-34. Table 4.2-10 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.11 SWMU 16-004(a)—Imhoff Tank

4.2.11.1 Site Description and Operational History

SWMU 16-004(a) is the inactive Imhoff tank (structure 16-530) used for sewage treatment at the TA-16 WWTP (Figure 4.2-35). The structure is approximately 20 ft by 35 ft with a total area of 700 ft^2. Located southeast of the former TA-16-340 Complex and north of the communitor (a cutting device for sewage solids), the Imhoff tank received effluent that flowed over a weir into a dosing siphon. Any sludge that may have collected in the tank was digested before being discharged to the drying beds [SWMUs 16-004(d) and 16-004(f)] (LANL 1993, 020948, p. 5-134).

4.2.11.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-004(a) at the four accessible sampling locations around structure 16-530 (locations 16-608673, 16-608674, 16-608675, and 16-608676). However, the proposed sampling location beneath the center of structure 16-530 (Imhoff tank) was not accessible during the site investigation; therefore extent of contamination is not defined for SWMU 16-004(a).

4.2.11.3 Delayed Site Investigation Rationale at SWMU 16-004(a)

Delayed investigation is proposed for SWMU 16-004(a) because the proposed sampling location beneath the center of the Imhoff tank (structure 16-530) is not accessible. Data from the four locations sampled around structure 16-530 during the 2010 investigation indicated it is unlikely releases occurred from the

Imhoff tank while it was in operation. For these reasons, the Laboratory proposes that completion of site characterization and investigation be delayed until future D&D of structure 16-530 has been completed.

4.2.12 SWMU 16-004(b)—Trickling Filter

4.2.12.1 Site Description and Operational History

SWMU 16-004(b) is the inactive trickling filter (structure 16-531) used for sewage treatment at the TA-16 WWTP (Figure 4.2-36). The trickling filter is located east of the Imhoff tank. The filter received effluent from a dosing siphon and digested organic waste via microorganisms that coated the pebble bed. At full capacity, the trickling filter could manage 100,000 gal./d (LANL 1993, 020948, p. 5-133).

4.2.12.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-004(b) at the four accessible sampling locations around structure 16-531 (locations 16-608684, 16-608685, 16-608686, and 16-608687) except for the following:

- Vertical extent of uranium-235/236 at locations 16-608687 and 16-608685

Sampling locations and results for radionuclides detected or detected above BVs/FVs are shown in Figure 4.2-37 for SWMU 16-004(b).

Additionally, the proposed sampling location beneath the center of structure 16-531 (trickling filter) was not accessible during the site investigation of SWMU 16-004(b).

4.2.12.3 Delayed Site Investigation Rationale at SWMU 16-004(b)

Delayed investigation is proposed for SWMU 16-004(b) because the proposed sampling location beneath the center of the trickling filter (structure 16-531) is not accessible. Data from the four locations sampled around structure 16-531 during the 2010 investigation indicated it is unlikely releases occurred from the trickling filter while it was in operation; detected activities of uranium-235/236 were less than 2 times the BV of 0.09 pCi/g. For these reasons, the Laboratory proposes that completion of site characterization and investigation be delayed until future D&D of structure 16-531 has been completed.

4.2.13 SWMU 16-004(c)—Clarifier Tank

4.2.13.1 Site Description and Operational History

SWMU 16-004(c) is the inactive clarifier or final tank (structure 16-532) used for sewage treatment at the TA-16 WWTP (Figure 4.2-38). The clarifier measures approximately 20 ft by 20 ft and is located southeast of the trickling filter. The clarifier received discharge from the trickling filter; water flowed through an outlet in the clarifier and discharged to formerly NPDES-permitted outfall EPA-SSS03S and eventually into a tributary of Water Canyon. At full capacity, structure 16-532 could manage 117,600 gal./d (LANL 1993, 020948, p. 5-133).

4.2.13.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-004(c) at the four accessible sampling locations around structure 16-532 (locations 16-608884, 16-608885, 16-608886, and 16-608887) except for the following:

- Vertical extent of extent of uranium-235/236 at locations 16-608885 and 16-608886

Sampling locations and results for radionuclides detected or detected above BVS/FVs are shown in Figure 4.2-39 for SWMU 16-004(c).

Additionally, the proposed sampling location beneath the center of structure 16-532 (clarifier tank) was not accessible during the site investigation of SWMU 16-004(c).

4.2.13.3 Delayed Site Investigation Rationale at SWMU 16-004(c)

Delayed investigation is proposed for SWMU 16-004(c) because the proposed sampling location beneath the center of the clarifier tank (structure 16-532) is not accessible. Data from the four locations sampled around structure 16-532 during the 2010 investigation indicate it is unlikely releases occurred from the clarifier tank while it was in operation; detected activities of uranium-235/236 were approximately at the BV of 0.09 pCi/. For these reasons, the Laboratory proposes that completion of site characterization and investigation be delayed until future D&D of structure 16-532 has been completed.

4.2.14 SWMU 16-004(d)—Sludge Drying Bed

4.2.14.1 Site Description and Operational History

SWMU 16-004(d) is one of two inactive sludge drying beds (structure 16-533) at the TA-16 sanitary WWTP (Figure 4.2-40). This drying bed is located southeast of the former TA-16-340 Complex and Imhoff tank. The drying bed received sludge from the Imhoff tank. Sludge was monitored for radioactivity and tritium before being removed for disposal at MDA G (LANL 1993, 020948, p. 5-133).

4.2.14.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-004(d), except for the following:

- Vertical extent of barium at locations 16-608941 and 16-608943
- Vertical extent of calcium at location 16-608942

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.2-41 for SWMU 16-004(d).

4.2.14.3 Proposed Activities at SWMU 16-004(d)

Subsurface samples will be collected at previously sampled locations 16-608941, 16-608942, and 16-608943, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 15–16 ft and 21–22 ft bgs.

Samples will be analyzed as follows:

- Samples collected at locations 16-608941 and 16-608943 will be analyzed for barium.
- Samples collected at location 16-608942 will be analyzed for calcium.

Proposed sampling locations at SWMU 16-004(d) are shown in Figure 4.2-42. Table 4.2-11 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.15 SWMU 16-004(f)—Sludge Drying Bed

4.2.15.1 Site Description and Operational History

SWMU 16-004(f) is one of two inactive sludge drying beds (structure 16-535) at the TA-16 WWTP (Figure 4.2-43). This drying bed is located southeast of the Imhoff tank. The drying bed received sludge from the Imhoff tank. Sludge was monitored for radioactivity and tritium before being removed for disposal at MDA G (LANL 1993, 020948, p. 5-133).

4.2.15.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-004(f), except for the following:

- Vertical extent of chromium at location 16-608898

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.2-44 for SWMU 16-004(f).

4.2.15.3 Proposed Activities at SWMU 16-004(f)

Subsurface samples will be collected at previously sampled location 16-608898, extending the depth at this location to define the vertical extent of contamination. Samples will be collected from depth intervals of 14–15 ft and 20–21 ft bgs and analyzed for chromium.

Proposed sampling locations at SWMU 16-004(f) are shown in Figure 4.2 -45. Table 4.2-12 summarizes the proposed sampling locations, depths, and analytical suites.

4.3 300s Line Subaggregate Area

The 300s Line Subaggregate Area consists of HE-processing buildings 16-300, 16-302, 16-304, and 16-306, along with their associated rest houses (buildings 16-301, 16-303, 16-305, and 16-307) (Figure 2.1-3). Construction of the 300s Line began in 1951 and was completed in 1953. The HE-processing buildings are located on the east side of the facility, and the rest houses are located on the west side. The primary function of this facility was casting HE such as TNT, Composition B, and Baratol. These explosives were used as lenses in the first implosion-type nuclear weapons developed during the Manhattan Project and during the Cold War.

Over the years, the function of 300s Line evolved as technologies in explosives advanced. In 1958, the 300s Line facility changed from casting HE to developing plastic-bonded explosives. Only one building (16-302) continued its function of casting HE after 1958. Building 16-300, the northernmost building in the facility, was converted to an inert processing facility in 1962 or 1963 (Barr 1992, 052964.4).

A shared liquid waste trunk line is located on the northeast side of buildings 16-300, 16-302, 16-304, and 16-306, and drainlines are present. Effluents from these buildings entered this trunk line to the northeast of the buildings and discharged through an NPDES-permitted outfall (EPA-05A058). The outfall discharged into a well-defined drainage across HE Road and southeast of building 16-306.

4.3.1 SWMU 16-026(z)—Outfall

4.3.1.1 Site Description and Operational History

SWMU 16-026(z) is an outfall from a plastics-component development facility (building 16-306) (Figure 4.3-1). The outfall is located on the southeast side of the building. Runoff from building 16-306 roof drains flows via an asphalt-lined culvert and natural drainages to Water Canyon.

4.3.1.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-026(z), except for the following:

- Vertical extent of barium at locations 16-609204 and 16-609207
- Vertical extent of cobalt at location 16-609204
- Lateral extent of anthracene downgradient of location 16-609207
- Vertical extent of anthracene at location 16-609205
- Lateral extent of benzo(a)anthracene downgradient of location 16-609207
- Lateral extent of benzo(b)fluoranthene downgradient of location 16-609207
- Lateral extent of benzo(a)pyrene downgradient of location 16-609207
- Lateral extent of benzo(g,h,i)perylene downgradient of location 16-609207
- Lateral extent of benzo(k)fluoranthene downgradient of location 16-609207
- Lateral extent of chrysene downgradient of location 16-609207
- Lateral extent of fluoranthene downgradient of location 16-609207
- Lateral extent of fluorene downgradient of location 16-609207
- Lateral extent of indeno(1,2,3-cd)pyrene downgradient of location 16-609207
- Vertical extent of naphthalene at location 16-609205
- Lateral extent of phenanthrene downgradient of location 16-609207
- Vertical extent of phenanthrene at location 16-609205
- Lateral extent of pyrene downgradient of location 16-609207

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-2, and detected organic chemicals are shown in Figure 4.3-3 for SWMU 16-026(z).

4.3.1.3 Proposed Activities at SWMU 16-026(z)

Subsurface samples will be collected at previously sampled locations 16-609204, 16-609205, and 16-609207 extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 11–12 ft and 17–18 ft bgs at locations 16-609204 and 16-609205; and 10–11 ft and 16–17 ft bgs at location 16-609207.

Samples will be analyzed as follows:

- Samples collected at location 16-609204 will be analyzed for barium and cobalt.
- Samples collected at location 16-609205 will be analyzed for anthracene, naphthalene, and phenanthrene.
- Samples collected at location 16-609207 will be analyzed for barium.

Samples will be collected at one new step-out location (26z-1) downgradient of sampling location 16-609207 to define the lateral extent of anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. Samples will be collected from depth intervals ranging from 0–1 ft to 4–5 ft bgs and will be analyzed for PAHs.

Proposed sampling locations at SWMU 16-026(z) are shown in Figure 4.3-4. Table 4.3-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.2 SWMU 16-001(e)—Dry Well

4.3.2.1 Site Description and Operational History

SWMU 16-001(e) is an inactive dry well located at TA-16 approximately 170 ft east of HE processing building 16-306 (Figure 4.3-5). Constructed in the 1980s, the dry well never functioned properly, because it drained to impermeable tuff (Qbt 4). Eventually, the dry well was filled with soil and capped with concrete.

4.3.2.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-001(e), except for the following:

- Vertical extent of barium at locations 16-609172 and 16-609173
- Vertical extent of acetone at locations 16-609170, 16-609172, and 16-609173
- Lateral extent of TNT at locations 16-609173 and 16-609174

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-6, and detected organic chemicals are shown in Figure 4.3-7 for SWMU 16-001(e).

4.3.2.3 Proposed Activities at SWMU 16-001(e)

Subsurface samples will be collected at previously sampled locations 16-609170, 16-609172, and 16-609173 extending the depths at each location to define the vertical extent of contamination. Samples

will be collected from depth intervals of 31–32 ft and 37–38 ft bgs at location 16-609170; 33–34 ft and 39–40 ft bgs at location 16-609172; and 22–23 ft and 28–29 ft bgs at location 16-609173.

Samples will be analyzed as follows:

- Samples collected at location 16-609170 will be analyzed for acetone.
- Samples collected at location 16-609172 will be analyzed for barium and acetone.
- Samples collected at location 16-609173 will be analyzed for barium and acetone.

Samples will be collected at one new step-out location (1e-1) to define the lateral extent of TNT downgradient of locations 16-609173 and 16-609174. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, 10–11 ft, 16–17 ft, and 20–21 ft bgs and will be analyzed for TNT.

Proposed sampling locations at SWMU 16-001(e) are shown in Figure 4.3-8. Table 4.3-2 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.3 SWMU 16-003(d)—Sumps

4.3.3.1 Site Description and Operational History

SWMU 16-003(d) consists of two inactive HE sumps that served building 16-300 (Figure 4.3-9). The sumps are located on the exterior north side of the building. Building 16-300 was initially an HE-casting facility converted to a mock (inert) explosives-preparation facility in 1962 (Barr 1992, 052964.4).

4.3.3.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-003(d), except for the following:

- Lateral and vertical extent of selenium at location 16-611884
- Lateral extent of acetone downgradient of locations 16-609177 and 16-611884

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-10, and detected organic chemicals are shown in Figure 4.3-11 for SWMU 16-003(d).

4.3.3.3 Proposed Activities at SWMU 16-003(d)

Subsurface samples will be collected at previously sampled location 16-611884, extending the depth to define the vertical extent of contamination. Samples will be collected from depth intervals of 20–21 ft and 26–27 ft bgs and analyzed as follows:

- Samples collected at location 16-611884 will be analyzed for selenium.

Samples will be collected at one new step-out location (3d-1) downgradient of existing sampling location 16-611884 to define the lateral extent of selenium and acetone. Samples will be collected from depth intervals of 14–15 ft, 20–21 ft, and 26–27 ft bgs and will be analyzed for selenium and acetone.

Samples will be collected at one new step-out location (3d-2) downgradient of existing sampling location 16-609177 to define the lateral extent of acetone. Samples will be collected from depth intervals of 6–7 ft and 9–10 ft bgs and will be analyzed for acetone.

Proposed sampling locations at SWMU 16-003(d) are shown in Figure 4.3-12. Table 4.3-3 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.4 SWMU 16-003(e)—Sumps

4.3.4.1 Site Description and Operational History

SWMU 16-003(e) consists of two inactive HE sumps at TA-16 associated with building 16-302 (Figure 4.3-13). The sumps are located on the exterior northeast side of the building. Building 16-302 was constructed between 1951 and 1953. It originally operated as an HE-casting facility where Composition B, Baratol, and TNT were cast. Casting equipment was cleaned using steam and high-temperature wash water. The wash water drained to the sumps. Currently, building 16-302 is a non-HE operations facility.

4.3.4.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-003(e), except for the following:

- Vertical extent of cobalt at location 16-01443
- Vertical extent of copper at location 16-01443
- Vertical extent of nickel at location 16-01443
- Vertical extent of zinc at location 16-01443
- Vertical extent of HMX at location 16-01443
- Vertical extent of RDX at location 16-01443

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-14, and detected organic chemicals are shown in Figure 4.3-15 for SWMU 16-003(e).

4.3.4.3 Proposed Activities at SWMU 16-003(e)

Subsurface samples will be collected at previously sampled location 16-01443, extending the depth to define the vertical extent of contamination. Samples will be collected from depth intervals of 20–21 ft and 26–27 ft bgs and analyzed for cobalt, copper, nickel, zinc, HMX, and RDX.

Proposed sampling locations at SWMU 16-003(e) are shown in Figure 4.3-16. Table 4.3-4 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.5 SWMU 16-003(f)—Sumps

4.3.5.1 Site Description and Operational History

SWMU 16-003(f) consists of two inactive HE sumps at TA-16 associated with building 16-304 (Figure 4.3-17). The sumps are located on the exterior northeast and southeast side of the building.

Constructed between 1951 and 1953, building 16-304 was used for developing and fabricating plastic components for the weapons program. Chemical solvents were used in the building.

4.3.5.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-003(f), except for the following:

- Vertical extent of arsenic at location 16-609167
- Vertical extent of chromium at locations 16-609166 and 16-609239
- Vertical extent of cobalt at location 16-609166
- Vertical extent of lead at location 16-609167
- Vertical extent of thallium at location 16-609167
- Vertical extent of acenaphthene at locations 16-609166 and 16-609167
- Vertical extent of anthracene at locations 16-609166 and 16-609167
- Vertical extent of benzo(a)anthracene at locations 16-609166 and 16-609167
- Vertical extent of benzo(a)pyrene at locations 16-609166 and 16-609167
- Vertical extent of benzo(b)fluoranthene at locations 16-609166 and 16-609167
- Vertical extent of benzo(g,h,i)perylene at locations 16-609166 and 16-609167
- Vertical extent of benzo(k)fluoranthene at location 16-609167
- Vertical extent of bis(2-ethylhexyl)phthalate at location 16-609167
- Vertical extent of chrysene at locations 16-609166 and 16-609167
- Vertical extent of fluoranthene at locations 16-609166 and 16-609167
- Vertical extent of fluorene at locations 16-609166 and 16-609167
- Vertical extent of indeno(1,2,3-cd)pyrene at locations 16-609166 and 16-609167
- Vertical extent of naphthalene at locations 16-609166 and 16-609167
- Vertical extent of phenanthrene at locations 16-609166 and 16-609167
- Vertical extent of pyrene at locations 16-609166 and 16-609167
- Vertical extent of RDX at location 16-609167

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-18, and detected organic chemicals are shown in Figure 4.3-19 for SWMU 16-003(f).

4.3.5.3 Proposed Activities at SWMU 16-003(f)

Subsurface samples will be collected at previously sampled locations 16-609166, 16-609167, and 16-609239 extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 15–16 ft and 21–22 ft bgs at locations 16-609166 and 16-609167; and 12–13 ft and 18–19 ft bgs at location 16-609239.

Samples will be analyzed as follows:

- Samples collected at location 16-609166 will be analyzed for chromium, cobalt, and PAHs.
- Samples collected at location 16-609167 will be analyzed for arsenic, lead, thallium, PAHs, and RDX.
- Samples collected at location 16-609239 will be analyzed for chromium.

Proposed sampling locations at SWMU 16-003(f) are shown in Figure 4.3-20. Table 4.3-5 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.6 SWMU 16-003(g)—Sumps

4.3.6.1 Site Description and Operational History

SWMU 16-003(g) consists of two inactive HE sumps associated with building 16-306 (Figure 4.3-21). The sumps are located approximately 6 ft from the exterior northeast side of the building. Constructed between 1951 and 1953, building 16-306 was used for developing plastic components for the weapons program, including polysiloxane foam and polyurethane components, intrusion molding, and epoxy and laminate work. Chemical solvents were used in the building and historically discharged directly into the sumps.

4.3.6.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-003(g), except for the following:

- Vertical extent of barium at location16-609187
- Vertical extent of calcium at location 16-609187
- Vertical extent of cobalt at location16-609186
- Vertical extent of lead at location16-609186
- Vertical extent of acenaphthene at location16-609186
- Vertical extent of anthracene at location 16-609186
- Vertical extent of benzo(a)anthracene at location 16-609186
- Vertical extent of benzo(a)pyrene at location 16-609186
- Vertical extent of benzo(b)fluoranthene at location16-609186
- Vertical extent of benzo(g,h,i)perylene at location 16-609186
- Vertical extent of benzo(k)fluoranthene at location 16-609186
- Vertical extent of chrysene at location 16-609186
- Vertical extent of fluoranthene at location16-609186
- Vertical extent of indeno(1,2,3-cd)pyrene at location 16-609186

- Vertical extent of phenanthrene at location 16-609186
- Vertical extent of pyrene at location 16-609186

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-22, and detected organic chemicals are shown in Figure 4.3-23 for SWMU 16-003(g).

4.3.6.3 Proposed Activities at SWMU 16-003(g)

Subsurface samples will be collected at previously sampled locations 16-609186 and 16-609187, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 20–21 ft and 26–27 ft bgs and analyzed as follows:

- Samples collected at location 16-609186 will be analyzed for cobalt, lead, and PAHs.
- Samples collected at location 16-609187 will be analyzed for barium and calcium.

Proposed sampling locations at SWMU 16-003(g) are shown in Figure 4.3-24. Table 4.3-6 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.7 SWMU 16-026(b)—Outfall

4.3.7.1 Site Description and Operational History

SWMU 16-026(b) is an outfall located to the east of a rest house (building 16-307) (Figure 4.3-25). The outfall formerly received discharge from two HE sumps [SWMU 16-029(a)] located near the exterior southeast wall of the rest house. The sumps were plugged in 1990−1991. Used to store molds and materials for plastics development, the rest house also previously housed a solvent disassembly tank used to remove HE from test devices (LANL 1989, 068685).

4.3.7.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-026(b), except for the following:

- Vertical extent of total cyanide at location 16-609189
- Lateral extent of fluoranthene at location 16-609215
- Lateral extent of phenanthrene at location 16-609215

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-26, and detected organic chemicals are shown in Figure 4.3-27 for SWMU 16-026(b).

4.3.7.3 Proposed Activities at SWMU 16-026(b)

Subsurface samples will be collected at previously sampled location 16-609189, extending the depth to define the vertical extent of contamination. Samples will be collected from depth intervals of 11–12 ft and 17–18 ft bgs and analyzed for total cyanide.

The investigation report indicated that the lateral extent of fluoranthene and phenanthrene is not defined downgradient of location 16-609215 (LANL 2011, 111810.32, pp. 150–153). However, detected

concentrations of fluoranthene and phenanthrene decrease downgradient at location 16-609216 (fluoranthene: 0.0694 mg/kg in the 0–0.5 ft bgs depth interval and nondetect in the 5.5–6 ft bgs depth interval; phenanthrene: 0.032 mg/kg in the 0–0.5 ft bgs depth interval and nondetect in the 5.5–6 ft bgs depth interval) (Figure 4.3-27). Therefore, additional sampling for fluoranthene and phenanthrene downgradient of sampling location 16-609215 is not required.

The results of the previous sampling at location 16-609189 showed benzo(a)pyrene to be present at 3.54 mg/kg in the sample from 0–0.5 ft bgs and 0.15 mg/kg in the sample from 5.5–6 ft bgs. Based on the decrease in concentrations with depth, vertical extent is defined at this location. However, benzo(a)pyrene was detected above the industrial SSL (2.34 mg/kg) in the surface soil, and the top 5.5 ft of soil will be removed from a 5-ft radius around location 16-609189. Results from the surface sample (0-0.5 ft bgs) collected at nearby location 16-01654 were below the industrial SSL and will be used to confirm cleanup to the east. Confirmation samples will be collected to the north, south, and west of the excavation (locations 26b-1, 26b-2, and 26b-3) at depths of 0–1 ft and 5–6 ft bgs; all confirmation samples will be analyzed for benzo(a)pyrene.

Proposed sampling locations at SWMU 16-026(b) are shown in Figure 4.3-28. Table 4.3-7 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.8 SWMU 16-026(c)—Outfall

4.3.8.1 Site Description and Operational History

SWMU 16-026(c) is an outfall located at TA-16 to the south of a rest house (building 16-305) (Figure 4.3-29). The outfall formerly received discharge from two HE sumps [SWMU 16-029(b)] located near the exterior southwest wall of the rest house. The sumps were plugged in 1990-1991. Used to store chemicals and solvents for plastics development and production, the rest house was also used for filament winding of developmental weapons components.

4.3.8.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-026(c), except for the following:

- Lateral extent of barium downgradient of location 16-609197
- Vertical extent of barium at locations 16-01460, 16-01461, 16-01462, 16-01464, and 16-609194
- Vertical extent of chromium at locations 16-01459, 16-01655, and 16-609194
- Vertical extent of copper at location 16-01464
- Lateral extent of selenium downgradient of location 16-609197
- Vertical extent of zinc at location 16-01464
- Lateral extent of benzoic acid downgradient of location 16-609197

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-30, and detected organic chemicals are shown in Figure 4.3-31 for SWMU 16-026(c).

4.3.8.3 Proposed Activities at SWMU 16-026(c)

Subsurface samples will be collected at previously sampled locations 16-01459, 16-01460, 16-01461, 16-01462, 16-01464, 16-01655, and 16-609194, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 5–6 ft and 11–12 ft bgs at locations 16-01460, 16-01461, 16-01462, and 16-01464; 10–11 ft and 16–17 ft bgs at locations 16-01459 and 16-01655; and 11–12 ft and 17–18 ft bgs at location 16-609194.

Samples will be analyzed as follows:

- Samples collected at location 16-01459 will be analyzed for chromium.
- Samples collected at location 16-01460 will be analyzed for barium.
- Samples collected at location 16-01461 will be analyzed for barium.
- Samples collected at location 16-01462 will be analyzed for barium.
- Samples collected at location 16-01464 will be analyzed for barium, copper, and zinc.
- Samples collected at location 16-01655 will be analyzed for chromium.
- Samples collected at location 16-609194 will be analyzed for barium and chromium.

The investigation report indicated that the lateral extent of barium, selenium, and benzoic acid is not defined downgradient of location 16-609197 (LANL 2011, 111810.32, pp. 155–157). However, detected concentrations of barium, selenium, and benzoic acid decrease downgradient at location 16-609216 within the Shared Drainages (section 4.3.14.1, Figure 4.3-52); barium was not detected in the 0–0.5 ft bgs depth interval and was detected below the maximum Qbt 2, 3, 4 BV at 49.8 mg/kg in the 5.5–6 ft bgs depth interval; selenium was not detected in either sampling interval; and benzoic acid was not detected in either sampling interval. Therefore, additional sampling for barium, selenium, and benzoic acid downgradient of sampling location 16-609197 is not required.

Proposed sampling locations at SWMU 16-026(c) are shown in Figure 4.3-32. Table 4.3-8 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.9 SWMU 16-026(d)—Outfall

4.3.9.1 Site Description and Operational History

SWMU 16-026(d) is an outfall located to the south of a rest house (building 16-303) (Figure 4.3-33). The outfall formerly received discharge from two HE sumps [SWMU 16-029(c)] located on the exterior southwest wall of the rest house. The sumps were plugged in 1990-1991.

4.3.9.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-026(d), except for the following:

- Vertical extent of barium at locations 16-01466, 16-01467, 16-01468, 16-01469, 16-01470, 16-01656, 16-609183, 16-609185, and 16-611017
- Vertical extent of chromium at location 16-01656
- Lateral extent of copper downgradient of location 16-611017

- Lateral extent of mercury downgradient of location 16-611017
- Vertical extent of selenium at location 16-609185
- Vertical extent of vanadium at location 16-01467
- Vertical extent of zinc at locations 16-01466 and 16-01468
- Vertical extent of benzo(a)anthracene at location 16-609182
- Vertical extent of benzo(b)fluoranthene at location 16-609182
- Vertical extent of benzo(g,h,i)perylene at location 16-609182
- Vertical extent of benzo(k)fluoranthene at location 16-609182
- Vertical extent of chrysene at location 16-609182
- Vertical extent of diethylphthalate at location 16-01656
- Vertical extent of fluoranthene at location 16-609182
- Vertical extent of indeno(1,2,3-cd)pyrene at location 16-609182
- Vertical extent of phenanthrene at location 16-01470
- Vertical extent of phenanthrene at location 16-609182
- Vertical extent of pyrene at location 16-01470
- Vertical extent of pyrene at location 16-609182
- Vertical extent of RDX at locations 16-609183 and 16-01467
- Lateral extent of cesium-137 downgradient of location 16-611017

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-34, detected organic chemicals are shown in Figure 4.3-35, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.3-36 for SWMU 16-026(d).

4.3.9.3 Proposed Activities at SWMU 16-026(d)

Subsurface samples will be collected at previously sampled locations 16-01466, 16-01467, 16-01468, 16-01469, 16-01470, 16-01656, 16-609182, 16-609183, 16-609185, and 16-611017 extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 5–6 ft and 11–12 ft bgs at locations 16-01466, 16-01467, 16-01468, 16-01469, and 16-01470; 10–11 ft and 16–17 ft bgs at location 16-609183; 11–12 ft and 17–18 ft bgs at locations 16-609182 and 16-609185; and 12–13 ft and 18–19 ft bgs at locations 16-01656 and 16-611017.

Samples will be analyzed as follows:

- Samples collected at location 16-01466 will be analyzed for barium and zinc.
- Samples collected at location 16-01467 will be analyzed for barium, vanadium, and RDX.
- Samples collected at location 16-01468 will be analyzed for barium and zinc.
- Samples collected at location 16-01469 will be analyzed for barium.
- Samples collected at location 16-01470 will be analyzed for barium, phenanthrene, and pyrene.

- Samples collected at location 16-01656 will be analyzed for barium, chromium, and diethylphthalate.
- Samples collected at location 16-609182 will be analyzed for PAHs.
- Samples collected at location 16-609183 will be analyzed for barium and RDX.
- Samples collected at location 16-609185 will be analyzed for barium and selenium.
- Samples collected at location 16-611017 will be analyzed for barium.

The investigation report stated that the lateral extent of copper, mercury, and cesium-137 is not defined downgradient of location 16-611017 (LANL 2011, 111810.32, pp. 159–162). However, detected concentrations of copper and mercury decrease downgradient at location 16-609197 within SWMU 16-026(c) (Figure 4.3-30). No radionuclides were detected or detected above the BVs/FVs in samples collected at SWMU 16-026(c) (LANL 2011, 111810.32, p. 157). Therefore, additional sampling for copper, mercury, and cesium-137 downgradient of sampling location 16-611017 is not required.

Proposed sampling locations at SWMU 16-026(d) are shown in Figure 4.3-37. Table 4.3-9 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.10 SWMU 16-026(e)—Outfall

4.3.10.1 Site Description and Operational History

SWMU 16-026(e) is an outfall located to the south of building 16-301 (Figure 4.3-38). The outfall formerly received discharge from two HE sumps [SWMU 16-029(d)] located on the exterior west side of building 16-301. The sumps were plugged in 1990-1991. Building 16-301 originally housed mock-HE processing operations and stored raw materials that were used to prepare mock HE. Building 16-301 was later used as an environmental testing laboratory for research into the effects of temperature, pressure, and humidity on weapons and components (LANL 1993, 020948, p. 5-28).

4.3.10.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-026(e), except for the following:

- Vertical extent of barium at locations 16-01474, 16-609201, and 16-611816
- Vertical extent of silver at location 16-611817
- Vertical extent of HMX at locations 16-609201 and 16-611815
- Lateral extent of RDX east of location 16-611878
- Vertical extent of plutonium-239/240 at locations 16-611813 and 16-611817

Sampling locations and results for inorganic chemicals detected above BVs are shown on Plate 9, detected organic chemicals are shown on Plate 10, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.3-39 for SWMU 16-026(e).

4.3.10.3 Proposed Activities at SWMU 16-026(e)

Subsurface samples will be collected at previously sampled locations 16-01474, 16-609201, 16-611813, 16-611815, 16-611816, and 16-611817, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 5–6 ft and 11–12 ft bgs at locations 16-01474 and 16-611817; 11–12 ft and 17–18 ft bgs at locations 16-609201 and 16-611813; and 14–15 ft and 20–21 ft bgs at locations 16-611815 and 16-611816.

Samples will be analyzed as follows:

- Samples collected at location 16-01474 will be analyzed for barium.
- Samples collected at location 16-609201 will be analyzed for barium and HMX.
- Samples collected at location 16-611813 will be analyzed for isotopic plutonium.
- Samples collected at location 16-611815 will be analyzed for HMX.
- Samples collected at location 16-611816 will be analyzed for barium.
- Samples collected at location 16-611817 will be analyzed for silver and isotopic plutonium.

Samples will be collected at one new step-out location (26e-1) east of existing sampling location 16-611878 to define the lateral extent of RDX. Samples will be collected from depth intervals of 0–1 ft, 5-6 ft, 11–12 ft, 19–20 ft, 20–21 ft, and 26–27 ft bgs and will be analyzed for RDX.

The results of the previous sampling at location 16-611878 showed RDX to be present at 380 mg/kg in the sample from 0–0.5 ft bgs and 3.6 mg/kg in the sample from 5.5–6 ft bgs. Based on the decrease in concentrations with depth, vertical extent is defined at this location. However, RDX was detected above the industrial SSL (174 mg/kg) in the surface soil, and the top 4 ft of soil will be removed from a 5-ft radius around location 16-611878. Results from nearby location 16-611813 were below the industrial SSL and will be used to confirm cleanup to the west, and data from new location 26e-1 will be used to confirm cleanup to the west. Additional confirmation samples will be collected to the north and south of the excavation (locations 26e-2 and 26e-3) at depths of 0–1 ft and 5–6 ft bgs and analyzed for RDX.

Proposed sampling locations at SWMU 16-026(e) are shown in Figure 4.3-40. Table 4.3-10 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.11 SWMU 16-029(a)—Sumps

4.3.11.1 Site Description and Operational History

SWMU 16-029(a) consists of two inactive HE sumps located on the south side of a rest house (building 16-307) (Figure 4.3-41). The sumps were plugged in 1990. Used to store molds and materials for plastics development, the rest house also housed a solvent disassembly tank used to remove HE from test devices (LANL 1989, 068685).

4.3.11.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-029(a), except for the following:

- Vertical extent of chromium at location 16-01453
- Lateral extent of acenaphthene downgradient of location 16-01453
- Lateral extent of anthracene downgradient of location 16-01453
- Vertical extent of anthracene at location 16-609209
- Lateral extent of benzo(a)anthracene downgradient of location 16-01453
- Vertical extent of benzo(a)anthracene at location 16-609209
- Lateral extent of benzo(a)pyrene downgradient of location 16-01453
- Vertical extent of benzo(a)pyrene at location 16-609209
- Lateral extent of benzo(b)fluoranthene downgradient of location 16-01453
- Vertical extent of benzo(b)fluoranthene at location 16-609209
- Lateral extent of benzo(g,h,i)perylene downgradient of location 16-01453
- Vertical extent of benzo(g,h,i)perylene at location 16-609209
- Lateral extent of chrysene downgradient of location 16-01453
- Vertical extent of chrysene at location 16-609209
- Lateral extent of diethylphthalate downgradient of location 16-01453
- Vertical extent of diethylphthalate at location 16-01453
- Lateral extent of fluoranthene downgradient of location 16-01453
- Vertical extent of fluoranthene at location 16-609209
- Lateral extent of fluorene downgradient of location 16-01453
- Vertical extent of fluorene at location 16-01453
- Lateral extent of indeno(1,2,3-cd)pyrene downgradient of location 16-01453
- Vertical extent of indeno(1,2,3-cd)pyrene at location 16-609209
- Lateral extent of phenanthrene downgradient of location 16-01453
- Vertical extent of phenanthrene at location 16-609209
- Lateral extent of pyrene downgradient of location 16-01453
- Vertical extent of pyrene at location 16-609209

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-42, and detected organic chemicals are shown in Figure 4.3-43 for SWMU 16-029(a).

4.3.11.3 Proposed Activities at SWMU 16-029(a)

Subsurface samples will be collected at previously sampled locations 16-01453 and 16-609209, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 9–10 ft and 15–16 ft bgs at location 16-01453; and 15–16 ft and 21-22 ft bgs at location 16-609209.

Samples will be analyzed as follows:

- Samples collected at location 16-01453 will be analyzed for chromium, diethylphthalate, and fluorene.
- Samples collected at location 16-609209 will be analyzed for PAHs.

The investigation report stated that the lateral extent of acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, diethylphthalate, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene is not defined downgradient of location 16-01453 (LANL 2011, 111810.32, pp. 171–173). However, detected concentrations of these PAHs decrease downgradient at location 16-609216, (Plate 11). In addition, the approved investigation report stated that the lateral extent of these PAHs is defined at location 16-01439 within the Shared Drainages (LANL 2011, 111810.32, pp. 186–187). Therefore, additional sampling for acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, diethylphthalate, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene downgradient of sampling location 16-01453 is not required.

The results of the previous sampling at location 16-01453 showed benzo(a)pyrene to be present at 19 mg/kg, benzo(b)fluoranthene at 28 mg/kg, and dibenz(a,h)anthracene at 3.5 mg/kg in the samples collected from 0.33–1.33 ft bgs at this location. Benzo(a)pyrene was detected at 2.0 mg/kg, benzo(b)fluoranthene at 3.1 mg/kg, and dibenz(a,h)anthracene at 0.39 mg/kg in the samples collected from 3–4 ft bgs at location 16-01453. Based on the decrease in concentrations with depth, vertical extent of these PAHs is defined at this location. Benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene were detected above industrial SSLs in the near-surface soil, and the top 3 ft of soil will be removed from a 5-ft radius around location 16-01453. Confirmation samples will be collected to the north, south, east, and west of the excavation (locations 29a-1, 29a-2, 29a-3, and 29a-4) at depths of 0–1 ft and 3–4 ft bgs and analyzed for benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene.

Proposed sampling locations at SWMU 16-029(a) are shown in Figure 4.3-44. Table 4.3-11 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.12 SWMU 16-029(b)—Sumps

4.3.12.1 Site Description and Operational History

SWMU 16-029(b) consists of two inactive HE sumps located on the exterior west wall of a rest house (building 16-305) (Figure 4.3-45). The sumps were plugged in 1990. Used to store chemicals and solvents for plastics development and production, the rest house was also used for filament winding of developmental weapons components.

4.3.12.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-029(b), except for the following:

- Vertical and lateral extent of calcium at location 16-609199
- Vertical and lateral extent of selenium at location 16-609199
- Vertical and lateral extent of acetone at location 16-609199
- Vertical and lateral extent of benzo(a)anthracene at location 16-609199
- Vertical and lateral extent of benzo(b)fluoranthene at location 16-609199
- Vertical and lateral extent of chrysene at location 16-609199
- Vertical and lateral extent of fluoranthene at location 16-609199
- Vertical and lateral extent of phenanthrene at location 16-609199
- Vertical and lateral extent of pyrene at location 16-609199

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-46, and detected organic chemicals are shown in Figure 4.3-47 for SWMU 16-029(b).

4.3.12.3 Proposed Activities at SWMU 16-029(b)

Subsurface samples will be collected at previously sampled location 16-609199, extending the depth to define the vertical extent of contamination. Samples will be collected from depth intervals of 15–16 ft and 21–22 ft bgs and analyzed for calcium, selenium, acetone, and PAHs.

The investigation report stated that the lateral extent of calcium and selenium is not defined downgradient of location 16-609199 (LANL 2011, 111810.32, p. 174). However, detected concentrations of calcium and selenium decrease downgradient at location 16-609216 within the Shared Drainages, (section 4.3.14.1, Figure 4.3-52). Therefore, additional sampling for calcium and selenium downgradient of sampling location 16-609199 is not required.

The investigation report stated that the lateral extent of acetone, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene is not defined downgradient of location 16-609199 (LANL 2011, 111810.32, p. 175). However, detected concentrations of these PAHs and acetone decrease downgradient at location 16-609216 within the Shared Drainages, (Plate 11). In addition, the approved investigation report stated that the lateral extent of these PAHs and acetone is defined at location 16-01439 within the Shared Drainages (LANL 2011, 111810.32, pp. 186–187). Therefore, additional sampling for acetone, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene downgradient of sampling location 16-609199 is not required.

Proposed sampling locations at SWMU 16-029(b) are shown in Figure 4.3-48. Table 4.3-12 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.13 SWMU 16-029(c)—Sumps

4.3.13.1 Site Description and Operational History

SWMU 16-029(c) consists of two inactive HE sumps located on the exterior west wall of a rest house (building 16-303) (Figure 4.3-49). The sumps formerly discharged to an outfall [SWMU 16-026(d)] located southeast of the rest house. The sumps were plugged in 1990. The rest house was used for storing raw materials for the HE casting facility (building 16-302).

4.3.13.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-029(c), except for the following:

- Vertical and lateral extent of selenium at location 16-609214

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-50 for SWMU 16-029(c).

4.3.13.3 Proposed Activities at SWMU 16-029(c)

Subsurface samples will be collected at previously sampled location 16-609214, extending the depth to define the vertical extent of contamination. Samples will be collected from depth intervals of 10–11 ft and 16–17 ft bgs and analyzed for selenium.

The investigation report stated that the lateral extent of selenium is not defined downgradient of location 16-609214 (LANL 2011, 111810.32, p. 177). However, detected concentrations of selenium decrease downgradient at location 16-609216 within the Shared Drainages, (section 4.3.14.1, Figure 4.3-52). Therefore, additional sampling for selenium downgradient of sampling location 16-609214 is not required.

Proposed sampling locations at SWMU 16-029(c) are shown in Figure 4.3-51. Table 4.3-13 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.14 Shared Drainages

4.3.14.1 Site Description and Operational History

Shared Drainages is not a SWMU or AOC. Samples were collected to assess off-site migration of contamination from 300s Line sumps and outfalls to the Extended Drainages area. Buildings 16-300, 16-302, 16-304, and 16-306 shared a liquid waste trunk line situated to the northeast of the buildings (Figure 4.3-52). The shared liquid waste trunk line discharged through an NPDES-permitted outfall (EPA-05A058) into a well-defined drainage across HE Road, southeast of building 16-306. The drainage generally flows toward the east in the direction of Martin Spring Canyon.

4.3.14.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at the Shared Drainages except for the following:

- Vertical extent of aluminum at locations 16-01653 and 16-609219
- Vertical extent of arsenic at locations 16-01439 and 16-609217
- Vertical extent of barium at locations 16-01439, 16-609215, and 16-609219
- Vertical extent of calcium at locations 16-01439 and 16-609219
- Vertical extent of chromium at locations 16-01439 and 16-609218
- Vertical extent of cobalt at locations 16-01653, 16-609215, and 16-609219
- Vertical extent of copper at locations 16-01439, 16-609218, 16-609219, and 16-609221
- Vertical extent of iron at location 16-01439
- Vertical extent of lead at locations 16-01439 and 16-609219
- Vertical extent of mercury at location 16-01439
- Vertical extent of nickel at location 16-609219
- Vertical extent of vanadium at locations 16-01439 and 16-609219
- Vertical extent of zinc at locations 16-01411, 16-01439, and 16-609221
- Vertical extent of acenaphthene at location 16-01439
- Vertical extent of 2-amino-4,6-dinitrotoluene at location 16-01439
- Vertical extent of anthracene at location 16-01439
- Vertical extent of benzo(a)pyrene at location 16-01439
- Vertical extent of benzo(b)fluoranthene at locations 16-01439 and 16-609221
- Vertical extent of benzo(g,h,i)perylene at location 16-01439
- Vertical extent of dibenzofuran at locations 16-01439 and 16-609221
- Vertical extent of fluoranthene at locations 16-01439 and 16-609221
- Vertical extent of fluorene at location 16-01439
- Vertical extent of HMX at locations 16-01439 and 16-609221
- Vertical extent of indeno(1,2,3-cd)pyrene at location 16-01439
- Vertical extent of 2-methylphenol at locations 16-01439 and 16-609221
- Vertical extent of 4-methylphenol at locations 16-01439 and 16-609221
- Vertical extent of phenanthrene at locations 16-01439 and 16-609221
- Vertical extent of pyrene at locations 16-01439 and 16-609221
- Vertical extent of RDX at locations 16-01439 and 16-609221

- Vertical extent of tetryl at locations 16-01439 and 16-609221
- Vertical extent of TNT at locations 16-01439 and 16-609221

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.3-53 and detected organic chemicals are shown on Plate 11 for the Shared Drainages.

4.3.14.3 Proposed Activities at the Shared Drainages

Subsurface samples will be collected at previously sampled locations 16-01411, 16-01439, 16-01653, 16-609215, 16-609217, 16-609218, 16-609219, and 16-609221 extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 5–6 ft and 11–12 ft bgs at location 16-01411; 2–3 ft and 3–4 ft bgs at locations 16-01439 and 16-609221; 7–8 ft and 13–14 ft bgs at location 16-609218; 10–11 ft and 16–17 ft bgs at location 16-609217; and 11–12 ft and 17–18 ft bgs at locations 16-01653, 16-609215, and 16-609219. The steep slope at locations 16-01439 and 16-609221 prevents access by a drill rig; therefore sample collection depths are limited.

Samples will be analyzed as follows.

- Samples collected at location 16-01411 will be analyzed for zinc.
- Samples collected at location 16-01439 will be analyzed for TAL metals, PAHs, 2-amino-4,6-dinitrotoluene, dibenzofuran, HMX, 2-methylphenol, 4-methylphenol, RDX, tetryl, and TNT.
- Samples collected at location 16-01653 will be analyzed for aluminum and cobalt.
- Samples collected at location 16-609215 will be analyzed for barium and cobalt.
- Samples collected at location 16-609217 will be analyzed for arsenic.
- Samples collected at location 16-609218 will be analyzed for chromium and copper.
- Samples collected at location 16-609219 will be analyzed for TAL metals.
- Samples collected at location 16-609221 will be analyzed for copper, benzo(b)fluoranthene, dibenzofuran, fluoranthene, HMX, 2-methylphenol, 4-methylphenol, phenanthrene, pyrene, RDX, tetryl, and TNT.

The investigation report indicated that the vertical extent of zinc is not defined at location 16-609221 because only one depth was sampled at this location (LANL 2011, 111810.32, p. 186). However, the detected concentration of zinc (54.5 mg/kg) in the surface sample at location 16-609221 was below the maximum soil BV (75.5 mg/kg). Therefore, additional sampling for zinc at location 16-609221 is not required.

The results of the previous sampling at locations 16-01653 and 16-609215 showed benzo(a)pyrene to be present at 2.3 and 3.82 mg/kg, respectively, in the samples collected from 0.5–1.25 ft bgs at location 16-01653 and in the samples collected from 0–0.5 ft bgs at location 16-609215. Benzo(a)pyrene was not detected in the samples collected from 4.5–5.5 ft bgs at location 16-01653 and was detected at 0.1 mg/kg in the samples collected from 5.5–6 ft bgs at location 16-609215. Based on the decrease in concentrations with depth, vertical extent of benzo(a)pyrene is defined at both locations. Benzo(a)pyrene was detected at the industrial SSL in the surface soil, and the top 5.5 ft of soil will be removed from a 5-ft radius around location 16-01653. Benzo(a)pyrene was detected above the industrial SSL in the near-surface soil, and the top 5.5 ft of soil will be removed from a 5-ft radius around location 16-609215. Results from the samples collected at nearby locations 16-01411 and 16-01435 were below the industrial

SSL for benzo(a)pyrene and will be used to confirm cleanup north and west of location 16-01653. Confirmation samples will be collected to the south and west of the excavation at location 16-01653 (locations SD-4 and SD-5) at depths of 0–1 ft and 5–6 ft bgs and analyzed for benzo(a)pyrene. Results from the samples collected at nearby location 16-01457 were below the industrial SSL for benzo(a)pyrene and will be used to confirm cleanup north of location 16-609215. Confirmation samples will be collected to the south, east, and west of the excavation at location 16-609215 (locations SD-1, SD-2, and SD-3) at depths of 0–1 ft and 5–6 ft bgs and analyzed for benzo(a)pyrene.

The results of the previous sampling at location 16-01434 showed benzo(a)pyrene to be present at 7.4 mg/kg in the sample collected from 0–0.5 ft bgs, and benzo(a)anthracene and benzo(a)pyrene to be present at 31 mg/kg and benzo(b)fluoranthene at 22 mg/kg in the sample collected from 0.33–0.83 ft bgs. Benzo(a)anthracene was detected at 0.64 mg/kg, benzo(a)pyrene at 0.6 mg/kg, and benzo(b)fluoranthene at 0.52 mg/kg in the samples collected from 2.5–3.5 ft bgs at location 16-01434. Based on the decrease in concentrations with depth, vertical extent of these PAHs is defined at this location. Benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene were detected above industrial SSLs in surface and near-surface samples at location 16-01434, and the top 2.5 ft of soil will be removed from a 5-ft radius around location 16-01434. Results from the samples collected at nearby locations 16-01411 and 16-01435 were below the industrial SSLs for benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene and will be used to confirm cleanup north and west of location 16-01434. Confirmation samples will be collected to the south and west of the excavation at location 16-01434 (locations SD-4 and SD-5) at depths of 0–1 ft and 5–6 ft bgs and analyzed for benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene.

Proposed sampling locations at the Shared Drainages are shown in Figure 4.3-54. Table 4.3-14 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.15 Liquid Waste Trunk Line

4.3.15.1 Site Description and Operational History

Liquid Waste Trunk Line is not a SWMU or AOC. Samples were collected to assess off-site migration of contamination from 300s Line sumps and outfalls to the Extended Drainages area. HE-processing buildings (16-300, 16-302, 16-304, and 16-306) are located on the east side of the 300s Line (Figure 4.3-55). Each building has two inactive HE sumps. HE-contaminated water from the buildings flowed into the sumps and discharged into a shared liquid waste trunk line on the northeast side of the buildings. The effluent flowed along the waste trunk line into a well-defined drainage discharging through an NPDES-permitted outfall (EPA-05A058) across HE road and southeast of building 16-306.

4.3.15.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at the Liquid Waste Trunk Line except for the following:

- Lateral extent of aluminum at location 16-609238
- Vertical extent of aluminum at locations 16-609238, 16-611851, and 16-611853
- Vertical extent of barium at locations 16-609237, 16-609238, 16-611851, and 16-611853
- Vertical extent of calcium at locations 16-609238 and 16-611853
- Vertical extent of chloride at location 16-609238

- Vertical extent of chromium at location 16-609239
- Lateral extent of cobalt at locations 16-609238 and 16-611853
- Vertical extent of selenium at locations 16-609237, 16-609244, 16-611851, 16-611853, and 16-611856
- Vertical extent of acetone at locations 16-609238 and 16-609241
- Vertical extent of acenaphthene at locations 16-609232 and 16-609240
- Vertical extent of anthracene at locations 16-609232 and 16-609240
- Vertical extent of benzo(a)anthracene at locations 16-609232, 16-609240, and 16-611851
- Vertical extent of benzo(a)pyrene at locations 16-609232, 16-609240, and 16-611851
- Vertical extent of benzo(b)fluoranthene at locations 16-609232, 16-609240, and 16-611851
- Vertical extent of benzo(g,h,i)perylene at locations 16-609232 and 16-609240
- Vertical extent of benzo(k)fluoranthene at locations 16-609232, 16-609240, and 16-611851
- Vertical extent of chrysene at locations 16-609232, 16-609240, and 16-611851
- Vertical extent of fluoranthene at locations 16-609232, 16-609240, and 16-611851
- Vertical extent of fluorene at locations 16-609232 and 16-609240
- Vertical extent of phenanthrene at locations 16-609232, 16-609240, and 16-611851
- Vertical extent of pyrene at locations 16-609232, 16-609240, and 16-611851
- Vertical extent of indeno(1,2,3-cd)pyrene at locations 16-609232 and 16-609240
- Vertical extent of 2-methylnaphthalene at locations 16-609232 and 16-609240
- Vertical extent of naphthalene at locations 16-609232 and 16-609240
- Vertical extent of bis(2-ethylhexyl)phthalate at location 16-611851
- Vertical extent of plutonium-238 at locations 16-609237 and 16-611849
- Vertical extent of uranium-235/236 at location 16-609238

Sampling locations and results for inorganic chemicals detected above BVs are shown on Plate 12, detected organic chemicals are shown on Plate 13, and radionuclides detected or detected above BVs/FVs are shown in Figure 4.3-56 for the Liquid Waste Trunk Line.

4.3.15.3 Proposed Activities at Liquid Waste Trunk Line

Subsurface samples will be collected at previously sampled locations 16-609232, 16-609237, 16-609238, 16-609239, 16-609240, 16-609241, 16-609244, 16-611849, 16-611851, 16-611853, and 16-611856, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 11–12 ft and 17–18 ft bgs at locations 16-609232, 16-611849, 16-611851, and 16-611853; 12–13 ft and 18–19 ft bgs at locations 16-609238, 16-609239, 16-609240, and 16-609241; and 14–15 ft and 20–21 ft bgs at locations 16-609237, 16-609244, and 16-611856.

Samples will be analyzed as follows:

- Samples collected at location 16-609232 will be analyzed for PAHs.
- Samples collected at location 16-609237 will be analyzed for barium, selenium, and isotopic plutonium.
- Samples collected at location 16-609238 will be analyzed for aluminum, barium, calcium, chloride, acetone, and isotopic uranium.
- Samples collected at location 16-609239 will be analyzed for chromium.
- Samples collected at location 16-609240 will be analyzed for PAHs.
- Samples collected at location 16-609241 will be analyzed for acetone.
- Samples collected at location 16-609244 will be analyzed for selenium.
- Samples collected at location 16-611849 will be analyzed for isotopic plutonium.
- Samples collected at location 16-611851 will be analyzed for aluminum, barium, selenium, PAHs, and bis(2-ethylhexyl)phthalate.
- Samples collected at location 16-611853 will be analyzed for aluminum, barium, calcium, and selenium.
- Samples collected at location 16-611856 will be analyzed for selenium.

Samples will be collected from one new location (LWTL-1) east of existing sampling location 16-611853 to define the lateral extent of cobalt. Samples will be collected from depth intervals of 0–1 ft and 5-6 ft bgs and will be analyzed for cobalt.

Samples will be collected from one new location (LWTL-2) east of existing sampling location 16-609238 to define the lateral extent of aluminum and cobalt. Samples will be collected from depth intervals of 0-1 ft and 5–6 ft bgs and will be analyzed for aluminum and cobalt.

Proposed sampling locations at the Liquid Waste Trunk Line are shown in Figure 4.3-57. Table 4.3-15 summarizes the proposed sampling locations, depths, and analytical suites.

4.4 V-Site Subaggregate Area

The V-Site Subaggregate Area is a historic site located at the eastern edge of the World War II era complex (Figure 2.1-4). V-Site included buildings for HE processing, machining, and casting; HE magazines; material storage buildings; and the recently restored High Bay assembly building. V-Site was a critical area during the Manhattan Project, during which operations included handling, loading, and testing of replicas or mockups of the first atomic bomb. This subaggregate area burned during the 2000 Cerro Grande fire, which razed its remaining structures except for buildings 16-516 and 16-517. Building 16-516 [SWMU 16-017(t)-99] is the historic High Bay assembly building, where components of the first atomic bomb were fit-tested before its transport and detonation at the Trinity Site. All V-Site operations have long since ceased; however, the High Bay building has been restored for historical purposes (LANL 2000, 066885, p. 2).

All proposed sampling locations and depth intervals proposed for sites located within the V-Site Subaggregate Area must be approved by Laboratory Cultural Resources staff and the State Historical Preservation Office.

4.4.1 AOC C-16-068—Former Building 16-522

4.4.1.1 Site Description and Operational History

AOC C-16-068 is former building 16-522 located at V-Site in TA-16 approximately 125 ft southeast of former building 16-515 and just west of former buildings 16-519 and 16-520 (Figure 4.4-1). Constructed in 1944 and removed in 1945, building 16-522 does not appear on engineering drawings or in aerial photographs. The Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) identified the remnants of a building foundation located west of former buildings 16-519 and 16-520 to be the foundation of building 16-522. The 1990 SWMU report states that building operations involved beryllium (LANL 1990, 007514). A former site worker also indicated that the building was contaminated with beryllium (Blackwell 1983, 005823; LANL 1997, 055653, p. 8).

4.4.1.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at AOC C-16-068 except for the following:

- Lateral extent of copper south of the AOC
- Lateral extent of lead south of the AOC
- Lateral extent of mercury south of the AOC
- Lateral extent of zinc south of the AOC
- Lateral extent of acetone downgradient of location 16-611439
- Vertical extent of acetone at location 16-611439
- Vertical extent of bis(2-ethylhexyl)phthalate at location 16-611439

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.4-2, and detected organic chemicals are shown in Figure 4.4-3 for AOC C-16-068.

4.4.1.3 Proposed Activities at AOC C-16-068

Subsurface samples will be collected at previously sampled location 16-611439, extending the depth at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 11–12 ft and 17–18 ft bgs at location 16-611439 and will be analyzed for acetone and bis(2-ethylhexyl)phthalate.

Samples will be collected from two new locations (C68-1 and C68-2) downgradient of existing sampling location 16-611439 and south of the AOC to define the lateral extent of copper, lead, mercury, zinc, and acetone. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for copper, lead, mercury, zinc, and acetone.

Proposed sampling locations at AOC C-16-068 are shown in Figure 4.4-4. Table 4.4-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.2 AOC C-16-074—Storage Area

4.4.2.1 Site Description and Operational History

AOC C-16-074 is a storage area located at V-Site directly east of building 16-517 (Figure 4.4-5) The storage area consists of a concrete pad that covers an abandoned-in-place pit [SWMU 16-029(g2)]. The concrete pad is surrounded by asphalt pavement and was used as a drum storage area beginning in 1945. The 1990 SWMU report (LANL 1990, 007514) states that the drums contained spent HE-contaminated hydraulic oil. It is not known when use of the storage area ceased; however, the pad was described as being empty in 1997 (LANL 1997, 055653, p. 8). Rust rings from drums are visible, but no oil stains are present on the concrete pad (LANL 1997, 055653, p. 8). Drainage from the pad flows south.

4.4.2.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at AOC C-16-074 except for the following:

- Lateral extent of barium at location 16-05820
- Lateral extent of chromium at location 16-05820
- Lateral extent of cobalt at location 16-05820
- Lateral extent of copper at location 16-05820
- Lateral extent of lead at location 16-05820
- Lateral extent of nickel at location 16-05820
- Lateral extent of acetone at location 16-05820

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.4-6, and detected organic chemicals are shown in Figure 4.4-7 for AOC C-16-074.

4.4.2.3 Proposed Activities at AOC C-16-074

Although lateral extent is not defined for inorganic chemicals and acetone, additional sampling needed to define extent at AOC C-16-074 is not possible and is not proposed. The Laboratory's Cultural Resources Management Team (CRMT) staff has determined that additional sampling within the V-Site boundary fence using a drill rig could potentially damage this nationally significant historical site and is not allowed (McGehee 2011, 205355). During previous sampling work at V-Site, the CRMT monitor noted the potential for adverse effects to unsupported earthen berms and to the historic landscape adjacent to the V-Site buildings and former building areas and requested that drill rig operations be discontinued, resulting in a formal deviation from the original sampling plan. Possible adverse effects noted at the time included direct impacts from the use of heavy equipment and indirect impacts from vibrations from the operation of the drill rig.

The planned use of the area for the foreseeable future is for limited public tours of the buildings and noncontaminated surface areas. There are no plans in the foreseeable future to demolish any of the remaining V-Site buildings or to excavate under the foundations or former foundations of the buildings within the V-Site boundary fence.

Extent of contamination has been defined to the extent possible at this site. Risk under the current and foreseeable future land use will be evaluated using existing decision-level data and reported in the Phase II investigation report.

4.4.3 SWMU 16-029(x)—Former Sump and Outfall

4.4.3.1 Site Description and Operational History

SWMU 16-029(x) is a former HE sump and outfall located at V-Site in TA-16 (Figure 4.4-8). The sump, which measured 4 × 6 ft, received effluent from former HE-processing building 16-515 [SWMU 16-017(v)-99], former septic tank 16-527 [SWMU 16-006(g)], and former electroplating laboratory 16-100 [SWMU 16-025(x)]. Liquid wastes from these three SWMUs discharged through drainlines into the sump, located approximately 90 ft south of former building 16-515. HE residues were routinely collected from the sump and burned at the TA-16 burning grounds. Effluent flowed from the sump passing through seven manholes (structures 16-793, 16-794, 16-795, 16-796, 16-797, 16-798, and 16-799) to an outfall pond located southeast of V-Site (LANL 2000, 066885). The sump, drainline, and 3 yd^3 of soil were removed in 1997 (IT Corporation 1999, 087145, pp. 98–119). Originally, building 16-515 functioned as a warehouse, shop, and small office. Sometime during the 1950s or 1960s, the building was converted to a laboratory, inspection room, and repair area for HE parts. After the conversion, x-ray work, photo processing, and HE casting were conducted in the building (LANL 1999, 063973, p. 5).

4.4.3.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-029(x) except for the following:

- Vertical extent of barium at locations 16-03054, 16-03072, 16-03064, and 16-609477
- Lateral extent of boron east of location 16-03174
- Vertical extent of boron at locations 16-03082, 16-03092, and 16-03174
- Vertical extent of bromide at location 16-609485
- Vertical extent of chromium at location 16-611771
- Lateral extent of copper east of location 16-03174
- Vertical extent of manganese at locations 16-03082 and 16-03148
- Vertical extent of nickel at location 16-611771
- Vertical extent of selenium at locations 16-609481 and 16-611771
- Lateral extent of silver east of location 16-03174
- Vertical extent of silver at locations 16-03077, 16-03082, 16-03088, 16-03092, 16-03094, and 16-03100
- Lateral extent of acetone downgradient at locations 16-609461, 16-609462, 16-609467, 16-609473, and 16-609484
- Vertical extent of acetone at locations 16-609473 and 16-609476
- Vertical extent of bis(2-chloroethyl)ether at location 16-609480

- Vertical extent of 2,4-dinitrotoluene at location 16-609481
- Vertical extent of fluoranthene at location 16-609471
- Vertical extent of pyrene at location 16-03058
- Vertical extent of HMX at location 16-03058
- Vertical extent of 2-amino-4,6-dinitrotoluene at locations 16-03058, 16-03064, 16-03082, and 16-03092
- Vertical extent of 4-amino-2,6-dinitrotoluene at locations 16-03058, 16-03082, and 16-03092
- Vertical extent of RDX at locations 16-03064, 16-03066, 16-03077, 16-03104, 16-03153, 16-03156, 16-609479, 16-609481, 16-609482, and 16-609485
- Vertical extent of 1,3,5-trimethylbenzene at locations 16-609481 and 16-609482
- Vertical extent of TNT at locations 16-03064 and 16-03058
- Vertical extent of plutonium-238 at locations 16-609465 and 16-609481

Sampling locations and results for inorganic chemicals detected above BVs are shown on Plate 14, and detected organic chemicals are shown on Plate 15 for SWMU 16-029(x).

4.4.3.3 Proposed Activities at SWMU 16-029(x)

Subsurface samples will be collected at previously sampled locations 16-03054, 16-03058, 16-03064, 16-03066, 16-03072, 16-03077, 16-03082, 16-03088, 16-03092, 16-03094, 16-03100, 16-03104, 16-03148, 16-03153, 16-03156, 16-03174, 16-609465, 16-609471, 16-609473, 16-609476, 16-609477, 16-609479, 16-609480, 16-609481, 16-609482, 16-609485, and 16-611771, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 4–5 ft and 10–11 ft bgs at location 16-03082; 5–6 ft and 11–12 ft bgs at locations 16-03148, 16-03174, and 16-609471; 9–10 ft and 15–16 ft bgs at locations 16-03077, 16-03100, 16-03104, 16-609482, and 16-611771; 10–11 ft and 16–17 ft bgs at locations 16-03058, 16-03064, 16-03088, 16-03092, and 16-03094; 11–12 ft and 17–18 ft bgs at locations 16-03054, 16-03066, and 16-03072; 16–17 ft and 22-23 ft bgs at locations 16- 03153 and 16-03156; 19–20 ft and 25–26 ft bgs at locations 16-609473 and 16-609477; 21–22 ft and 27–28 ft bgs at location 16-609479; 22–23 ft and 28–29 ft bgs at location 16-609485; 23–24 ft and 29–30 ft bgs at locations 16-609465, 16-609476, and 16-609480; and 24–25 ft and 30–31 ft bgs at location 16-609481.

Samples will be analyzed as follows:

- Samples collected at location 16-03054 will be analyzed for barium.
- Samples collected at location 16-03058 will be analyzed for pyrene, HMX, TNT, 2-amino-4,6-dinitrotoluene, and 4-amino-2,6-dinitrotoluene.
- Samples collected at location 16-03064 will be analyzed for barium, 2-amino-4,6-dinitrotoluene, RDX, and TNT.
- Samples collected at location 16-03066 will be analyzed for RDX.
- Samples collected at location 16-03072 will be analyzed for barium.
- Samples collected at location 16-03077 will be analyzed for silver and RDX.

- Samples collected at location 16-03082 will be analyzed for boron, manganese, silver, 2-amino-4,6-dinitrotoluene, and 4-amino-2,6-dinitrotoluene.
- Samples collected at location 16-03088 will be analyzed for silver.
- Samples collected at location 16-03092 will be analyzed for boron, silver, 2-amino-4,6-dinitrotoluene, and 4-amino-2,6-dinitrotoluene.
- Samples collected at location 16-03094 will be analyzed for silver.
- Samples collected at location 16-03100 will be analyzed for silver.
- Samples collected at location 16-03104 will be analyzed for RDX.
- Samples collected at location 16-03148 will be analyzed for manganese.
- Samples collected at location 16-03153 will be analyzed for RDX.
- Samples collected at location 16-03156 will be analyzed for RDX.
- Samples collected at location 16-03174 will be analyzed for boron.
- Samples collected at location 16-609465 will be analyzed for isotopic plutonium.
- Samples collected at location 16-609471 will be analyzed for fluoranthene.
- Samples collected at location 16-609473 will be analyzed for acetone.
- Samples collected at location 16-609476 will be analyzed for acetone.
- Samples collected at location 16-609479 will be analyzed for RDX.
- Samples collected at location 16-609480 will be analyzed for bis(2-chloroethyl)ether.
- Samples collected at location 16-609481 will be analyzed for selenium, 2,4-dinitrotoluene, RDX, 1,3,5-trimethylbenzene, and isotopic plutonium.
- Samples collected at location 16-609482 will be analyzed for RDX and 1,3,5-trimethylbenzene.
- Samples collected at location 16-609485 will be analyzed for bromide and RDX.
- Samples collected at location 16-611771 will be analyzed for chromium, nickel, and selenium.

The investigation report indicated that the vertical extent of barium is not defined at location 16-609477 (LANL 2011, 111810.32, p. 205). However, the detected concentration of barium (48 mg/kg) in the sample from 11.5–13.5 ft bgs at location 16-609477 was below the maximum soil BV (51.6 mg/kg). Therefore, additional sampling for barium at location 16-609477 is not required.

Samples will be collected from new step-out locations 29x-1, 29x-3, 29x-4, 29x-5, and 29x-6 to define the lateral extent of acetone at existing sampling locations 16-609473, 16-609484, 16-609467, 16-609461, and 16-609462. Samples will be collected from depth intervals of 5–6 ft, 10–11 ft, 16–17 ft, and 22-23 ft bgs and will be analyzed for acetone.

Samples will be collected from new step-out location 29x-2 to define the lateral extent of boron, copper, and silver at existing sampling location 16-03174 Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, 10–11 ft, 16–17 ft, and 22–23 ft bgs and will be analyzed for boron, copper, and silver.

Proposed sampling locations at SWMU 16-029(x) are shown in Figure 4.4-9. Table 4.4-2 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.4 SWMU 16-029(w)—Former Sump and Outfall

4.4.4.1 Site Description and Operational History

SWMU 16-029(w) is a former HE sump and outfall located at V-Site in TA-16 (Figure 4.4-10). The sump measured 6 × 14 ft and was located approximately 10 ft to the east of a former electroplating laboratory (former building 16-100). The sump drained via a 4-in. pipe that passed through two manholes (structures 16-795 and 16-796) to an outfall located approximately 800 ft southeast of the electroplating laboratory. The electroplating laboratory consisted of a utility room and a work room (LANL 1994, 039440, p. 5-504). The sump and associated drainline were removed in 1997 (IT Corporation 1999, 087145, pp.54−56).

4.4.4.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-029(w) except for the following:

- Vertical extent of aluminum at locations 16-03409 and 16-05829
- Vertical extent of arsenic at location 16-03409
- Vertical extent of barium at location 16-05829
- Vertical extent of calcium at location 16-03409
- Vertical extent of cobalt at locations 16-03409 and 16-05829
- Vertical extent of copper at location 16-03409
- Vertical extent of lead at location 16-03409
- Vertical extent of magnesium at location 16-03409
- Vertical extent of nickel at location 16-03409
- Lateral extent of selenium downgradient of the SWMU (locations 16-609486 and 16-609488)
- Vertical extent of selenium at locations 16-05829, 16-609486, 16-609488, and 16-609489
- Vertical extent of vanadium at location 16-05829
- Vertical extent of zinc at location 16-03409
- Vertical extent of acetone at location 16-609489

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.4-11, and detected organic chemicals are shown in Figure 4.4-12 for SWMU 16-029(w).

4.4.4.3 Proposed Activities at SWMU 16-029(w)

Subsurface samples will be collected at previously sampled locations 16-03409, 16-05829, 16-609486, 16-609488, and 16-609489, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 9–10 ft and 15–16 ft bgs at location 16-05829; 11–12 ft and 17–18 ft bgs at location 16-03409; 19–20 ft and 25–26 ft bgs at location 16-609488; 22–23 ft and 28–29 ft bgs at location 16-609489; and 23–24 ft and 29–30 ft bgs at location 16-609486.

Samples will be analyzed as follows:

- Samples collected at location 16-03409 will be analyzed for aluminum, arsenic, calcium, cobalt, copper, lead, magnesium, nickel and zinc.
- Samples collected at location 16-05829 will be analyzed for aluminum, barium, cobalt, selenium, and vanadium.
- Samples collected at location 16-609486 will be analyzed for selenium.
- Samples collected at location 16-609488 will be analyzed for selenium.
- Samples collected at location 16-609489 will be analyzed for selenium and acetone.

Samples will be collected from two new locations (29w-1 and 29w-2) downgradient of existing sampling locations 16-609486 and 16-609488, to define the lateral extent of selenium. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, 11–12 ft, and 20–21 ft bgs and will be analyzed for selenium.

Proposed sampling locations at SWMU 16-029(w) are shown in Figure 4.4-13. Table 4.4-3 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.5 SWMU 16-025(x)—Potential Soil Contamination Associated with Former Building 16-100

4.4.5.1 Site Description and Operational History

SWMU 16-025(x) is an area of potentially contaminated soil located at V-Site in TA-16, approximately 250 ft southwest of former building 16-515 (Figure 4.4-14). The potential soil contamination is associated with a former electroplating laboratory (former building 16-100). The electroplating laboratory, a 25 × 33 ft building of wood-frame construction, contained a utility room and work room (LANL 1994, 039440, p. 5-504). In 1960, the building was removed by intentional burning.

4.4.5.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-025(x) except for the following:

- Vertical extent of antimony at location 16-609492
- Vertical extent of barium at location 16-609494
- Vertical extent of bromide at location 16-609494
- Vertical extent of lead at location 16-609494
- Vertical extent of uranium at locations 16-03015 and 16-03017

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.4-15 for SWMU 16-025(x).

4.4.5.3 Proposed Activities at SWMU 16-025(x)

Subsurface samples will be collected at previously sampled locations 16-03015, 16-03017, 16-609492, and 16-609494, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 9–10 ft and 15–16 ft bgs at location 16-03017; 11–12 ft

and 17–18 ft bgs at location 16-03015; 19–20 ft and 25–26 ft bgs at location 16-609494; and 23–24 ft and 29–30 ft bgs at location 16-609492.

Samples will be analyzed as follows:

- Samples collected at location 16-03015 will be analyzed for uranium.
- Samples collected at location 16-03017 will be analyzed for uranium.
- Samples collected at location 16-609492 will be analyzed for antimony.
- Samples collected at location 16-609494 will be analyzed for barium, bromide, and lead.

Proposed sampling locations at SWMU 16-025(x) are shown in Figure 4.4-16. Table 4.4-4 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.6 SWMU 16-017(w)-99—Former Storage Magazine 16-073

4.4.6.1 Site Description and Operational History

SWMU 16-017(w)-99 is a former storage magazine (structure 16-73) located at V-Site in TA-16, southeast of the intersection of V-Site and Burning Ground Roads (Figure 4.4-17). The magazine measured 10 × 12 ft and was of wood-frame construction surrounded by an earthen berm on three sides. The magazine was removed during D&D activities in 1995. This SWMU was originally designated as SWMU 16-017, a group of several structures in central TA-16. In 1999, SWMU 16-017 was separated into 24 SWMUs, each of which consists of a single structure.

4.4.6.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-017(w)-99 except for the following:

- Lateral extent of bromide downgradient of location 16-609446
- Vertical extent of cobalt at location 16-609442
- Vertical extent of perchlorate at locations 16-609444 and 16-609445
- Vertical extent of 2-butanone at location 16-609445

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.4-18 and detected organic chemicals are shown in Figure 4.4-19 for SWMU 16-017(w)-99.

4.4.6.3 Proposed Activities at SWMU 16-017(w)-99

Subsurface samples will be collected at previously sampled locations 16-609442, 16-609444, and 16-609445, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 11–12 ft and 17–18 ft bgs at all three locations.

Samples will be analyzed as follows:

- Samples collected at location 16-609442 will be analyzed for cobalt.
- Samples collected at location 16-609444 will be analyzed for perchlorate.
- Samples collected at location 16-609445 will be analyzed for perchlorate and 2-butanone.

Samples will be collected from one new locations (17w-1) downgradient of existing sampling location 16-609466 to define the lateral extent of bromide. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, and 11–12 ft bgs and will be analyzed for bromide.

Proposed sampling locations at SWMU 16-017(w)-99 are shown in Figure 4.4-20. Table 4.4-5 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.7 SWMU 16-034(m)—Potential Soil Contamination Associated with Former Building 16-86

4.4.7.1 Site Description and Operational History

SWMU 16-034(m) is an area of potentially contaminated soil located at the eastern portion of V-Site at TA-16 (Figure 4.4-21). The potential soil contamination is associated with a former laboratory (former building 16-86) built in 1945; the laboratory building was of wood-frame construction (including the floor) and measured 10 × 16 ft. The building housed temperature-controlled curing ovens. According to a former site worker, the building was used to dry plumbatol charges (Martin and Hickmott 1993, 087661). A second former site worker indicated that the building may also have been used as a rest house (Martin 1993, 052964.268). Use of the building ceased in 1959, and the building was removed by intentional burning in 1960.

4.4.7.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-034(m) except for the following:

- Lateral extent of aluminum downgradient of locations 16-611841 and 16-609247
- Vertical extent of aluminum at locations 16-609247 and 16-611841
- Vertical extent of barium at locations 16-609247 and 16-611841
- Lateral extent of selenium downgradient of locations 16-611840, 16-611841, 16-611845, and 16-609247
- Vertical extent of selenium at locations 16-609245, 16-609247, 16-611840, and 16-611841
- Lateral extent of 1,2,4-trimethylbenzene downgradient of location 16-611840 and southeast of the SWMU

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.4-22 and detected organic chemicals are shown in Figure 4.4-23 for SWMU 16-034(m).

4.4.7.3 Proposed Activities at SWMU 16-034(m)

Subsurface samples will be collected at previously sampled locations 16-609245, 16-609247, 16-611840, and 16-611841, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 14–15 ft and 20–21 ft bgs at all four locations.

Samples will be analyzed as follows:

- Samples collected at location 16-609245 will be analyzed for selenium.
- Samples collected at location 16-609247 will be analyzed for aluminum, barium, and selenium.
- Samples collected at location 16-611840 will be analyzed for selenium.
- Samples collected at location 16-611841 will be analyzed for aluminum, barium, and selenium.

Samples will be collected from one new location (34m-1) downgradient of existing sampling locations 16-609245 and 16-611840 to define the lateral extent of selenium and 1,2,4-trimethylbenzene. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, and 11–12 ft bgs and will be analyzed for selenium and 1,2,4-trimethylbenzene.

Samples will be collected from one new location (34m-2) downgradient of existing sampling locations 16-609247 and 16-611841 to define the lateral extent of aluminum and selenium. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, and 11–12 ft bgs and will be analyzed for aluminum and selenium.

Proposed sampling locations at SWMU 16-034(m) are shown in Figure 4.4-24. Table 4.4-6 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.8 AOC 16-024(n)—Potential Soil Contamination Associated with Former HE Magazine 16-84

4.4.8.1 Site Description and Operational History

AOC 16-024(n) is an area of potentially contaminated soil located in the eastern portion of V-Site at TA-16 (Figure 4.4-25). The potential soil contamination is associated with a former HE magazine (structure 16-84). The magazine was a 16 × 16 × 9 ft structure of wood-frame construction. It was used from 1944 through the early 1950s to store packaged HE and finished HE products before processing, though no production-scale HE operations were conducted in the area. Use of the magazine ceased in 1959, and the building was removed by intentional burning in 1960.

4.4.8.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at AOC 16-024(n) except for the following:

- Lateral extent of antimony downgradient of location 16-609303
- Lateral extent of cadmium downgradient of location 16-609301
- Lateral extent of copper northeast of location 16-16-609305 and northwest of location 16-609304
- Lateral extent of zinc northeast of location 16-16-609305, northwest of location 16-609304, and downgradient of location 16-609301

- Lateral extent of benzoic acid downgradient of locations 16-609301 and 16-609303
- Lateral extent of 4-isopropyltoluene downgradient of location 16-609303

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.4-26, and detected organic chemicals are shown in Figure 4.4-27 for AOC 16-024(n).

4.4.8.3 Proposed Activities at AOC 16-024(n)

The investigation report indicated that the lateral extent of zinc is not defined northwest of location 16-609301 and downgradient of location 16-609304 (LANL 2011, 111810.32, p. 228). However, the detected concentrations of zinc (57.9 mg/kg and 55.8 mg/kg, respectively) in the samples from 0-0.5 ft bgs at both locations were below the maximum soil BV (75.5 mg/kg). Therefore, additional sampling to define the lateral extent of zinc at locations 16-609301 and 16-609304 is not required.

Samples will be collected from one new location (24n-1) downgradient of existing sampling location 16-609301 to define the lateral extent of cadmium and benzoic acid. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for cadmium and benzoic acid.

Samples will be collected from one new location (24n-2) downgradient of existing sampling location 16-609303 to define the lateral extent of antimony, benzoic acid, and 4-isopropyltoluene. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for antimony, benzoic acid, and 4-isopropyltoluene.

Samples will be collected from one new location (24n-3) downgradient of existing sampling location 16-609304 to define the lateral extent of copper. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for copper.

Samples will be collected from one new location (24n-4) downgradient of existing sampling location 16-609305 to define the lateral extent of copper and zinc. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for copper and zinc.

Proposed sampling locations at AOC 16-024(n) are shown in Figure 4.4-28. Table 4.4-7 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.9 SWMU 16-034(n)—Potential Soil Contamination Associated with Former Building 16-83

4.4.9.1 Site Description and Operational History

SWMU 16-034(n) is an area of potentially contaminated soil located in the eastern portion of V-Site at TA-16 (Figure 4.4-29). The potential soil contamination is associated with a former laboratory (building 16-83). Built in 1945, the laboratory building was of wood-frame construction (including the floor) and measured 16 × 16 ft. The building housed temperature-controlled curing ovens. According to a former site worker, the building was used to dry plumbatol charges. A second former site worker indicated the building may also have been used as a magazine (Martin 1993, 052964.268). Use of the building ceased in 1959, and the building was removed by intentional burning in 1960.

4.4.9.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-034(n) except for the following:

- Lateral extent of antimony northwest of location 16-609775
- Vertical extent of antimony at locations 16-609772 and 16-609773
- Lateral extent of lead northeast of location 16-609773
- Vertical extent of lead at locations 16-04029 and 16-04032
- Lateral extent of mercury northeast of location 16-609773
- Vertical extent of mercury at locations 16-04029 and 16-04032
- Lateral extent of zinc northeast of location 16-609773
- Vertical extent of zinc at location 16-04029
- Lateral extent of perchlorate west of locations 16-609772 and 16-609775
- Vertical extent of perchlorate at locations 16-609772 and 16-609775
- Lateral extent of acetone southwest of location 16-609774 and northwest of location 16-609775
- Vertical extent of acetone at locations 16-609772, 16-609774, and 16-609775
- Lateral extent of benzo(b)fluoranthene northeast of location 16-609773
- Lateral extent of fluoranthene northeast of location 16-609773
- Lateral extent of 4-isopropyltoluene northeast of location 16-609773
- Vertical extent of 4-isopropyltoluene at location 16-609775
- Lateral extent of phenanthrene northeast of location 16-609773
- Lateral extent of pyrene northeast of location 16-609773
- Lateral extent of toluene northeast of location 16-609773

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.4-30, and detected organic chemicals are shown in Figure 4.4-31 for SWMU 16-034(n).

4.4.9.3 Proposed Activities at SWMU 16-034(n)

Subsurface samples will be collected at previously sampled locations 16-04029, 16-04032, 16-609772, 16-609773, 16-609774, and 16-609775, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 6–7 ft and 12–13 ft bgs at locations 16-04029 and 16-04032; and 11–12 ft and 17–18 ft bgs at locations 16-609772, 16-609773, 16-609774, and 16-609775.

Samples will be analyzed as follows:

- Samples collected at location 16-04029 will be analyzed for lead, mercury, and zinc.
- Samples collected at location 16-04032 will be analyzed for lead and mercury.

- Samples collected at location 16-609772 will be analyzed for antimony, perchlorate, and acetone.
- Samples collected at location 16-609773 will be analyzed for antimony.
- Samples collected at location 16-609774 will be analyzed for acetone.
- Samples collected at location 16-609775 will be analyzed for perchlorate, acetone, and 4-isopropyltoluene.

Samples will be collected from one new location (34n-1) northwest of existing sampling location 16-609775 to define the lateral extent of antimony, perchlorate, and acetone. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for antimony, perchlorate, and acetone.

Samples will be collected from one new location (34n-2) northeast of existing sampling location 16-609773 to define the lateral extent of lead, mercury, zinc, benzo(b)fluoranthene, fluoranthene, 4-isopropyltoluene, phenanthrene, pyrene, and toluene. Samples will be collected from depth intervals of 0–1 ft and 5–6 ft bgs and will be analyzed for lead, mercury, zinc, benzo(b)fluoranthene, fluoranthene, 4-isopropyltoluene, phenanthrene, pyrene, and toluene.

Samples will be collected from one new location (34n-3) downgradient of existing sampling location 16-16-609774 to define the lateral extent of acetone. Samples will be collected from depth intervals of 0-1 ft and 5–6 ft bgs and will be analyzed for acetone.

Samples will be collected from one new location (34n-4) downgradient of existing sampling location 16-609772 to define the lateral extent of perchlorate. Samples will be collected from depth intervals of 0-1 ft and 5–6 ft bgs and will be analyzed for perchlorate.

Proposed sampling locations at SWMU 16-034(n) are shown in Figure 4.4-32. Table 4.4-8 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.10 AOC 16-024(m)—Potential Soil Contamination Associated with Former HE Magazine 16-66

4.4.10.1 Site Description and Operational History

AOC 16-024(m) is an area of potentially contaminated soil located in the eastern portion of V-Site at TA-16, approximately 260 ft northwest of former building 16-61 (Figure 4.4-33). The potential soil contamination is associated with a former HE magazine (structure 16-66). Built in the mid-1940s, the magazine was a 6 × 6 × 7 ft structure of wood-frame construction with earthen berms on three sides and the top. It was used to store packaged HE and finished HE products before processing; though no production-scale HE operations were conducted in the area. Use of the magazine ceased in 1959, and the building was removed by intentional burning in 1960.

4.4.10.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at AOC 16-024(m) except for the following:

- Lateral extent of aluminum at locations 16-611836, 16-611839, and 16-611838
- Vertical extent of aluminum at location 16-611836
- Lateral extent of barium at locations 16-611838 and 16-611839

- Vertical extent of barium at locations 16-609251, 16-611836, 16-611837, and 16-609253
- Lateral extent of calcium at locations 16-611837, 16-611839, and 16-611838
- Vertical extent of calcium at location 16-611836
- Lateral extent of chromium at locations 16-611837, 16-611838, and 16-611839
- Lateral extent of copper at locations 16-611836, 16-611837, 16-611838, and 16-611839
- Vertical extent of copper at locations 16-609251 and 16-611836
- Vertical extent of cobalt at locations 16-611836 and 16-609251
- Lateral extent of lead at location 16-611838 and 16-611839
- Vertical extent of lead at locations 16-609250 and 16-611836
- Lateral extent of nickel at locations 16-611838 and 16-611839
- Vertical extent of nickel at location 16-609250
- Lateral extent of selenium at location 16-611839
- Vertical extent of selenium at locations 16-609253 and 16-611839
- Vertical extent of thallium at location 16-609250
- Lateral extent of vanadium at locations 16-611838 and 16-611839
- Vertical extent of vanadium at location 16-609251
- Vertical extent of acetone at location 16-611839
- Vertical extent of methylene chloride at locations 16-609253 and 16-611839
- Vertical extent of benzoic acid at location 16-04041
- Vertical extent of bis(2-ethylhexyl)phthalate at location 16-04041

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.4-34, and detected organic chemicals are shown in Figure 4.4-35 for AOC 16-024(m).

4.4.10.3 Proposed Activities at AOC 16-024(m)

Subsurface samples will be collected at previously sampled locations 16-04041, 16-609250, 16-609251, 16-609253, 16-611836, 16-611837, and 16-611839, extending the depths at each location to define the vertical extent of contamination. Samples will be collected from depth intervals of 6–7 ft and 12–13 ft bgs at location 16-04041, and 14–15 ft and 20–21 ft bgs at the remaining six locations.

Samples will be analyzed as follows:

- Samples collected at location 16-04041 will be analyzed for benzoic acid and bis(2-ethylhexyl)phthalate.
- Samples collected at location 16-609250 will be analyzed for lead, nickel, and thallium.
- Samples collected at location 16-609251 will be analyzed for barium, cobalt, copper, and vanadium.
- Samples collected at location 16-609253 will be analyzed for barium, selenium, and methylene chloride.

- Samples collected at location 16-611836 will be analyzed for aluminum, barium, calcium, cobalt, copper, and lead.
- Samples collected at location 16-611837 will be analyzed for barium.
- Samples collected at location 16-611839 will be analyzed for selenium, acetone, and methylene chloride.

The investigation report indicated that the lateral extent of chromium, lead, and vanadium is not defined at location 16-611839 based on detection in the sample collected from 5.5–6 ft bgs (LANL 2011, 111810.32, pp. 234–235). However, the detected concentrations of chromium (9.3 mg/kg), lead (12.6 mg/kg), and vanadium (19.1 mg/kg) were below the maximum Qbt 2, 3, 4 BVs (13 mg/kg, 15.5 mg/kg, and 21 mg/kg, respectively). Therefore, additional sampling to define the lateral extent of chromium, lead, and vanadium at location 16-611839 is not required.

Samples will be collected from one new location (24m-1) southeast of existing sampling location 16-611836 to define the lateral extent of aluminum and copper. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, and 11–12 ft bgs and will be analyzed for aluminum and copper.

Samples will be collected from one new location (24m-2) northeast of existing sampling location 16-611837 to define the lateral extent of calcium, chromium, and copper. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, and 11–12 ft bgs and will be analyzed for barium, calcium, chromium, and copper.

Samples will be collected from one new location (24m-3) northwest of existing sampling location 16-611838 to define the lateral extent of aluminum, barium, calcium, chromium, copper, lead, nickel, and vanadium. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, and 11–12 ft bgs and will be analyzed for aluminum, barium, calcium, chromium, copper, lead, nickel, and vanadium.

Samples will be collected from one new location (24m-4) southwest of existing sampling location 16-611839 to define the lateral extent of aluminum, barium, calcium, copper, nickel, and selenium. Samples will be collected from depth intervals of 0–1 ft, 5–6 ft, and 11–12 ft bgs and will be analyzed for aluminum, barium, calcium, copper, nickel, and selenium.

Proposed sampling locations at AOC 16-024(m) are shown in Figure 4.4-36. Table 4.4-9 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.11 SWMU 16-017(v)-99—Former HE Processing Building 16-515

4.4.11.1 Site Description and Operational History

SWMU 16-017(v)-99 is former HE-processing building 16-515, which was located in the western portion of V-site at TA-16 (Figure 4.4-37). Built in 1944, building 16-515 was initially used as a warehouse, shop, and small office. In 1945, the building was converted to a laboratory, inspection room, and repair area for HE parts. By the 1950s to 1960s, building 16-515 had undergone another remodel to accommodate x-ray work, photo processing, and HE casting (LANL 1999, 063973, p. 5). This remodel included covering portions of the wall near the x-ray machine with lead shielding and reconstructing the floors in the inspection and repair rooms to include a 1% slope to allow drainage to lead-lined troughs constructed into the floors. HE wastes from the casting room and wash water from cleaning HE residue were directed into these troughs, which drained to a sump on the west side of building 16-515. HE residues were collected from the sump and burned at the TA-16 burning grounds. The sump discharged effluent to a secondary sump [SWMU 16-029(x)], which in turn discharged to an area southeast of V-Site and eventually formed

the V-Site pond (LANL 2000, 066885). All operations at building 16-515 ceased by 1980 (LANL 1999, 063973, p. 6). Building 16-515 burned in the 2000 Cerro Grande fire.

4.4.11.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at SWMU 16-017(v)-99 except for the following:

- Vertical extent of aluminum at location 16-609436
- Vertical extent of barium at location 16-609436
- Vertical extent of calcium at location 16-609436
- Vertical extent of magnesium at location 16-609436
- Vertical extent of nickel at location 16-609436

Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.4-38, and detected organic chemicals are shown in Figure 4.4-39 for SWMU 16-017(v)-99.

4.4.11.3 Proposed Activities at SWMU 16-017(v)-99

Subsurface samples will be collected at previously sampled location 16-609436, extending the depth to define the vertical extent of contamination. Samples will be collected from depth intervals of 11–12 ft and 17–18 ft bgs and analyzed for aluminum, barium, calcium, magnesium, and nickel.

The results of the previous sampling at location 16-609436 showed benzo(a)pyrene to be present at 3.41 mg/kg in the sample from 0–0.5 ft bgs and 0.16 mg/kg in the sample from 5.5–6 ft bgs. Based on the decrease in concentrations with depth, vertical extent is defined at this location. However, benzo(a)pyrene was detected above the industrial SSL (2.34 mg/kg) in the surface soil, and the top 5.5 ft of soil will be removed from a 5-ft radius around location 16-609436. Confirmation samples will be collected to the north, south, east, and west of the excavation (locations 17v-1, 17v-2, 17v-3, and 17v-4) at depths of 0–1 ft and 5–6 ft bgs; all confirmation samples will be analyzed for benzo(a)pyrene.

Proposed sampling locations at SWMU 16-017(v)-99 are shown in Figure 4.4-40. Table 4.4-10 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.12 Courtyard Periphery Area

The V-Site Courtyard Area is of historical significance because of its association with the Manhattan Project. In this area, the Trinity test device was assembled and tests of Fat Man and Little Boy weapon components were conducted. The National Historic Preservation Act (NHPA) requires historic building management at the Laboratory. Compliance with the NHPA is regulated by the New Mexico Historic Preservation Division of the New Mexico Department of Cultural Affairs.

Six S-Site Aggregate Area SWMUs [16-006(h), 16-013, 16-017(q)-99, 16-017(r)-99, 16-017(s)-99, and 16-017(t)-99] are located within the V-Site Courtyard Area. Historic preservation restrictions prohibit the Laboratory from sampling within this historically protected area, thereby preventing the determination of the nature and extent of contamination for each of the six sites that lie within the V-Site Courtyard Area. Because of the historic preservation sampling restrictions, the Laboratory proposed sampling the periphery of the V-Site Courtyard Area to determine whether any contaminants are migrating off-site.

NMED conditionally approved the Laboratory's proposal (NMED 2009, 108102). Therefore, for the purposes of the S-Site Aggregate Area investigation, SWMUs 16-006(h), 16-013, 16-017(q)-99,16-017(r)-99, 16-017(s)-99, and 16-017(t)-99 have been assembled into a grouping designated as the Courtyard Periphery Area.

The Courtyard Periphery Area includes the six sites described below and the relatively level drainage area north of SWMU 16-013 and west of K-Site Road.

4.4.12.1 Site Description and Operational History

SWMU 16-006(h)–Pit

SWMU 16-006(h) is a 6 × 6 × 6 pit (structure 16-526) located at V-Site in TA-16 against the berm retaining wall of building 16-517 (Figure 4.4-41). Built in 1945, the pit housed a condensate pump for the TA-16 steam-heating distribution system. Condensate from steam radiators was routed to the pump pit to be returned to the source boiler. The condensate pump served buildings 16-515, 16-516, 16-519, and 16-520 (LANL 1997, 055512, p. 7). The 1990 SWMU report (LANL 1990, 007512) incorrectly listed structure 16-526 as a septic system. Field verification correctly identified the structure as a pit that housed a condensate pump (LANL 1994, 039440).

SWMU 16-013–Decommissioned Storage Area

SWMU 16-013 is a decommissioned storage area located in the V-Site Courtyard at TA-16 (Figure 4.4-41). The courtyard was open at the north end and surrounded on three sides by buildings or covered structures. Buildings 16-516 and 16-517 composed the west side of the courtyard; former building 16-518 (a covered structure with no walls) composed the east side; and former buildings 16-519, 16-520, and the south portion of former building 16-518 composed the south side. The storage area occupied the entire V-Site Courtyard, which is approximately 90 × 90 ft and paved with asphalt. The area was used to store drums containing spent HE-contaminated hydraulic oil. Spent solvents, barium nitrate, empty containers (formerly holding radioactive material), and empty drums (formerly containing lithium hydride) were stored in this area (DOE 1987, 008663). The beginning date of operation for this storage area is not known. Evidence of leaks was observed during a 1987 field visit. The area ceased being used for storage in 1989.

SWMU 16-017(q)-99–Storage Building 16-517

SWMU 16-017(q)-99 is building 16-517, located at V-Site in TA-16 (Figure 4.4-41). Constructed in 1944, building 16-517 was originally used as a laboratory and later for equipment storage. The building may also have been used as a storage magazine (LANL 1994, 039440, pp. 5-503, 6-23). Building 16-517 is one of the few V-Site buildings that did not burn in the Cerro Grande fire (LANL 2000, 066885). This building was originally designated as SWMU 16-017, a group of several structures in central TA-16. In 1999, SWMU 16-017 was separated into 24 SWMUs, each of which consists of a single structure.

SWMU 16-017(r)-99–Former Building 16-519

SWMU 16-017(r)-99 is former building 16-519, located at V-Site in TA-16 (Figure 4.4-41). Constructed in 1945, building 16-519 was initially used for varnishing and assembling Fat Man mockups. Later uses included storage and photo processing (LANL 1994, 039440, pp. 5-503, 6-32). Building 16-519 burned in the 2000 Cerro Grande fire. This building was originally designated as SWMU 16-017, a group of several

structures in central TA-16. In 1999, SWMU 16-017 was separated into 24 SWMUs, each of which consists of a single structure.

SWMU 16-017(s)-99–Former Building 16-520

SWMU 16-017(s)-99 is former building 16-520, located at V-Site in TA-16 (Figure 4.4-41). Constructed in 1945, building 16-520 was initially used for varnishing and assembling Fat Man mockups. Later uses included storage and photo processing (LANL 1994, 039440, pp. 5-503, 6-32). Building 16-520 burned in the 2000 Cerro Grande fire. This building was originally designated as SWMU 16-017, a group of several structures in central TA-16. In 1999, SWMU 16-017 was separated into 24 SWMUs, each of which consists of a single structure.

SWMU 16-017(t)-99–High Bay Building 16-516

SWMU 16-017(t)-99 is the historic High Bay (building 16-516) located at V-Site in TA-16 (Figure 4.4-41). Building 16-516 originally housed a laboratory used to fit-test the Trinity Device. Later uses included pioneer work in plastic explosives and storage of equipment (LANL 1994, 039440, pp. 5-503, 6-32). The building has been undergoing restoration since shortly after the time of the 2000 Cerro Grande fire. Building 16-516 was originally designated as SWMU 16-017, a group of several structures in central TA-16. In 1999, SWMU 16-017 was separated into 24 SWMUs, each of which consists of a single structure.

4.4.12.2 Nature and Extent of Contamination

The approved investigation report (LANL 2011, 111810.32; NMED 2011, 201633) concluded that the nature and extent have been defined for inorganic and organic chemicals and radionuclides detected at the V-Site Courtyard Periphery Area except for the following:

- Lateral and vertical extent of aluminum at locations 16-609266, 16-609288, and 16-609297
- Lateral extent of arsenic at location 16-609466
- Vertical extent of arsenic at locations 16-03009 and 16-609466
- Lateral extent of barium at locations 16-609255, 16-609266, 16-609267, 16-609287, 16-609288, 16-609289, 16-609297, and 16-609496
- Lateral extent of calcium at location 16-611437
- Lateral extent of cobalt at locations 16-609255, 16-609266, 16-609287, and 16-609288
- Lateral extent of copper at locations 16-609255, 16-609256, 16-609266, 16-609267, 16-609287, 16-609288, and 16-609289
- Vertical extent of copper at locations 16-03008 and 16-03009
- Lateral extent of lead at locations 16-609255, 16-609266, 16-609267, 16-609287, 16-609289, 16-609297, and 16-609496
- Vertical extent of lead at location 16-609496
- Vertical extent of selenium at location 16-03009
- Lateral extent of silver at locations 16-609256 and 16-609289
- Lateral and vertical extent of thallium at location 16-609496

- Lateral extent of zinc at locations 16-609256, 16-609266, 16-609267, 16-609287, and 16-609297
- Vertical extent of zinc at location 16-03009
- Lateral and vertical extent of acenaphthene at location 16-609289
- Lateral extent of acetone at locations 16-609255, 16-609256, 16-609266, 16-609289, 16-609296, and 16-611437
- Vertical extent of acetone at locations 16-609266, 16-609289, 16-609296, and 16-611437
- Lateral and vertical extent of anthracene at location 16-609289
- Lateral extent of benzo(a)anthracene at locations 16-609289 and 16-609497
- Vertical extent of benzo(a)anthracene at location 16-609289
- Lateral extent of benzo(a)pyrene at locations 16-609289 and 16-609499
- Vertical extent of benzo(a)pyrene at location 16-609289
- Lateral extent of benzo(b)fluoranthene at locations 16-609266, 16-609289, and 16-609497
- Vertical extent of benzo(b)fluoranthene at location 16-609289
- Lateral extent of benzo(g,h,i)perylene at locations 16-609289 and 16-609499
- Vertical extent of benzo(g,h,i)perylene at location 16-609289
- Lateral extent of chrysene at locations 16-609289, 16-609496, 16-609499, and 16-609500
- Vertical extent of chrysene at location 16-609289
- Lateral and vertical extent of dibenzofuran at location 16-609289
- Lateral and vertical extent of diphenylamine at location 16-609289
- Lateral extent of fluoranthene at locations 16-609289, 16-609296, 16-609300, 16-609496, 16-609497, 16-609499, and 16-609500
- Vertical extent of fluoranthene at locations 16-609289 and 16-609296
- Lateral and vertical extent of fluorene at location 16-609289
- Lateral extent of HMX at location 16-609498
- Lateral extent of indeno(1,2,3-cd)pyrene at locations 16-609266, 16-609267, 16-609289, and 16-609499
- Vertical extent of indeno(1,2,3-cd)pyrene at location 16-609289
- Lateral and vertical extent of 4-isopropyltoluene at locations 16-609255, 16-609266, and 16-609289
- Lateral and vertical extent of 2-methylnaphthalene at location 16-609289
- Lateral and vertical extent of naphthalene at location 16-609289
- Lateral extent of phenanthrene at locations 16-609289, 16-609300, 16-609496, and 16-609497
- Vertical extent of phenanthrene at location 16-609289
- Lateral extent of pyrene at locations 16-609289, 16-609296, 16-609300, 16-609496, 16-609497, and 16-609499
- Vertical extent of pyrene at locations 16-609289 and 16-609296

- Lateral extent of RDX at location 16-609498
- Lateral extent of toluene at locations 16-609255 and 16-609266
- Vertical extent of toluene at location 16-609266

Sampling locations and results for inorganic chemicals detected above BVs are shown on Plate 16, and detected organic chemicals are shown on Plate 17 for the Courtyard Periphery Area.

4.4.12.3 Proposed Activities for Courtyard Periphery Area

Although lateral and vertical extent is not defined for several inorganic and organic chemicals, the additional sampling needed to define extent at sites within the Courtyard Periphery Area is not possible and is therefore not proposed. The CRMT staff has determined that additional subsurface sampling within the V-Site boundary fence using a drill rig could potentially damage this nationally significant historical site and has, therefore, prohibited additional sampling (McGehee 2011, 205355). During previous sampling work at V-Site, the CRMT monitor noted the potential for adverse effects to the unsupported earthen berms and historic landscape adjacent to the V-Site buildings and required that drill rig operations be discontinued. This resulted in a formal deviation from the original sampling plan. Possible adverse effects noted at the time included direct impacts from the use of heavy equipment and indirect impacts from vibrations from the operation of the drill rig.

The planned use of the area for the foreseeable future is for limited public tours of the buildings and noncontaminated surface areas. There are no plans in the foreseeable future to demolish any of the remaining V-Site buildings or to excavate under the foundations or former foundations of the buildings within the V-Site boundary fence.

Extent of contamination has been defined to the extent possible at this site. Risk under the current and foreseeable future land use will be evaluated using existing decision-level data and reported in the Phase II investigation report.

4.4.13 SWMU 16-006(g)—Former Septic System

4.4.13.1 Site Description and Operational History

SWMU 16-006(g) is a former septic system located at TA-16 approximately 50 ft south of building 16-515 (Figure 4.4-41). The septic system consisted of a septic tank (structure 16-527) and its associated drainline. The system received effluent from sinks and toilets in a restroom located at the southeast section of building 16-515, an HE processing building. The drainline discharged into a manhole (structure 16-795). The septic tank, drainline, and manhole ceased to be used in 1970 when the manhole was removed. The drainline was removed in 1997, and the septic tank was removed in 1998 (IT Corporation 1999, 087145, pp. 25−27). The former location of the septic system is in the near vicinity of a historic earthen berm identified as a historic preservation area.

4.4.13.2 Nature and Extent of Contamination

SWMU 16-006(g) has not been sampled because of historic preservation constraints; therefore extent is not defined.

4.4.13.3 Proposed Activities for SWMU 16-006(g)

Although lateral and vertical extent is not defined, the sampling needed to define extent at SWMU 16-006(g) is not possible and is therefore not proposed. CRMT staff has determined that additional surface sampling within the V-Site boundary fence using a drill rig could potentially damage this nationally significant historical site and has, therefore, prohibited additional sampling (McGehee 2011, 205355). During previous sampling work at V-Site, the CRMT monitor noted the potential for adverse effects to the unsupported earthen berms and historic landscape adjacent to the V-Site buildings and required that drill rig operations be discontinued. This resulted in a formal deviation from the original sampling plan. Possible adverse effects noted at the time included direct impacts from the use of heavy equipment and indirect impacts from vibrations from the operation of the drill rig.

The planned use of the area for the foreseeable future is for limited public tours of the buildings and noncontaminated surface areas. There are no plans in the foreseeable future to demolish any of the remaining V-Site buildings or to excavate under the foundations or former foundations of the buildings within the V-Site boundary fence.

Extent of contamination in the vicinity of this site has been defined to the extent possible. Risk associated with the V-Site Courtyard Area under the current and foreseeable future land use will be evaluated using existing decision-level data and reported in the Phase II investigation report.

4.4.14 SWMU 16-031(c)—Former Drainline

4.4.14.1 Site Description and Operational History

SWMU 16-031(c) is a former drainline at V-Site in TA-16 (Figure 4.4-41). This drainline received sanitary and industrial effluent from former HE processing building 16-515 and discharged the effluent into a sump [SWMU 16-029(x)] located approximately 90 ft south of former building 16-515. The drainline and 1 yd^3 of soil were removed in 1997 (IT Corporation 1999, 087145, pp. 98−120). The former location of this drainline is in the near vicinity of a historic earthen berm identified as a historic preservation area.

4.4.14.2 Nature and Extent of Contamination

SWMU 16-031(c) has not been sampled because of historic preservation constraints; therefore extent is not defined.

4.4.14.3 Proposed Activities at SWMU 16-031(c)

Although lateral and vertical extent is not defined, the sampling needed to define extent at SWMU 16-031(c) is not possible and is therefore not proposed. CRMT staff has determined that additional subsurface sampling within the V-Site boundary fence using a drill rig could potentially damage this nationally significant historical site and has, therefore, prohibited additional sampling (McGehee 2011, 205355). During previous sampling work at V-Site, the CRMT monitor noted the potential for adverse effects to the unsupported earthen berms and historic landscape adjacent to the V-Site buildings and required that drill rig operations be discontinued. This resulted in a formal deviation from the original sampling plan. Possible adverse effects noted at the time included direct impacts from the use of heavy equipment and indirect impacts from vibrations from the operation of the drill rig.

The planned use of the area for the foreseeable future is for limited public tours of the buildings and noncontaminated surface areas. There are no plans in the foreseeable future to demolish any of the

remaining V-Site buildings or to excavate under the foundations or former foundations of the buildings within the V-Site boundary fence.

Extent of contamination in the vicinity of this site has been defined to the extent possible at this site. Risk associated with V-Site Courtyard Area under the current and foreseeable future land use will be evaluated using existing decision-level data and reported in the Phase II investigation report.

5.0 INVESTIGATION METHODS

A summary of investigation methods to be implemented is presented in Table 5.0-1. The standard operating procedures (SOPs) used to implement these methods are available at http://adep.lanl.gov/epdc/default.aspx.

Descriptions of the field investigation methods are provided below. Additional procedures may be added as necessary to describe and document quality-affecting activities.

Chemical analyses will be performed in accordance with the current analytical statement of work (LANL 2008, 109962). Accredited non-Laboratory contract analytical laboratories will use the most recent EPA– and industry-accepted extraction and analytical methods for the requested analyses.

5.1 Sampling Locations

Proposed sampling locations are identified for each site based on engineering drawings, surveyed locations of existing structures (from the geographic information system database), previous sampling locations, and topography or other features identified in the field (e.g., drainage channels and sediment accumulation areas). The coordinates of proposed new sampling locations will be obtained by georeferencing the points from the proposed sampling maps. Coordinates will be located and flagged or otherwise marked in the field using a differential global positioning system (GPS) unit. If any proposed sampling locations are moved because of field conditions, utilities, or other unexpected reasons, the new locations will be surveyed immediately following sample collection as described in section 5.2. Surveying and determining sampling locations will be conducted in accordance with the latest version of SOP-5028, Coordinating and Evaluating Geodetic Surveys.

5.2 Geodetic Surveys

Geodetic surveys will be conducted in accordance with the latest version of SOP-5028, Coordinating and Evaluating Geodetic Surveys, to locate historical structures and previous sampling locations and to document field activities such as sample collection. The surveyors will use a Trimble GeoXT handheld GPS, or equivalent, for the surveys. The coordinate values will be expressed in the New Mexico State Plane Coordinate System (transverse Mercator), Central Zone, North American Datum 1983. Elevations will be reported per the National Geodetic Vertical Datum of 1929. All GPS equipment used will meet the accuracy requirements specified in SOP-5028, Coordinating and Evaluating Geodetic Surveys.

5.3 Surface and Shallow Subsurface Sampling

Soil and tuff samples will be collected by the most efficient, least invasive method practicable. The methods will be determined by the field team based on site conditions such as topography, the nature of the material to be sampled, the depth intervals sampled, accessibility, and the level of disruption to Laboratory activities. Typically, samples will be collected using spade-and-scoop, hand-auger, or hollow-stem auger drilling methods. The deepest sample collected at every location shall be from undisturbed

soil or unweathered tuff; sample collection depths will be adjusted accordingly in the field and recorded on SCLs.

5.3.1 Spade-and-Scoop Method

Surface and shallow subsurface samples will be collected in accordance with SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples. Stainless-steel shovels, spades, or scoops will be used to collect sample material in approximately 6-in. increments. If the surface location is at bedrock, an axe or hammer and chisel may be used to collect samples. .Samples for VOC analysis will be transferred immediately from the sampler to the sample container to minimize the loss of VOCs during the sample collection process. Containers for VOC samples will be filled as completely as possible, leaving no or minimal headspace, and sealed with a Teflon-lined cap. .The remaining sample material will be placed in a stainless-steel bowl, after which it will be transferred to sterile sample collection jars or bags.

5.3.2 Sediment Samples

Sediment samples will be collected from areas of sediment accumulation that include sediment judged to be representative of the historical period of Laboratory operations (i.e., post-1943). Sediment samples will be collected using either spade-and-scoop and/or hand-auger methods. Proposed sediment sampling locations have been identified and are shown in the figures in the previous sections. The actual sediment sampling locations will be selected in the field based on geomorphic relationships in areas likely to have been affected by discharges from Laboratory operations. Because sediment is dynamic and subject to redistribution by runoff events, some locations may need to be adjusted when this work plan is implemented. In the course of collecting sediment samples, it may be determined, based on field conditions, that the selected location is not appropriate (e.g., the sediment is much shallower than anticipated, the sediment is predominantly coarse grained, or the sediment shows evidence of being older than the target age). Sediment sampling locations will be adjusted as appropriate based on geomorphic verification to ensure sampling locations are in the drainage(s) downgradient of the site. Any revised locations will be surveyed, and the updated coordinates will be submitted for inclusion in the appropriate database. The deepest sample collected at every location shall be from undisturbed soil or unweathered tuff; sample collection depths will be adjusted accordingly in the field and recorded on SCLs.

5.4 Subsurface Sampling

Subsurface sampling is proposed to include surface soil and fill, sediment, and tuff. Any adjustments will be noted in SCLs and recorded in the Phase II investigation report as deviations from this investigation work plan. Subsurface samples will be collected following the current version of SOP-06.24, Sample Collection from Split-Spoon Samplers and Shelby Tube Samplers, and SOP-06.26, Core-Barrel Sampling for Subsurface Earth Materials. The deepest sample collected at every location shall be from undisturbed soil or unweathered tuff; sample collection depths will be adjusted accordingly in the field and recorded on SCLs.

Samples for VOC analysis will be collected immediately upon retrieval of the split-spoon core barrel or hand auger to minimize the loss of VOCs during the sample-collection process. The remaining material will then be field screened for radioactivity and visually inspected. After collection of VOC samples and field screening, the remaining sample material will be placed in a stainless-steel bowl, and the material will be broken, if necessary, with a decontaminated rock hammer or stainless-steel spoon to allow material to fit into the sample containers.

A stainless-steel scoop and bowl will be used to transfer samples to sterile sample collection jars or bags for transport to the Sample Management Office (SMO). The sample collection tools will be decontaminated immediately before each sample is collected in accordance with an approved subcontractor procedure technically equivalent to SOP-5061, Field Decontamination of Equipment.

5.4.1 Hollow-Stem Auger

A hollow-stem auger may be used to drill holes deeper than approximately 15 ft or to shallower depths where hand-auger refusal is encountered. The hollow-stem auger consists of a hollow steel shaft with a continuous spiraled steel flight welded onto the exterior of the stem. The stem is connected to an auger bit; when it is rotated, it transports cuttings to the surface. The hollow stem of the auger allows insertion of drill rods, split-spoon core barrels, Shelby tubes, and other samplers through the center of the auger so samples may be retrieved during drilling operations. The hollow stem also acts to case the borehole core temporarily so a well casing (riser) may be inserted down through the center of the auger once the desired depth is reached, thus minimizing the risk of possible collapse of the borehole. A bottom plug or pilot bit can be fastened onto the bottom of the auger to keep out most of the soil and/or water that tends to clog the bottom of augers during drilling. Drilling without a center plug is acceptable if the soil plug, formed in the bottom of the auger, is removed before sampling or installing a well casing. The soil plug can be removed by washing out the plug using a side-discharge rotary bit or auguring out the plug with a solid-stem auger bit sized to fit inside the hollow-stem auger.

During sampling, the auger will be advanced to just above the desired sampling interval. The sample will be collected by driving a split-spoon sampler into undisturbed soil-tuff to the desired depth. Samples will be collected in accordance with SOP-06.26, Core-Barrel Sampling for Subsurface Earth Materials.

Samples for VOC analysis will be collected immediately upon retrieval of the split-spoon core barrel to minimize the loss of VOCs during the sample-collection process. Containers for VOC samples will be filled as completely as possible, leaving no or minimal headspace, and sealed with a Teflon-lined cap. If necessary, pieces small enough to fit into the sample container will be removed from the core using a decontaminated rock hammer or stainless-steel spoon. The remaining material will be field screened for radioactivity and visually inspected. After the VOC samples are collected and field screened, the remaining sample material will be placed in a stainless-steel bowl, and the material will be broken, if necessary, with a decontaminated rock hammer or stainless-steel spoon to fit the material into the sample containers.

5.4.2 Hand Auger

Hand augers may be used to advance shallow holes in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler. The hand auger is advanced by turning the auger into the soil or tuff until the barrel is filled. The auger is removed, and the sample for VOC analysis is transferred immediately from the sampler to the sample container to minimize the loss of VOCs during the sample collection process. Containers for VOC samples are filled as completely as possible, leaving no or minimal headspace, and sealed with a Teflon-lined cap. .The remaining sample material is placed in a stainless-steel bowl, after which the sample material is transferred to sterile sample collection jars or bags.

5.4.3 Borehole Abandonment

All boreholes will be properly abandoned according to the current version of SOP-5.03, Monitoring Well and RFI Borehole Abandonment.

Shallow boreholes (less than approximately 20 ft deep or advanced by methods other than a drill rig) will be abandoned by filling the borehole with bentonite chips, which are subsequently hydrated, in 1- to 2-ft lifts. The borehole will be visually inspected while the bentonite chips are added to ensure bridging does not occur.

Deeper boreholes will be pressure-grouted from the bottom of the borehole to the surface using the tremie pipe method. Acceptable grout materials include cement or bentonite grout, neat cement, or concrete.

The use of backfill materials, such as bentonite and grout, will be documented in a field logbook with regard to volume (calculated and actual), intervals of placement, and additives used to enhance backfilling. All borehole abandonment information will be provided in the Phase II investigation report.

5.5 Cleanup Activities

SWMUs 16-026(b), 16-026(e), 16-029(a), and 16-017(v)-99, and AOCs C-16-050 and 16-024(u), and the Shared Drainages are proposed for remediation under this investigation work plan. Excavation of waste, contaminated media, waste disposition, and confirmation sampling will be completed at these sites. This section summarizes proposed remediation activities. The general sequence of activities for waste excavation, transportation, disposal, and confirmation sampling is summarized below. Specific details are provided for each site in section 4.

5.5.1 Removal of Contaminated Soil

The general sequence of soil-removal activities is as follows.

- Mobilization
    - ❖ Assemble construction documents
    - ❖ Conduct construction readiness assessment
    - ❖ Conduct preconstruction meeting
    - ❖ Construct access roads
    - ❖ Construct staging area
    - ❖ Install temporary field trailers
    - ❖ Determine boundaries of contamination. First, coordinates of the area to be excavated will be surveyed and staked, as identified in this Phase II investigation work plan.
    - ❖ Mobilize heavy equipment to site
    - ❖ Identify underground utilities
- Site preparation
    - ❖ Install fencing
    - ❖ Install stormwater controls
    - ❖ Abandon/relocate utilities
    - ❖ Conduct preexcavation survey

- Removal of contaminated soil
    - ❖ Excavate contaminated soil
    - ❖ Stockpile and load rolloff container
    - ❖ Survey boundaries of excavation
    - ❖ Perform confirmation sampling
    - ❖ Characterize for dispositioning
    - ❖ Establish subgrade and conduct survey
    - ❖ Transport to off-site disposal facility
- Backfill
    - ❖ Backfill and compact
    - ❖ Vegetate surface
    - ❖ Survey finished surface
- Demobilize

5.5.2 Waste Management and Disposal

Management of all investigation waste, including waste generated during cleanup, is described in Appendix B.

5.5.3 Confirmation Sampling

Confirmation sampling will be performed at all remediated sites (section 4).

5.6 Chain of Custody and Sample Collection Logs

The collection, screening, and transport of samples will be documented on standard forms generated by the SMO. These include sample container labels and combined SCL/chain-of-custody (COC) forms. Sample collection portions of the combined forms will be completed at the time of sample collection and signed by the sampler and a reviewer who will verify the logs for completeness and accuracy. The COC portions of the combined forms will be completed and signed to verify the samples are not left unattended. Corresponding labels will be initialed and applied to each sample container, and custody seals will be placed around container lids or openings. Documentation and handling of all samples will be conducted in accordance with WES-EDA-QP-219, Sample Control and Field Documentation, and with SOP-5057, Handling, Packaging, and Transporting Field Samples.

5.7 Field-Screening Methods

The primary field-screening methods to be used on samples include radiological screening and organic vapor screening using a photoionization detector (PID). Field screening will be used primarily for health and safety purposes and for determining transportability of samples from the field sites to the SMO and from the SMO to the analytical laboratories. Field-screening results may be used at the discretion of the field personnel to collect additional samples beyond those planned or to extend the depth of sampling as required. Field changes to sampling plans will be approved by the subcontractor technical representative and will be documented on field paperwork and in the Phase II investigation report.

5.7.1 Radiological Screening

Based on the results of past sampling, field screening for radioactivity will be conducted primarily to ensure worker health and safety rather than to direct sampling. Radiological screening will target gross-alpha, -beta, and -gamma radiation. Field screening for alpha, beta, and gamma radiation will be conducted within 6 in. of soil and core material using appropriate field instruments as determined by the Laboratory's Health Physics Operations Group. Instruments will be calibrated in accordance with the Health Physics Operations Group procedures or equivalent procedures. All instrument calibration activities will be documented daily in the field logbooks in accordance with SOP-5181, Notebook and Logbook Documentation for Environmental Directorate Technical and Field Activities.

5.7.2 Organic Vapor Field Screening

Based on 2009 investigation results, significant VOC contamination is not expected to be encountered, and screening will be conducted for health and safety purposes.

Screening will be conducted using a PID capable of measuring quantities as low as 1.0 ppm. Vapor screening of soil, sediment, and subsurface core will be conducted using a PID equipped with an 11.7 electronvolt lamp. All samples will be screened for organic vapors in headspace gas in accordance with SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector.

The PID will be calibrated daily to the manufacturer's standard for instrument operation, and the daily calibration results will be documented in the field logbooks. All instrument background checks, background ranges, and calibration procedures will be documented daily in the field logbooks in accordance with SOP-5181, Notebook and Logbook Documentation for Environmental Directorate Technical and Field Activities.

5.8 Quality Assurance/Quality Control Samples

Quality assurance/quality control (QA/QC) samples will include field duplicate, equipment rinsate, and field trip blank samples. Field duplicate samples and field rinsate blanks will be collected at an overall frequency of at least 1 for every 10 regular samples or as directed by the current version of SOP-5059, Field Quality Control Samples. Field trip blanks will be collected at a rate of at least one per day on days when VOC samples are collected.

5.9 Laboratory Analytical Methods

The analytical suites for laboratory analyses and the specific analytical methods to be used are summarized in Table 5.9-1. All analytical methods are presented in the statement of work for analytical laboratories (LANL 2008, 109962). Sample collection and analysis will be coordinated with the SMO.

5.10 Health and Safety

The field investigations described in this Phase II investigation work plan will comply with all applicable requirements pertaining to worker health and safety. An integrated work document and a site-specific health and safety plan will be in place before fieldwork is conducted.

5.11 Equipment Decontamination

Equipment for drilling and sampling will be decontaminated before and after sampling activities to minimize the potential for cross-contamination. All equipment will be decontaminated using dry decontamination methods whenever possible to minimize generating liquid waste. All sampling equipment will be decontaminated using dry decontamination methods if possible, as described in SOP-5061, Field Decontamination of Equipment. If dry decontamination methods are not effective as determined by field screening of the equipment after dry decontamination, drilling/exploration equipment that may come in contact with the borehole will be decontaminated by steam-cleaning, hot-water pressure-washing, or another method before each new borehole is drilled. If wet decontamination is necessary, the equipment will be decontaminated on a high-density polyethylene liner on a temporary decontamination pad. Cleaning solutions and wash water will be collected and contained for proper disposal. Decontamination solutions will be sampled and analyzed to determine the final disposition of the wastewater and the effectiveness of the decontamination procedures.

5.12 IDW

IDW generated during field-investigation activities may include, but is not limited to, drill cuttings; contaminated soil; contaminated personal protective equipment (PPE), sampling supplies, and plastic; fluids from the decontamination of PPE and sampling equipment; and all other waste that has potentially come into contact with contamination.

All IDW generated during field-investigation activities will be managed in accordance with applicable EPA and NMED regulations, DOE orders, and Laboratory requirements. Appendix B presents the IDW management plan.

6.0 MONITORING PROGRAMS

Groundwater, sediment, and surface-water monitoring are conducted in the S-Site Aggregate Area as part of other environmental activities. This monitoring is summarized below.

6.1 Groundwater

Groundwater-monitoring activities in S-Site, located within the Water Canyon/Cañon de Valle watershed, are performed independent of this investigation and in accordance with the Laboratory's Interim Facility-Wide Groundwater Monitoring Plan, which is updated annually. This includes semiannual monitoring near or downstream from areas of past Laboratory activities. Monitoring locations include alluvial wells MSC-16-06293, MSC-16-06294, and MSC-16-06295; intermediate well CdV-37-1(i); regional groundwater observation wells R-48, CdV-R-37-2, and R-27; and Martin Spring (LANL 2011, 205715).

6.2 Stormwater

SWMUs 11-005(a), 11-005(b), 11-005(c), 11-006(b), 11-006(c), 11-006(d), 11-011(a), 11-011(b), 11-011(d), 16-001(e), 16-003(f), 16-026(b), 16-026(c), 16-026(d), and 16-026(e) are subject to the stormwater monitoring requirements of the Laboratory's NPDES individual permit (IP) for stormwater discharges from SWMUs and AOCs. Monitoring under the IP is performed using site-monitoring areas (SMAs) that monitor stormwater runoff from individual SWMUs and AOCs or groups of SWMUs and

AOCs. The SMAs in the S-Site Aggregate Area monitored under the IP and the corresponding SWMUs and AOCs include

- W-SMA-5.0: SWMUs 16-001(e), 16-003(f), 16-026(b), 16-026(c), 16-026(d), and 16-026(e);
- W-SMA-9.7: SWMUs 11-011(a) and 11-011(b);
- W-SMA-9.8: SWMU 11-005(c);
- W-SMA-9.9: SWMU 11-006(b); and
- W-SMA-10.0: SWMUs 11-005(a), 11-005(b), 11-006(c), 11-006(d), and 11-011(d).

The monitoring results are reported to EPA annually.

7.0 SCHEDULE

The schedule for the Phase II investigation is affected by work constraints associated with the protection of threatened and endangered species. The sites to be investigated are located within core habitat for the Mexican Spotted Owl, a federally protected threatened species. Breeding owls have historically been identified within the S-Site Aggregate Area. Work restrictions will prevent investigation activities from taking place from March 1 to August 31. Therefore, field investigation activities are proposed to begin on October 1, 2012. Field activities will take approximately 3 mo to complete. A submittal date of no later than July 31, 2013, is proposed for the Phase II investigation report.

8.0 REFERENCES AND MAP DATA SOURCES

8.1 References

The following list includes all documents cited in this plan. 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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8.2 Map Data Sources

Data sources used in original figures and/or plates created for this report are described below and identified by legend title.

Legend Item	Data Source
LANL Technical Areas	Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.
Paved roads	Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
Paved parking	Paved Parking; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
Dirt roads	Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
LANL structures	Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
LANL fence lines	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.
LANL communications lines	Communication Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 08 August 2002; as published 28 May 2009.
LANL electric lines	Primary Electric Grid; 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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LANL sewer lines	Sewer Line System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
LANL steam lines	Steam Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.
LANL water lines	Water Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
LANL industrial waste lines	Primary Industrial Waste Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 October 2008.
LANL historical sampling locations	Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, 5 June 2010.
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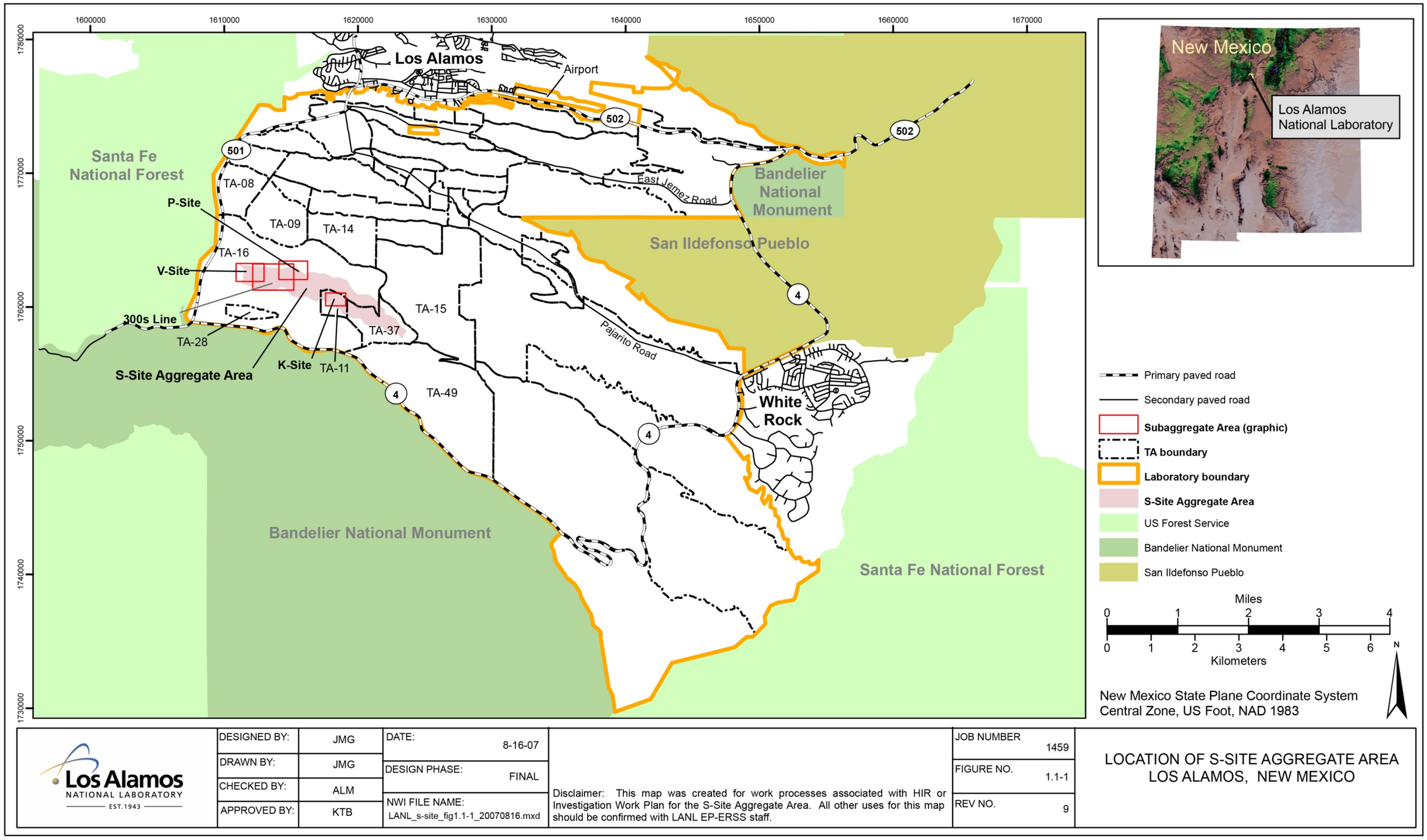
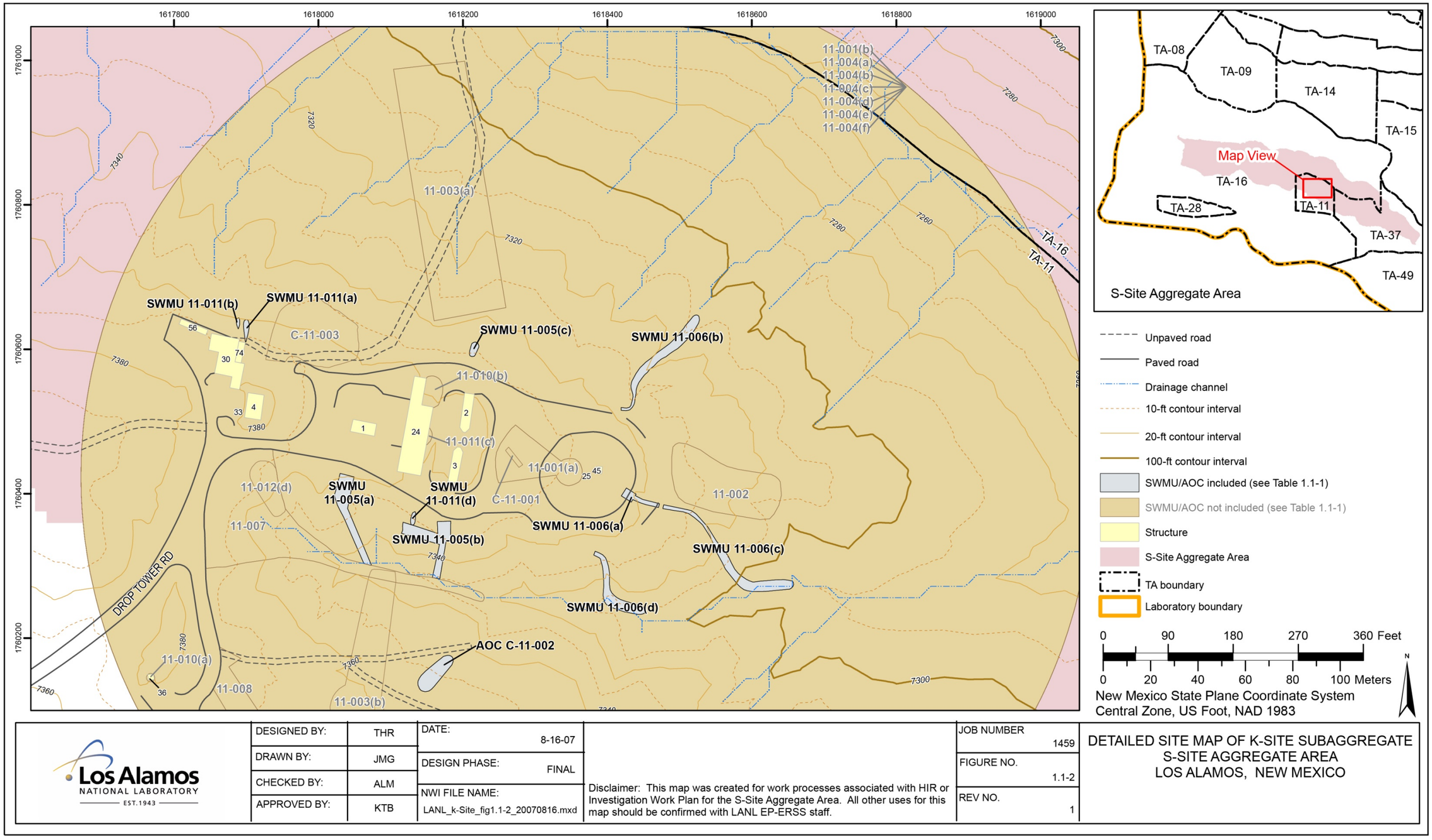
Contours	Hypsography, 2, 10, 20, and 100 Foot Contour Interval; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.



Los Alamos NATIONAL LABORATORY EST.1943	DESIGNED BY:	JMG	DATE: 8-16-07	Disclaimer: This map was created for work processes associated with HIR or Investigation Work Plan for the S-Site Aggregate Area. All other uses for this map should be confirmed with LANL EP-ERSS staff.	JOB NUMBER 1459	LOCATION OF S-SITE AGGREGATE AREA LOS ALAMOS, NEW MEXICO
	DRAWN BY:	JMG	DESIGN PHASE: FINAL		FIGURE NO. 1.1-1	
	CHECKED BY:	ALM	NWI FILE NAME: LANL_s-site_fig1.1-1_20070816.mxd		REV NO. 9	
	APPROVED BY:	KTB				

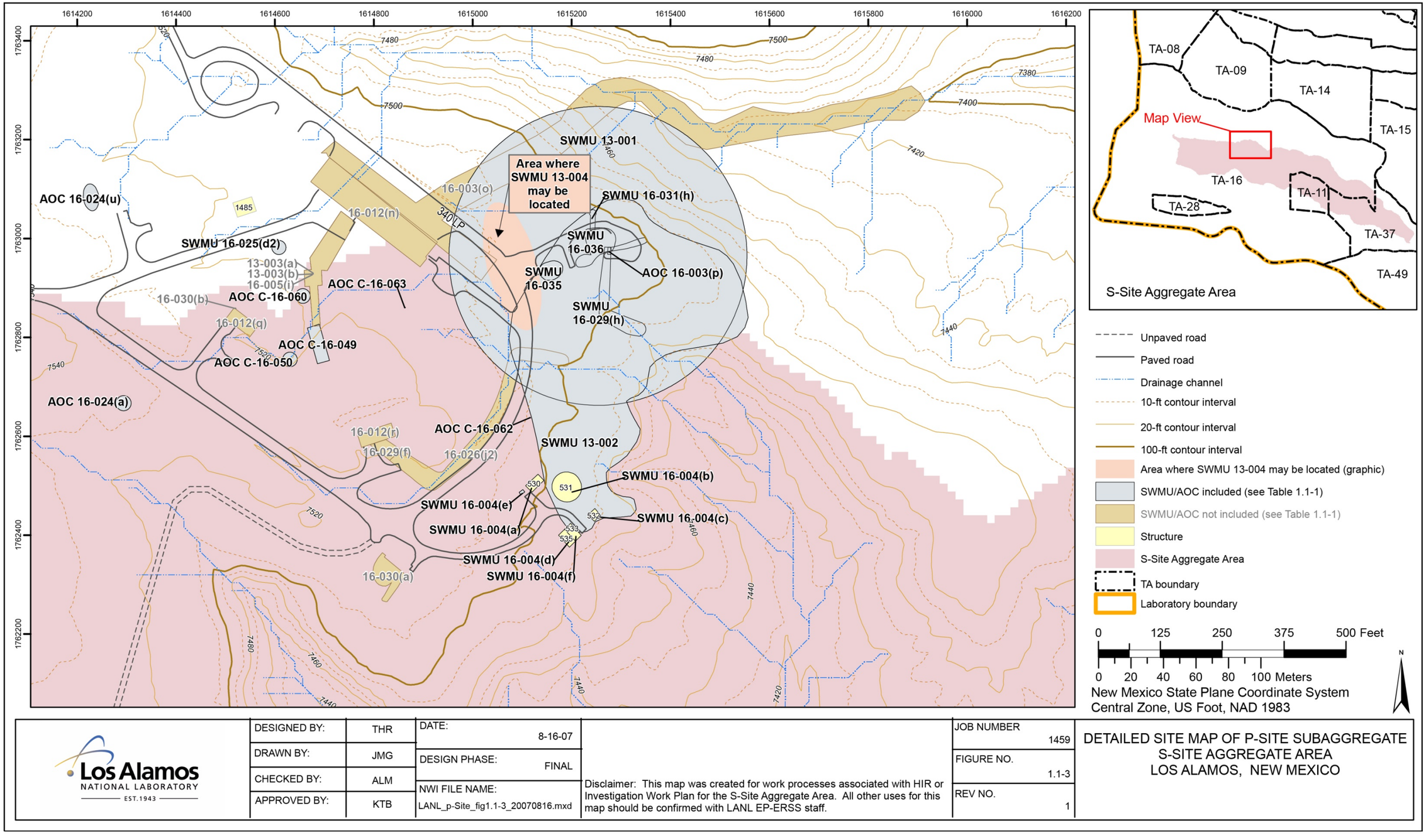
Figure 1.1-1 Location of S-Site Aggregate Area with respect to Laboratory technical areas



Los Alamos NATIONAL LABORATORY EST.1943

DESIGNED BY:	THR	DATE: 8-16-07	Disclaimer: This map was created for work processes associated with HIR or Investigation Work Plan for the S-Site Aggregate Area. All other uses for this map should be confirmed with LANL EP-ERSS staff.	JOB NUMBER 1459	DETAILED SITE MAP OF K-SITE SUBAGGREGATE S-SITE AGGREGATE AREA LOS ALAMOS, NEW MEXICO
DRAWN BY:	JMG	DESIGN PHASE: FINAL		FIGURE NO. 1.1-2	
CHECKED BY:	ALM	NWI FILE NAME: LANL_k-Site_fig1.1-2_20070816.mxd		REV NO. 1	
APPROVED BY:	KTB				

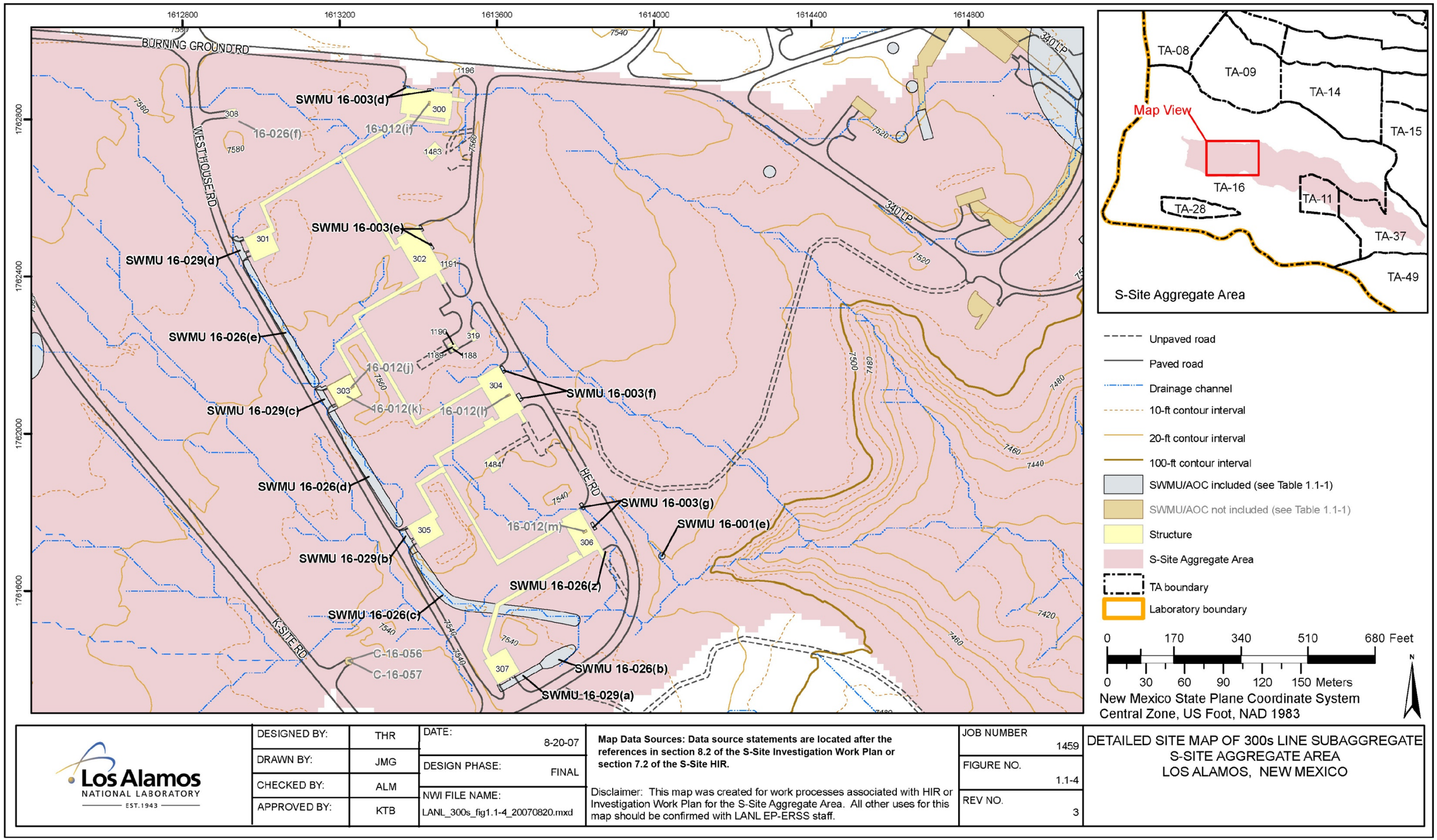
Figure 2.1-1 Site map of K-Site Subaggregate Area



Los Alamos NATIONAL LABORATORY EST.1943

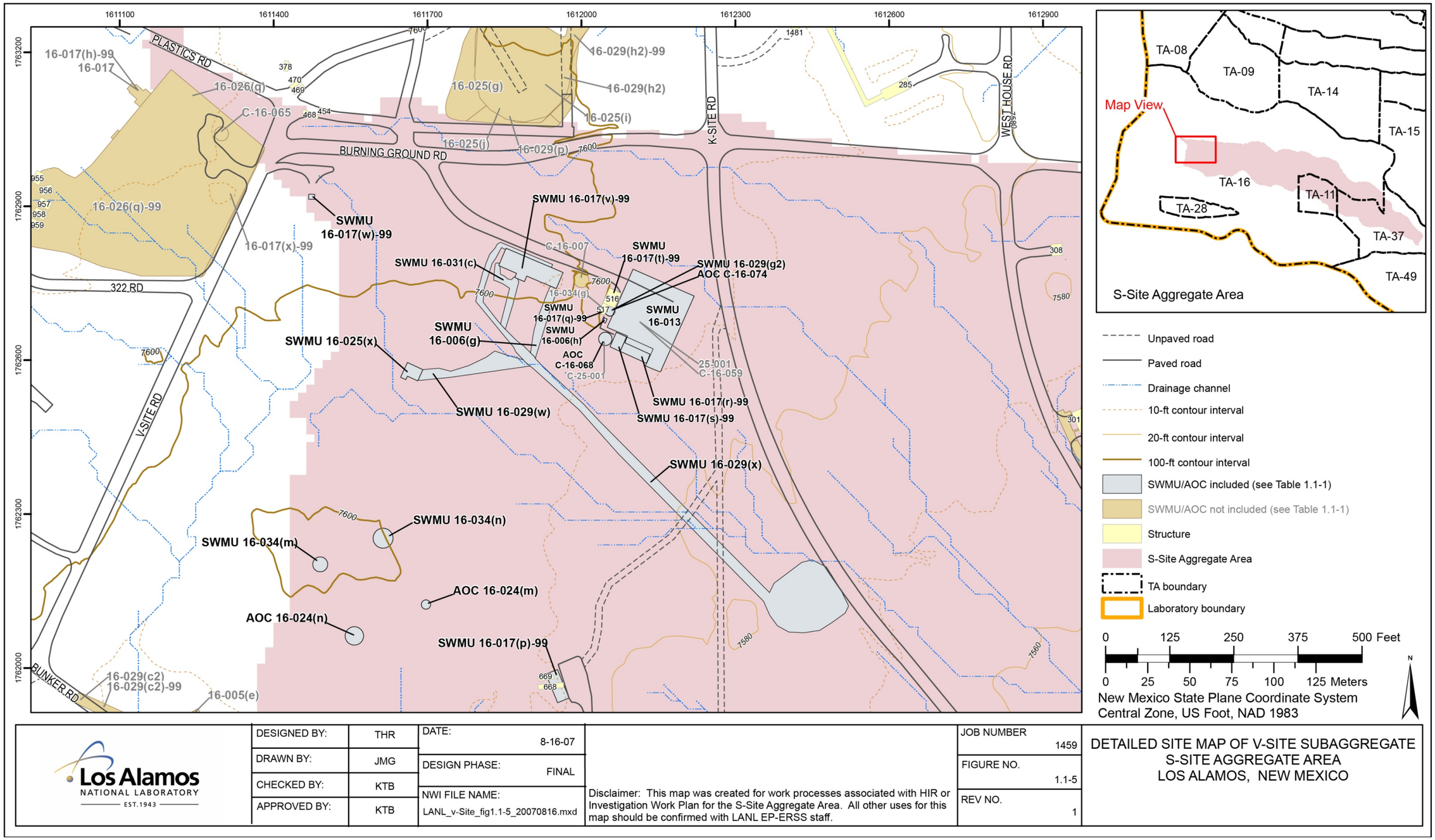
DESIGNED BY:	THR	DATE: 8-16-07	Disclaimer: This map was created for work processes associated with HIR or Investigation Work Plan for the S-Site Aggregate Area. All other uses for this map should be confirmed with LANL EP-ERSS staff.	JOB NUMBER 1459	DETAILED SITE MAP OF P-SITE SUBAGGREGATE S-SITE AGGREGATE AREA LOS ALAMOS, NEW MEXICO
DRAWN BY:	JMG	DESIGN PHASE: FINAL		FIGURE NO. 1.1-3	
CHECKED BY:	ALM	NWI FILE NAME: LANL_p-Site_fig1.1-3_20070816.mxd		REV NO. 1	
APPROVED BY:	KTB				

Figure 2.1-2 Site map of P-Site Subaggregate Area



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

Figure 2.1-3 Site map of 300s Line Subaggregate Area



Los Alamos NATIONAL LABORATORY EST.1943	DESIGNED BY: THR DRAWN BY: JMG CHECKED BY: KTB APPROVED BY: KTB	DATE: 8-16-07 DESIGN PHASE: FINAL NWI FILE NAME: LANL_v-Site_fig1.1-5_20070816.mxd	Disclaimer: This map was created for work processes associated with HIR or Investigation Work Plan for the S-Site Aggregate Area. All other uses for this map should be confirmed with LANL EP-ERSS staff.	JOB NUMBER 1459 FIGURE NO. 1.1-5 REV NO. 1	DETAILED SITE MAP OF V-SITE SUBAGGREGATE S-SITE AGGREGATE AREA LOS ALAMOS, NEW MEXICO

Figure 2.1-4 Site map of V-Site Subaggregate Area

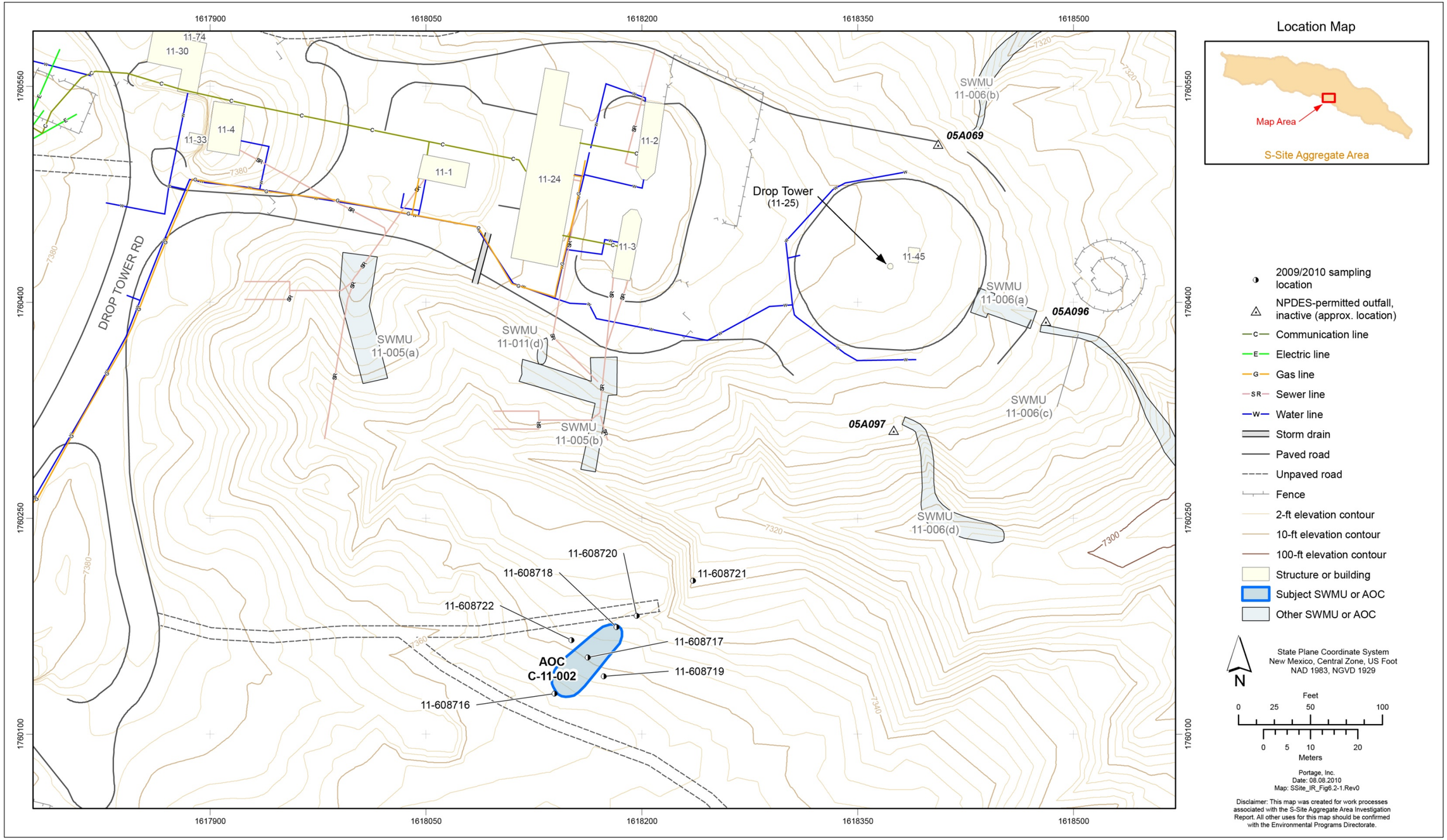


Figure 4.1-1 Site map and sampling locations at AOC C-11-002

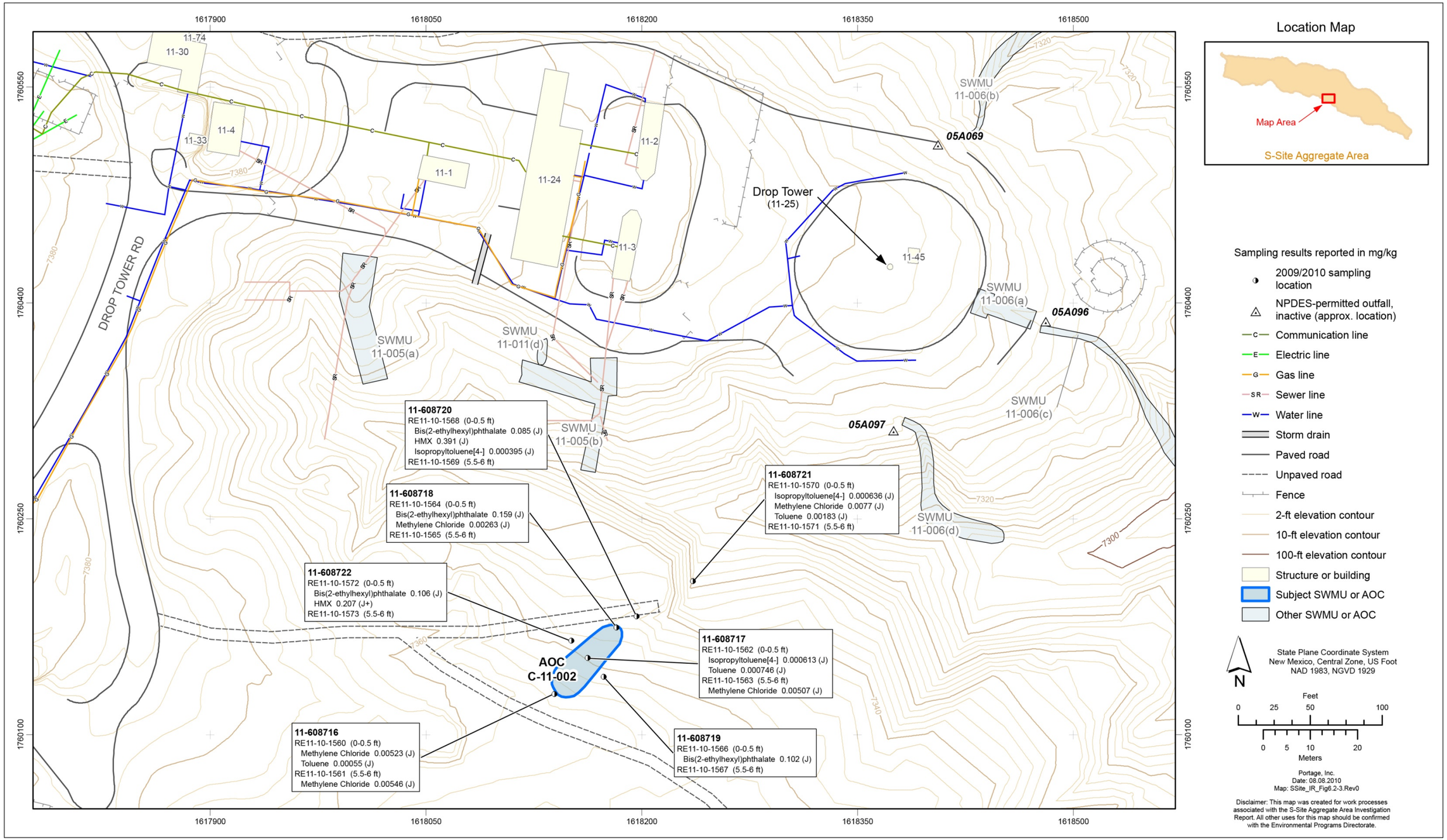


Figure 4.1-2 Organic chemicals detected at AOC C-11-002

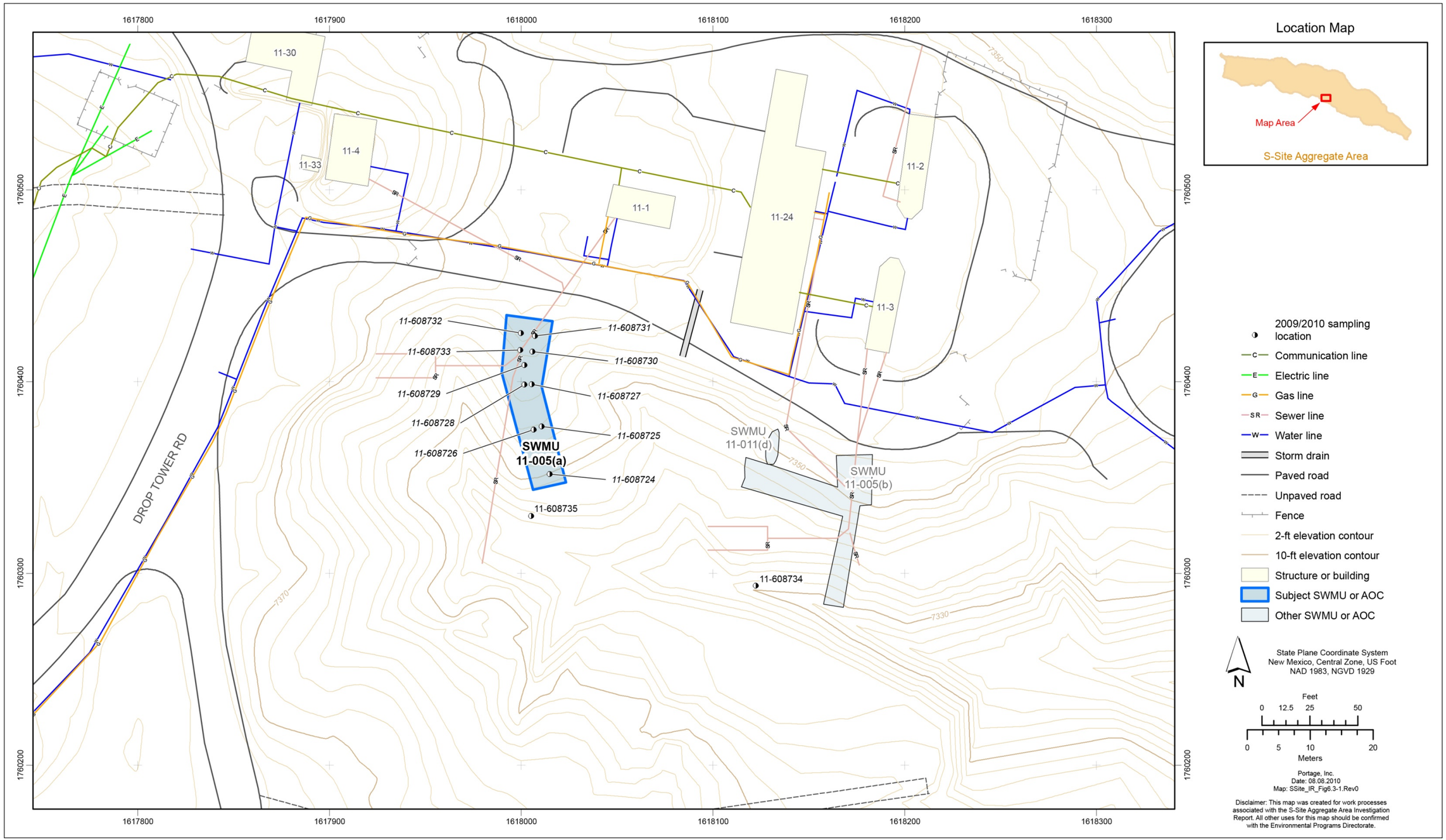


Figure 4.1-3 Site map and sampling locations at SWMU 11-005(a)

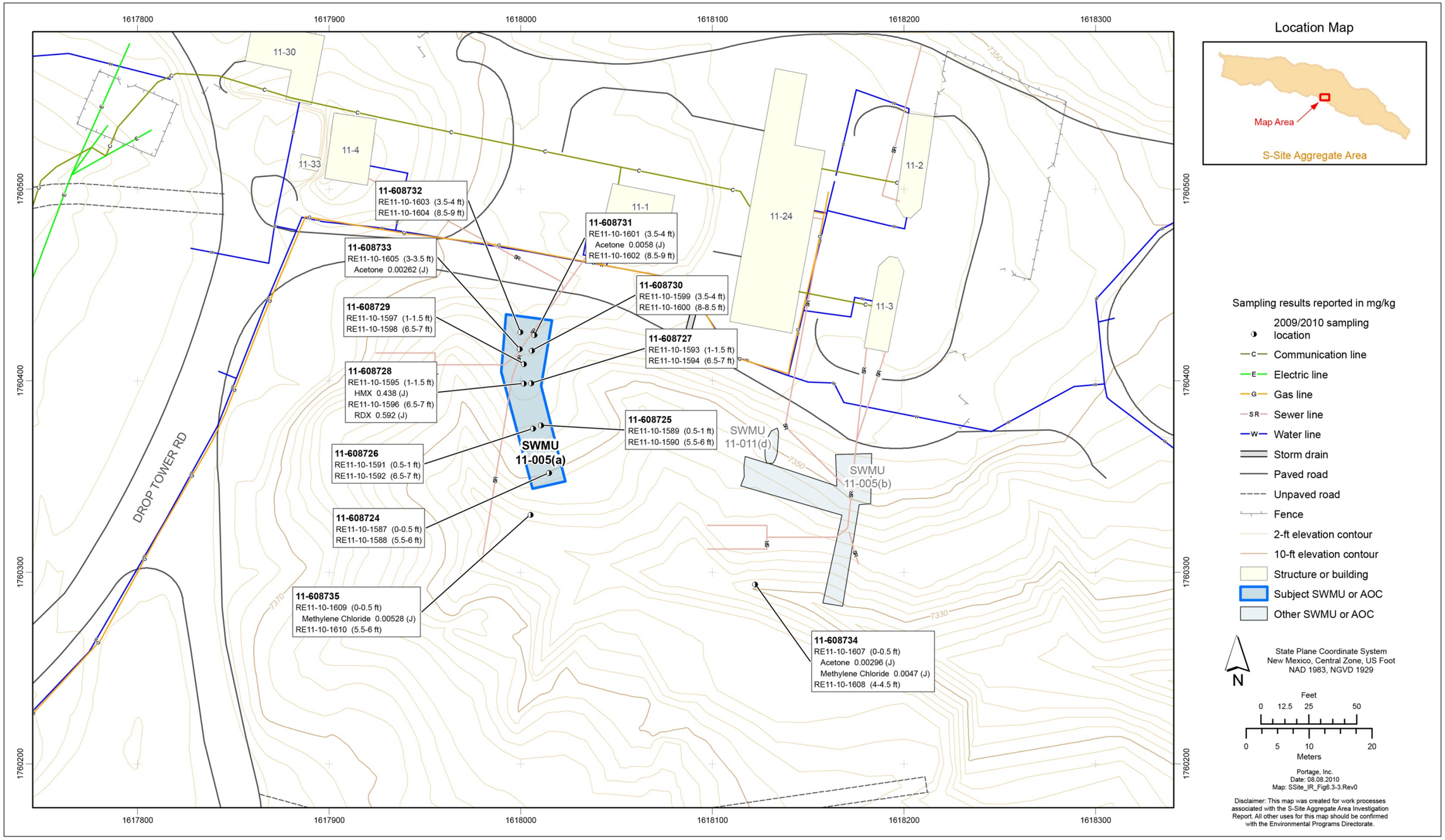


Figure 4.1-4 Organic chemicals detected at SWMU 11-005(a)

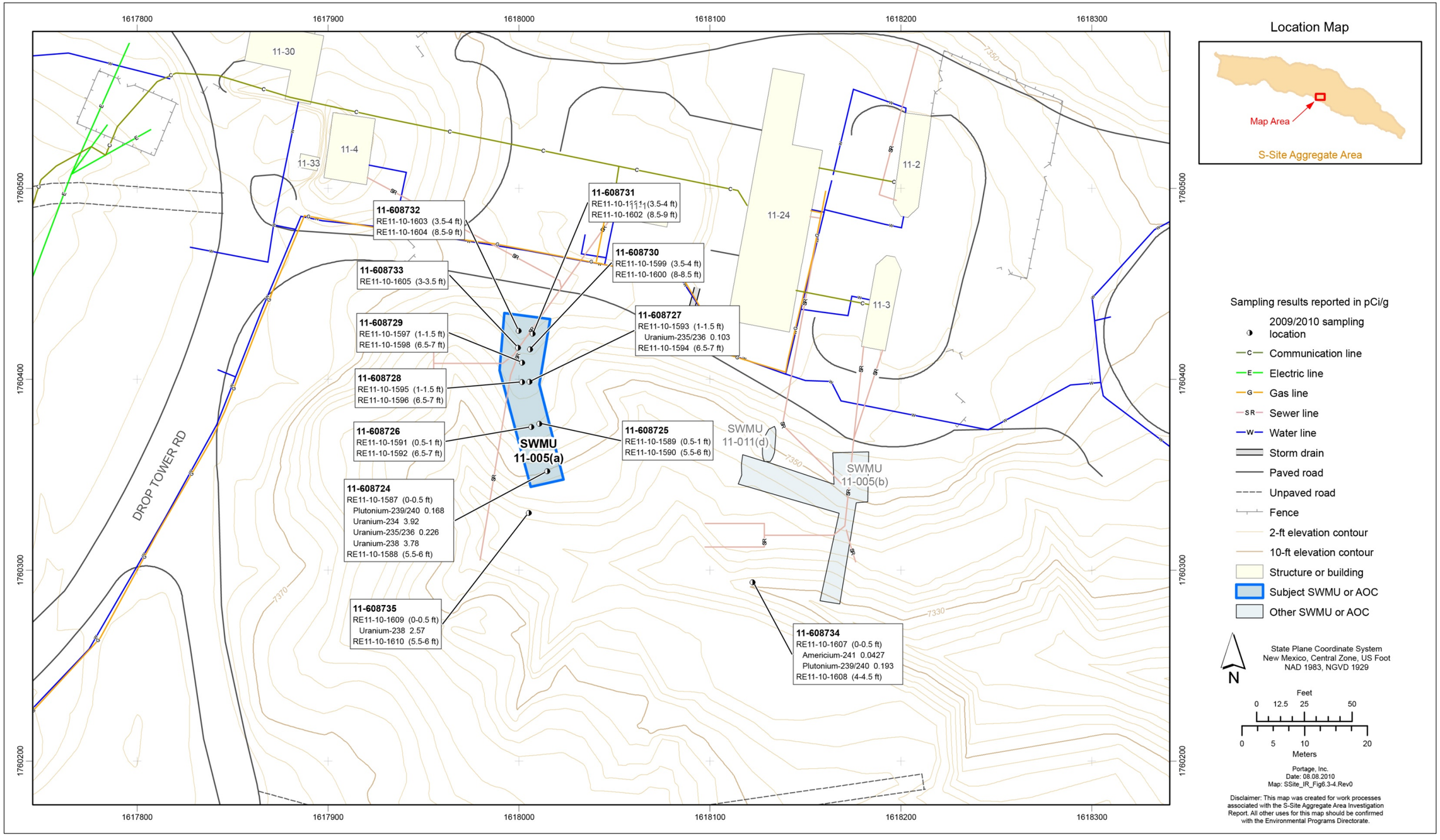


Figure 4.1-5 Radionuclides detected or detected above BVs/FVs at SWMU 11-005(a)

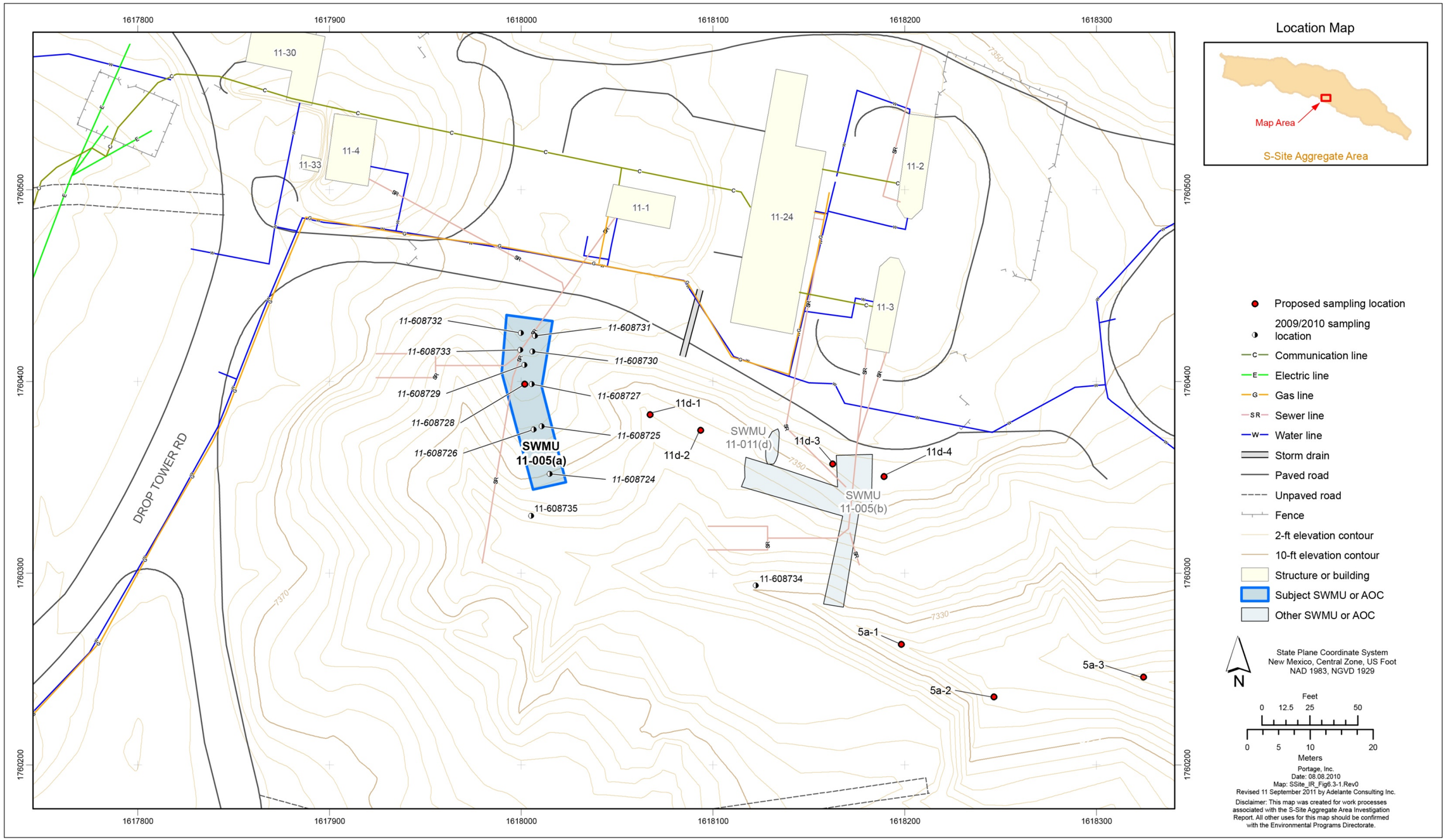


Figure 4.1-6 Proposed sampling locations at SWMU 11-005(a)

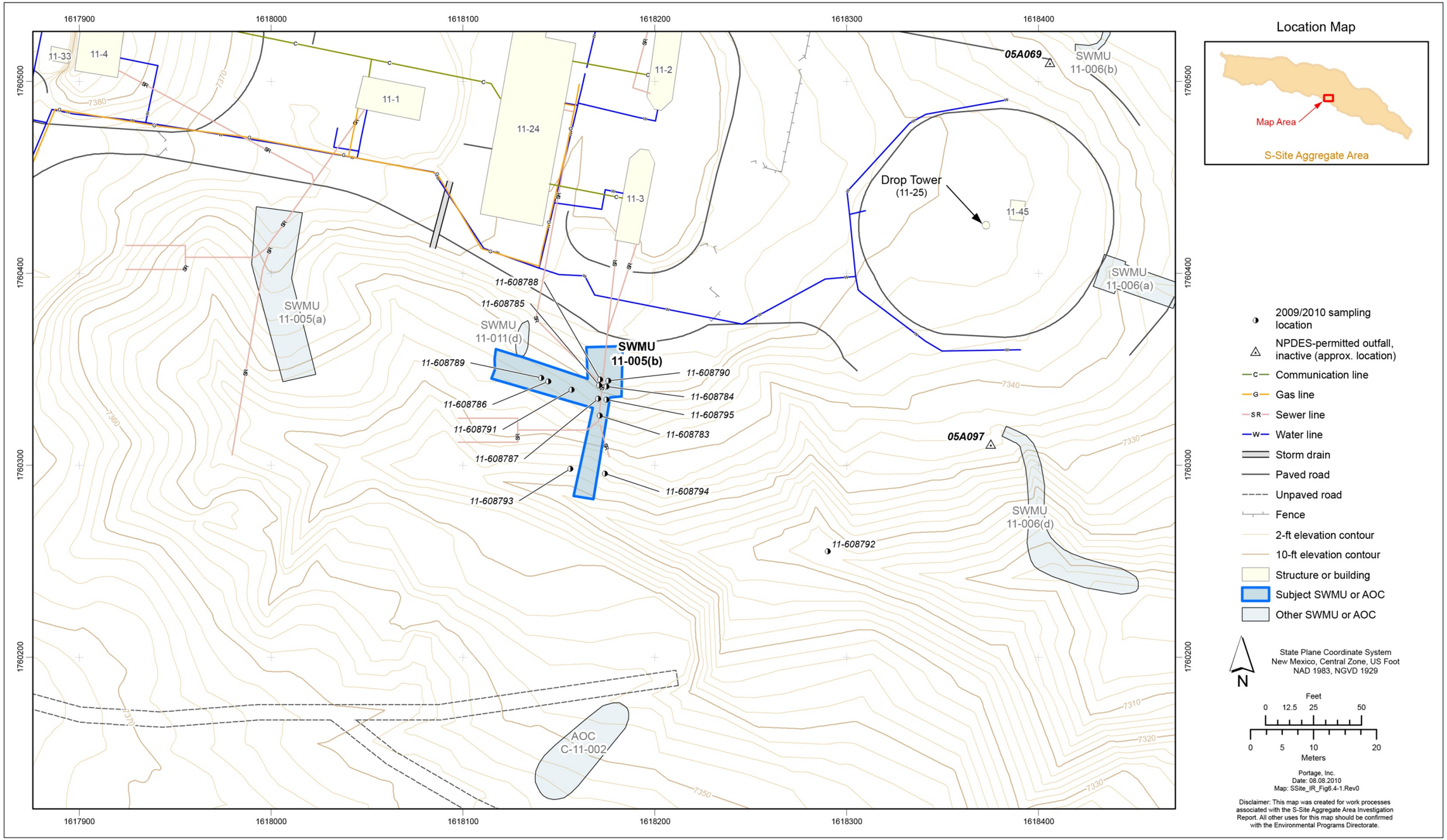


Figure 4.1-7 Site map and sampling locations at SWMU 11-005(b)

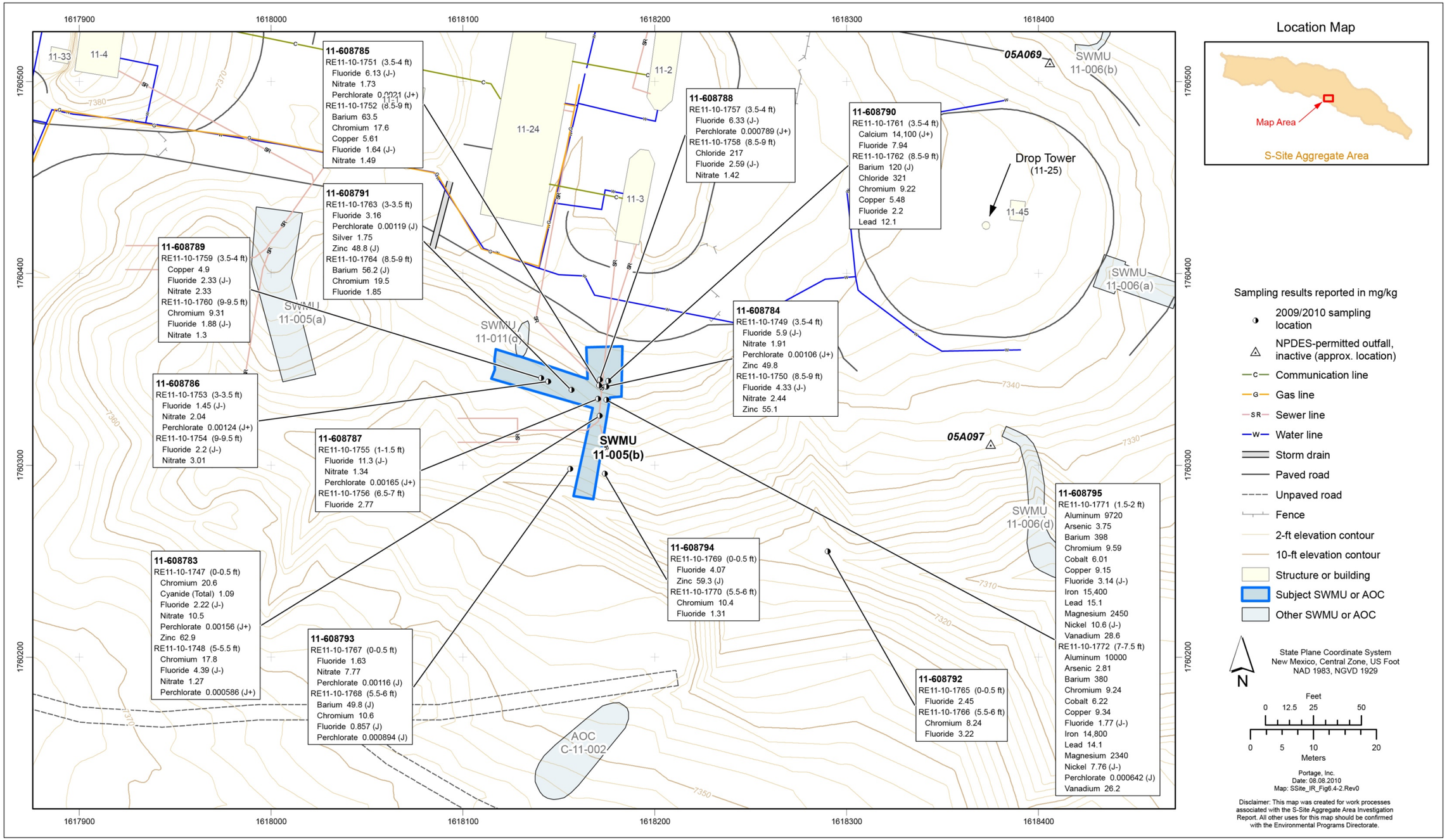


Figure 4.1-8 Inorganic chemicals detected or detected above BVs at SWMU 11-005(b)

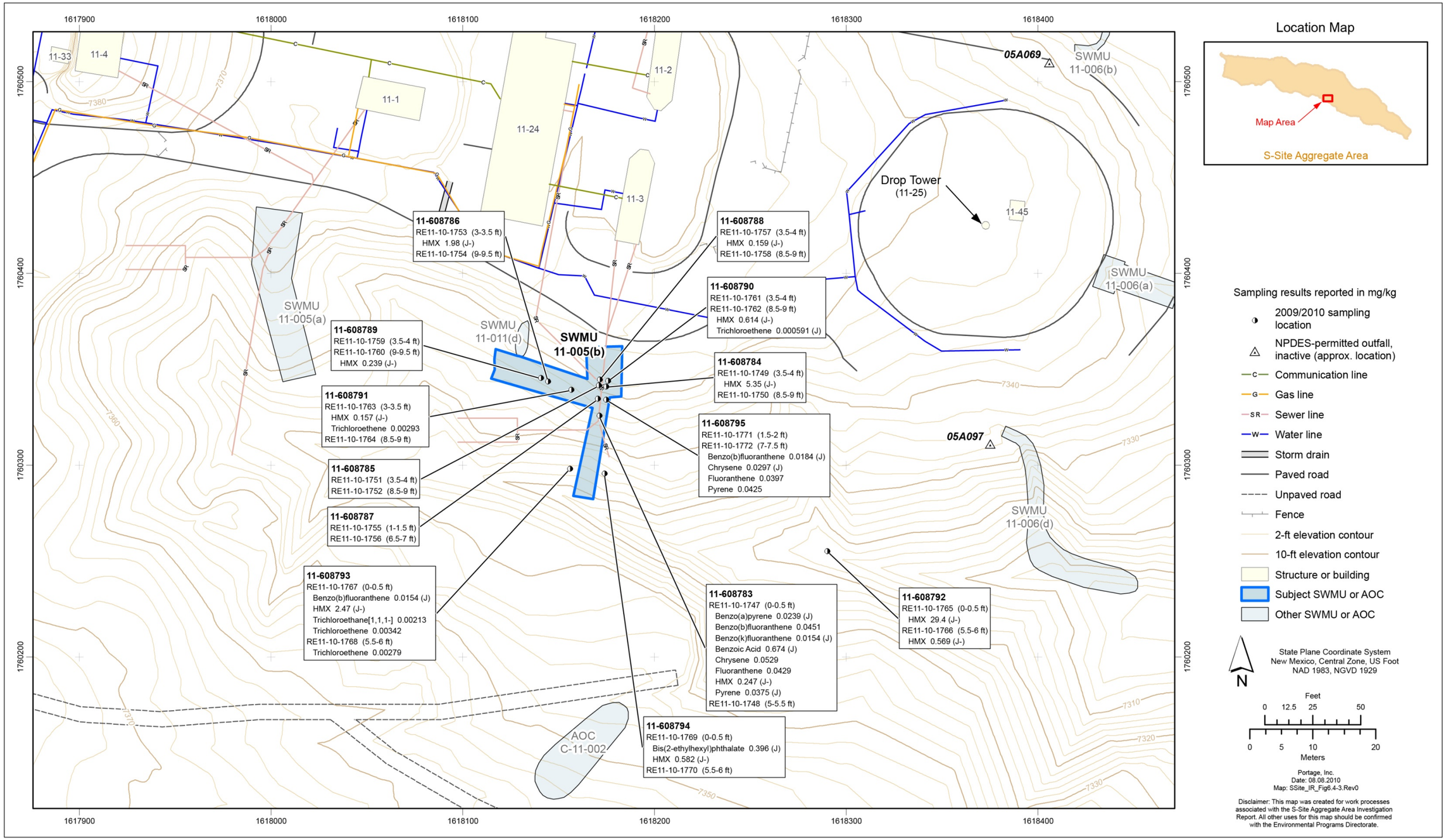


Figure 4.1-9 Organic chemicals detected at SWMU 11-005(b)

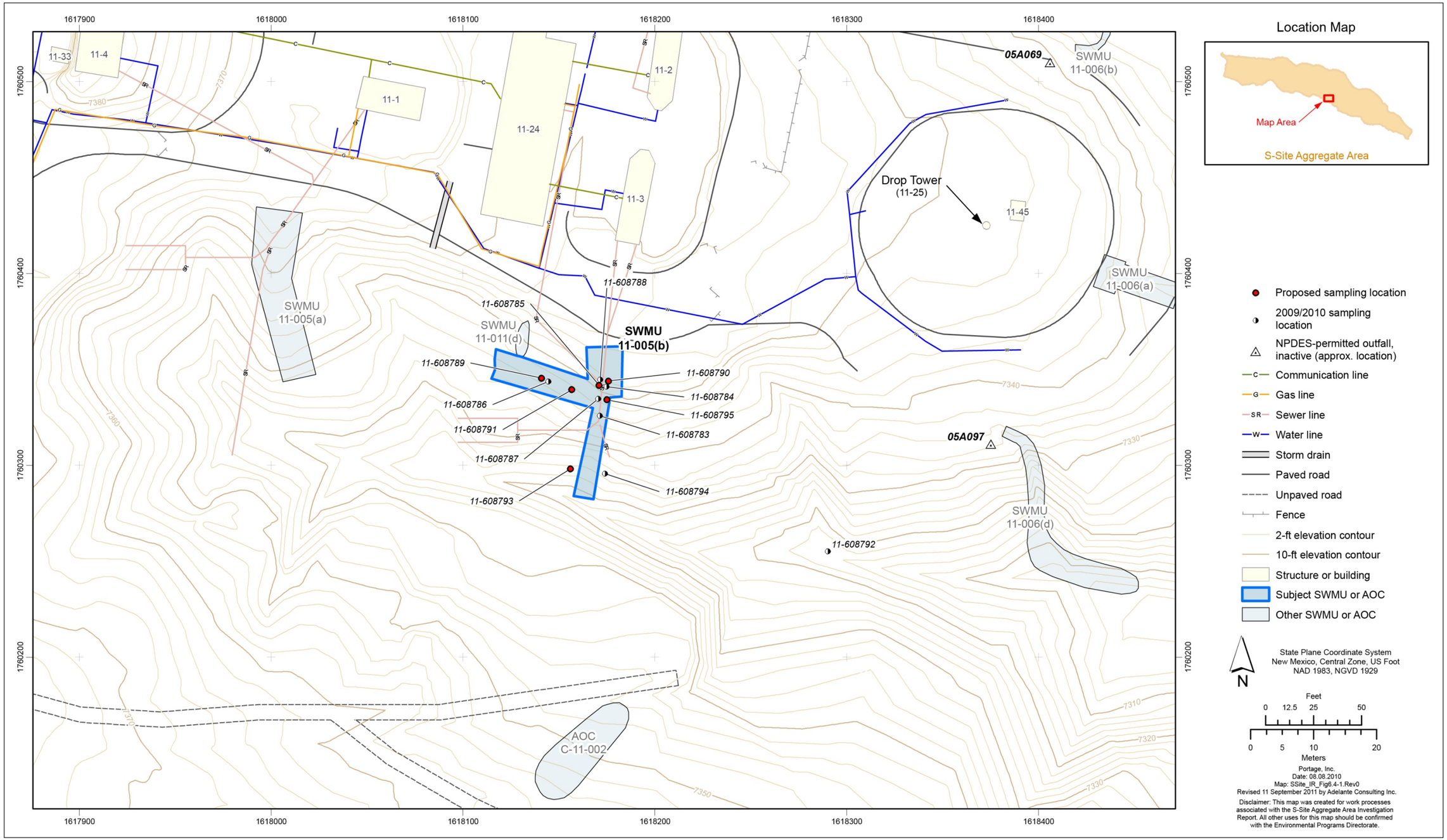


Figure 4.1-10 Proposed sampling locations at SWMU 11-005(b)

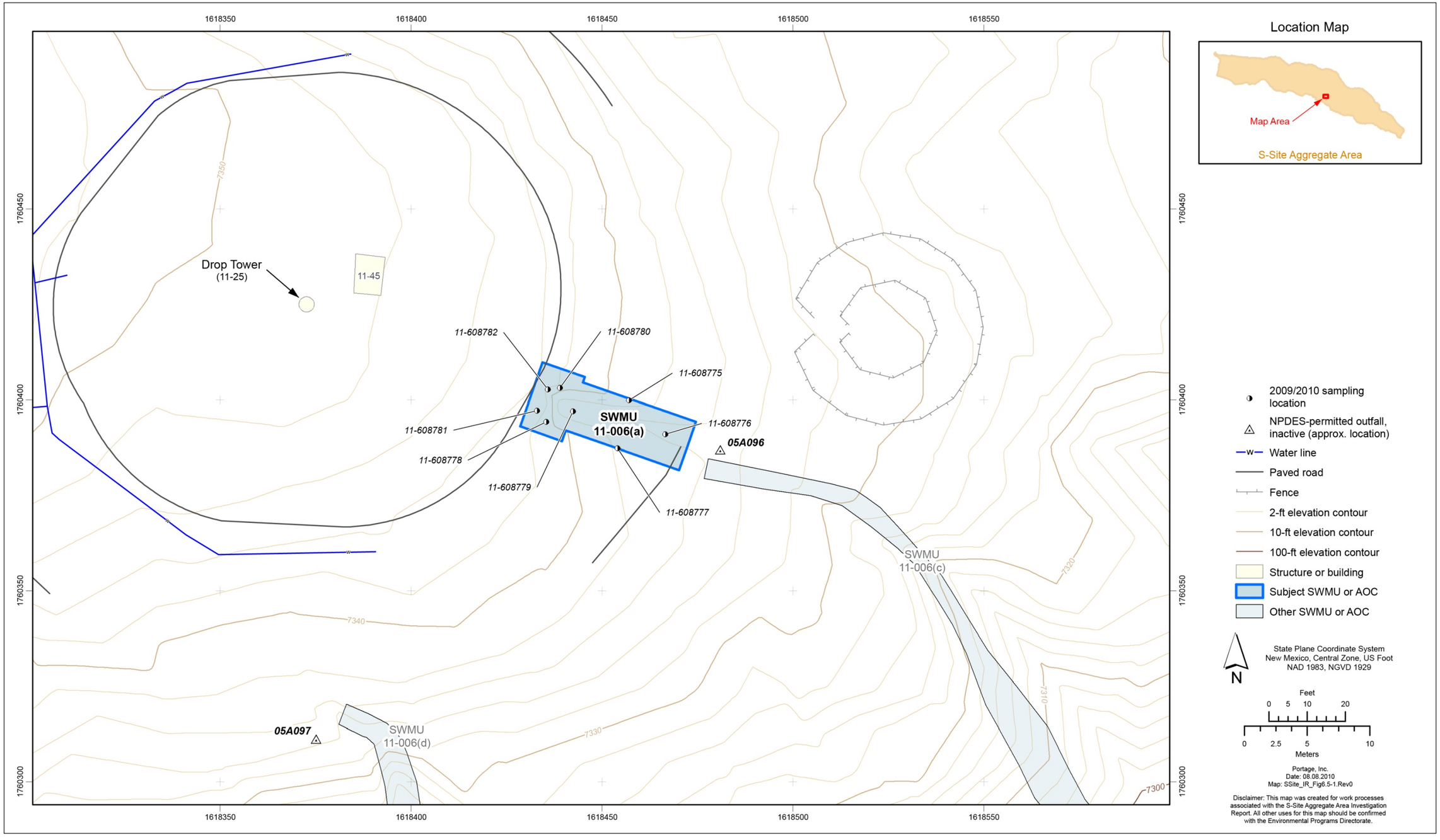


Figure 4.1-11 Site map and sampling locations at SWMU 11-006(a)

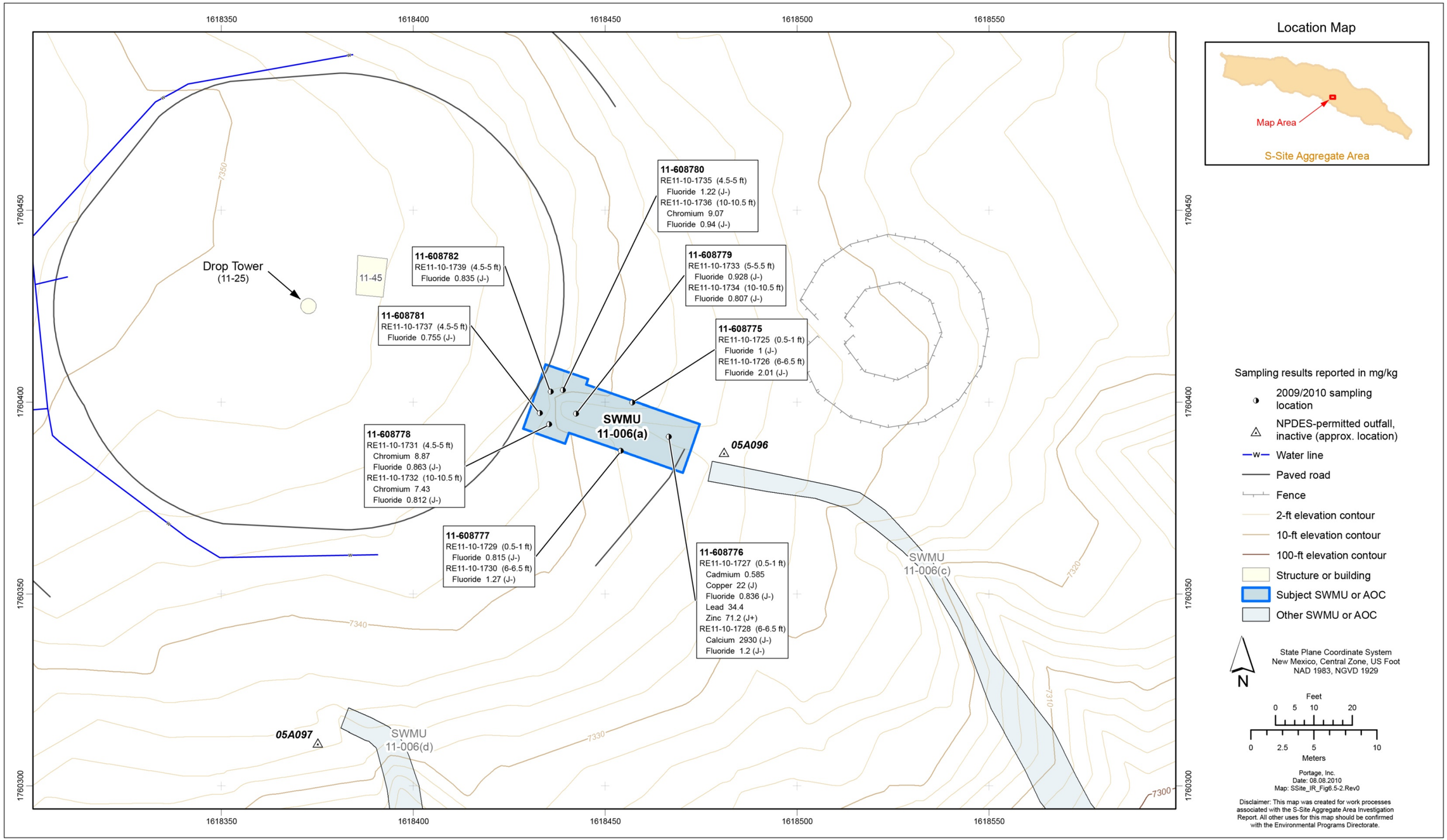


Figure 4.1-12 Inorganic chemicals detected or detected above BVs at SWMU 11-006(a)

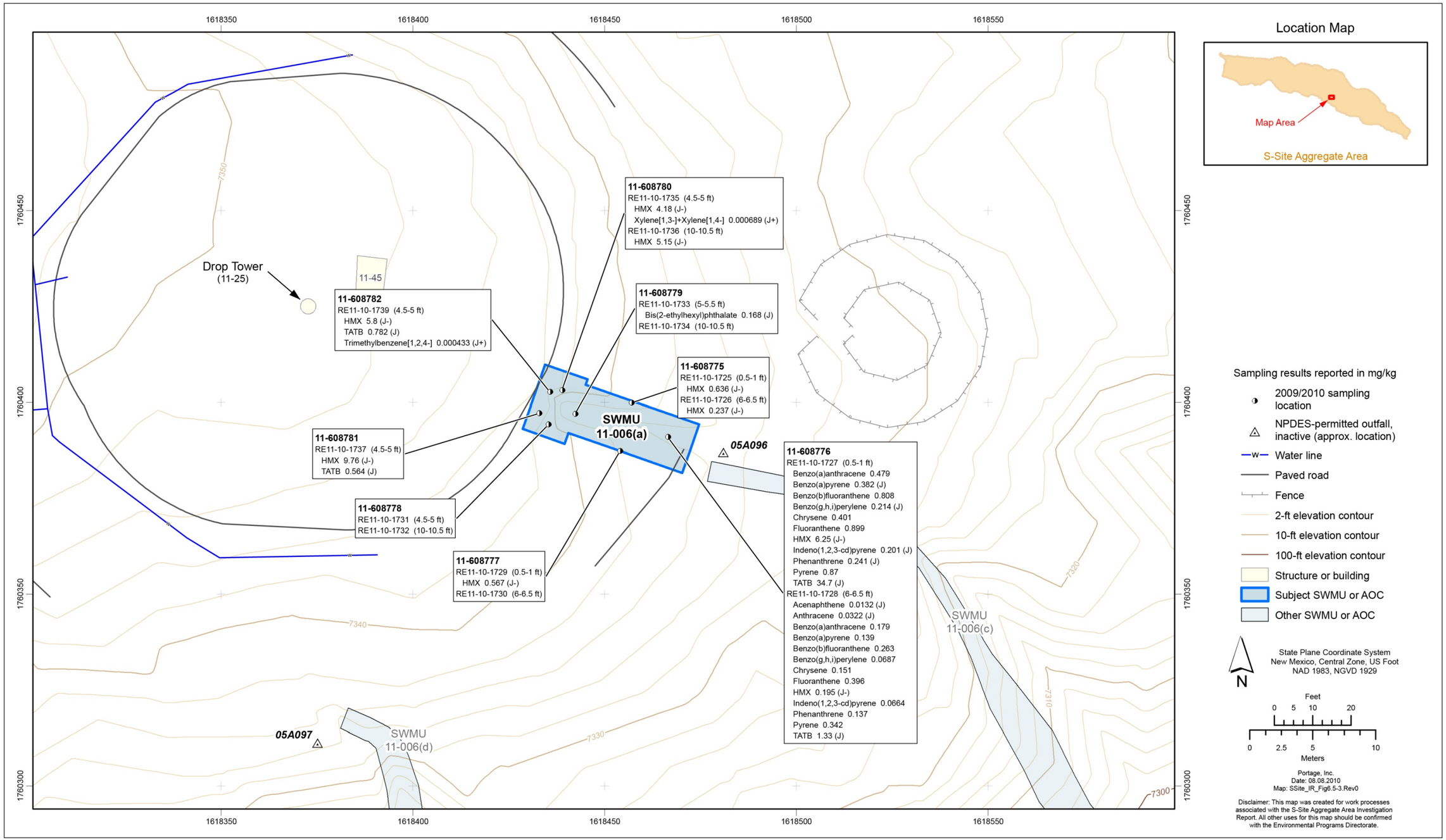


Figure 4.1-13 Organic chemicals detected at SWMU 11-006(a)

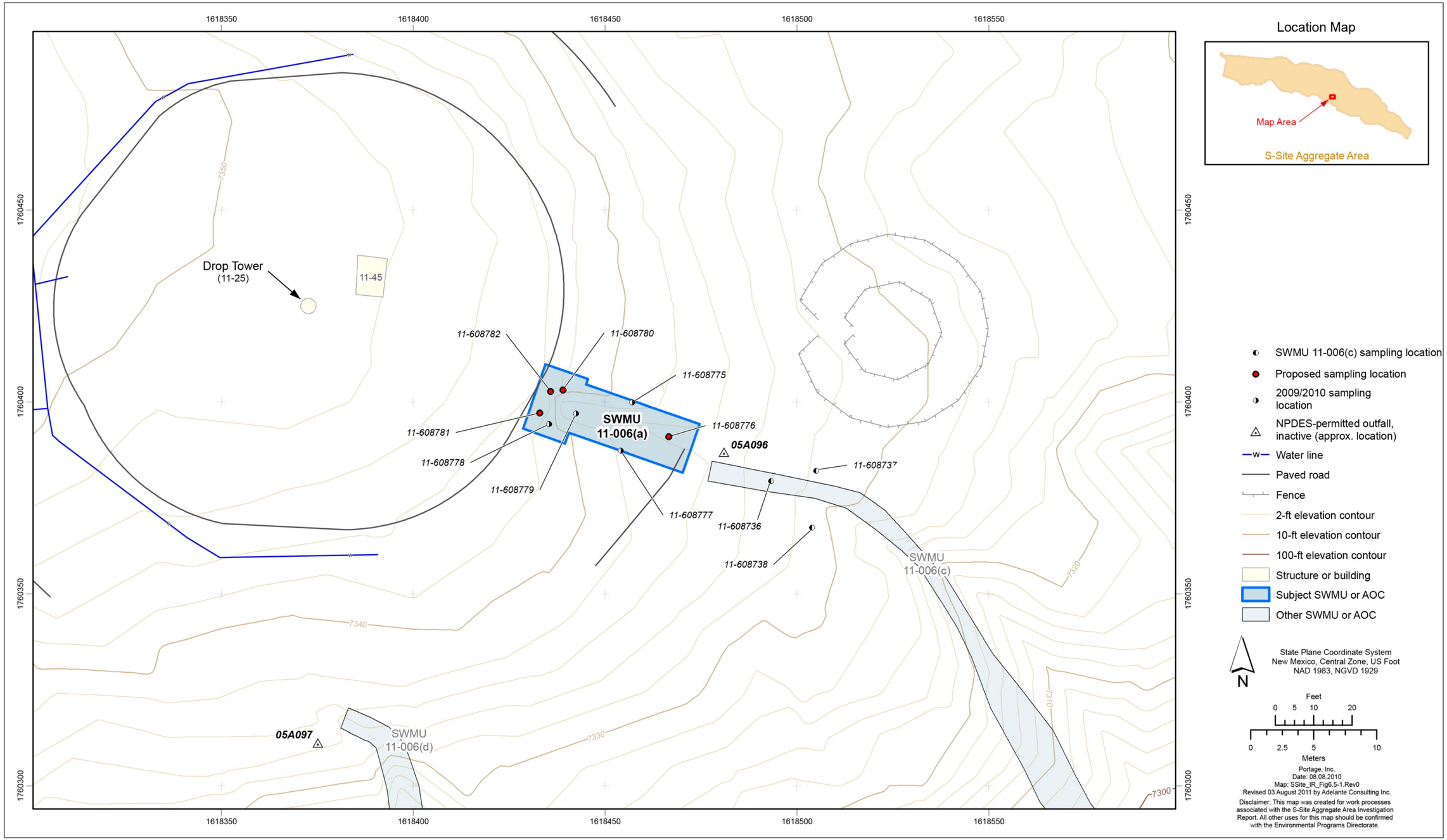


Figure 4.1-14 Proposed sampling locations at SWMU 11-006(a)

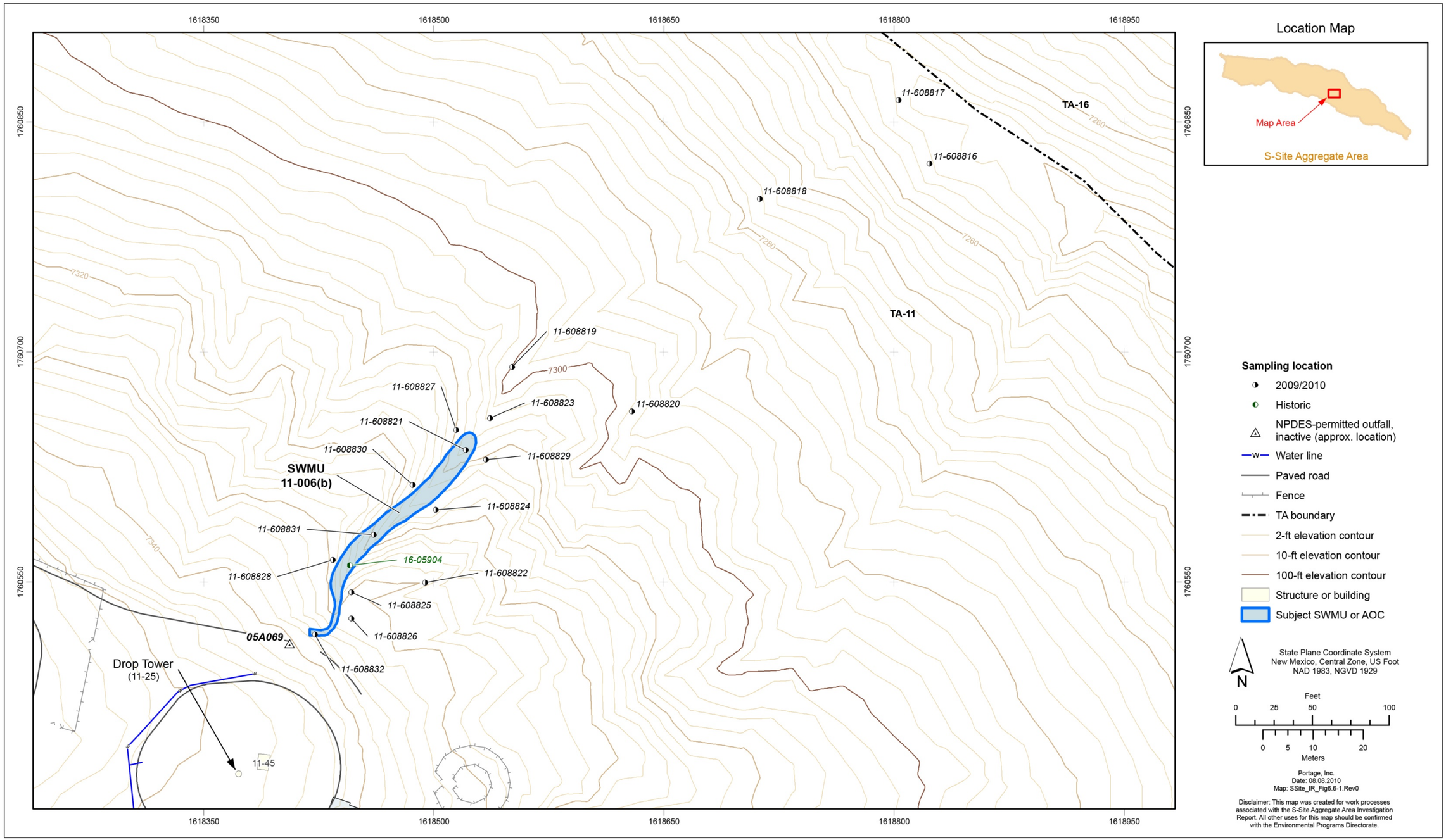


Figure 4.1-15 Site map and sampling locations at SWMU 11-006(b)

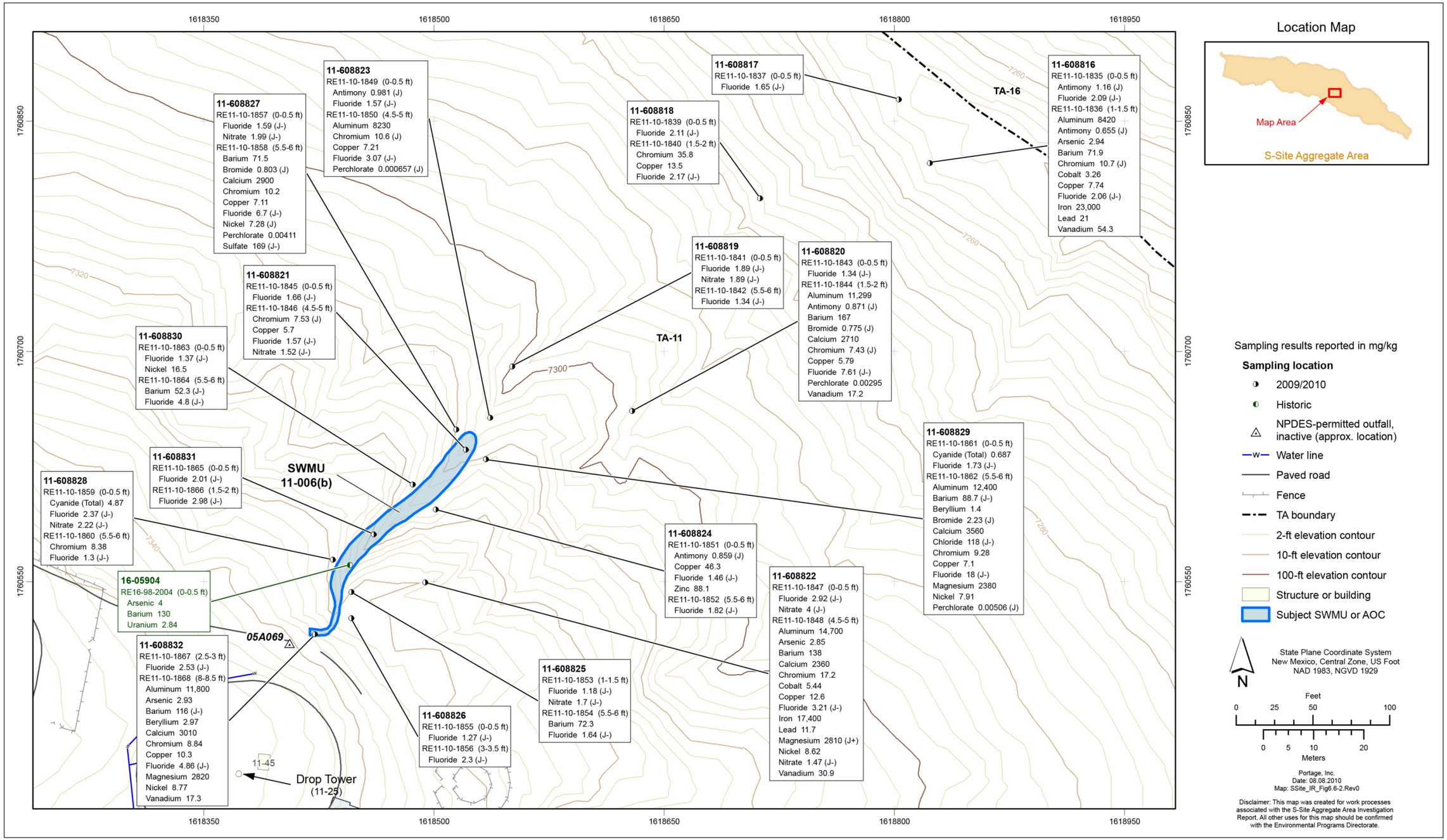


Figure 4.1-16 Inorganic chemicals detected or detected above BVs at SWMU 11-006(b)

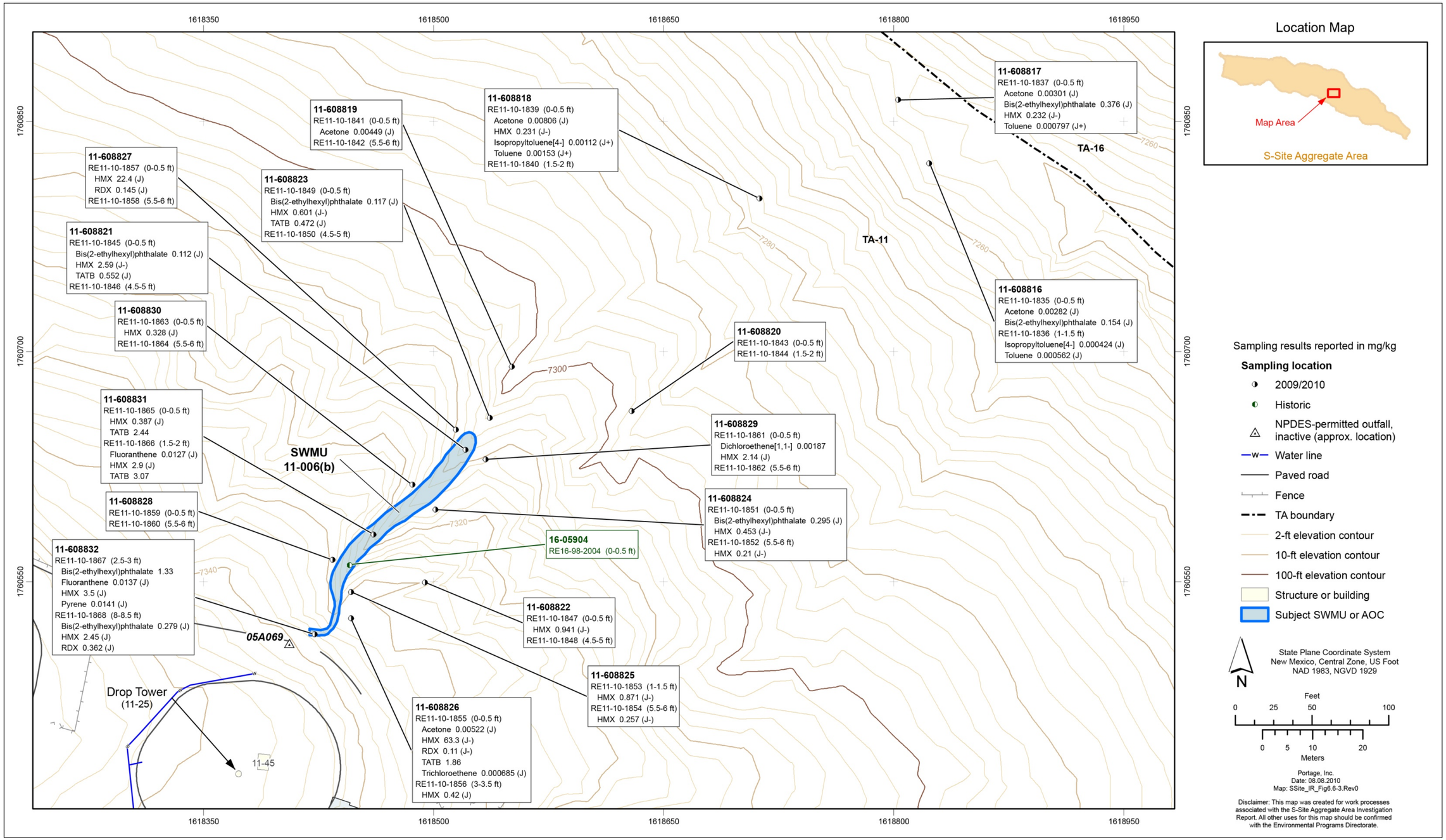


Figure 4.1-17 Organic chemicals detected at SWMU 11-006(b)

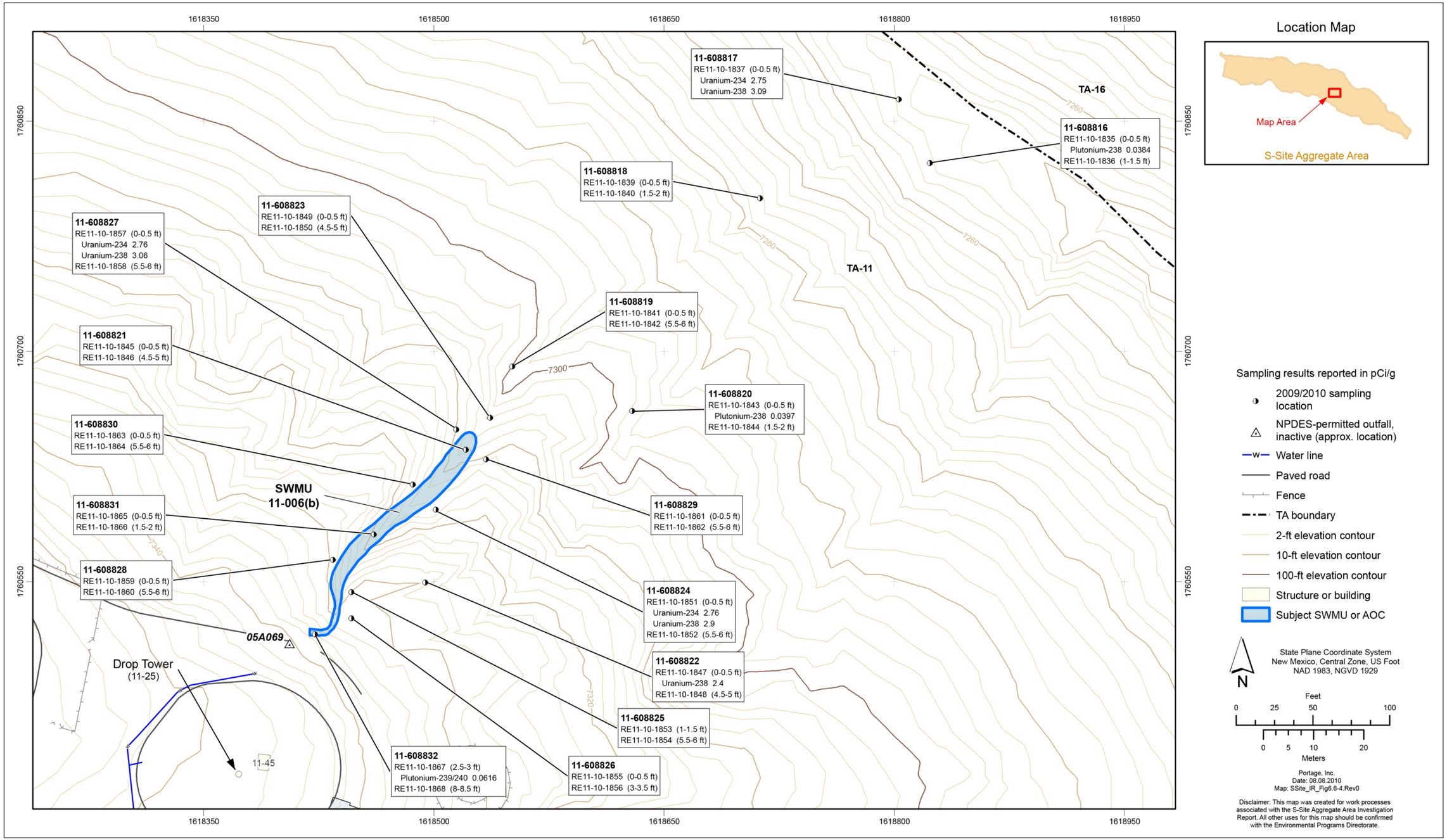


Figure 4.1-18 Radionuclides detected or detected above BVs/FVs at SWMU 11-006(b)

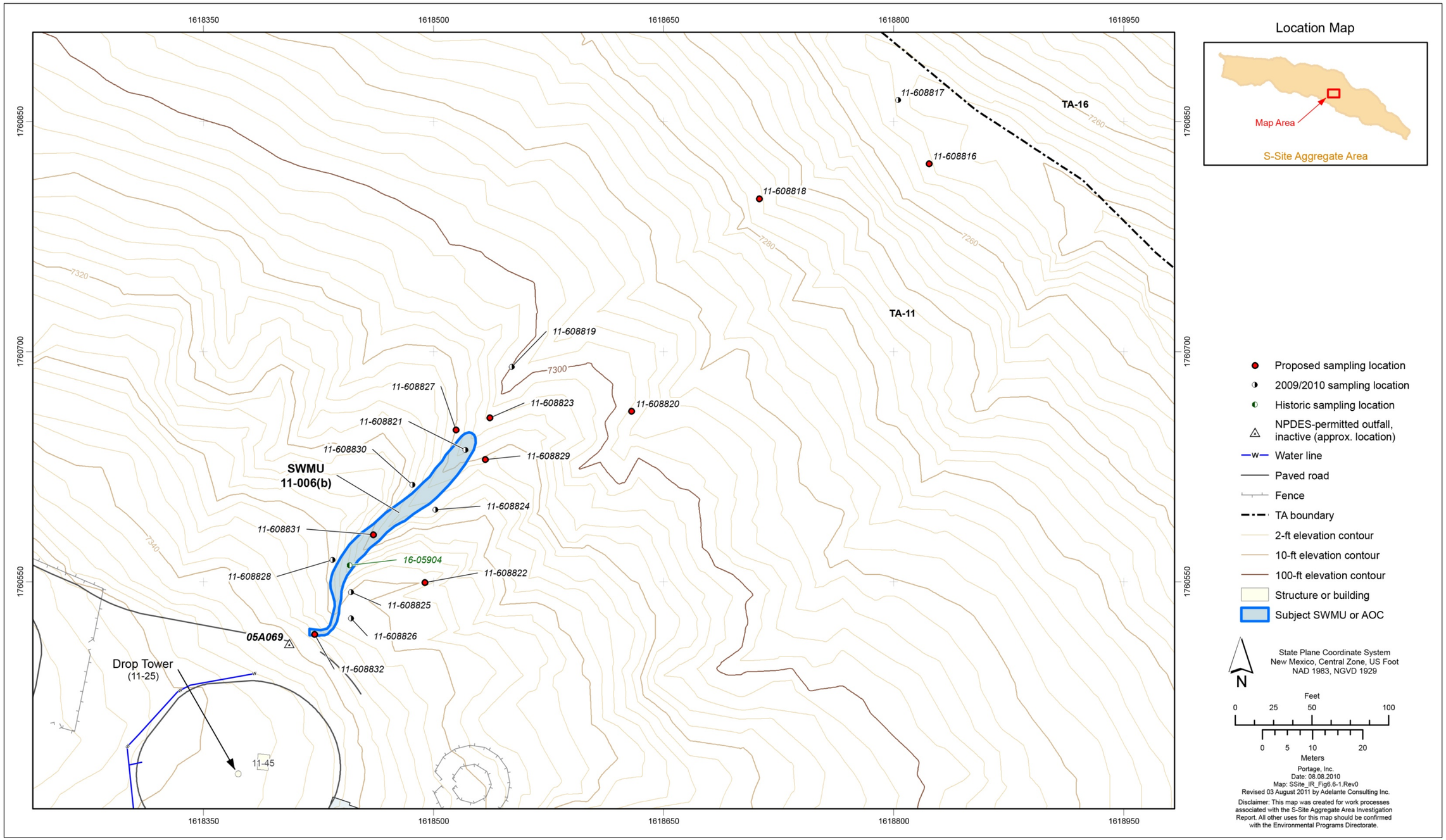


Figure 4.1-19 Proposed sampling locations at SWMU 11-006(b)

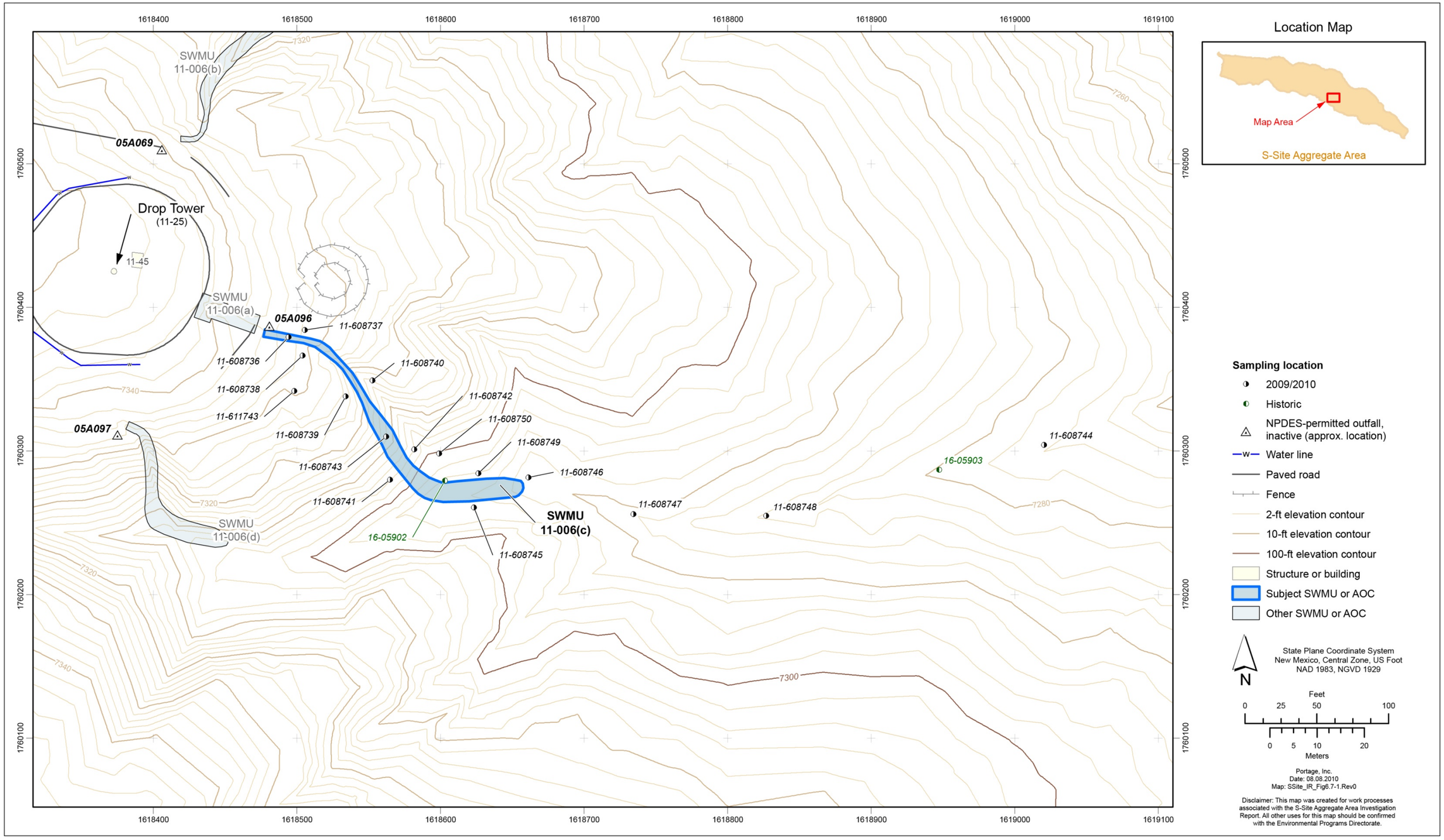


Figure 4.1-20 Site map and sampling locations at SWMU 11-006(c)

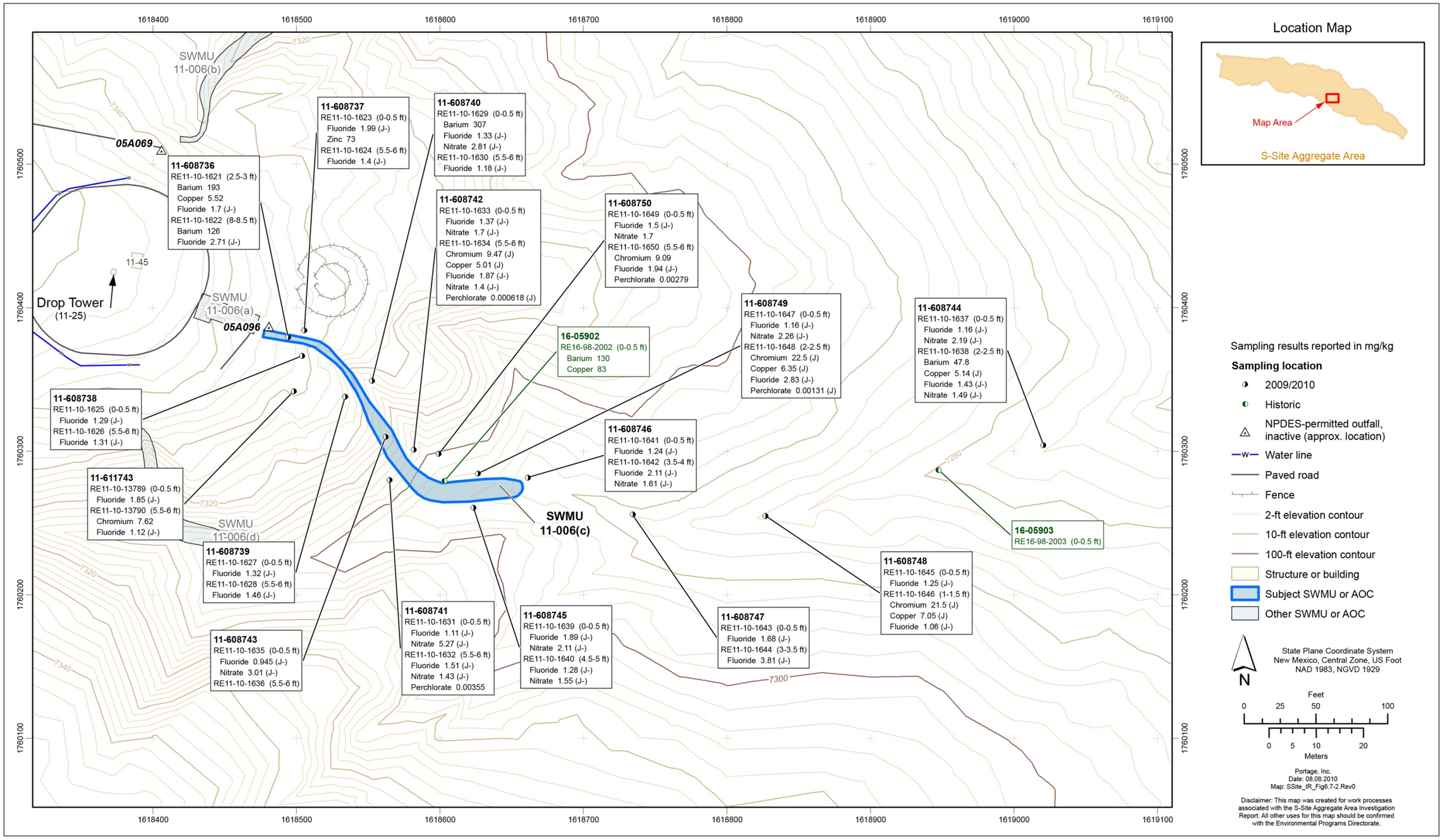


Figure 4.1-21 Inorganic chemicals detected or detected above BVs at SWMU 11-006(c)

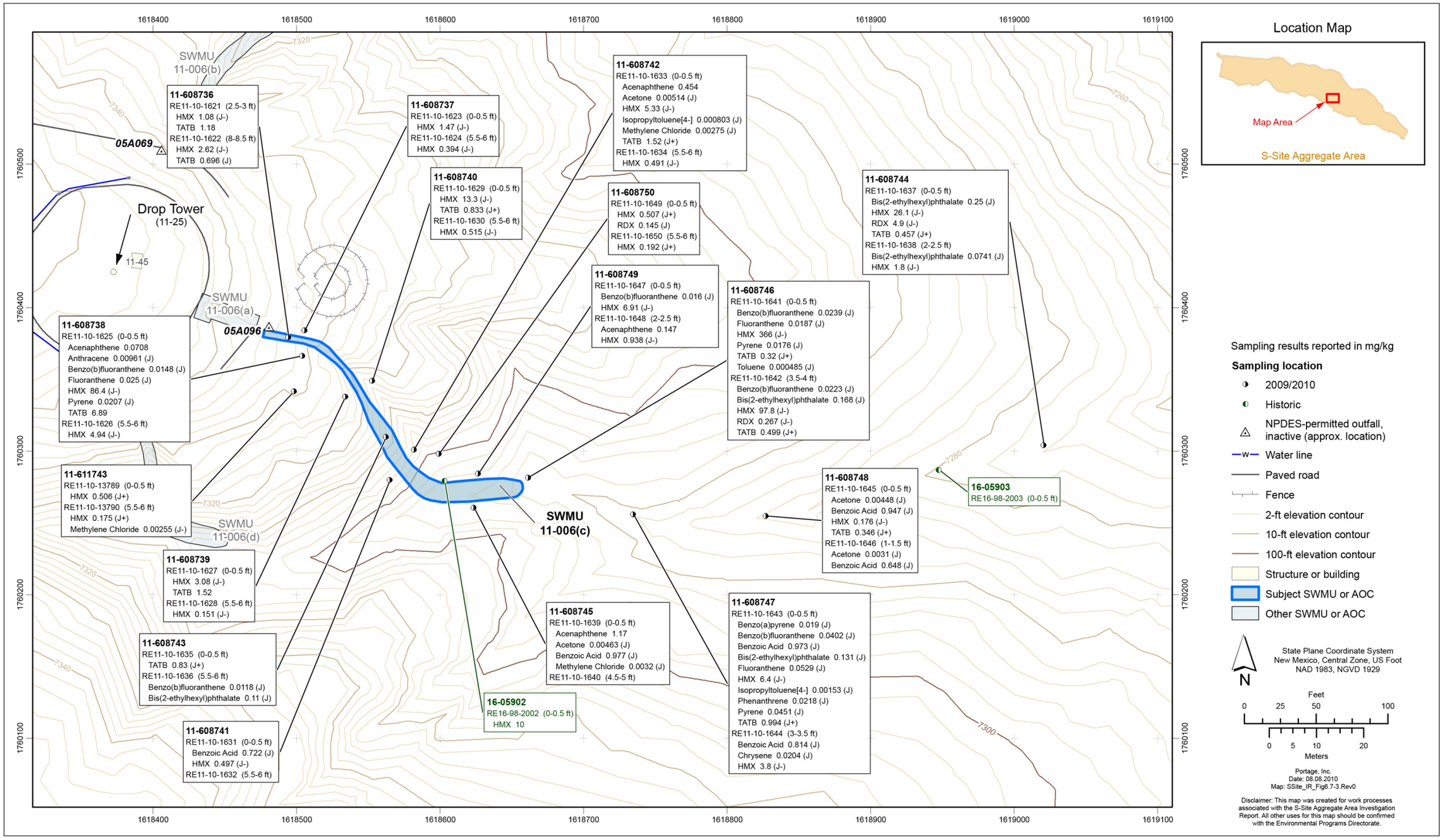


Figure 4.1-22 Organic chemicals detected at SWMU 11-006(c)

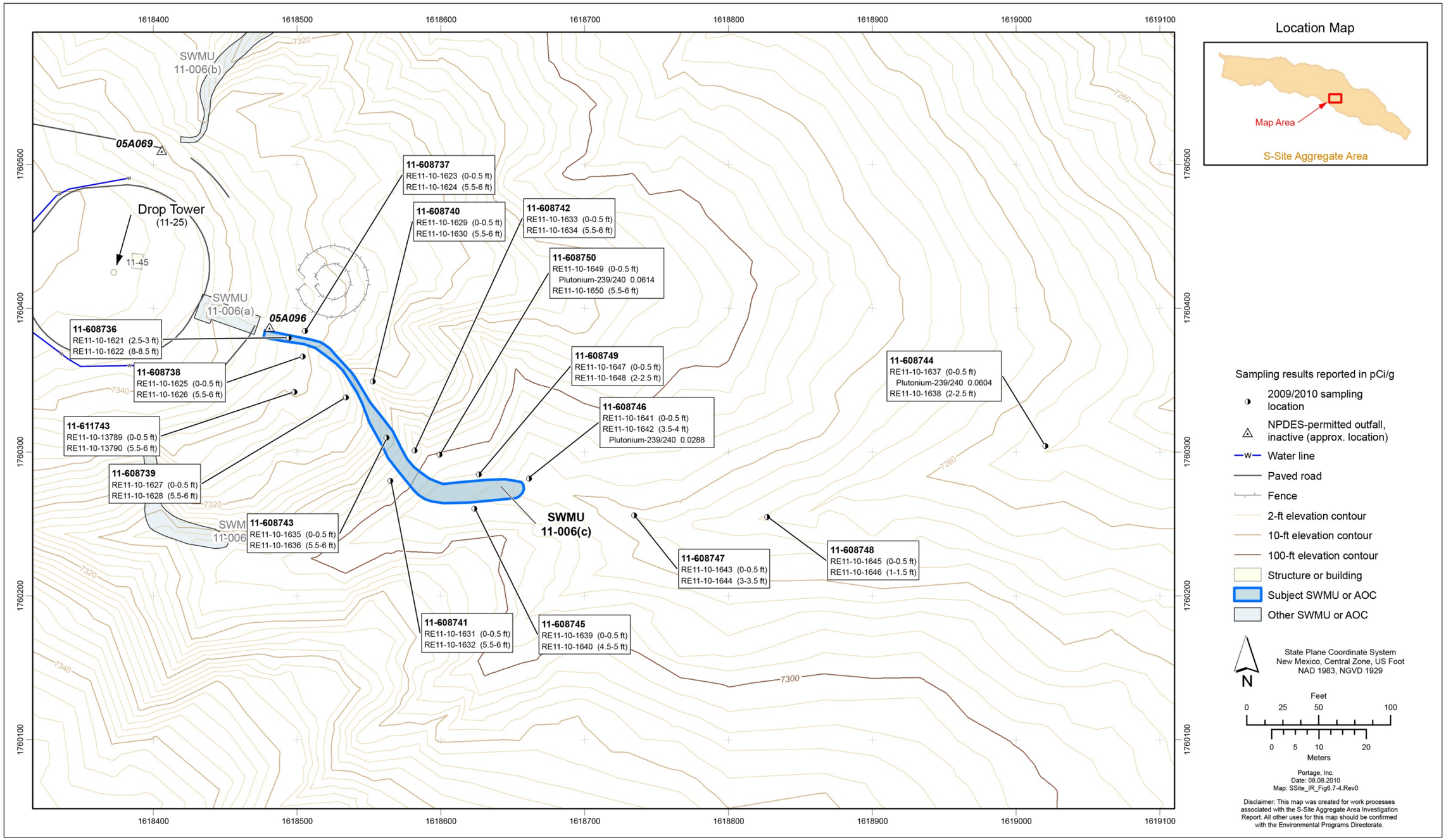


Figure 4.1-23 Radionuclides detected or detected above BVs/FVs at SWMU 11-006(c)

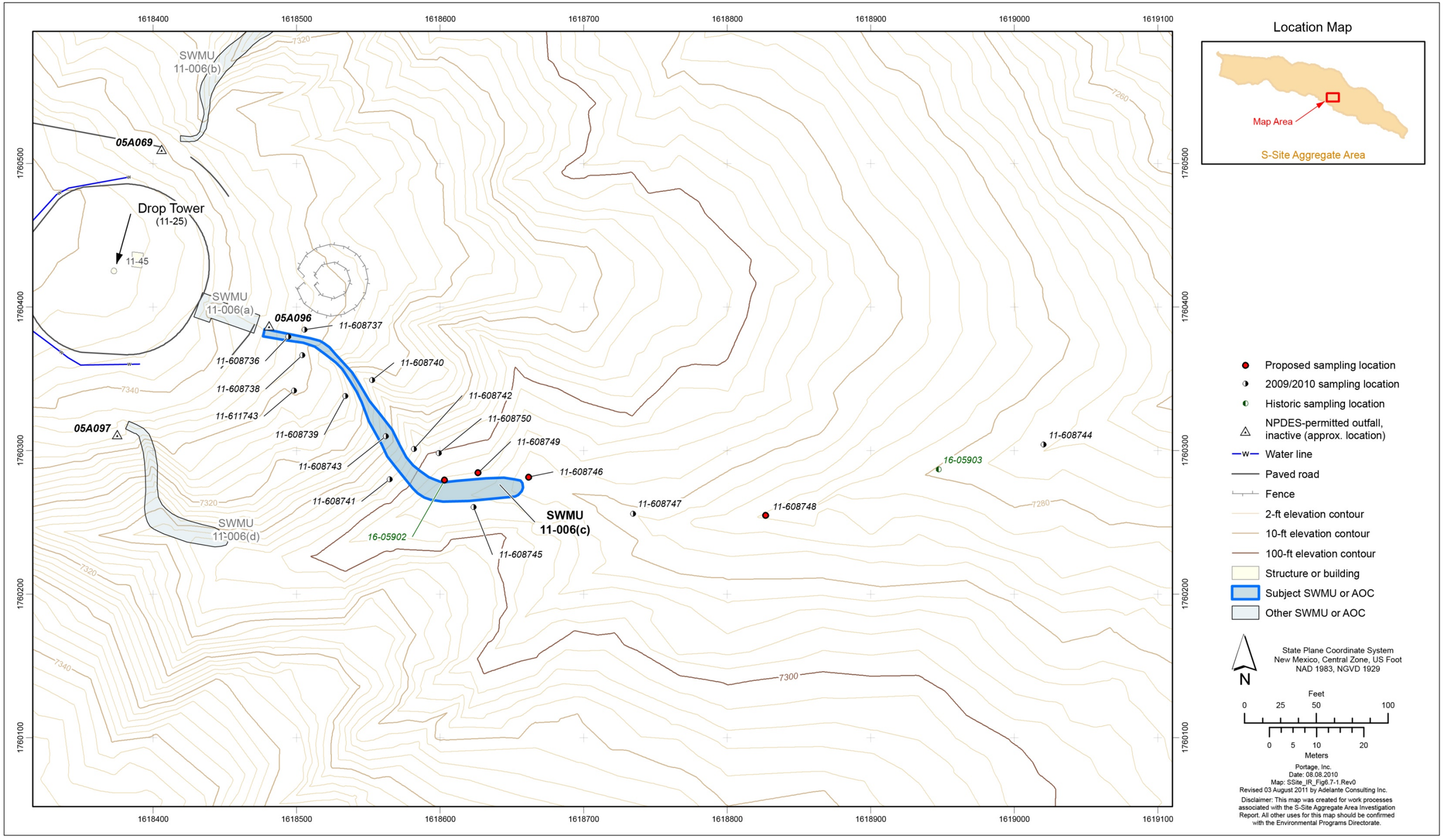


Figure 4.1-24 Proposed sampling locations at SWMU 11-006(c)

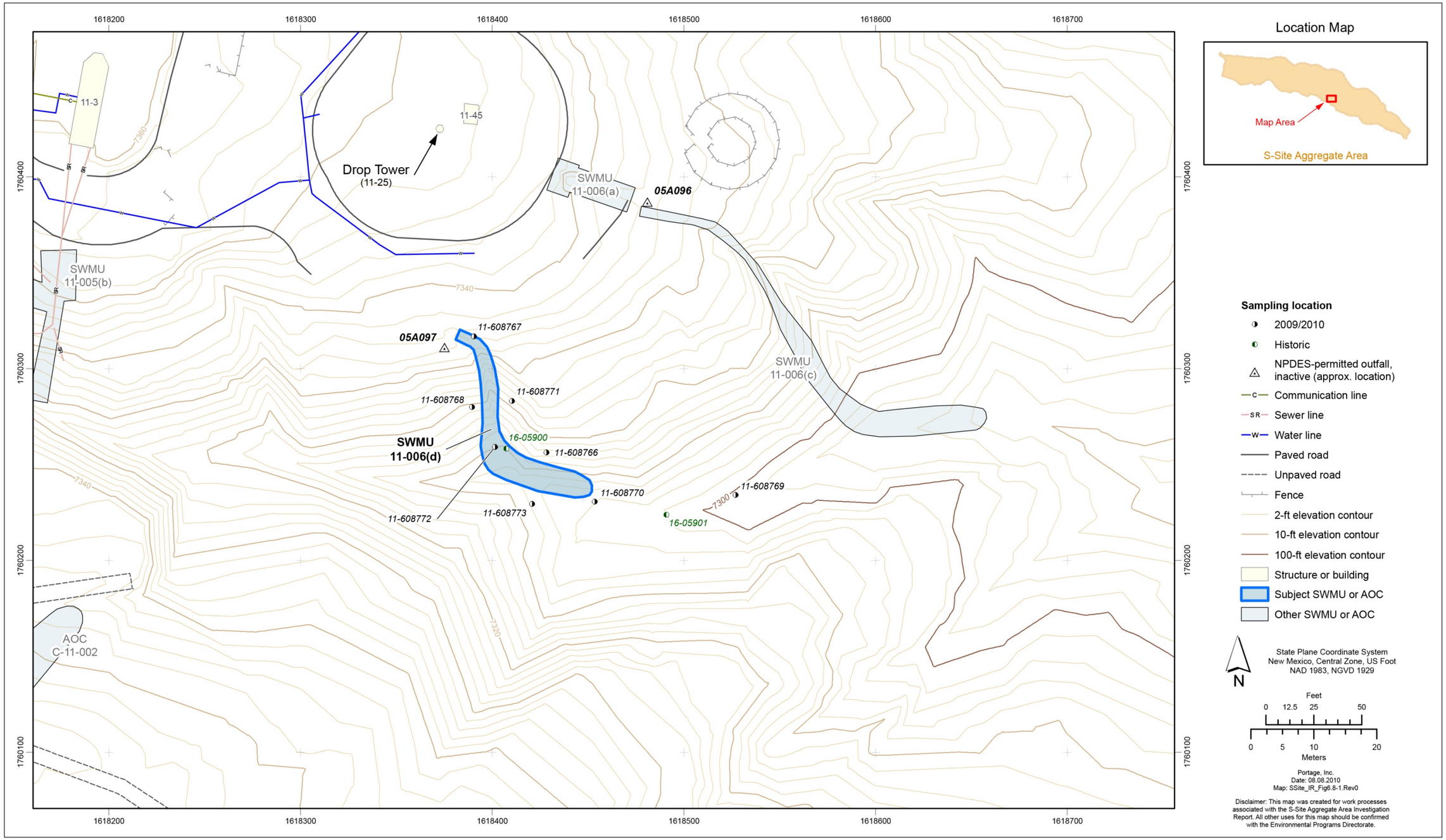


Figure 4.1-25 Site map and sampling locations at SWMU 11-006(d)

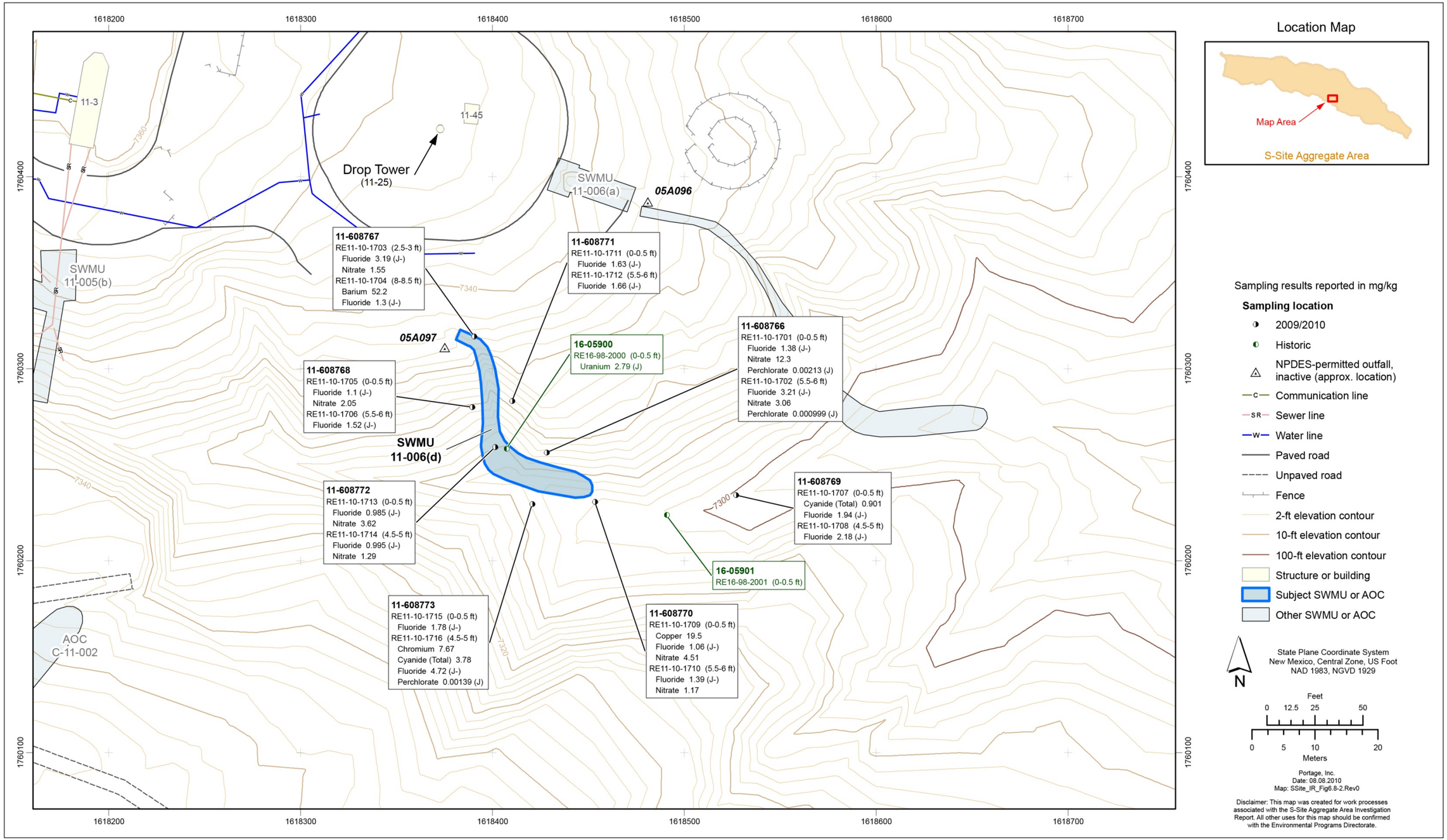


Figure 4.1-26 Inorganic chemicals detected or detected above BVs at SWMU 11-006(d)

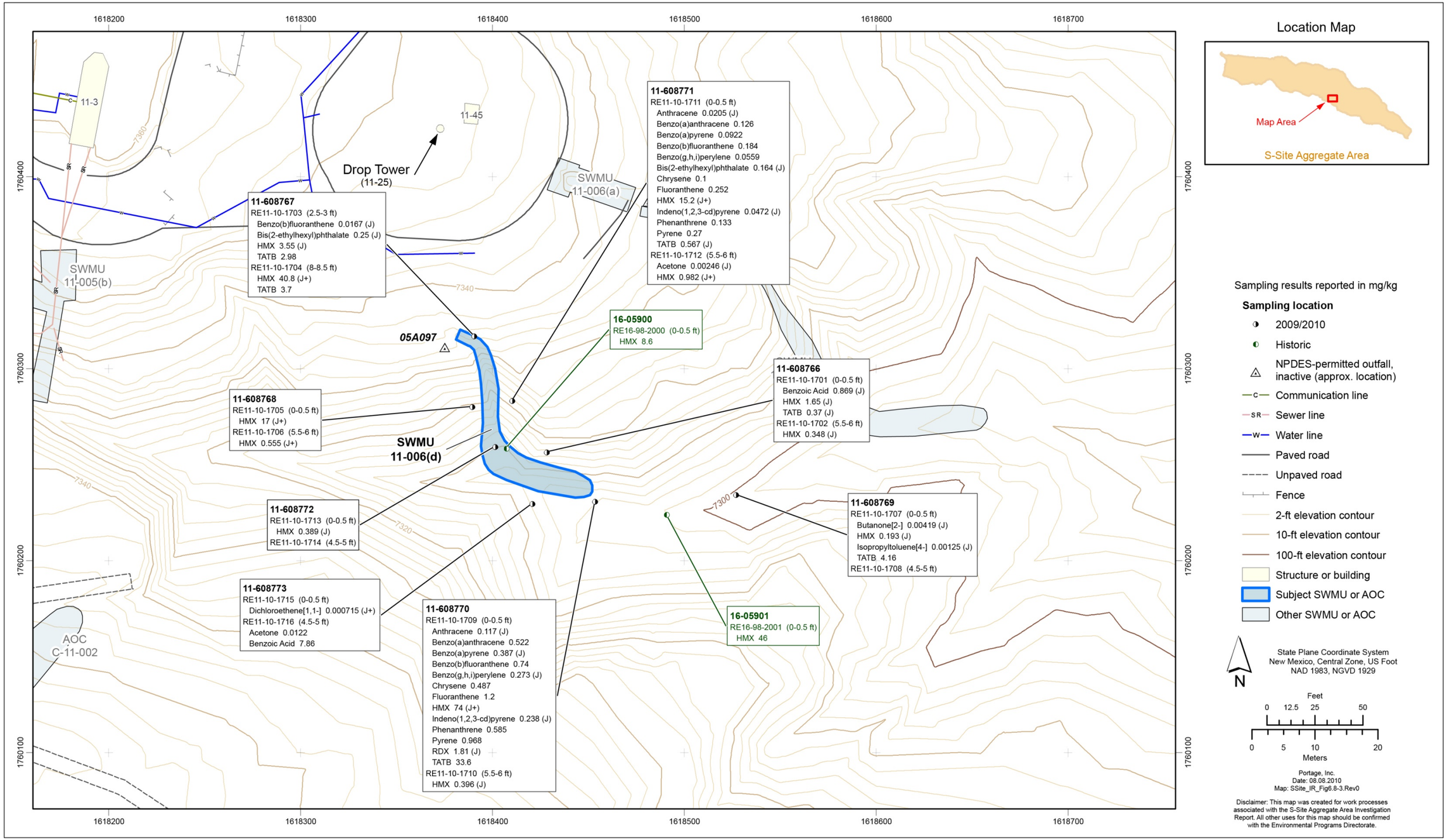


Figure 4.1-27 Organic chemicals detected at SWMU 11-006(d)

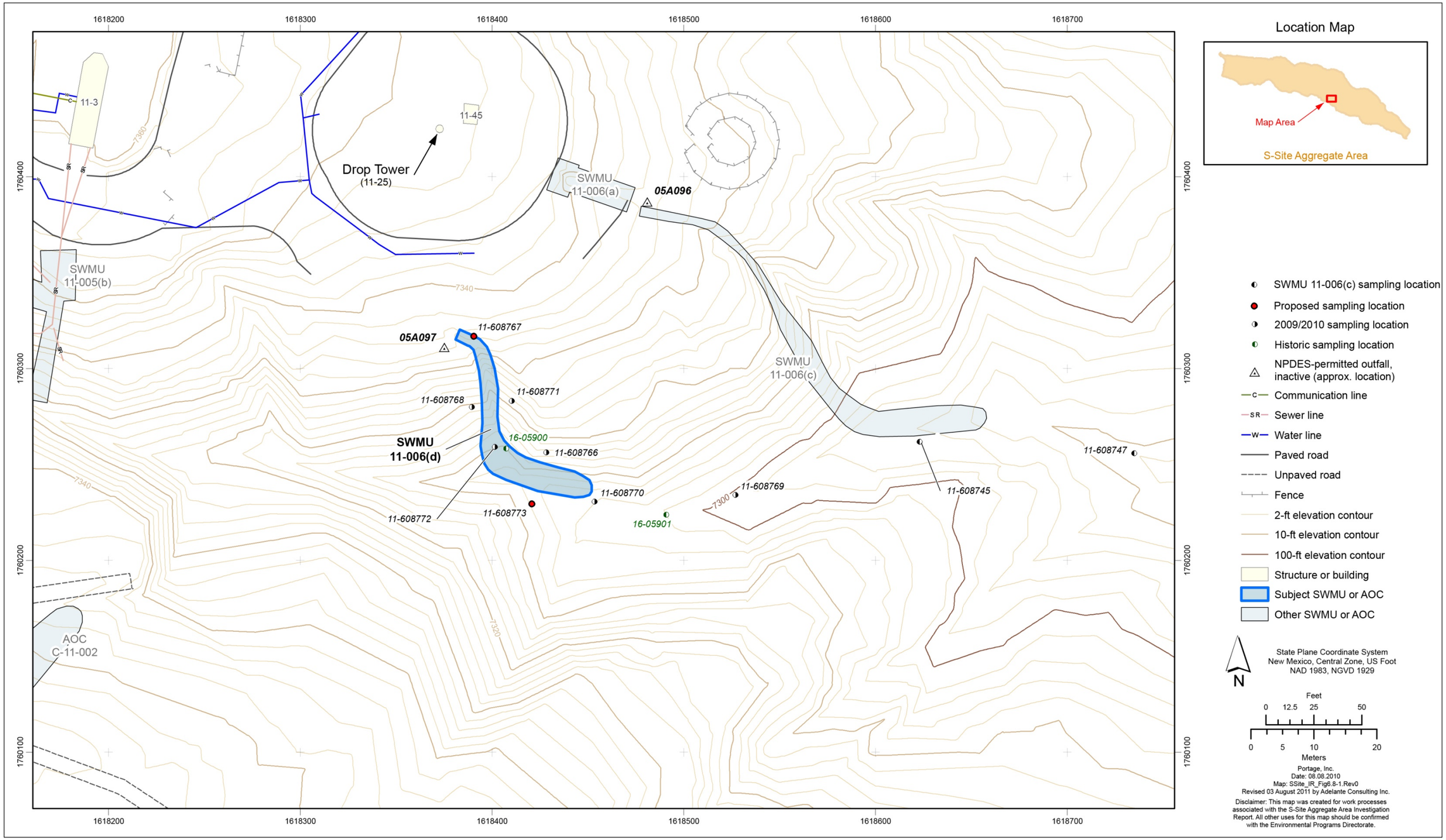


Figure 4.1-28 Proposed sampling locations at SWMU 11-006(d)

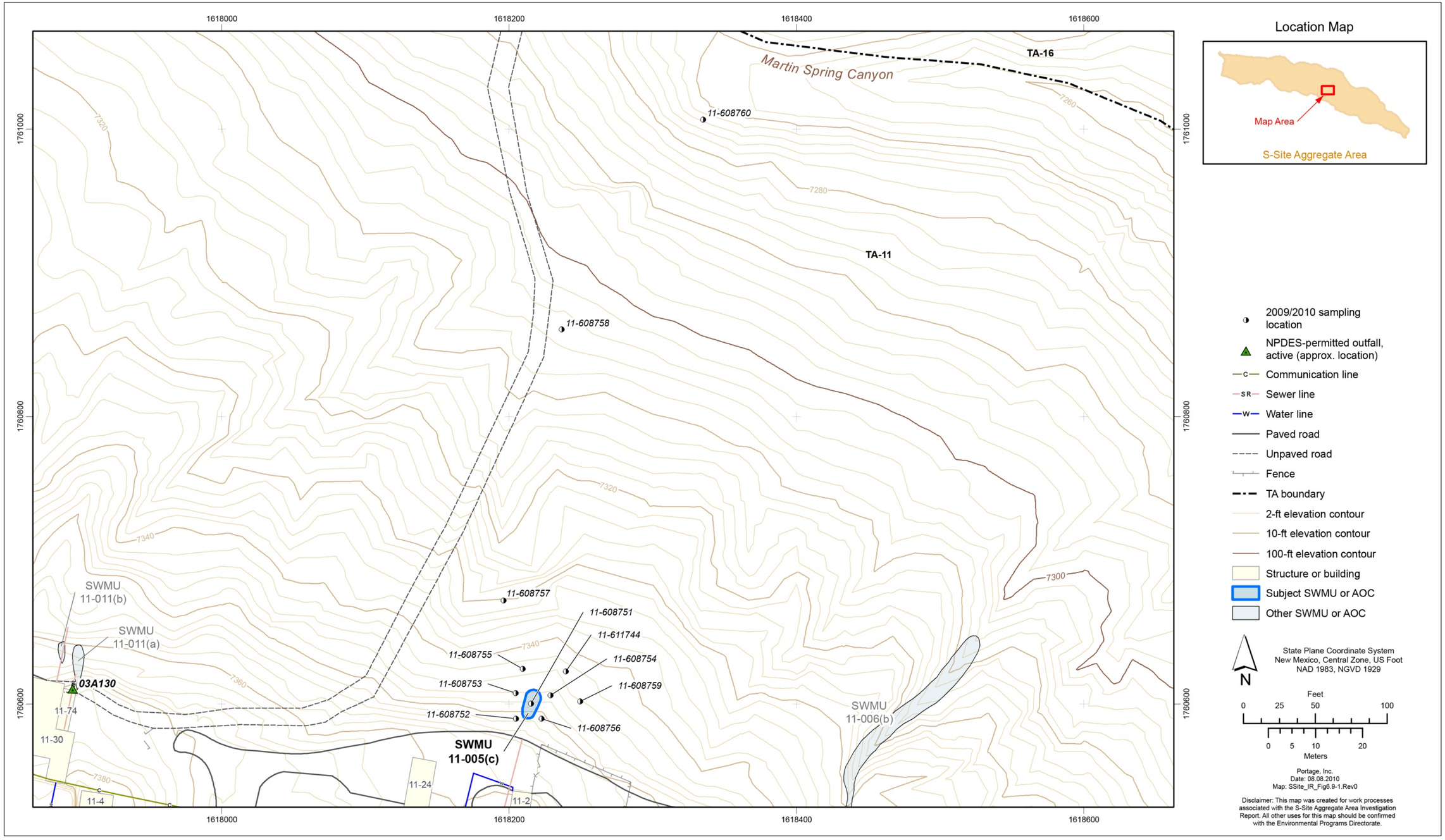


Figure 4.1-29 Site map and sampling locations at SWMU 11-005(c)

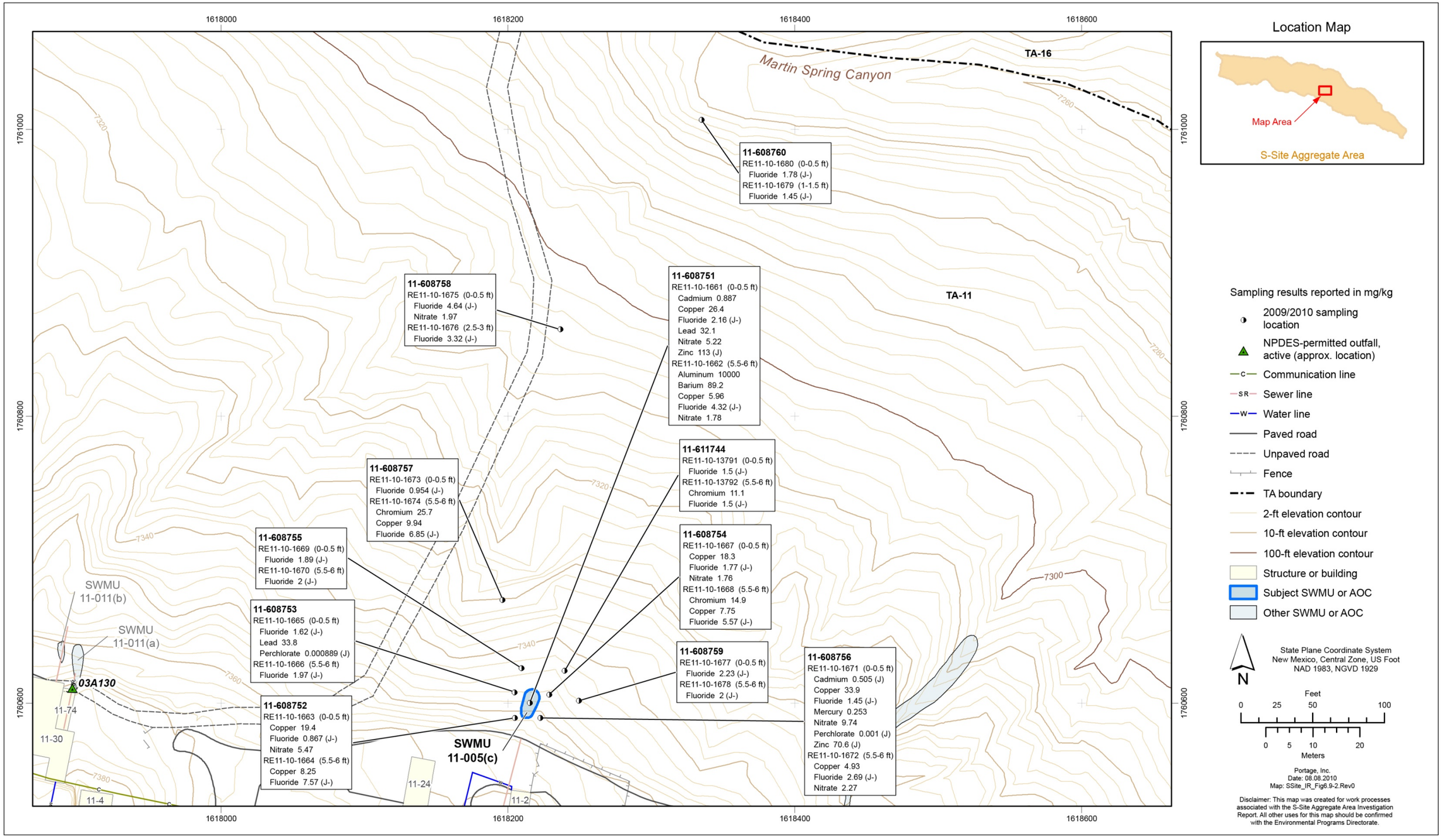


Figure 4.1-30 Inorganic chemicals detected or detected above BVs at SWMU 11-005(c)

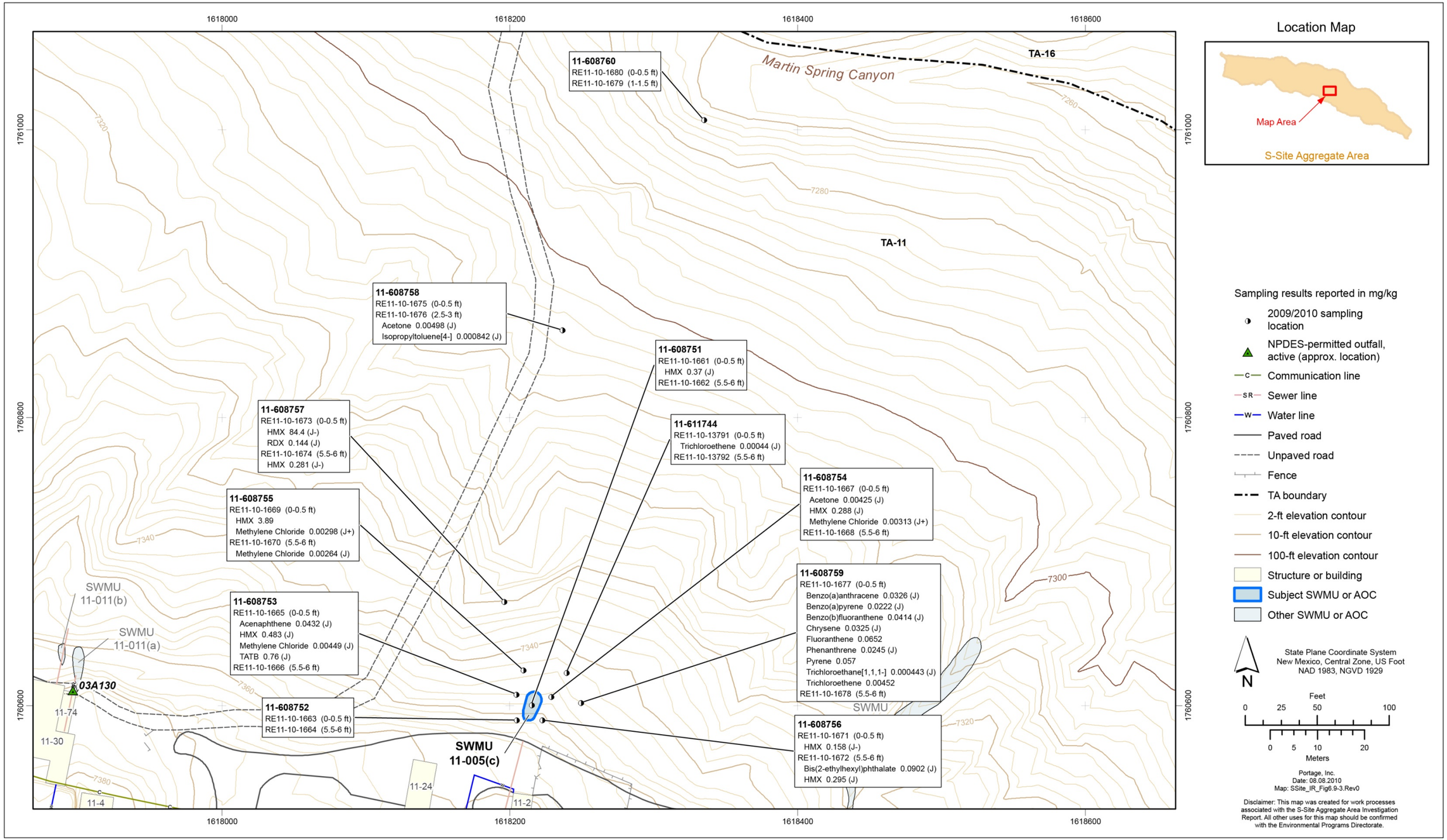


Figure 4.1-31 Organic chemicals detected at SWMU 11-005(c)

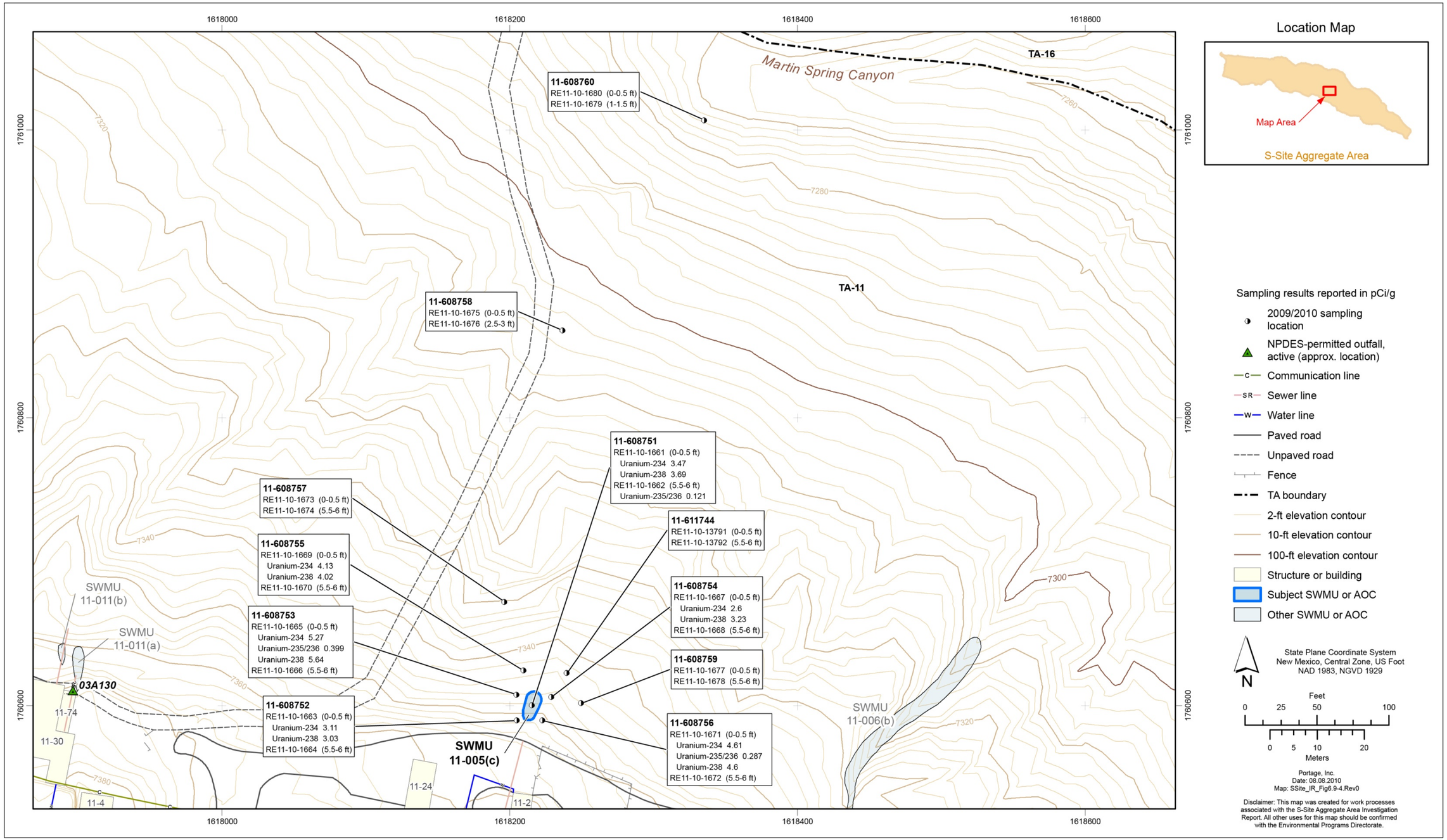


Figure 4.1-32 Radionuclides detected or detected above BVs/FVs at SWMU 11-005(c)

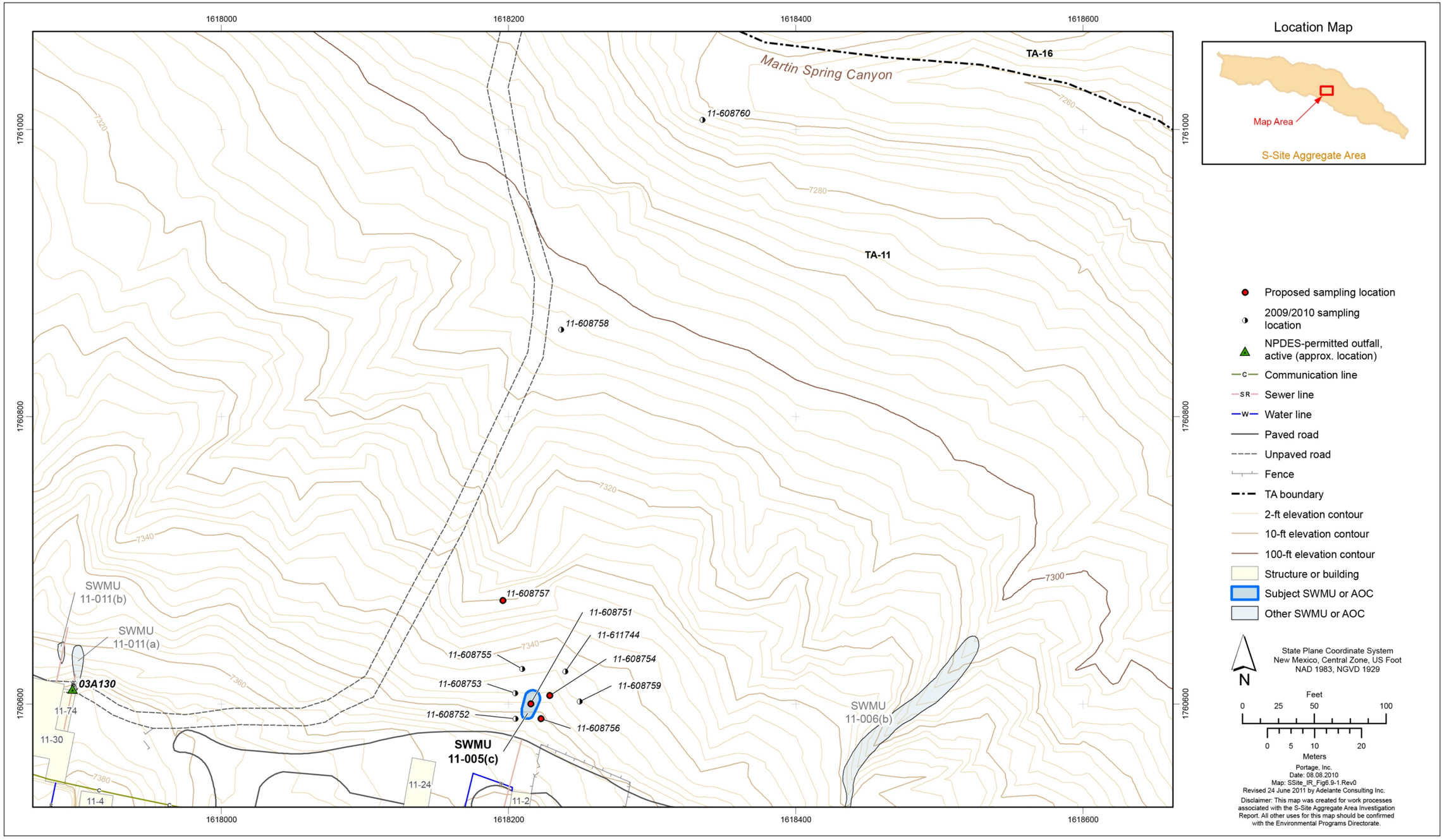


Figure 4.1-33 Proposed sampling locations at SWMU 11-005(c)

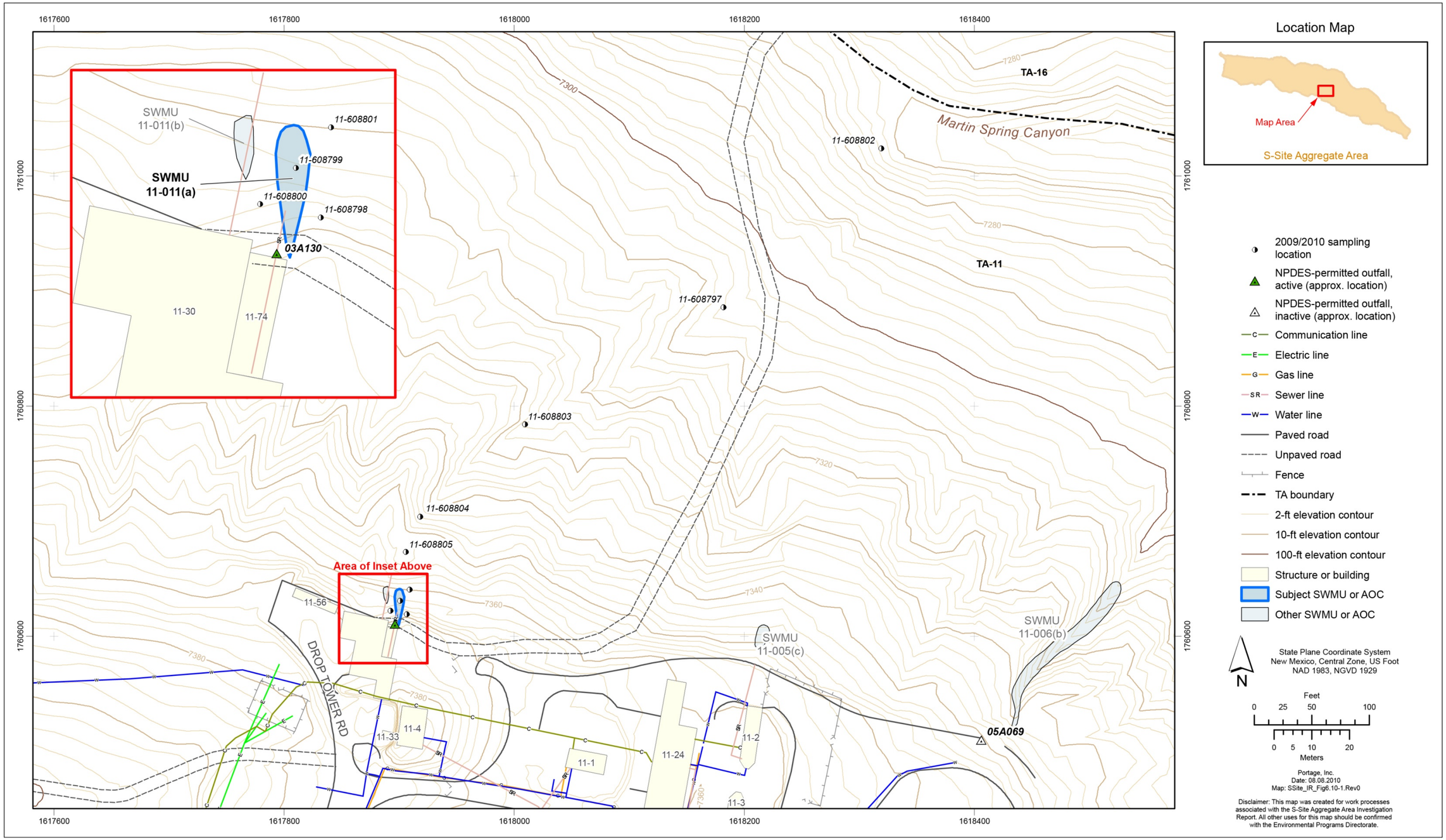


Figure 4.1-34 Site map and sampling locations at SWMU 11-011(a)

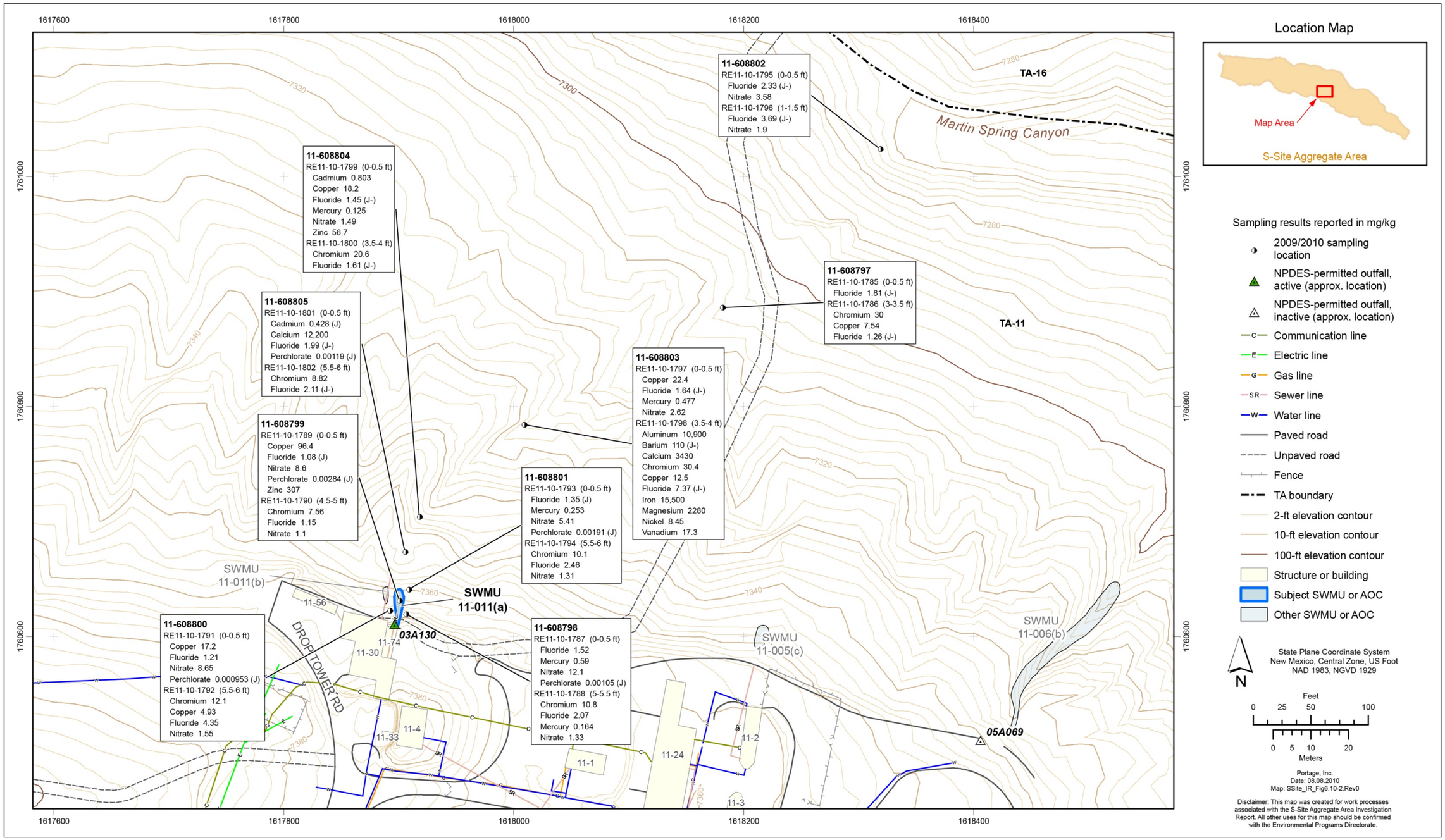


Figure 4.1-35 Inorganic chemicals detected or detected above BVs at SWMU 11-011(a)

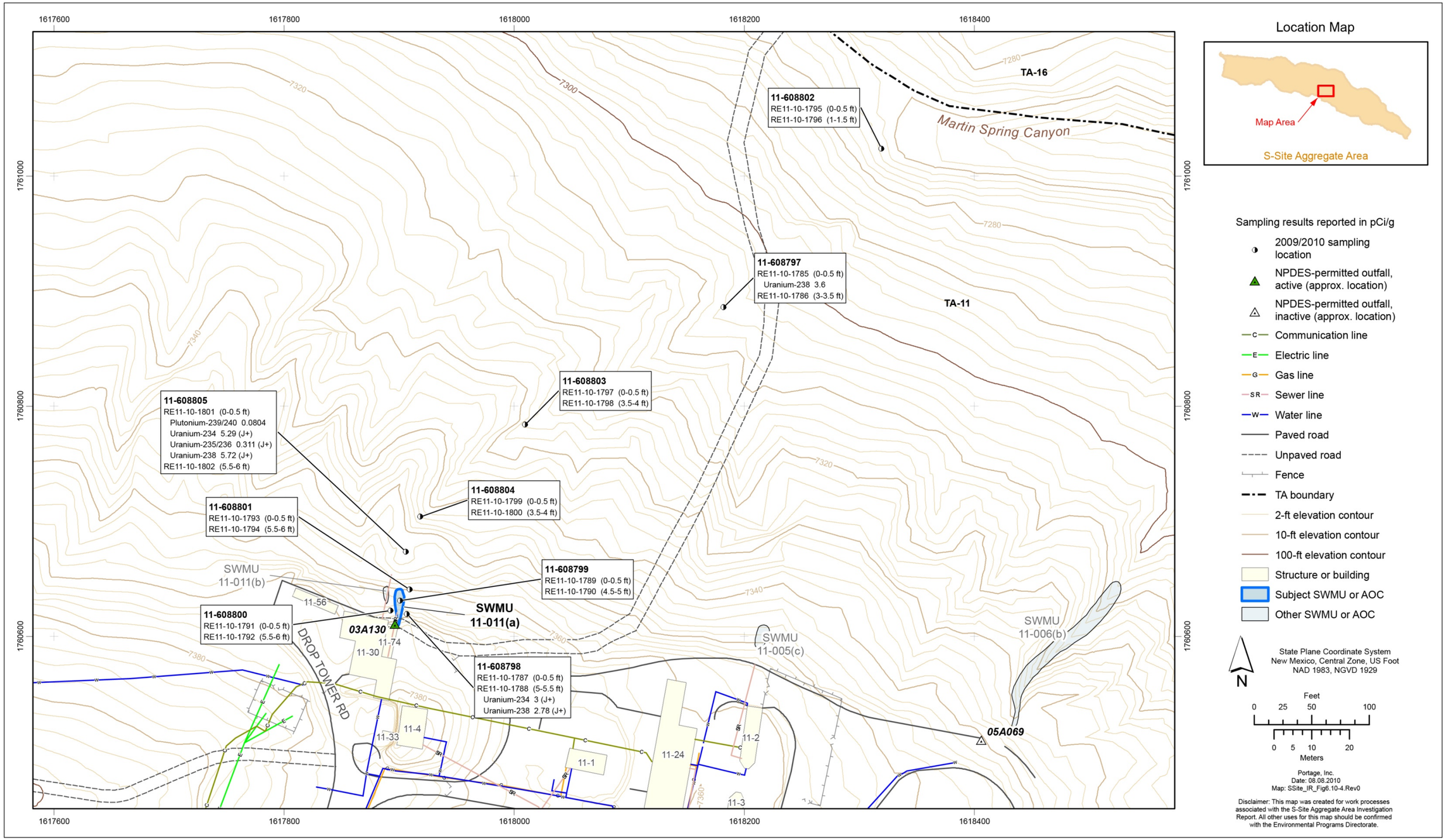


Figure 4.1-36 Radionuclides detected or detected above BVs/FVs at SWMU 11-011(a)

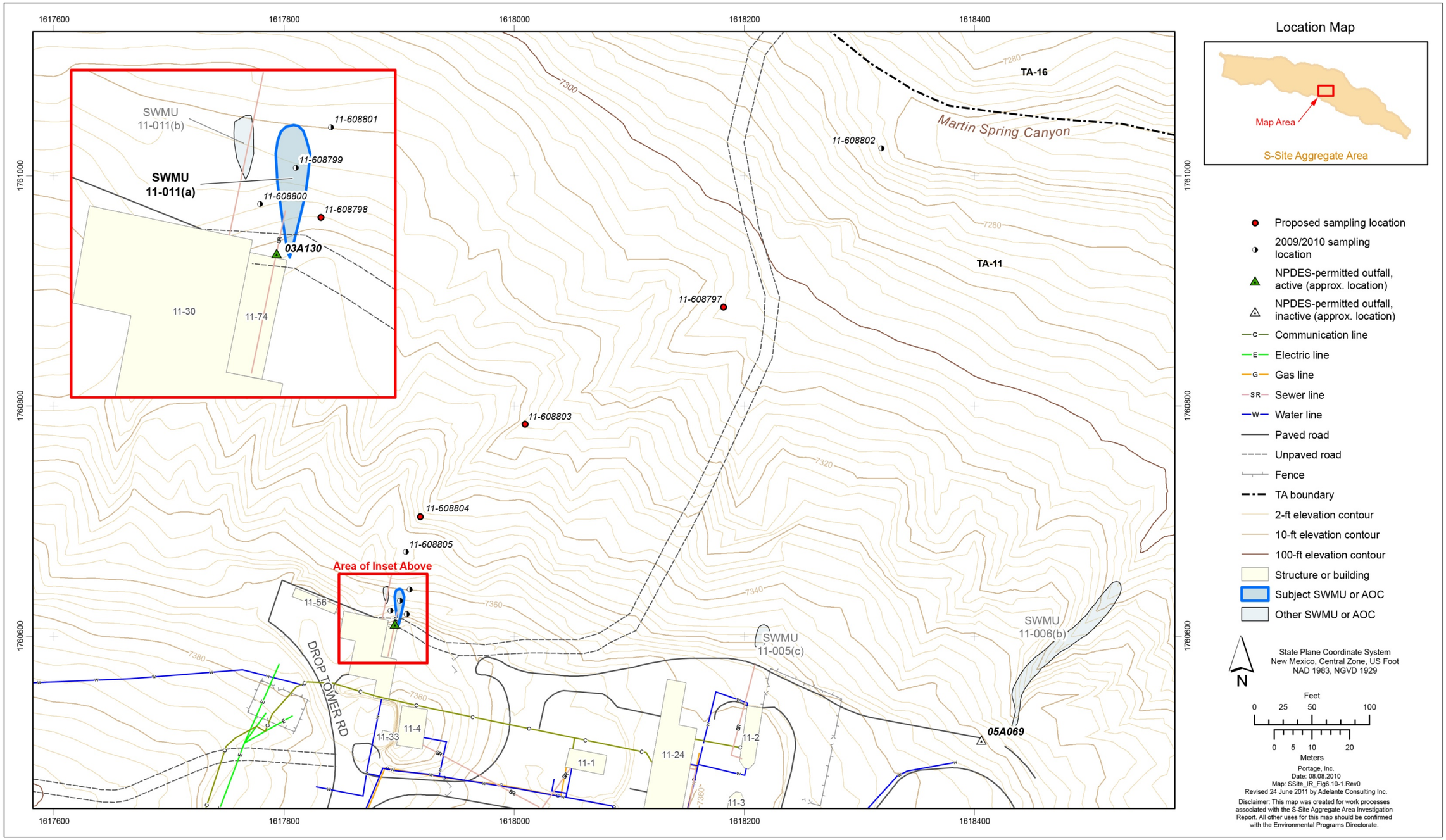


Figure 4.1-37 Proposed sampling locations at SWMU 11-011(a)

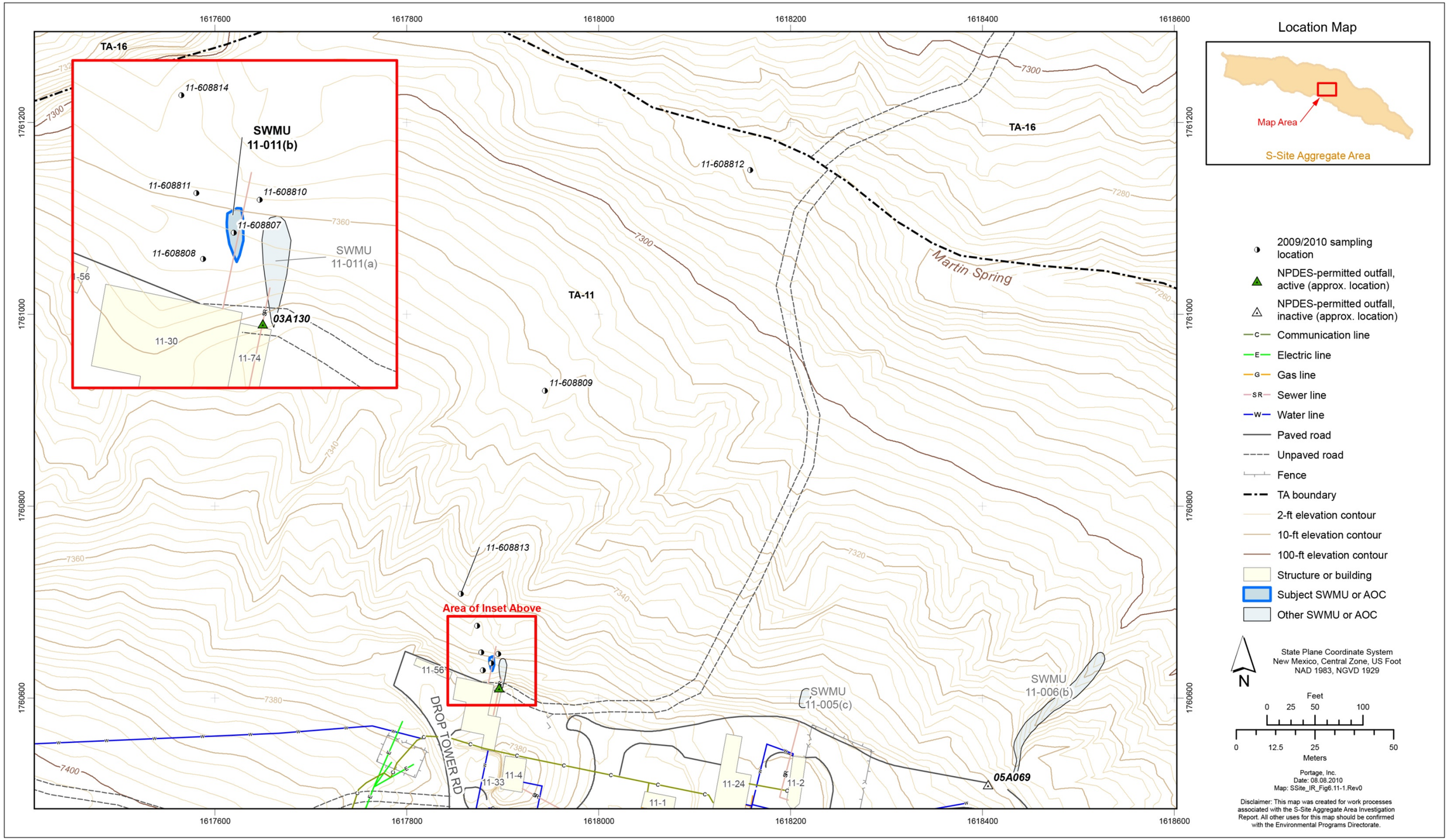


Figure 4.1-38 Site map and sampling locations at SWMU 11-011(b)

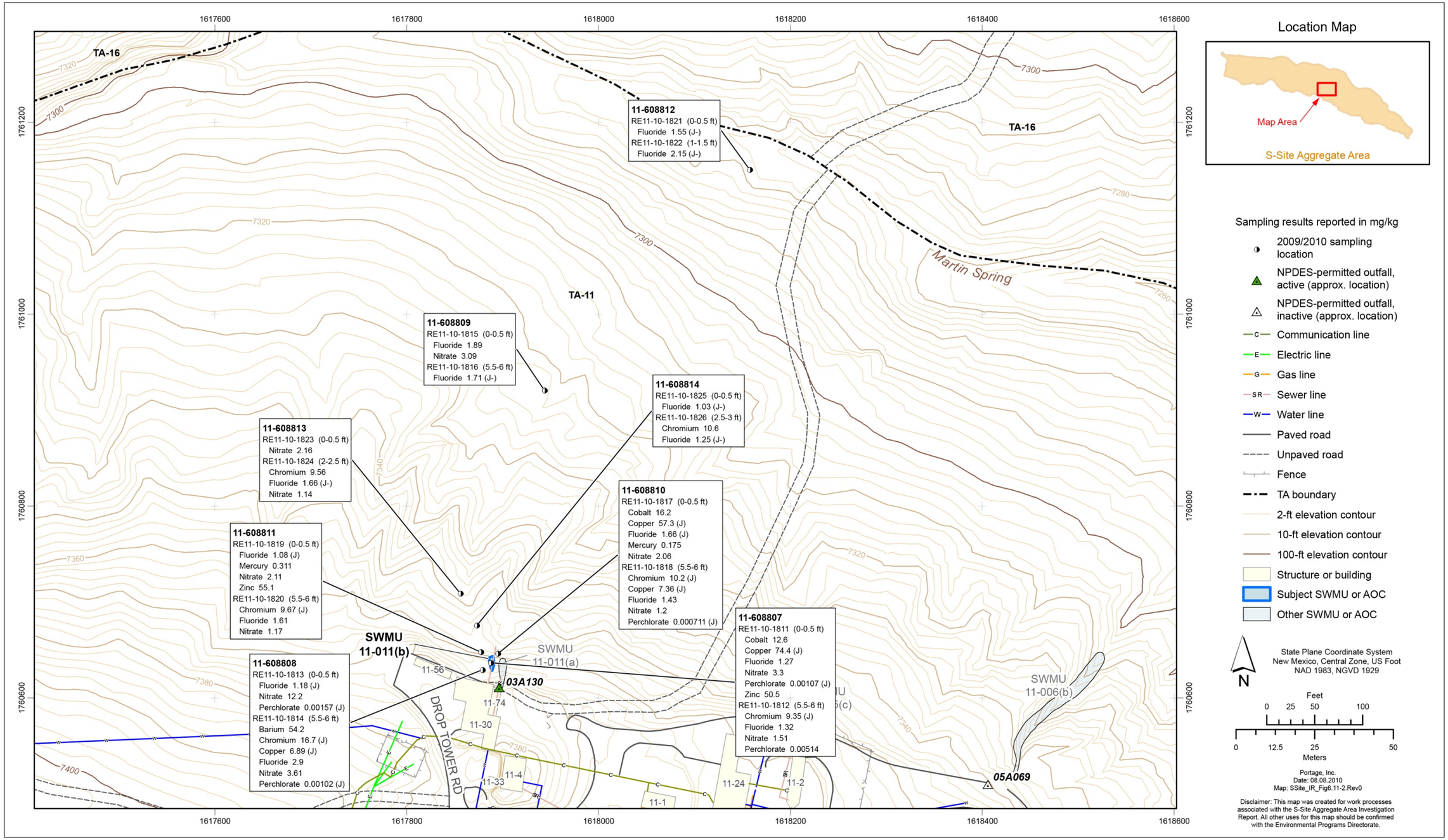


Figure 4.1-39 Inorganic chemicals detected or detected above BVs at SWMU 11-011(b)

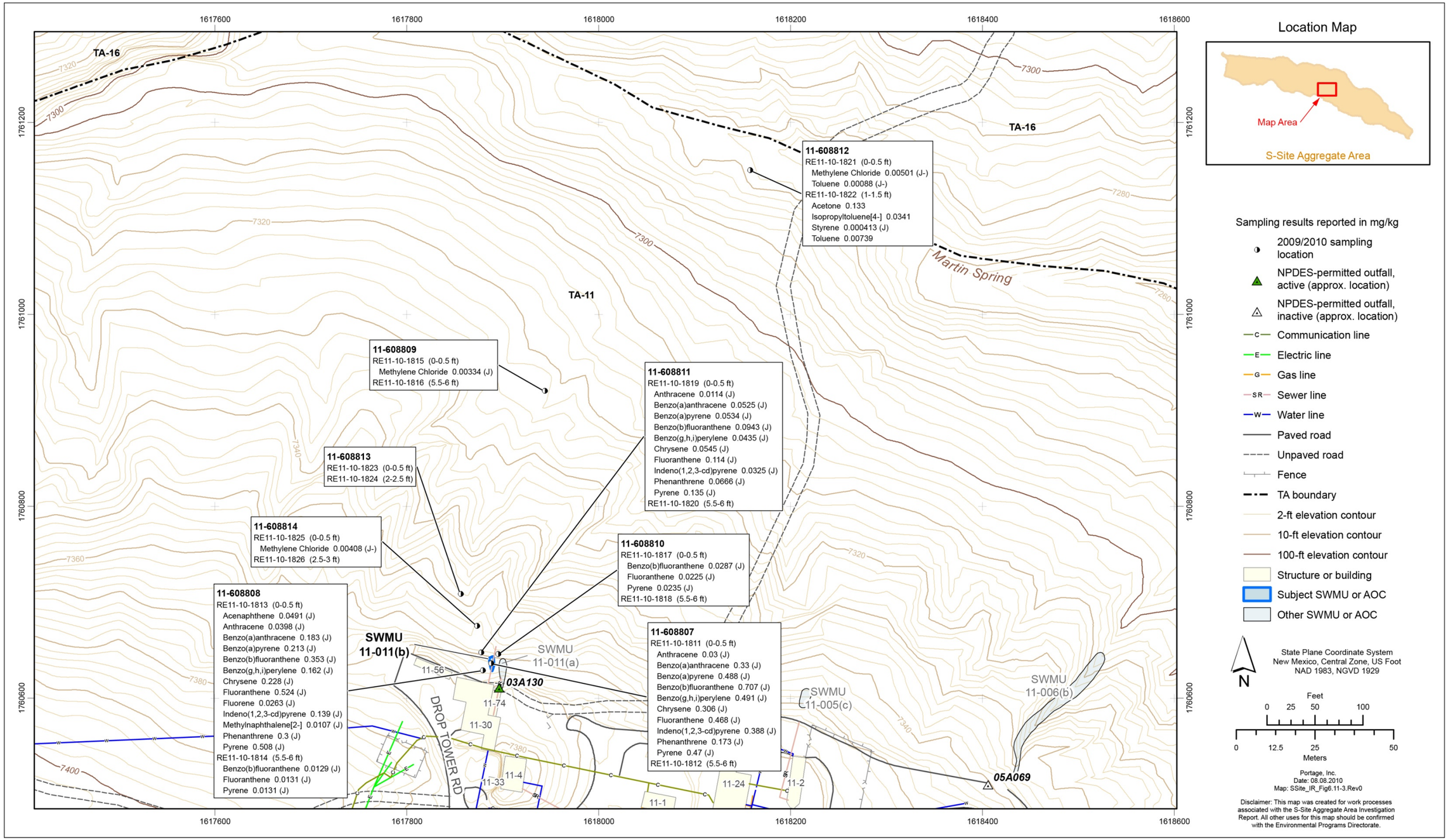


Figure 4.1-40 Organic chemicals detected at SWMU 11-011(b)

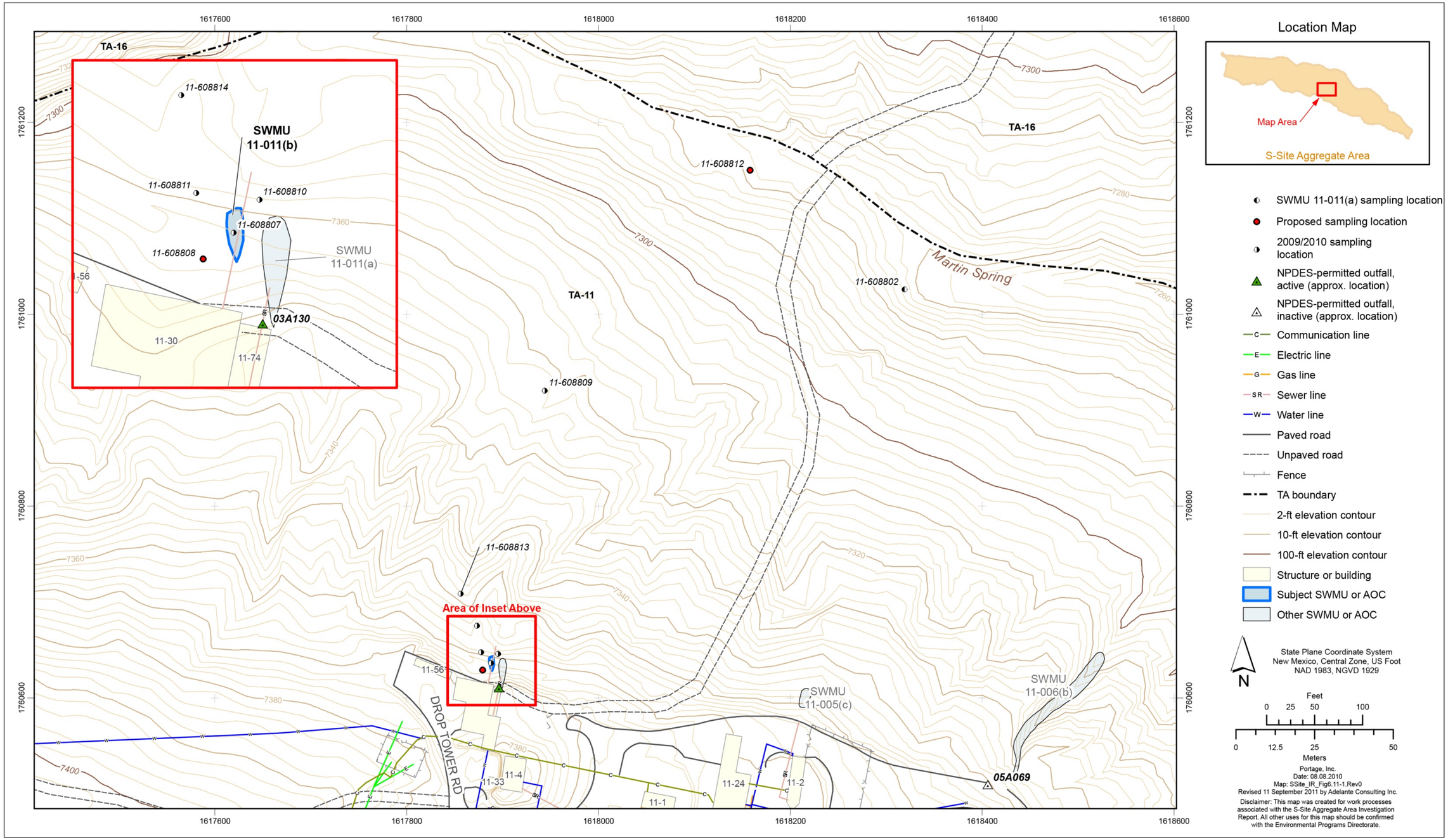


Figure 4.1-41 Proposed sampling locations at SWMU 11-011(b)

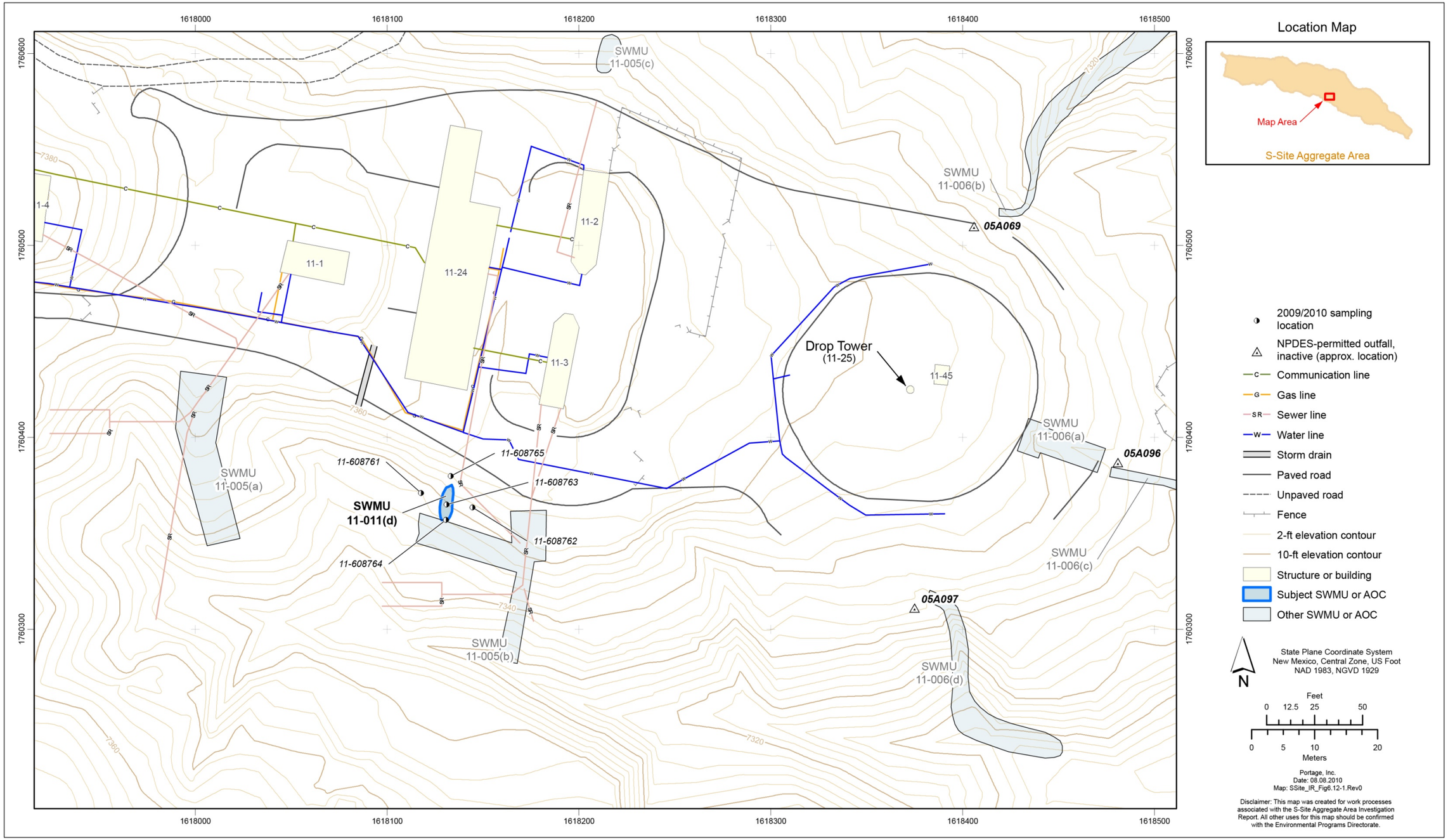


Figure 4.1-42 Site map and sampling locations at SWMU 11-011(d)

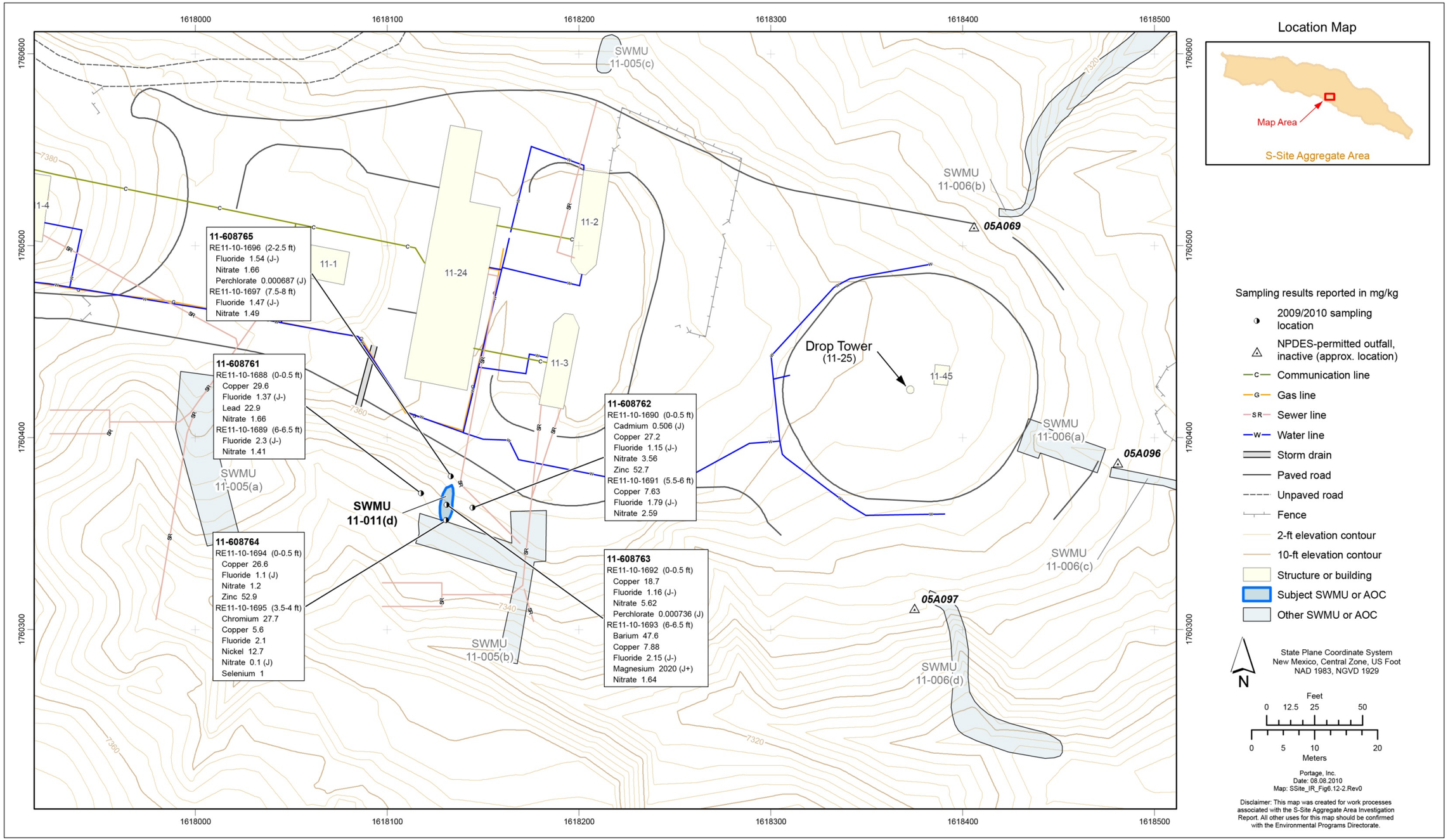


Figure 4.1-43 Inorganic chemicals detected or detected above BVs at SWMU 11-011(d)

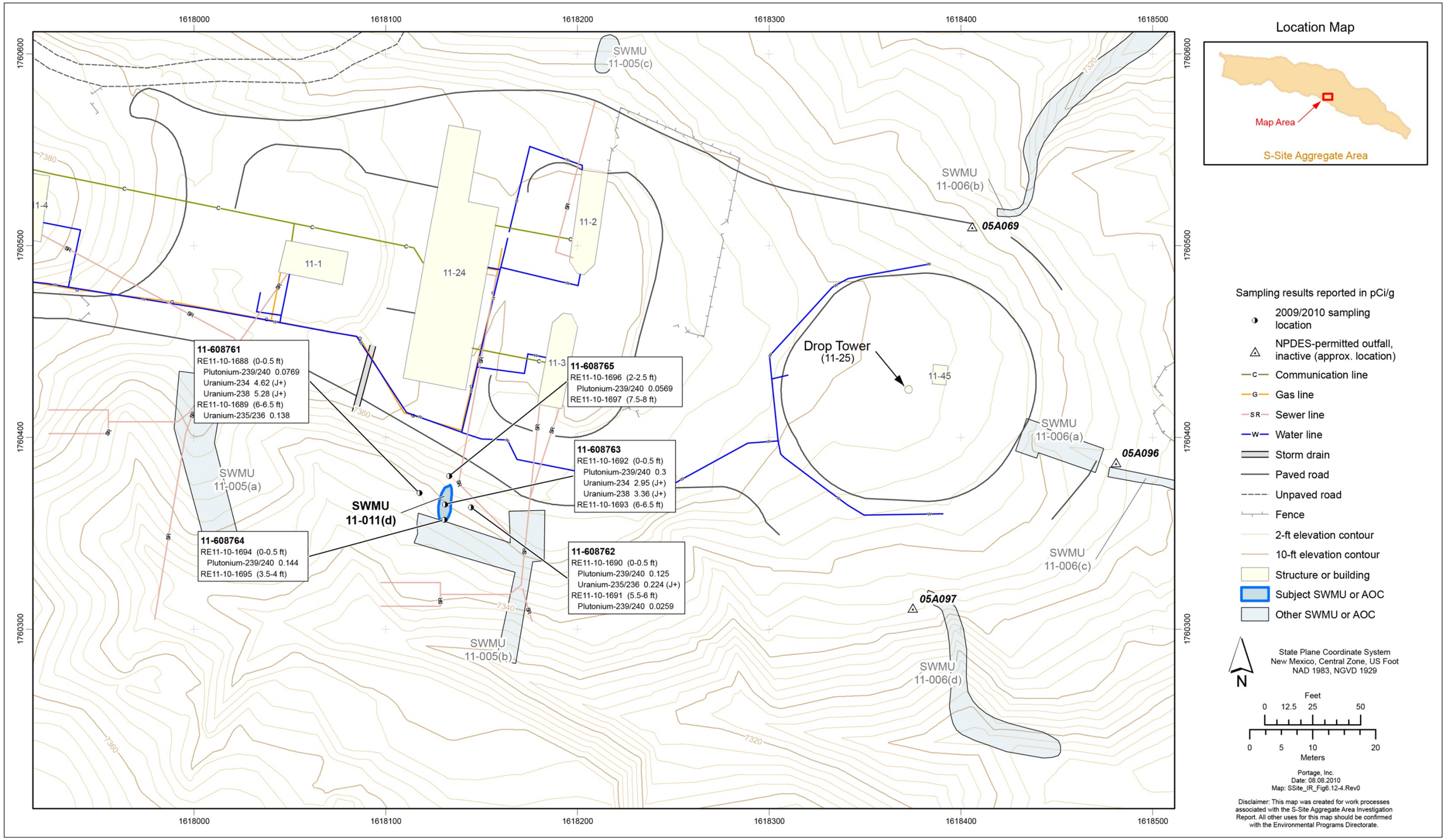


Figure 4.1-44 Radionuclides detected or detected above BVs/FVs at SWMU 11-011(d)

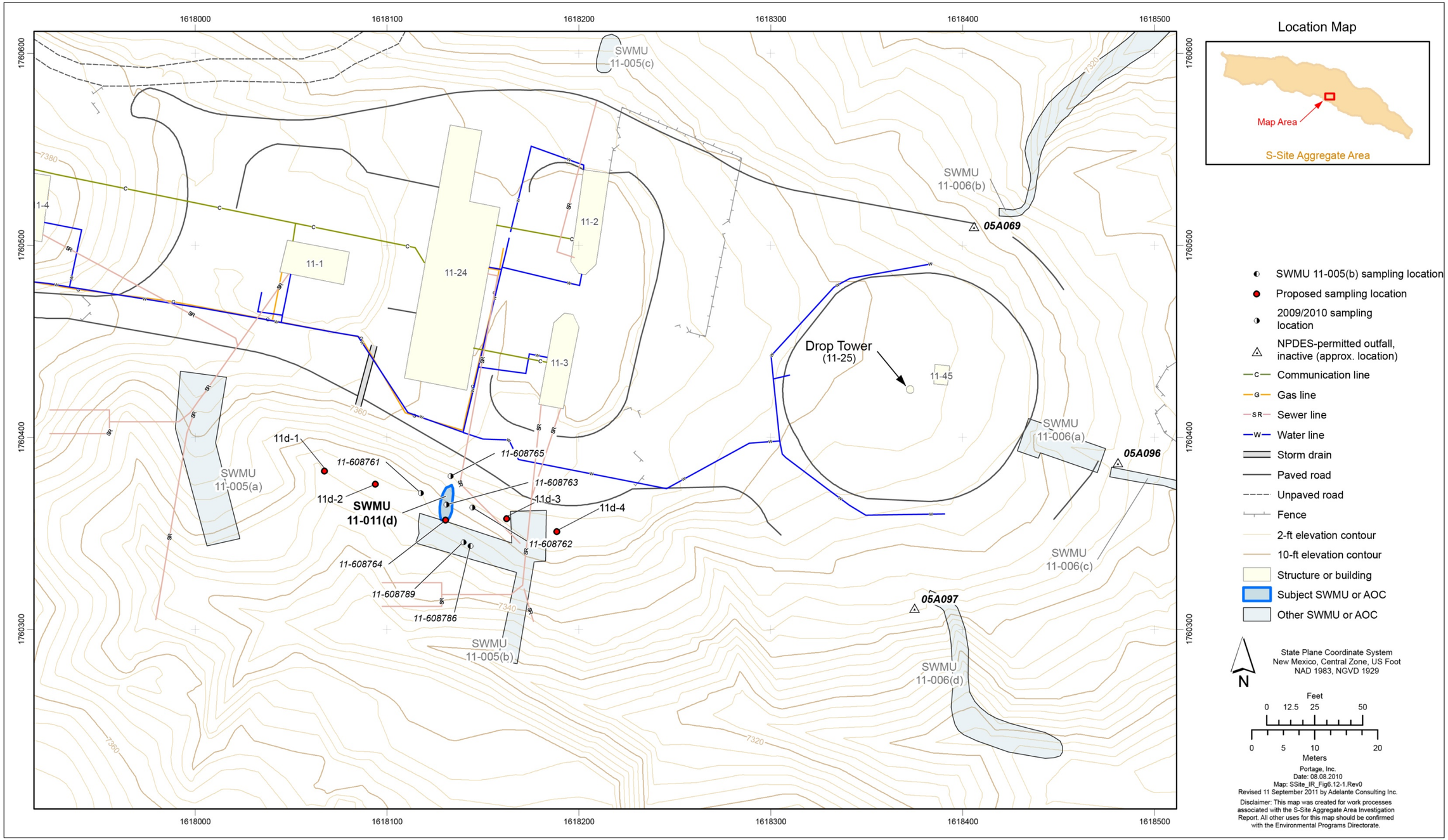


Figure 4.1-45 Proposed sampling locations at SWMU 11-011(d)

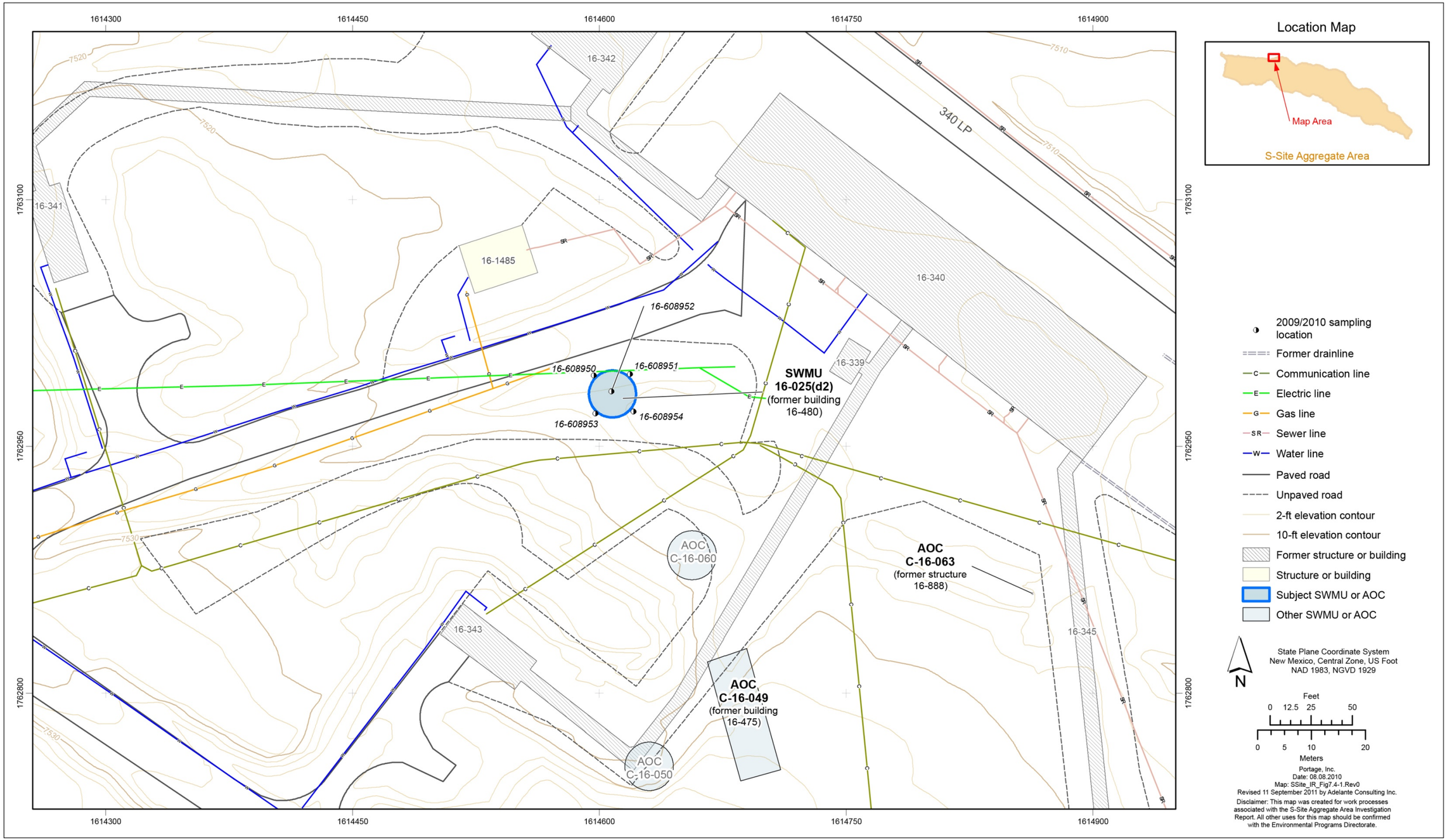


Figure 4.2-1 Site map and sampling locations at SWMU 16-025(d2)

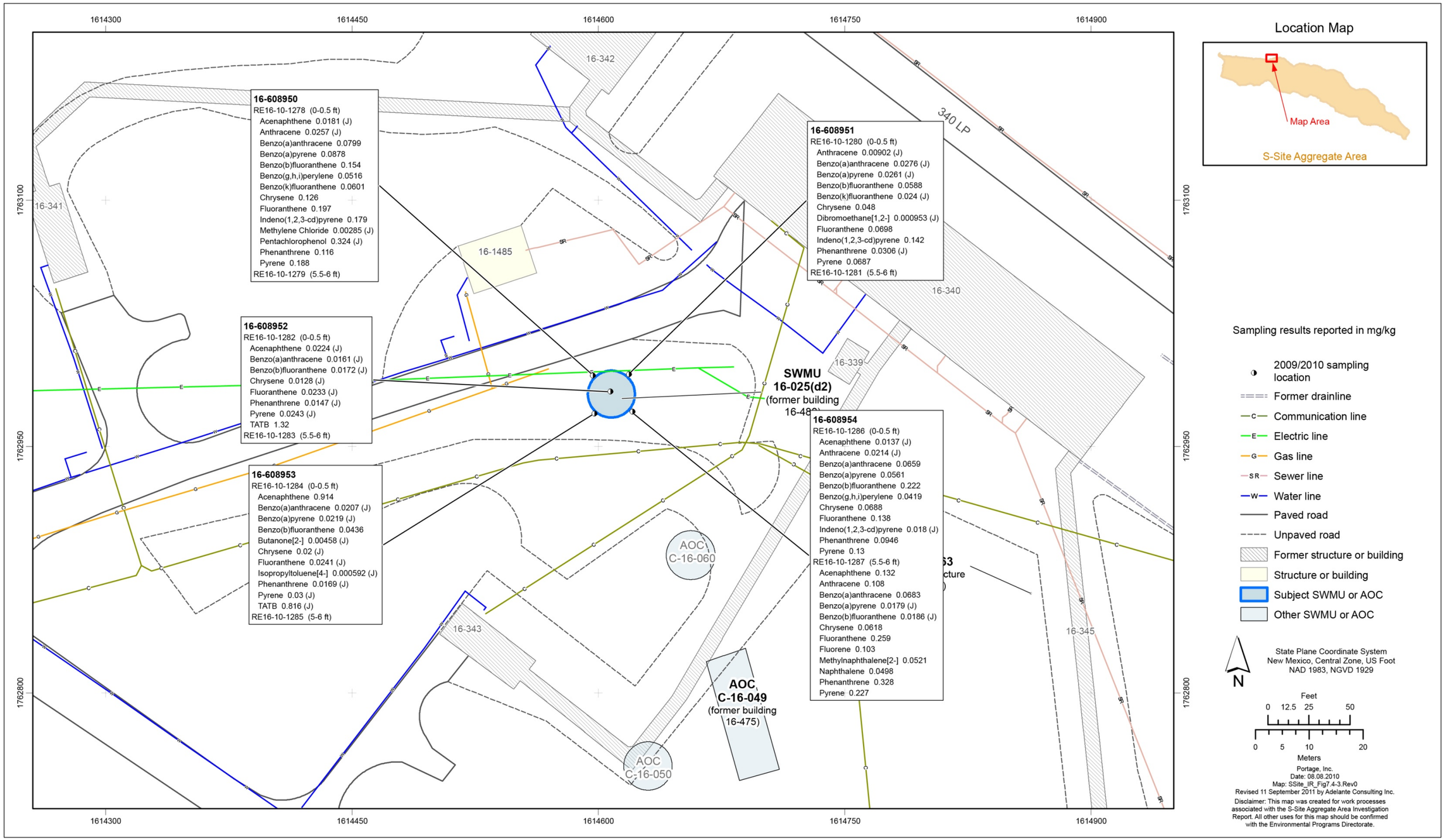


Figure 4.2-2 Organic chemicals detected at SWMU 16-025(d2)

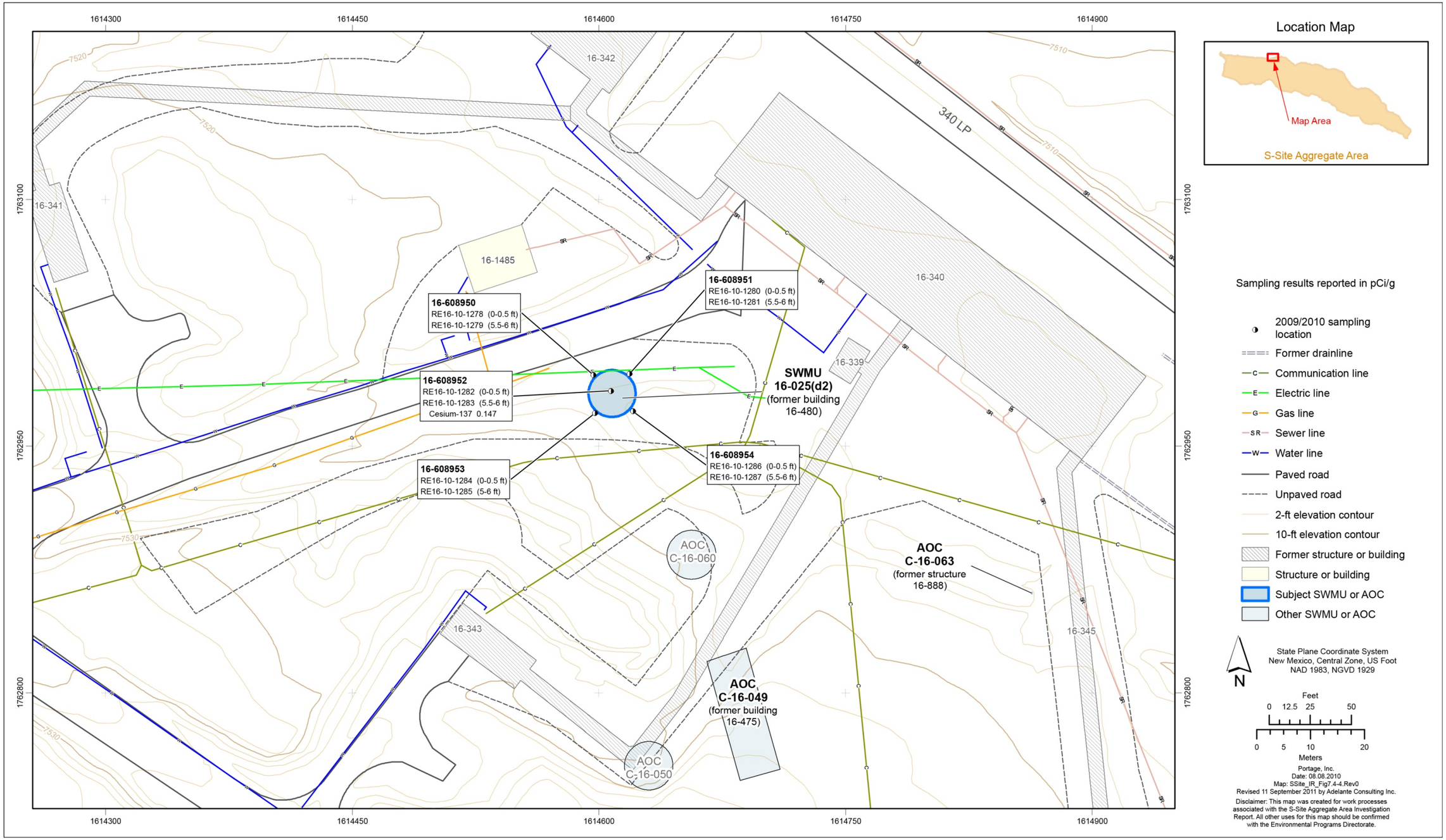


Figure 4.2-3 Radionuclides detected or detected above BVs/FVs at SWMU 16-025(d2)

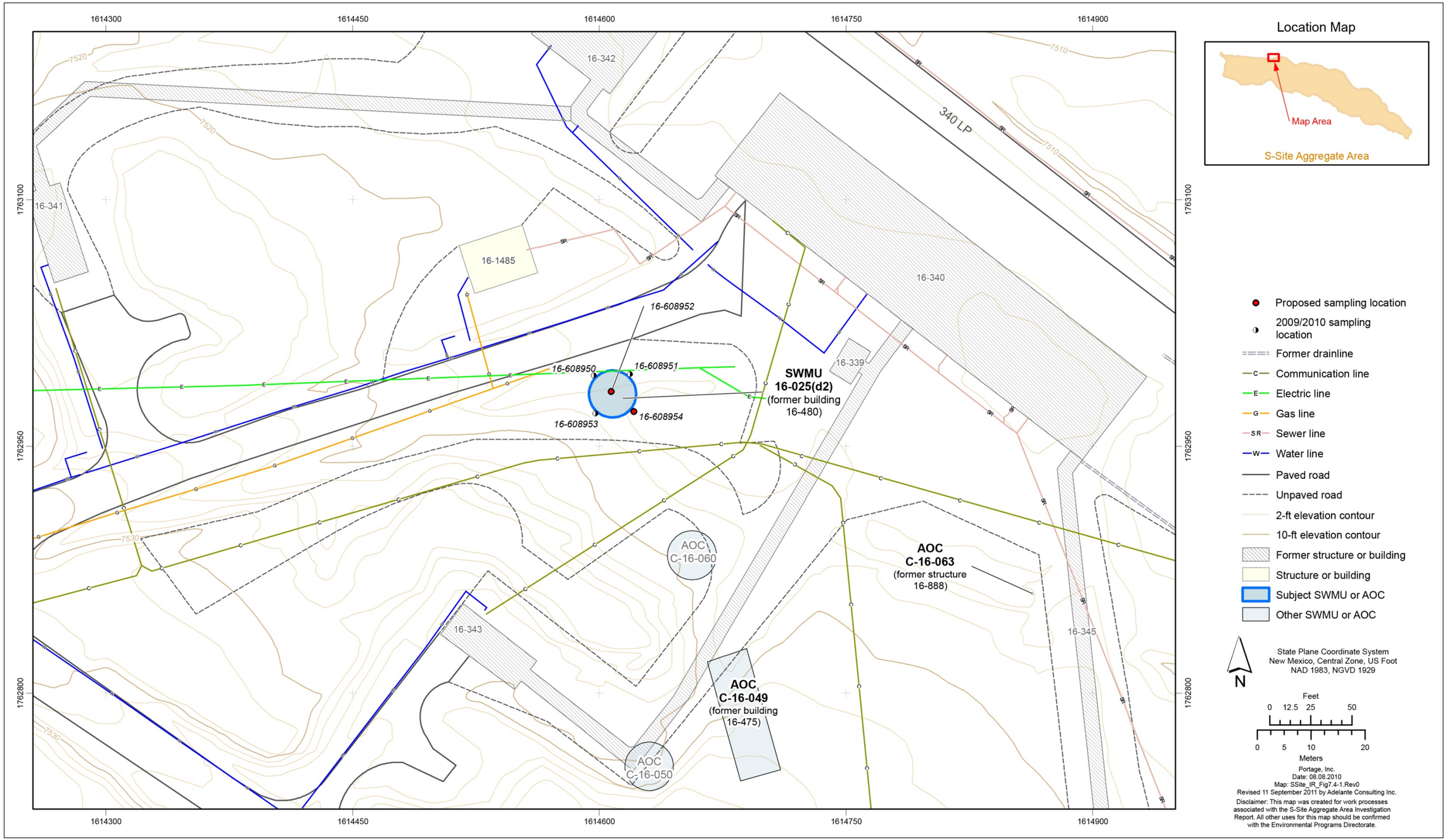


Figure 4.2-4 Proposed sampling locations at SWMU 16-025(d2)

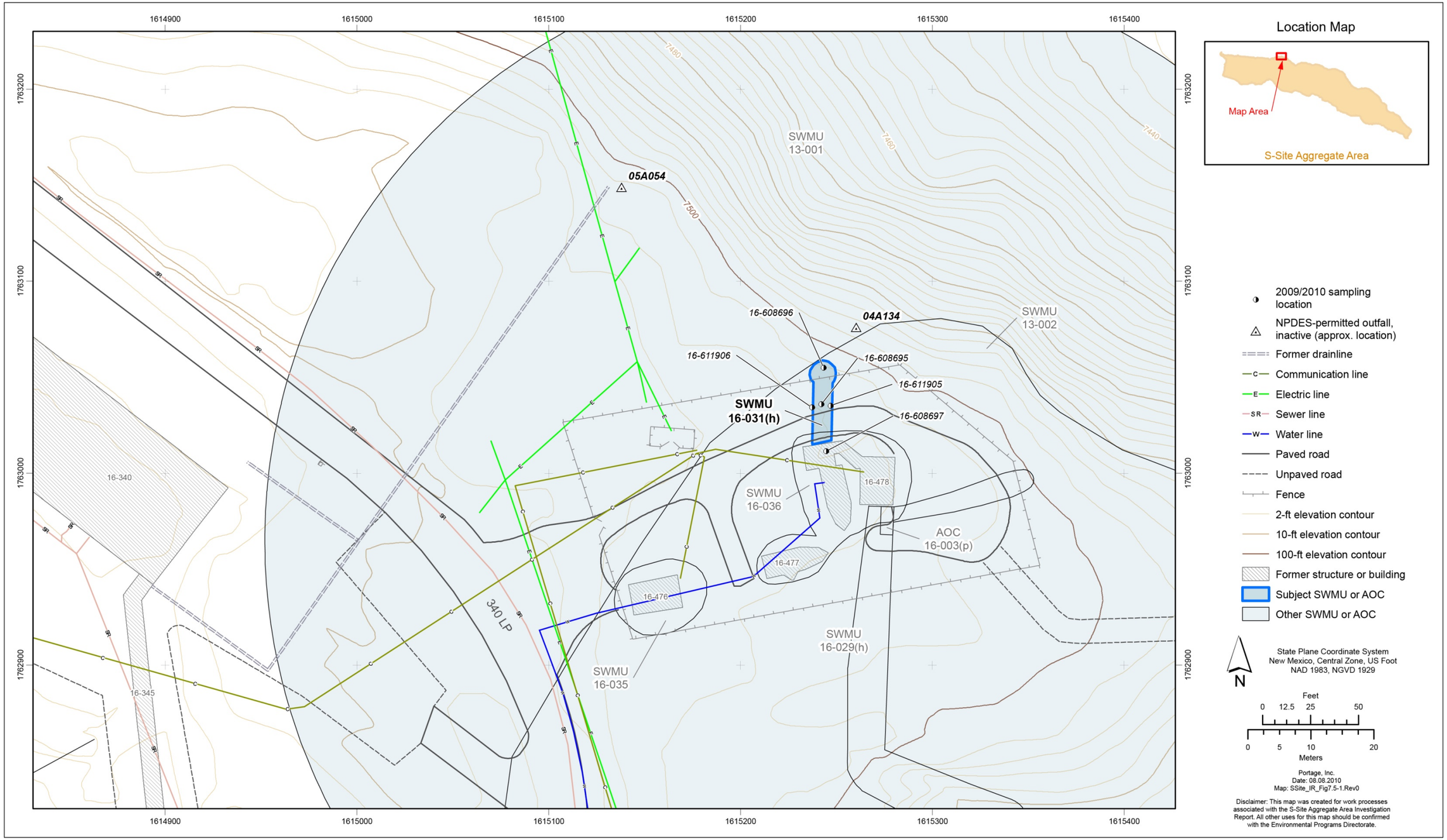


Figure 4.2-5 Site map and sampling locations at SWMU 16-031(h)

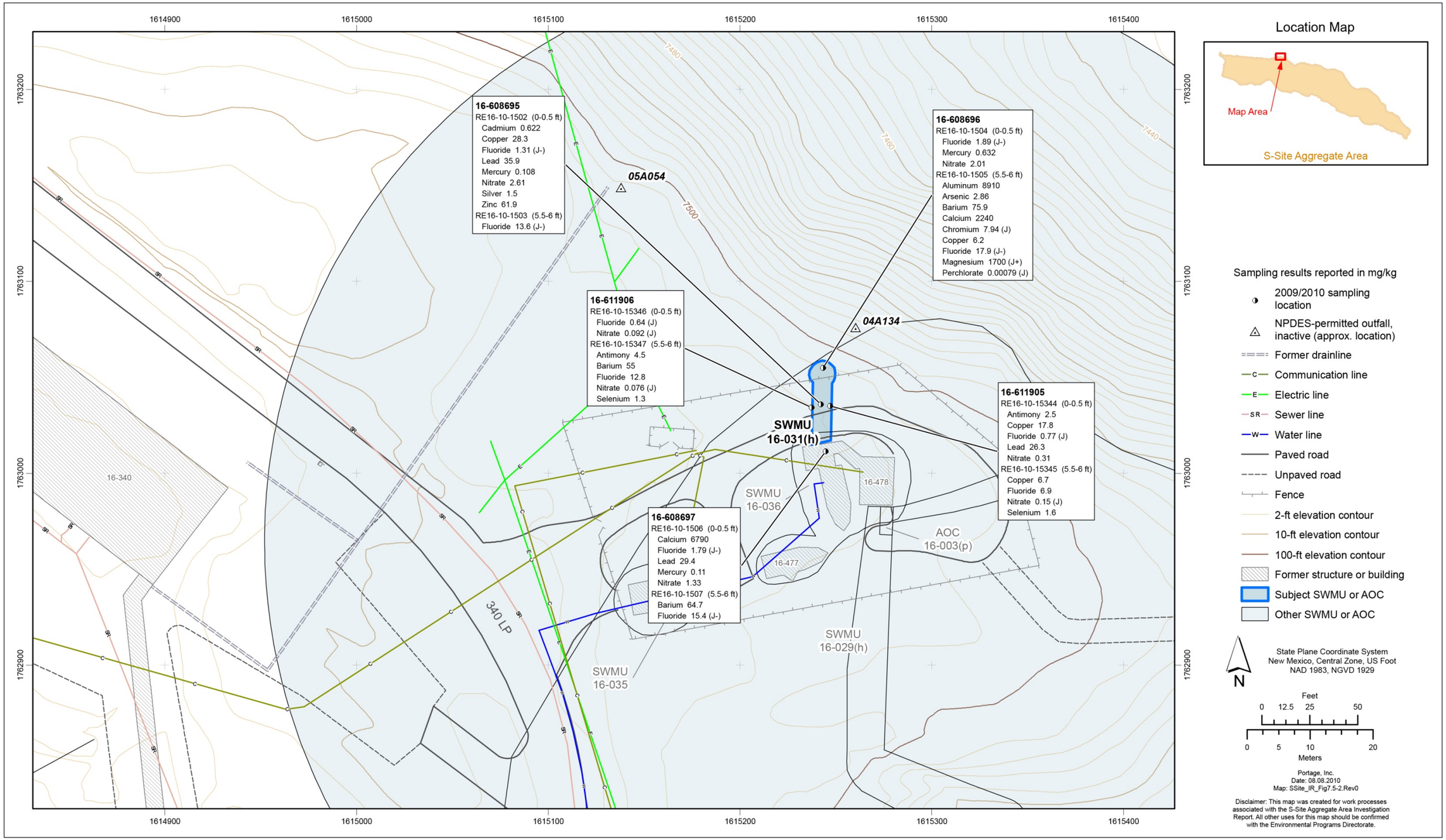


Figure 4.2-6 Inorganic chemicals detected or detected above BVs at SWMU 16-031(h)

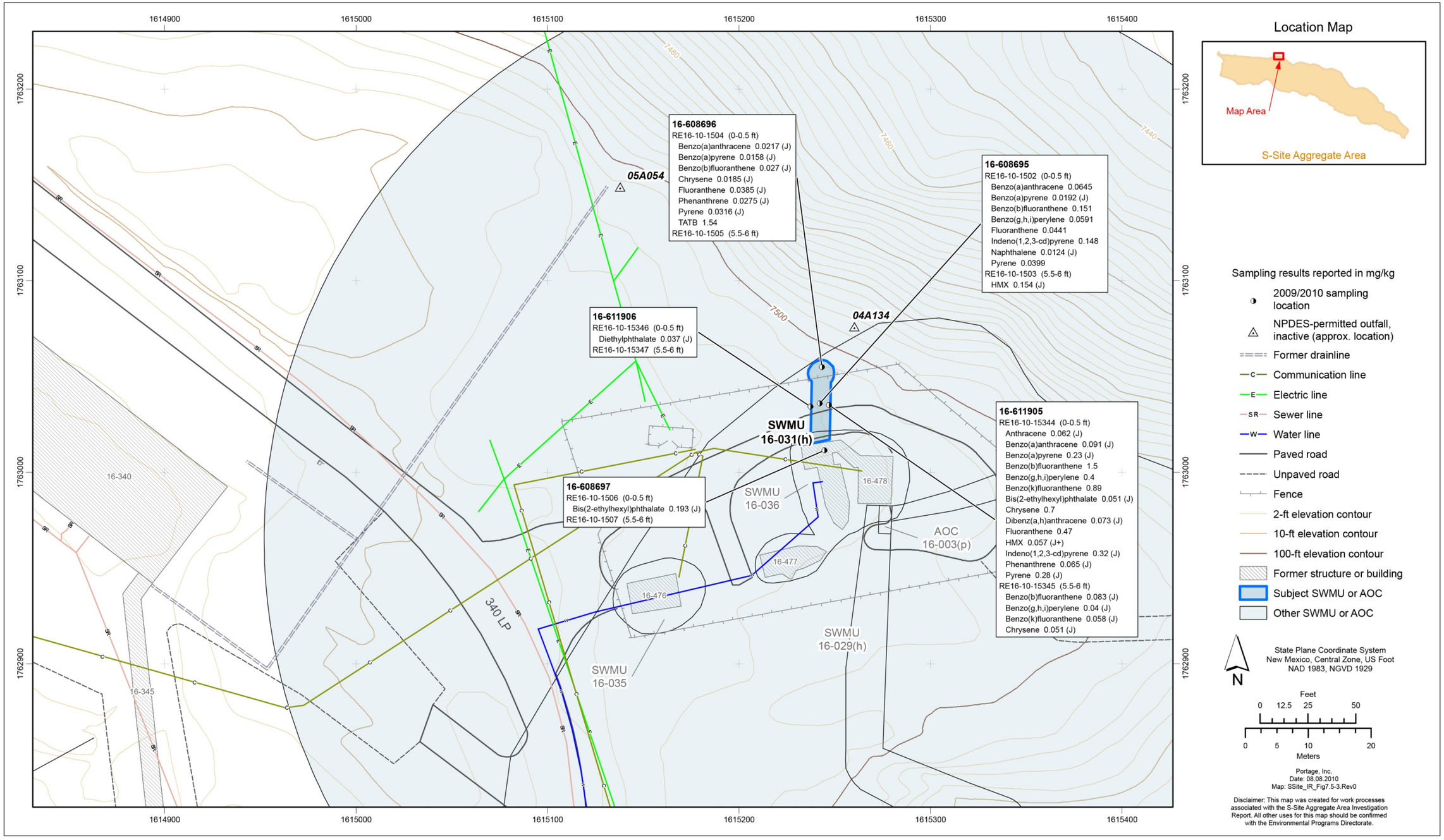


Figure 4.2-7 Organic chemicals detected at SWMU 16-031(h)

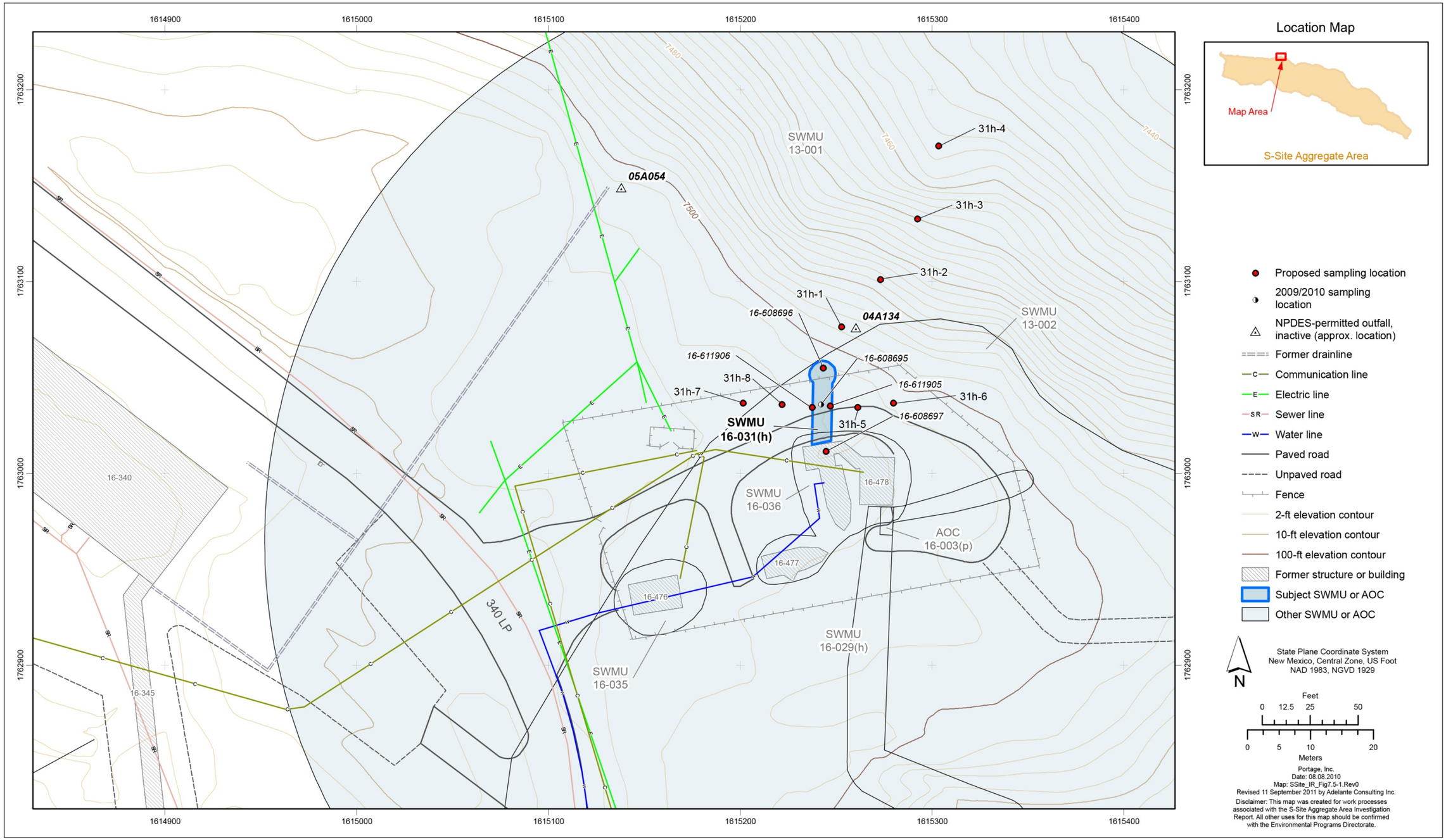


Figure 4.2-8 Proposed sampling locations at SWMU 16-031(h)

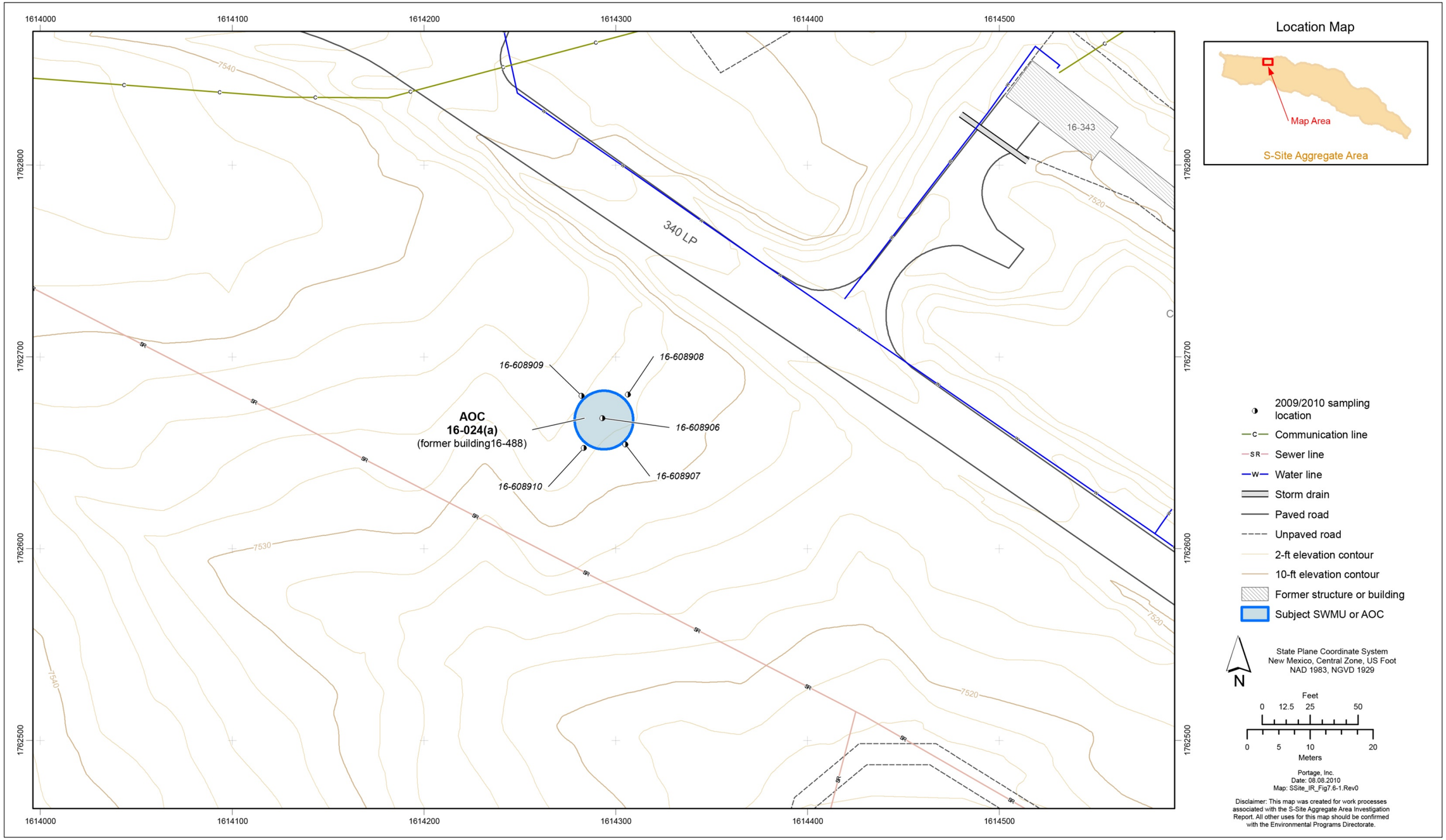


Figure 4.2-9 Site map and sampling locations at AOC 16-024(a)

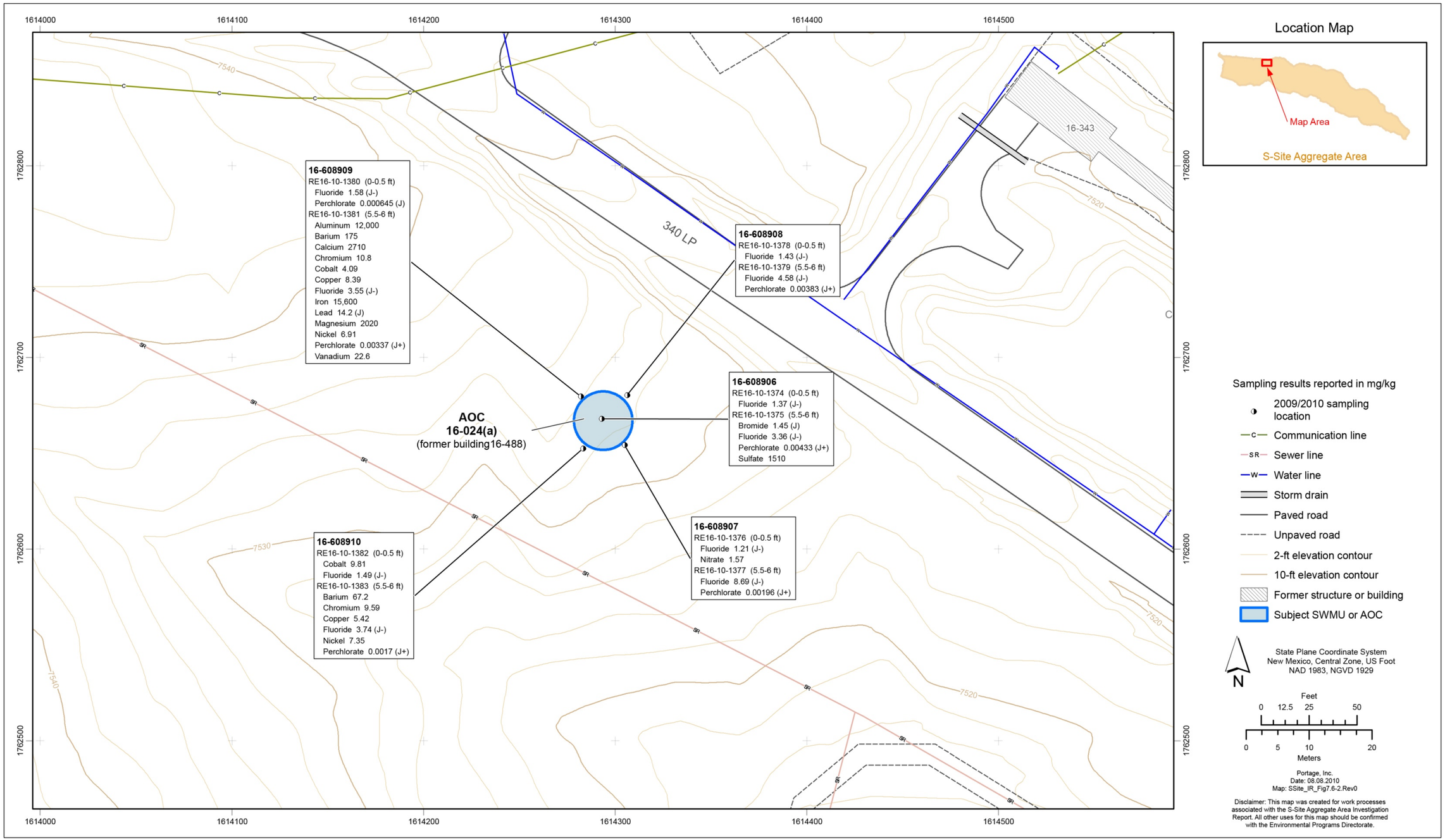


Figure 4.2-10 Inorganic chemicals detected or detected above BVs at AOC 16-024(a)

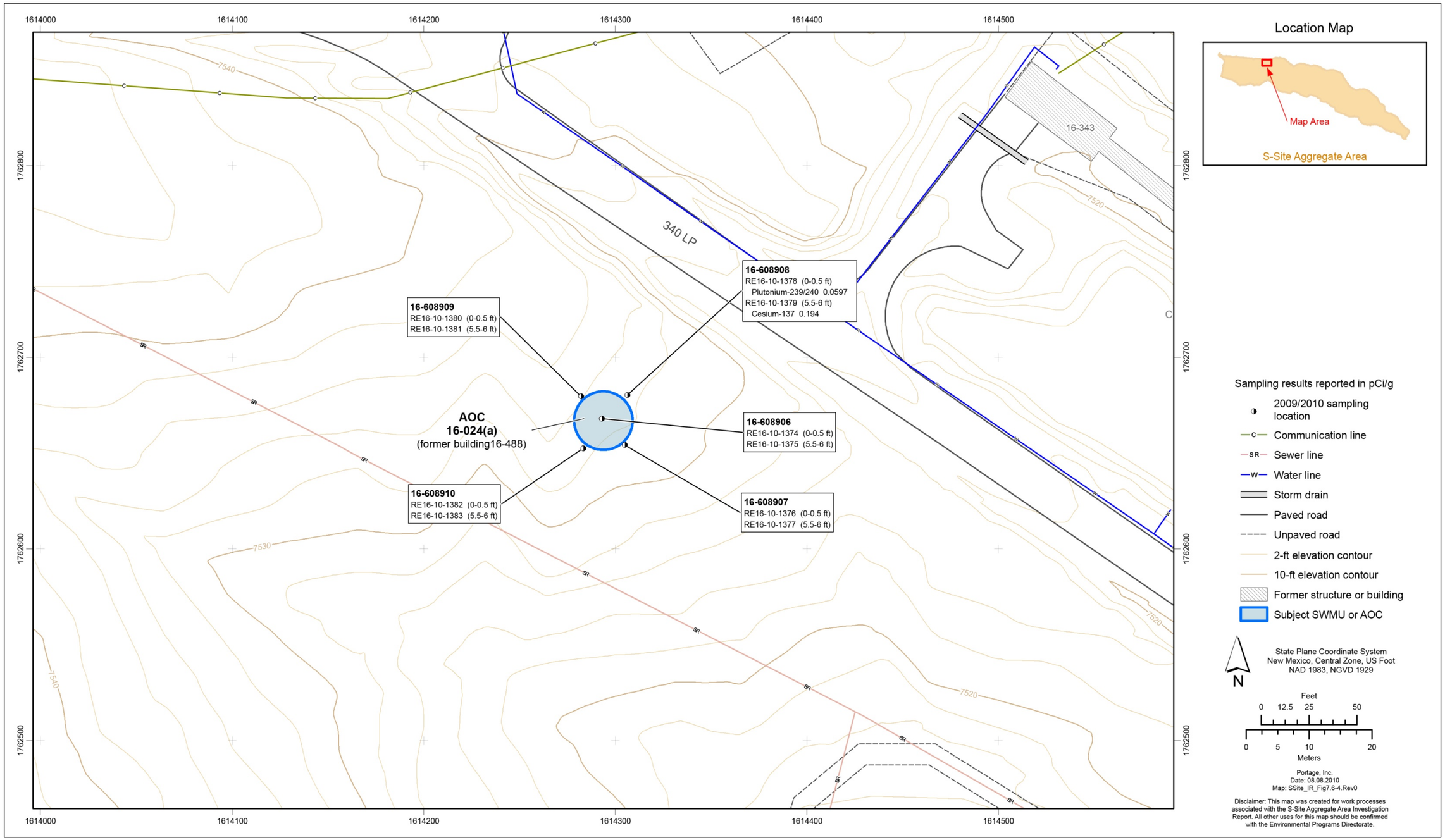


Figure 4.2-11 Radionuclides detected or detected above BVs/FVs at AOC 16-024(a)

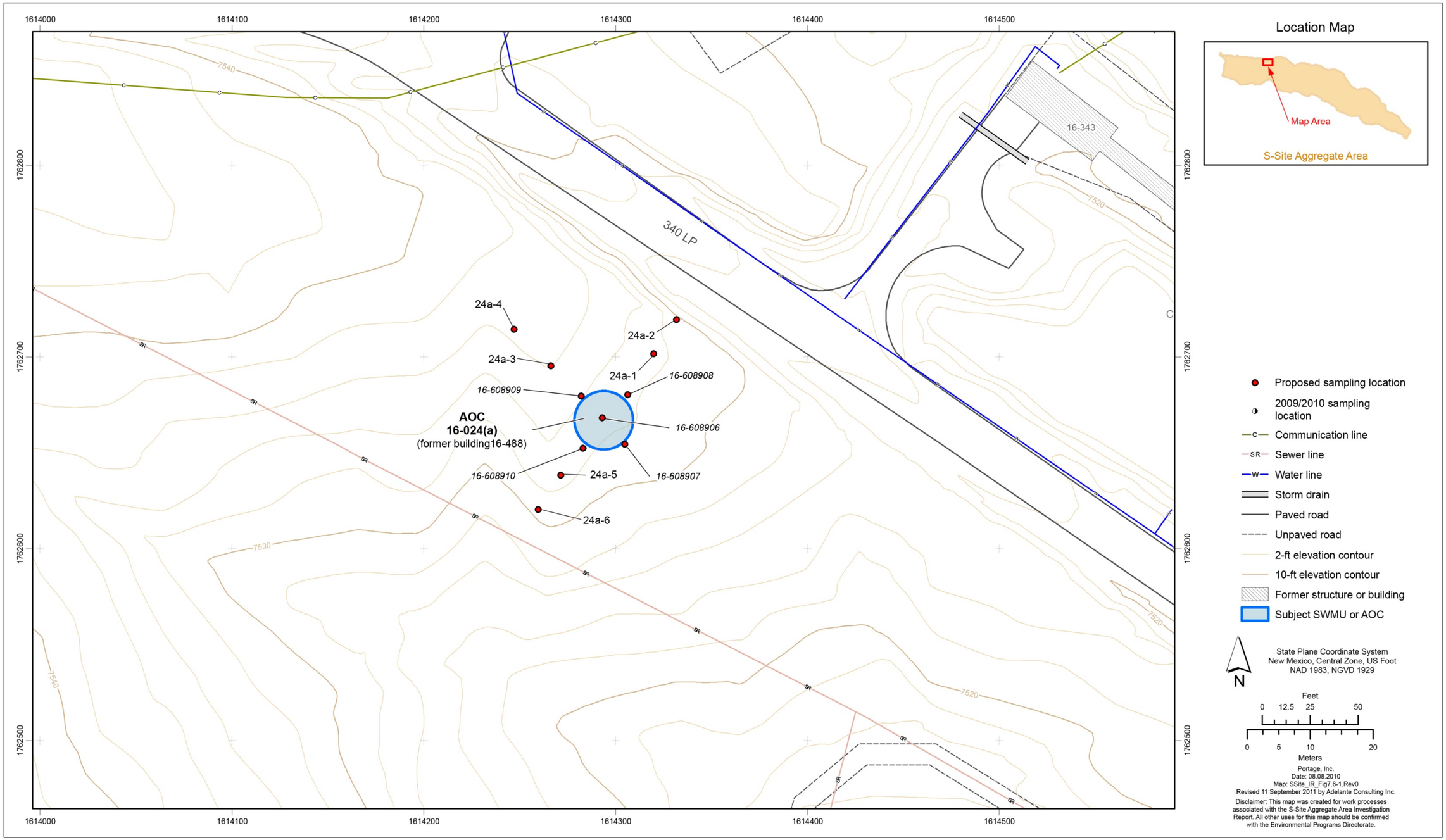


Figure 4.2-12 Proposed sampling locations at AOC 16-024(a)

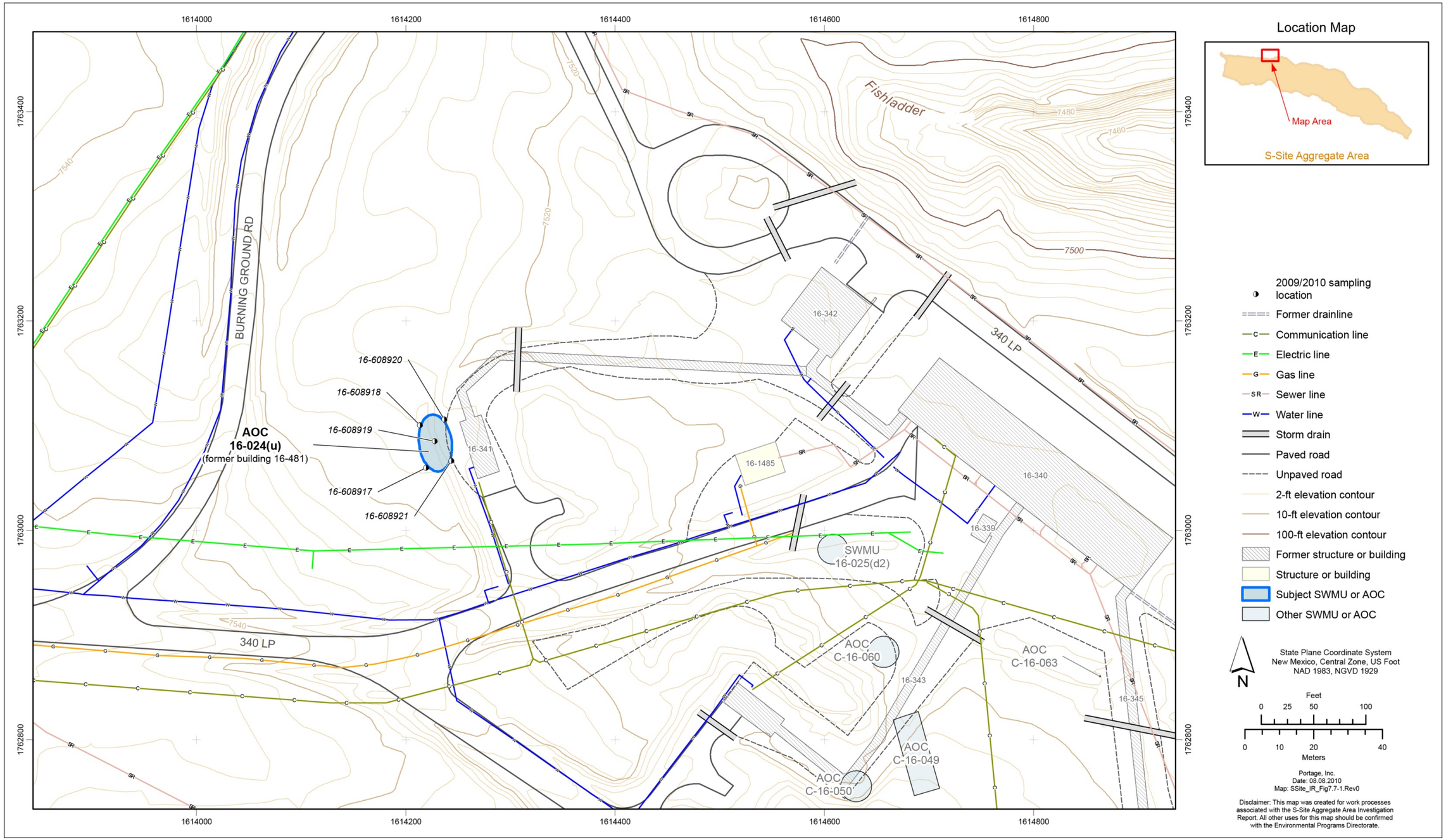


Figure 4.2-13 Site map and sampling locations at AOC 16-024(u)

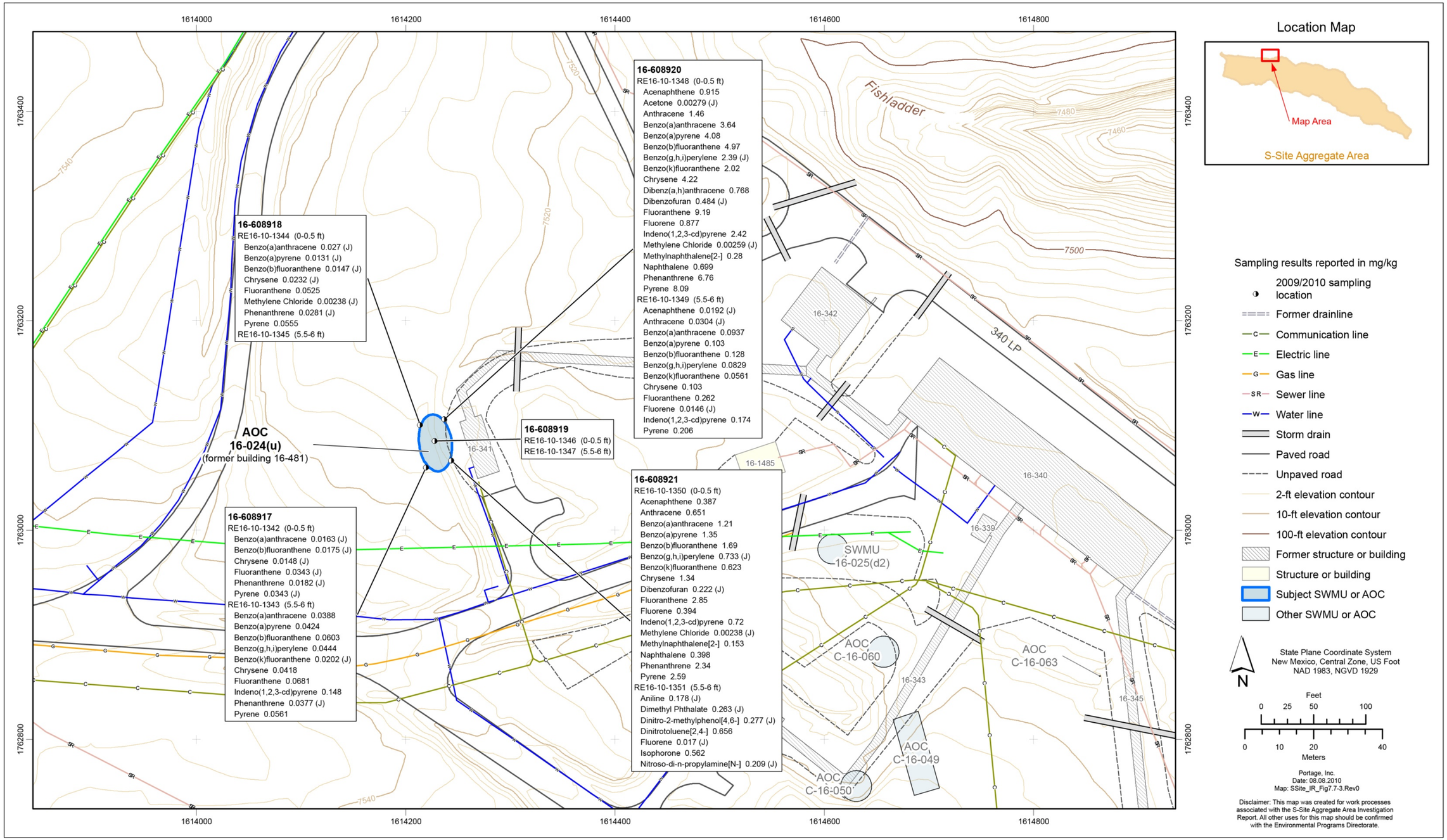


Figure 4.2-14 Organic chemicals detected at AOC 16-024(u)

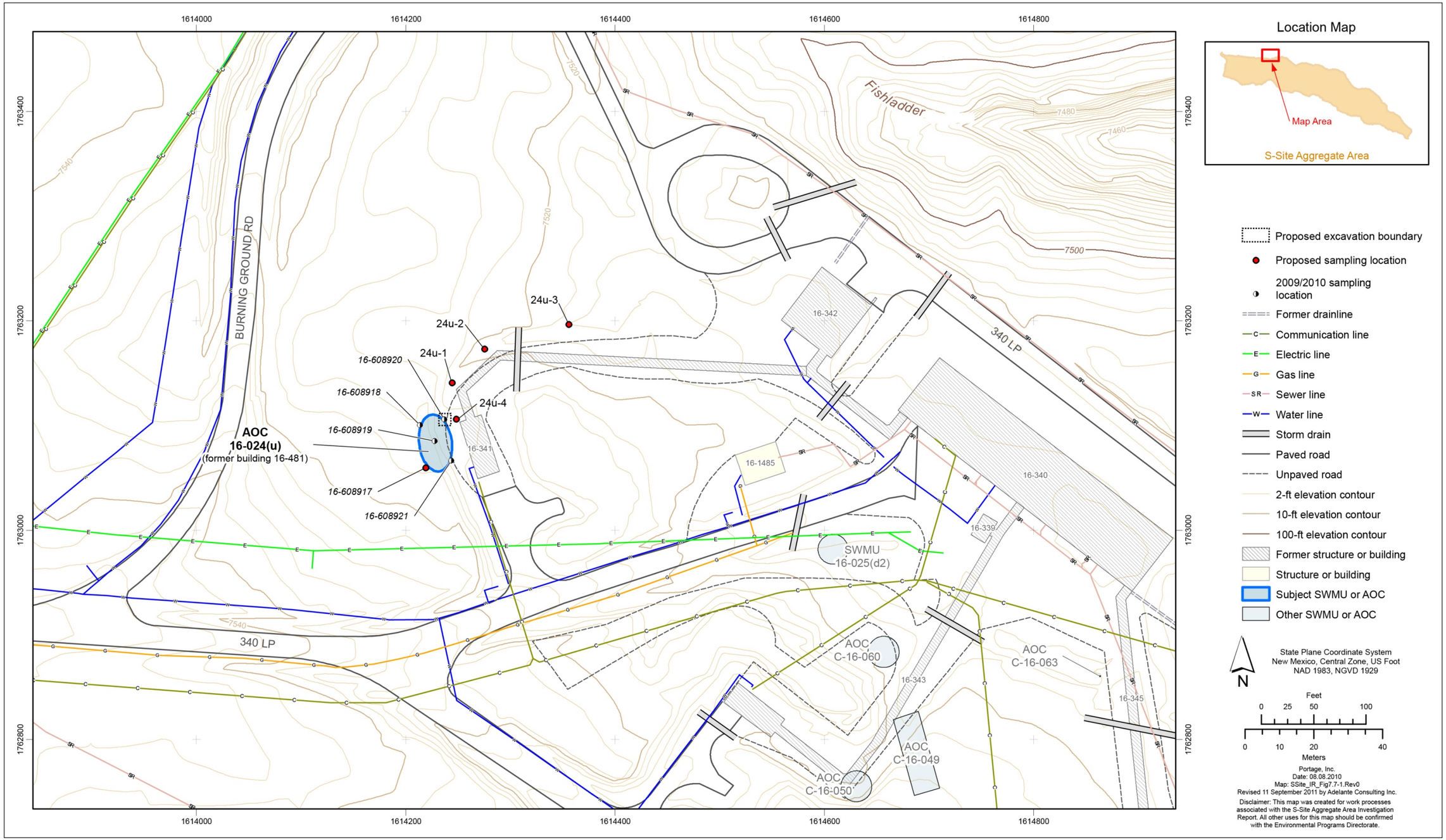


Figure 4.2-15 Proposed sampling locations at AOC 16-024(u)

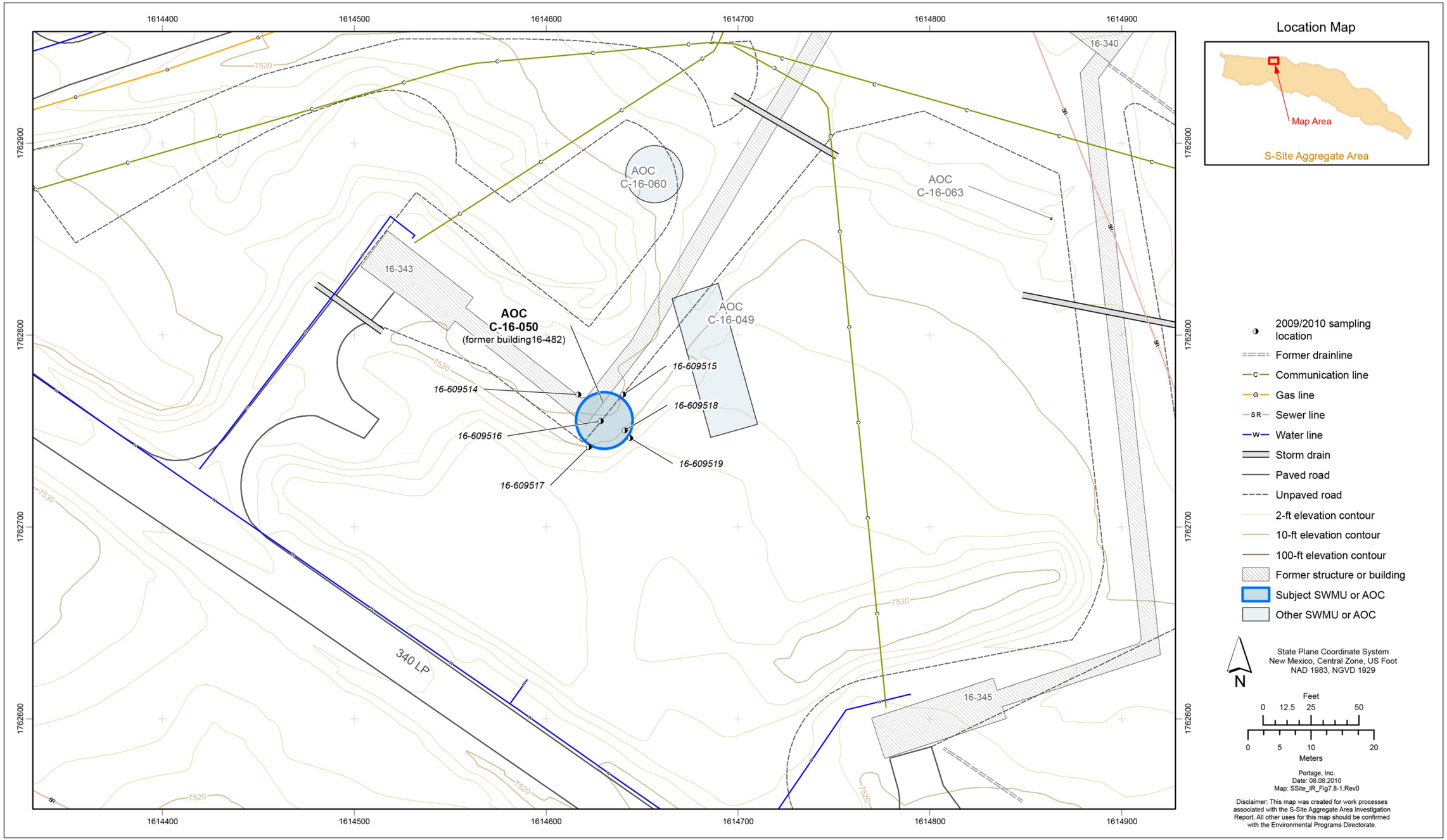


Figure 4.2-16 Site map and sampling locations at AOC C-16-050

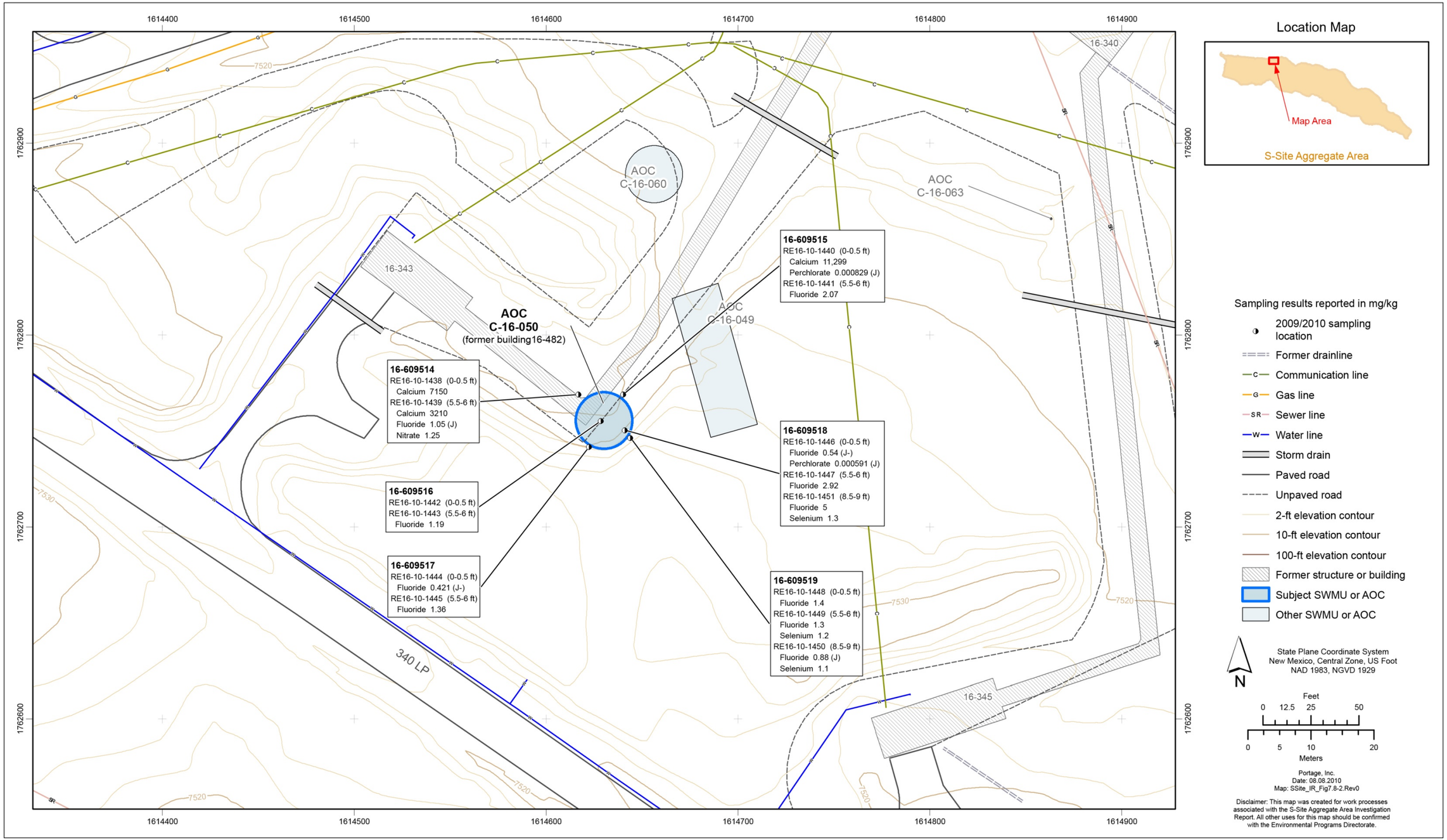


Figure 4.2-17 Inorganic chemicals detected or detected above BVs at AOC C-16-050

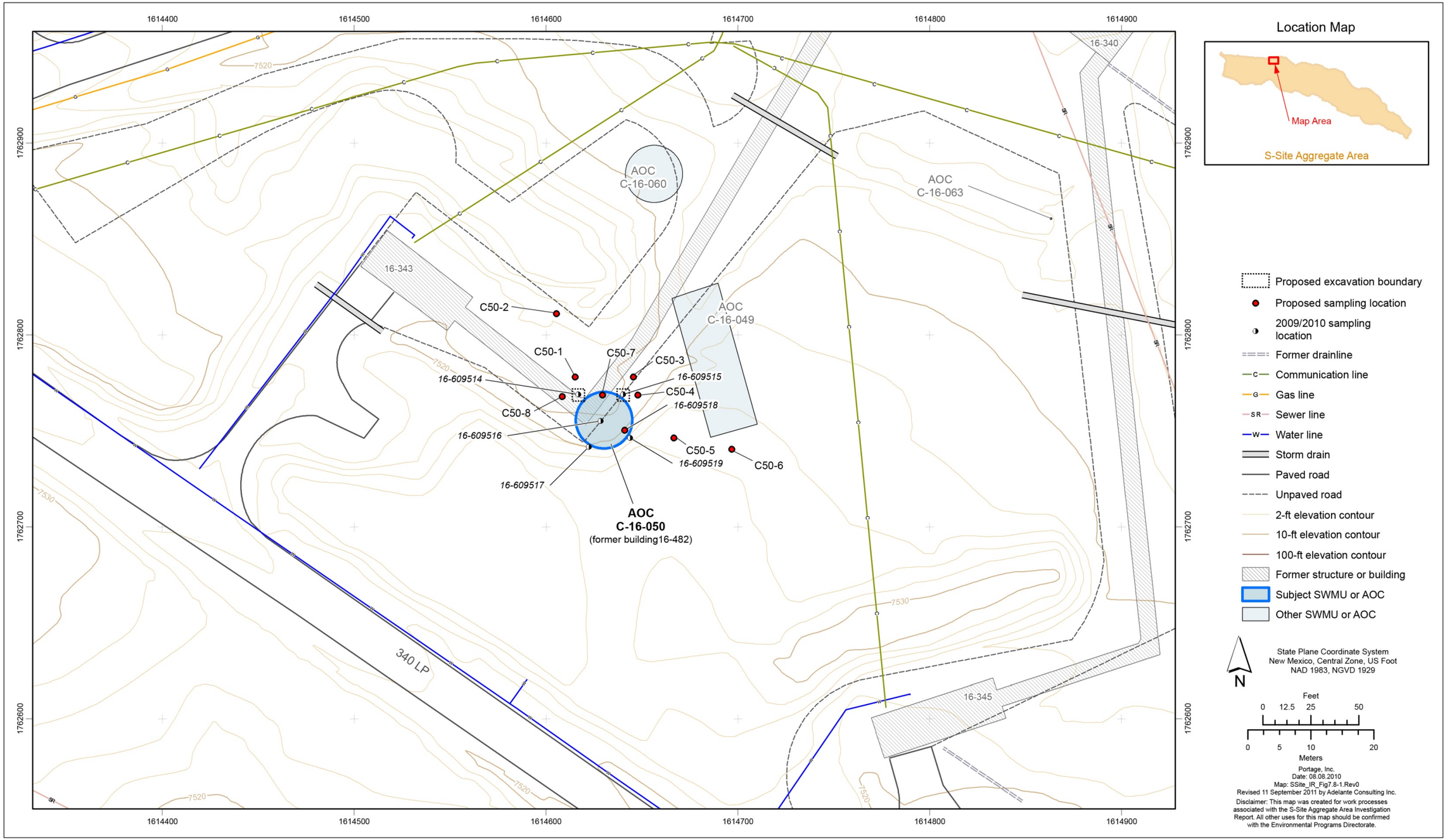


Figure 4.2-18 Proposed sampling locations at AOC C-16-050

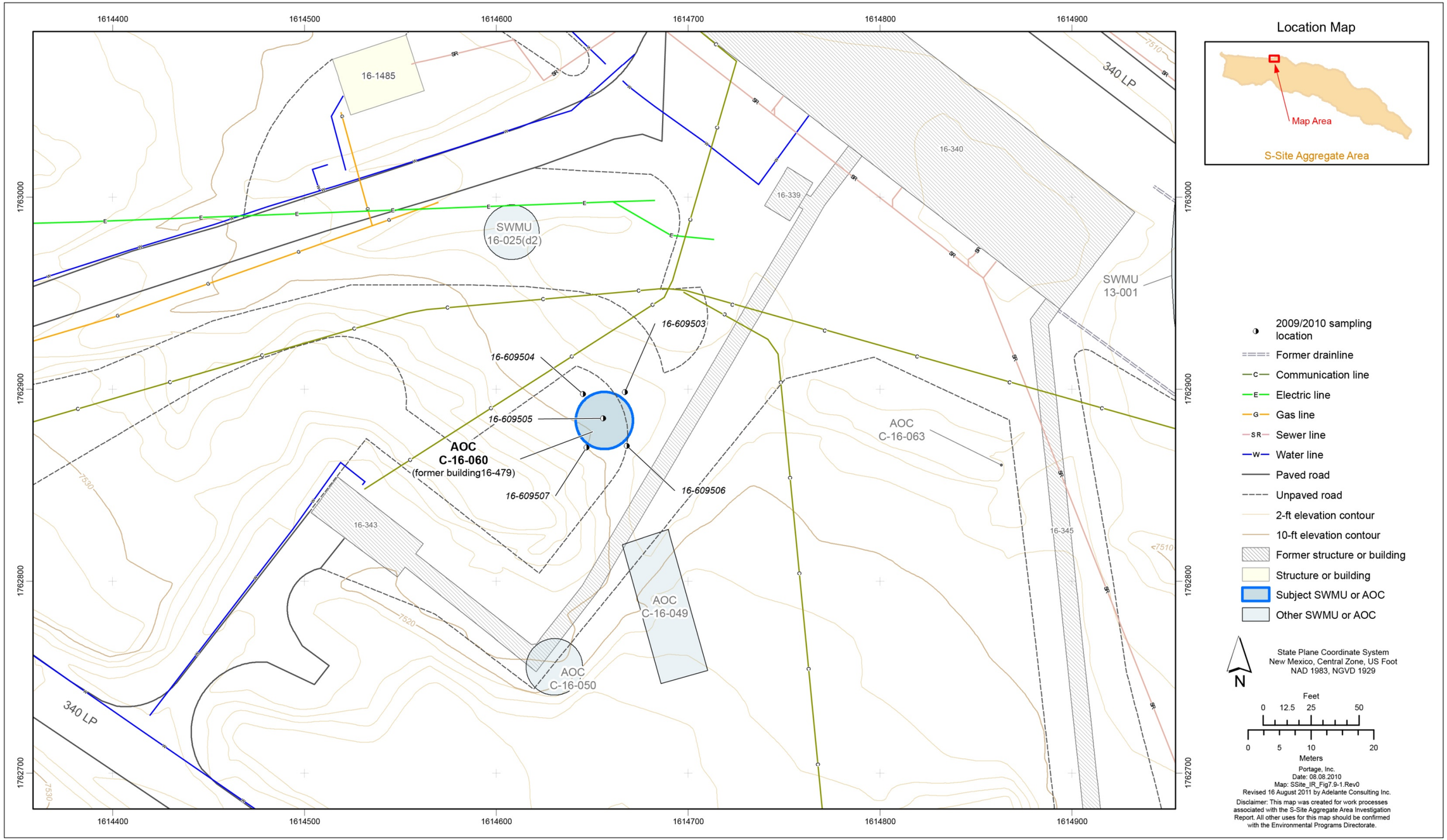


Figure 4.2-19 Site map and sampling locations at AOC C-16-060

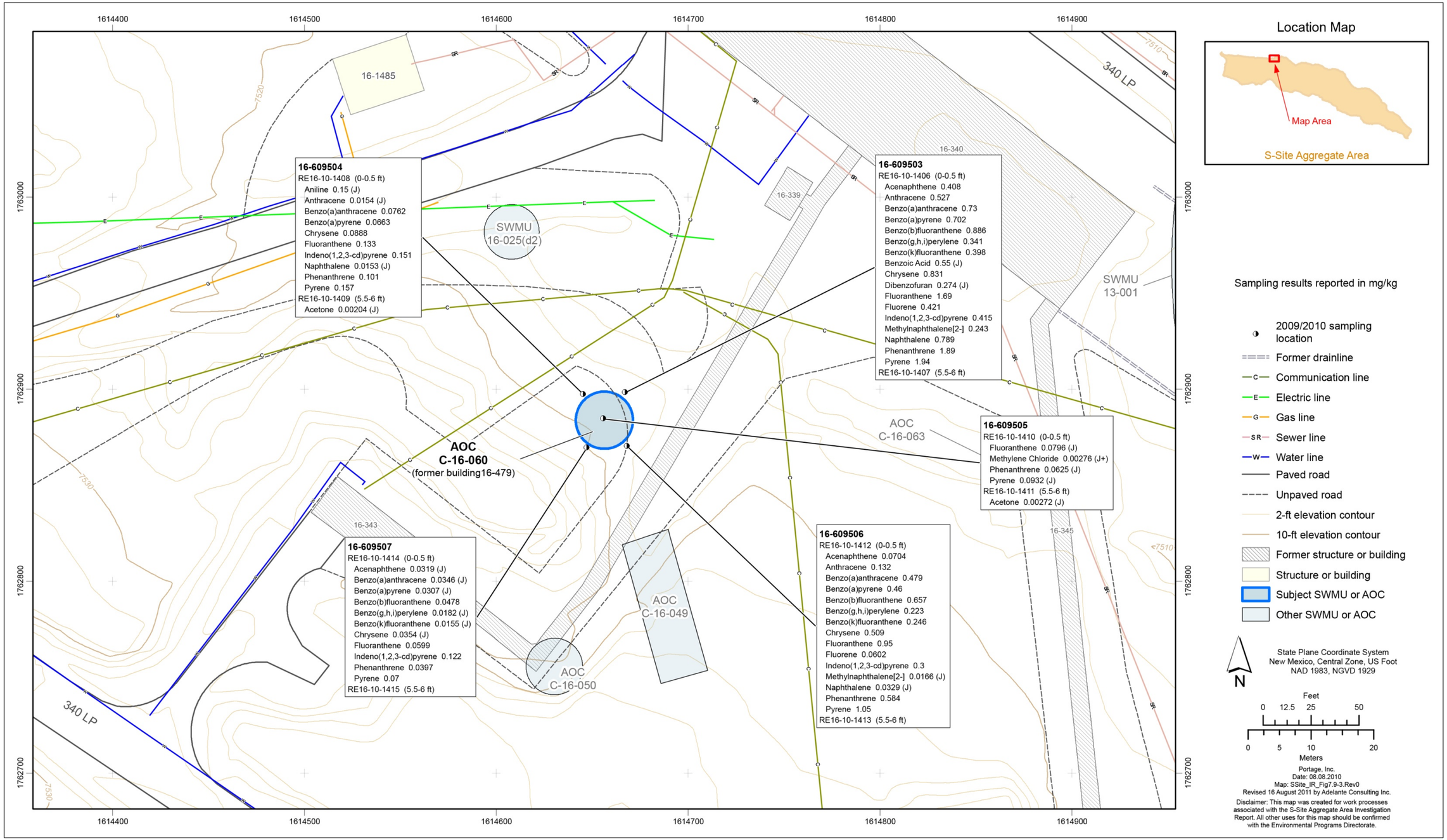


Figure 4.2-20 Organic chemicals detected at AOC C-16-060

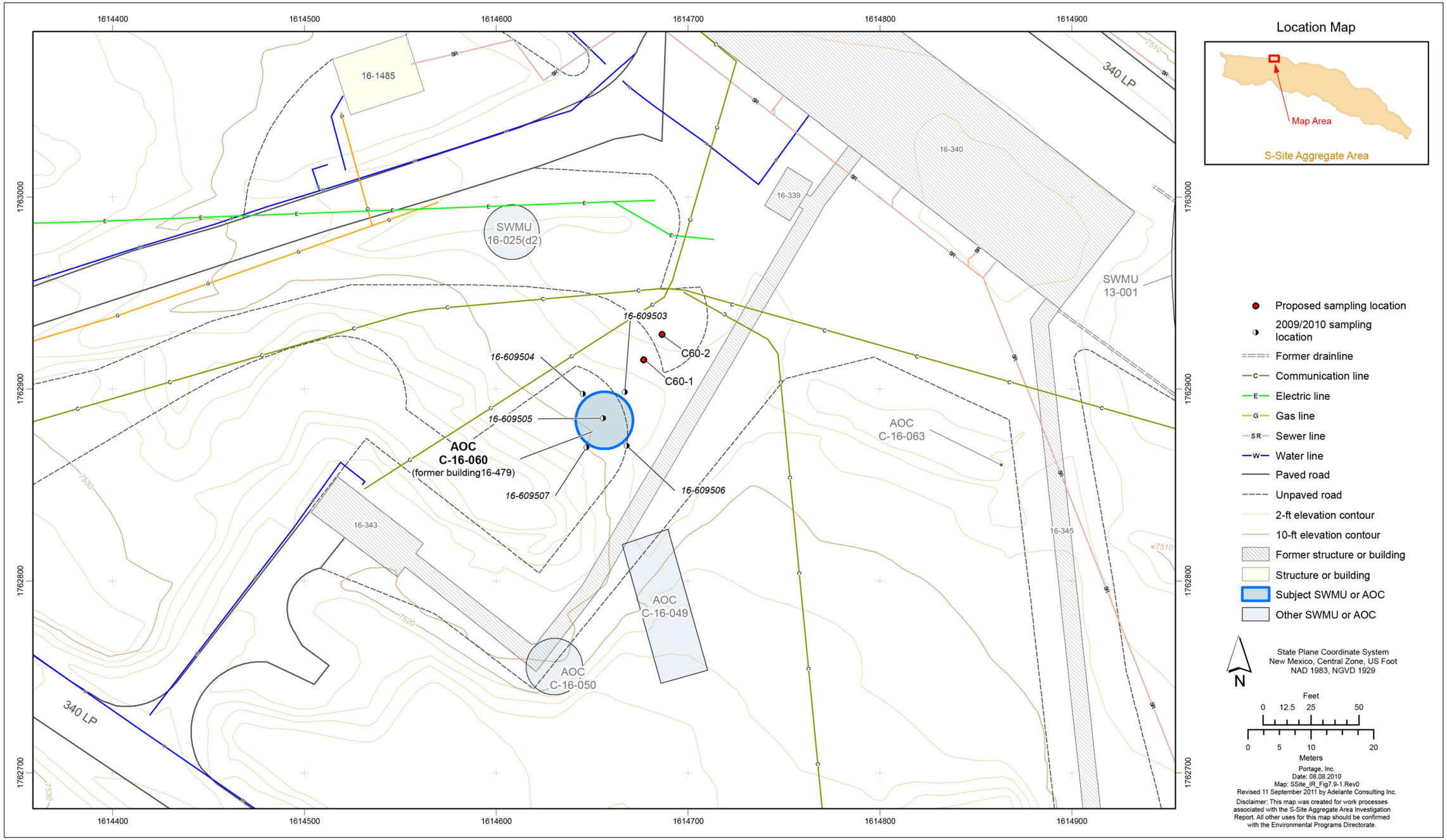


Figure 4.2-21 Proposed sampling locations at AOC C-16-060

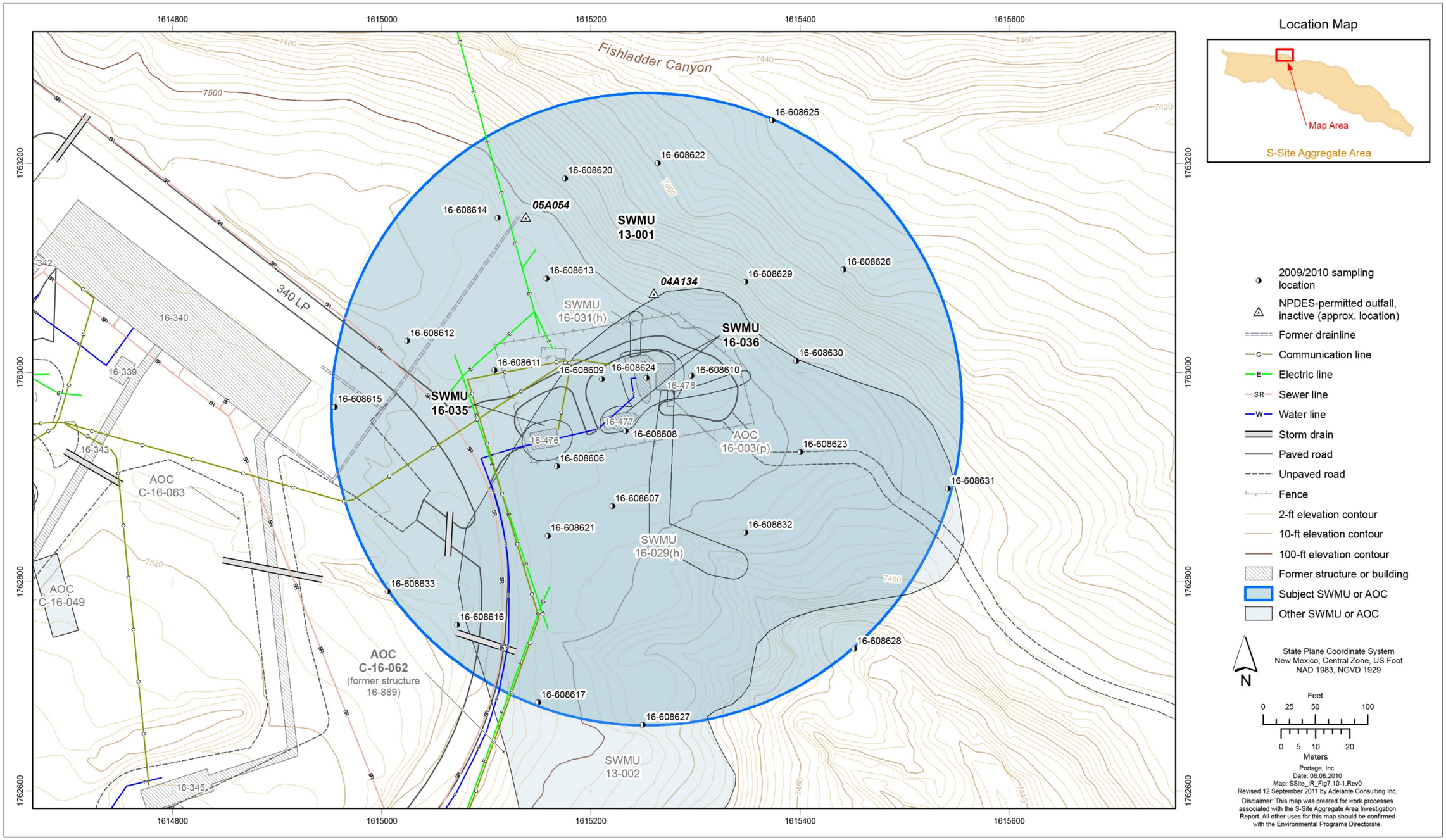


Figure 4.2-22 Site map and sampling locations at SWMU 13-001

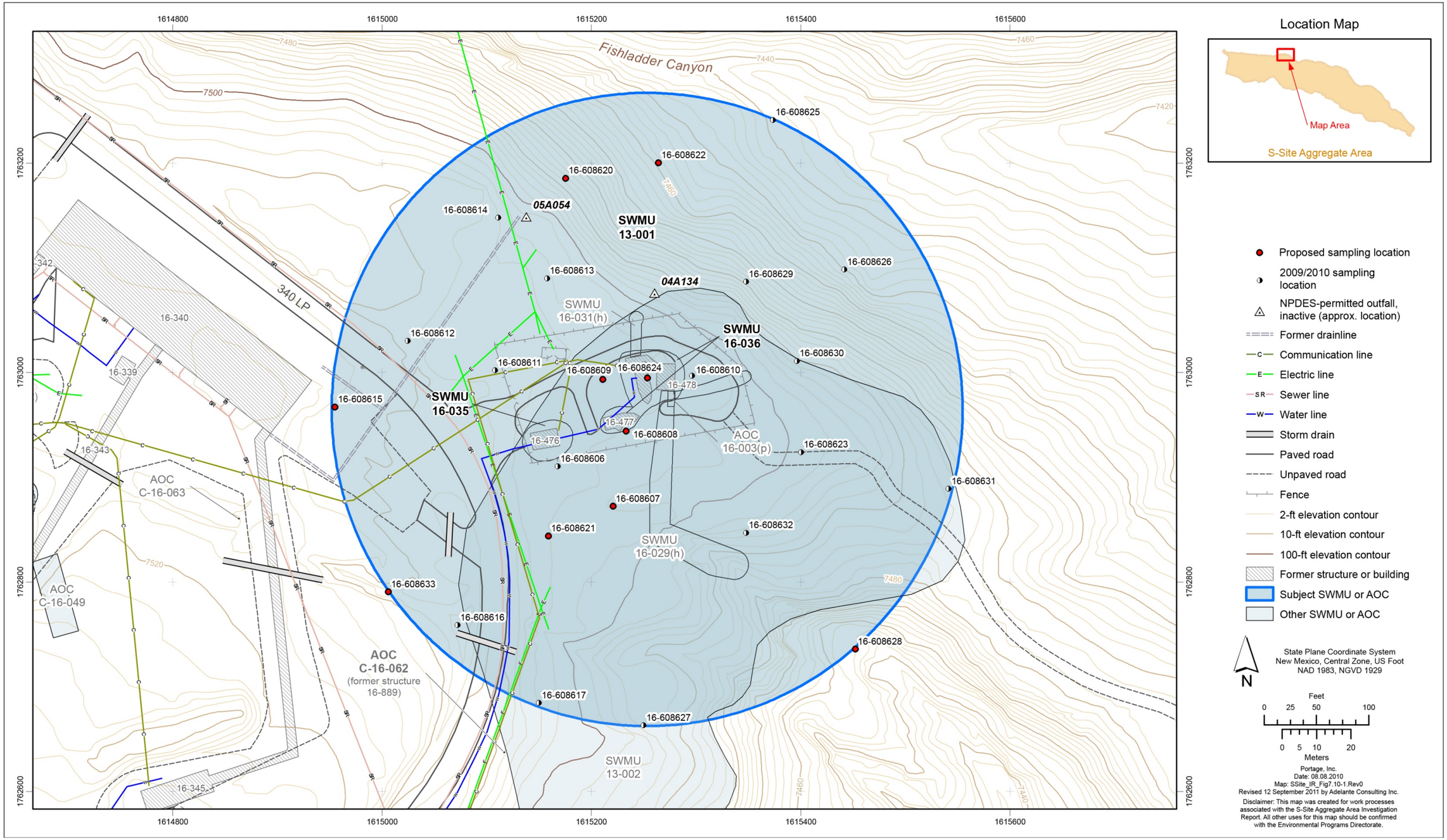


Figure 4.2-23 Proposed sampling locations at SWMU 13-001

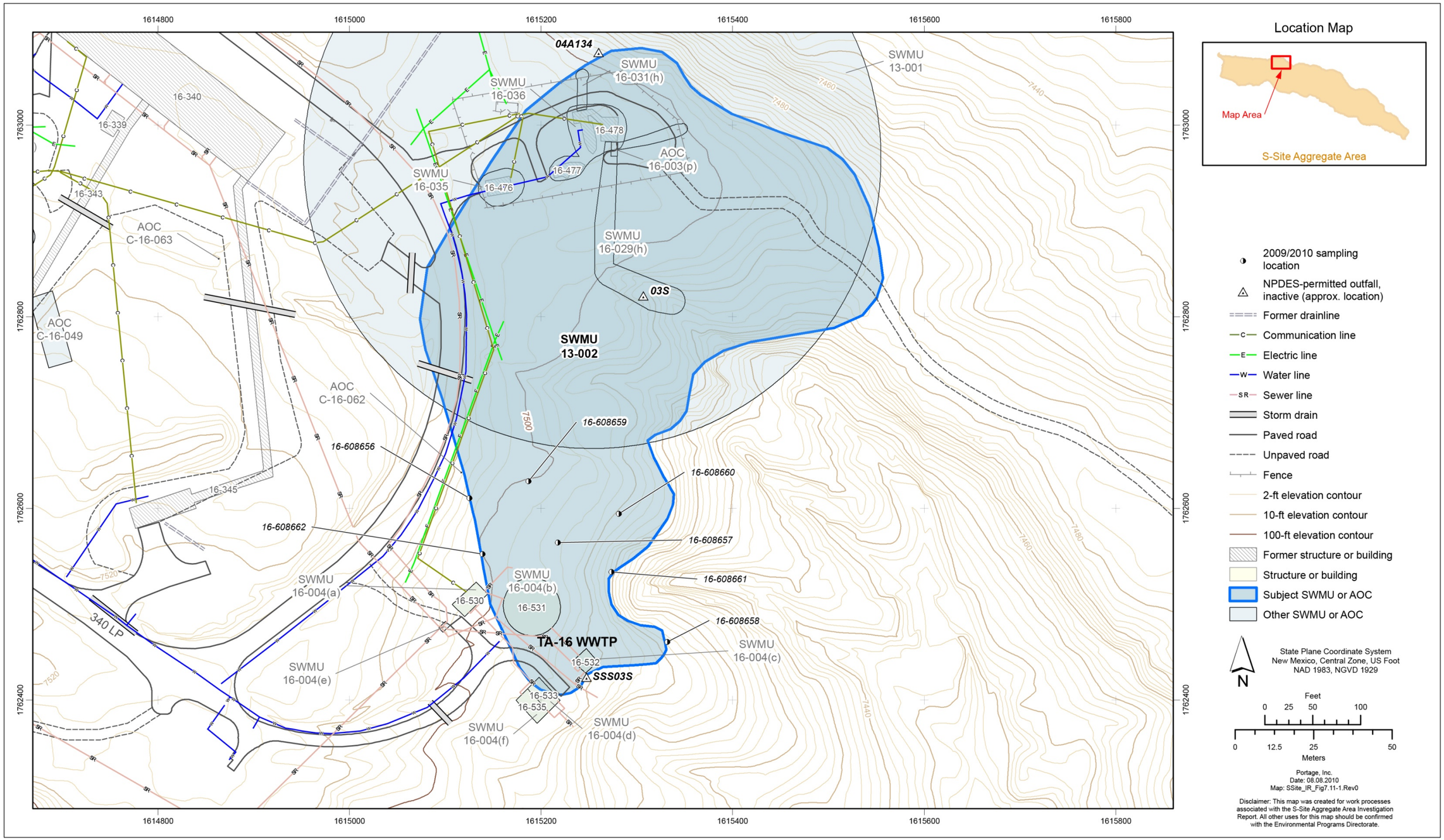


Figure 4.2-24 Site map and sampling locations at SWMU 13-002

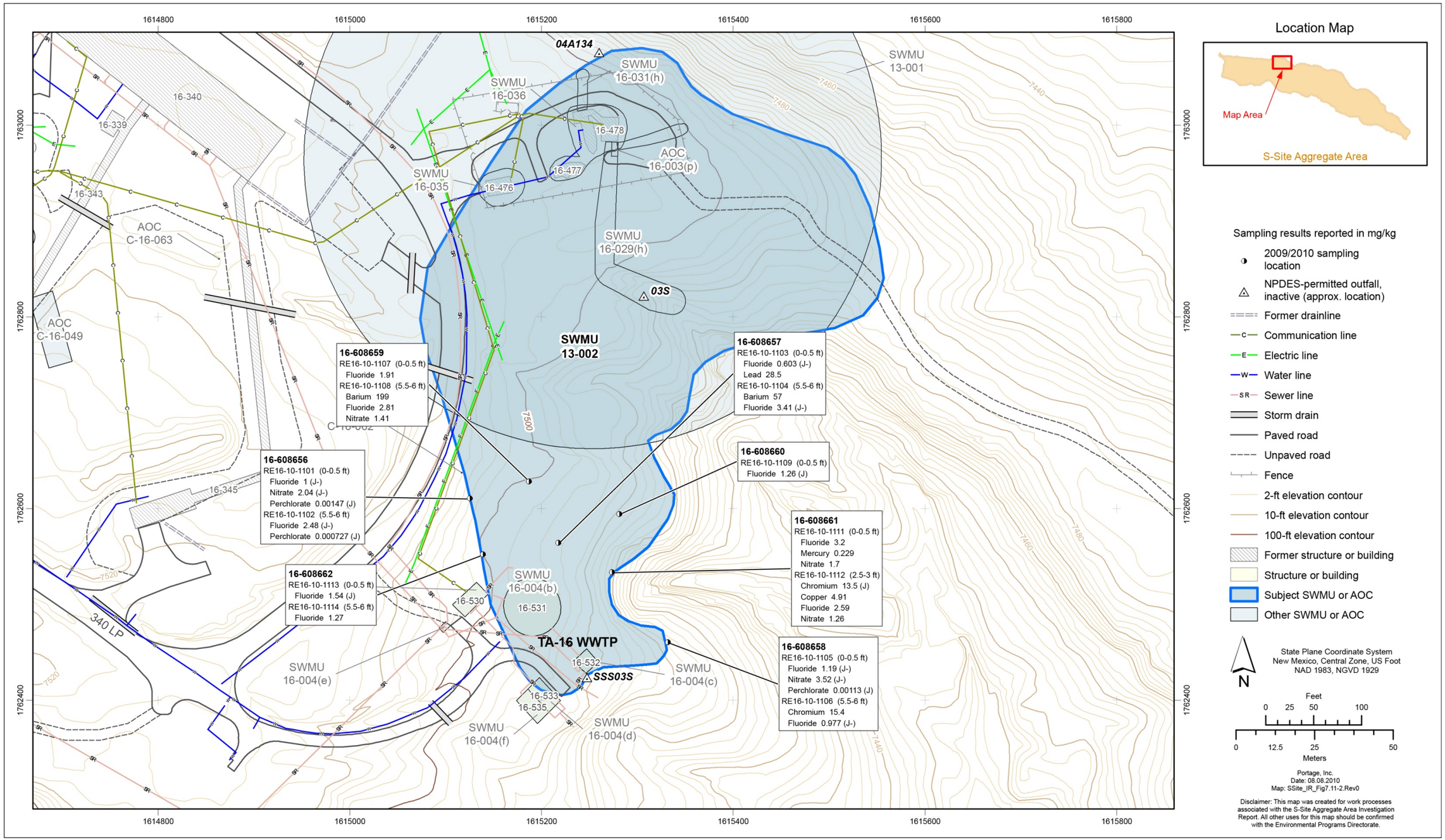


Figure 4.2-25 Inorganic chemicals detected or detected above BVs at SWMU 13-002

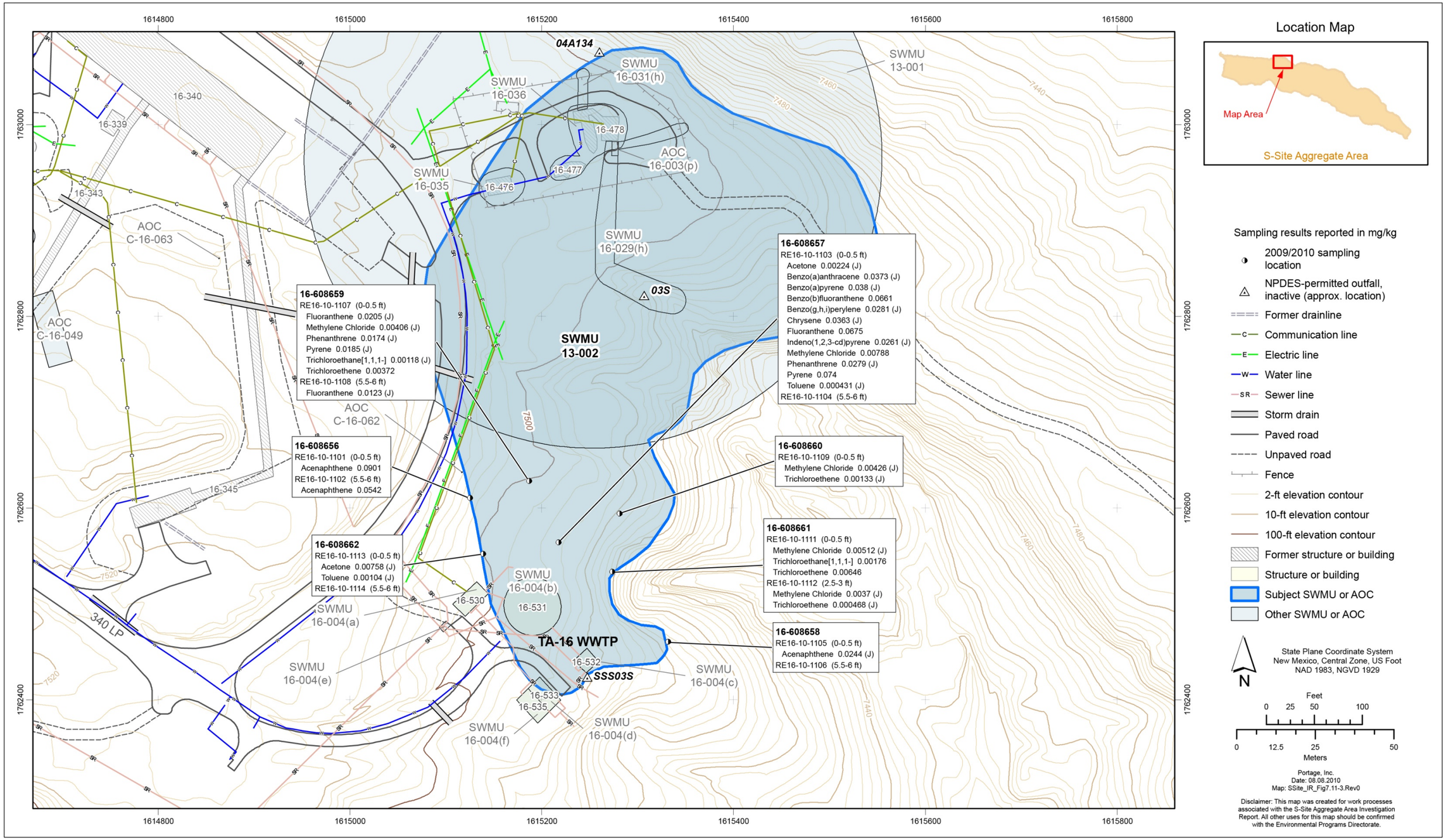


Figure 4.2-26 Organic chemicals detected at SWMU 13-002

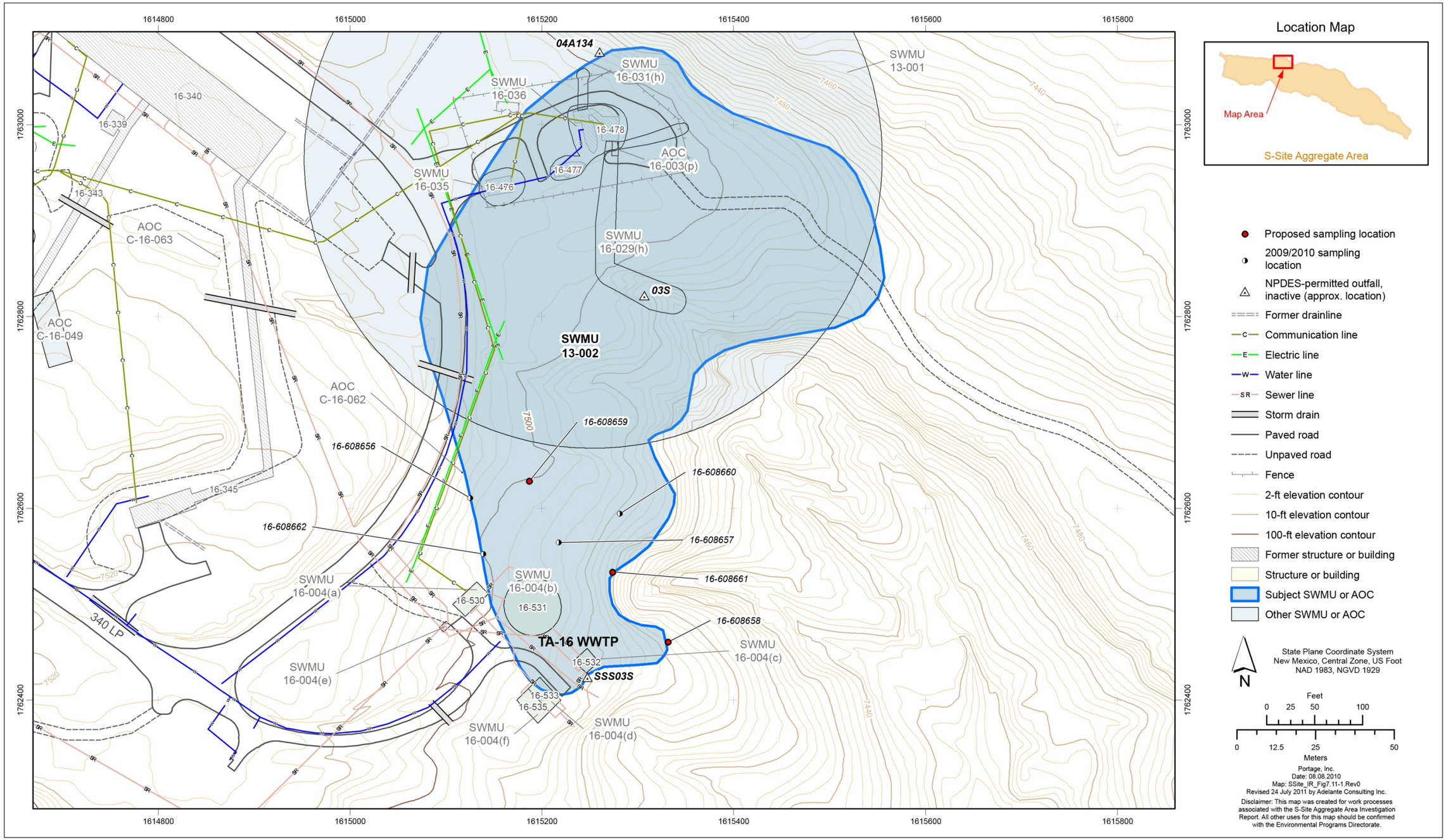


Figure 4.2-27 Proposed sampling locations at SWMU 13-002

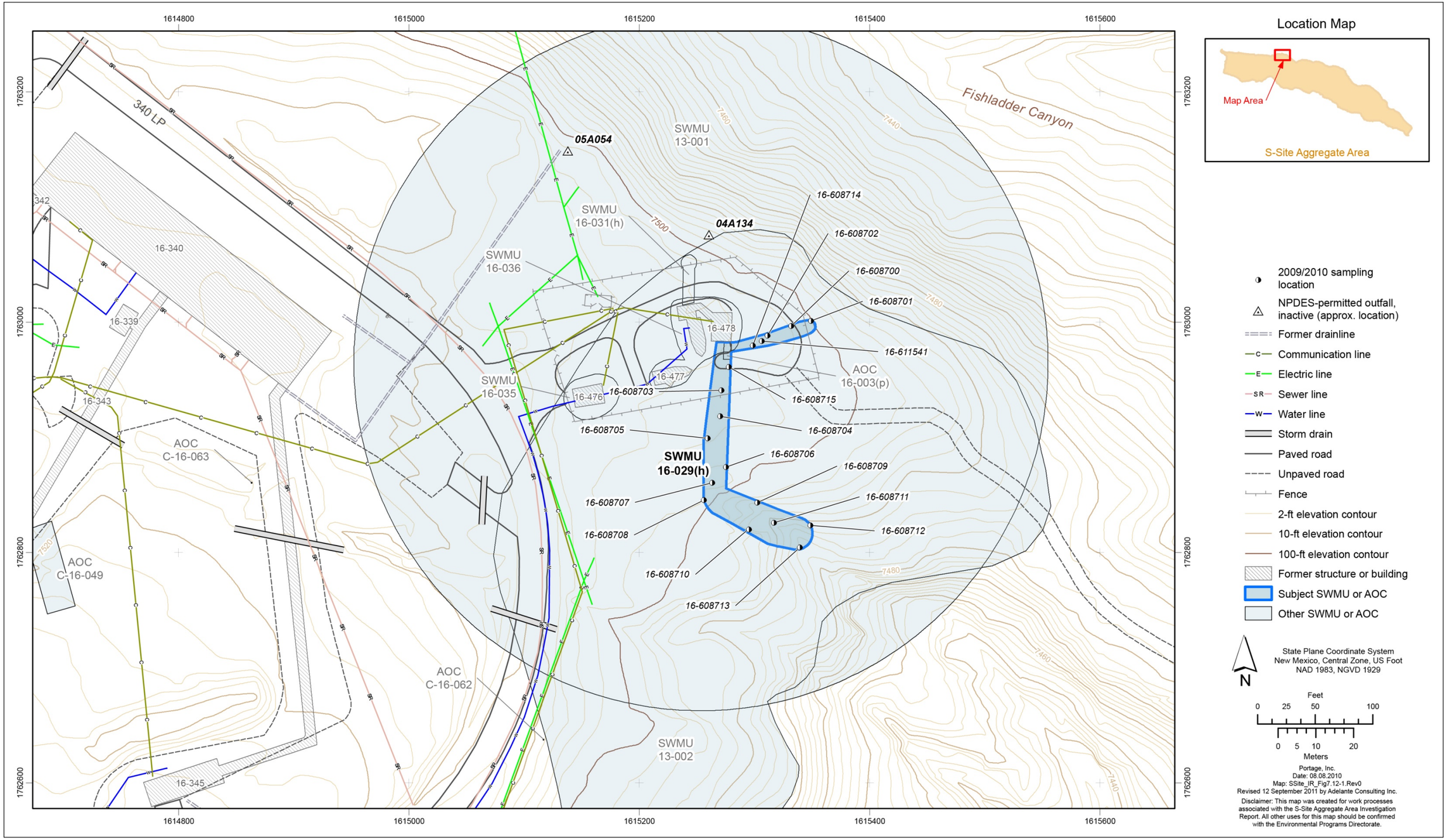


Figure 4.2-28 Site map and sampling locations at SWMU 16-029(h)

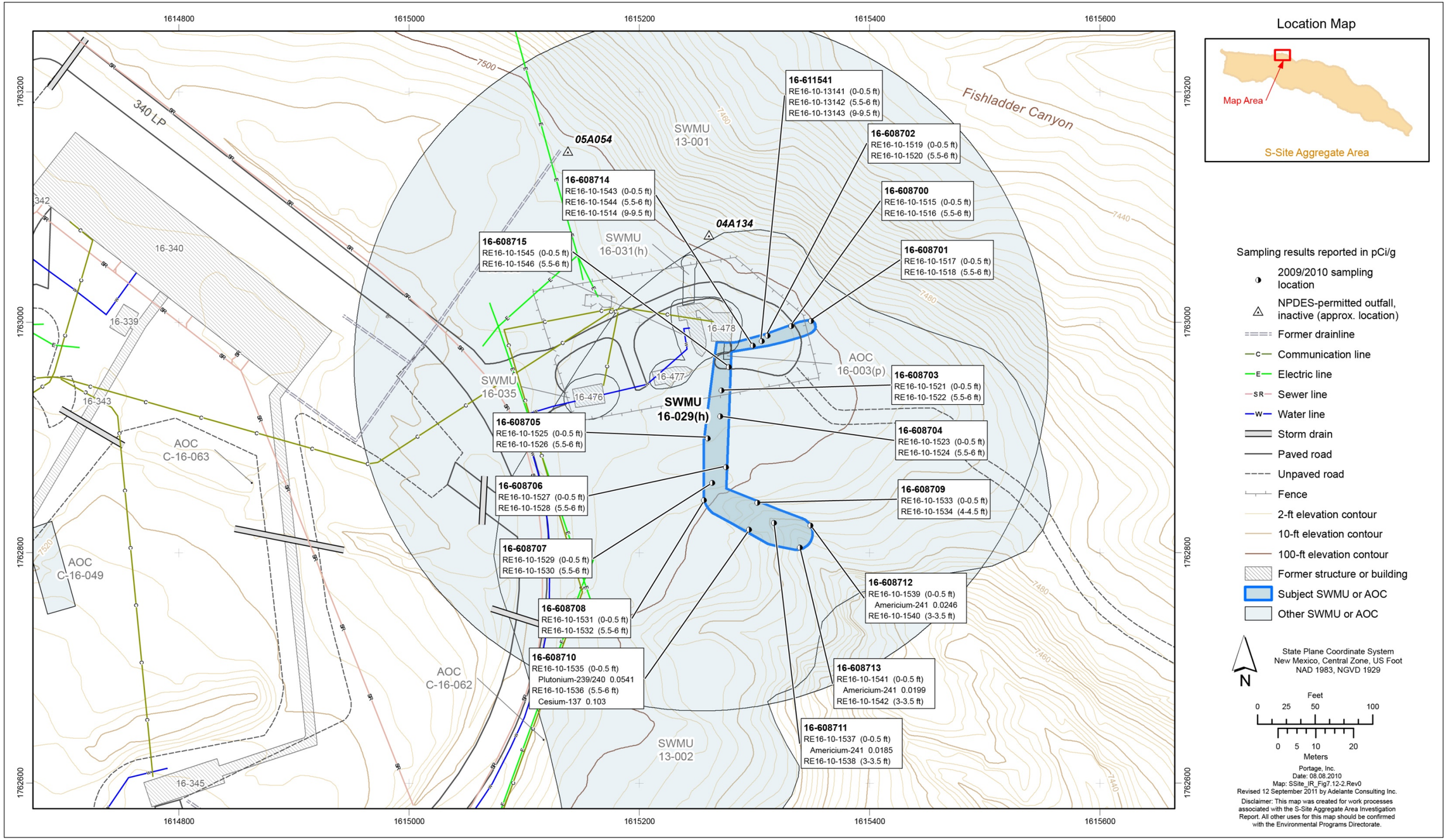


Figure 4.2-29 Radionuclides detected or detected above BVs/FVs at SWMU 16-029(h)

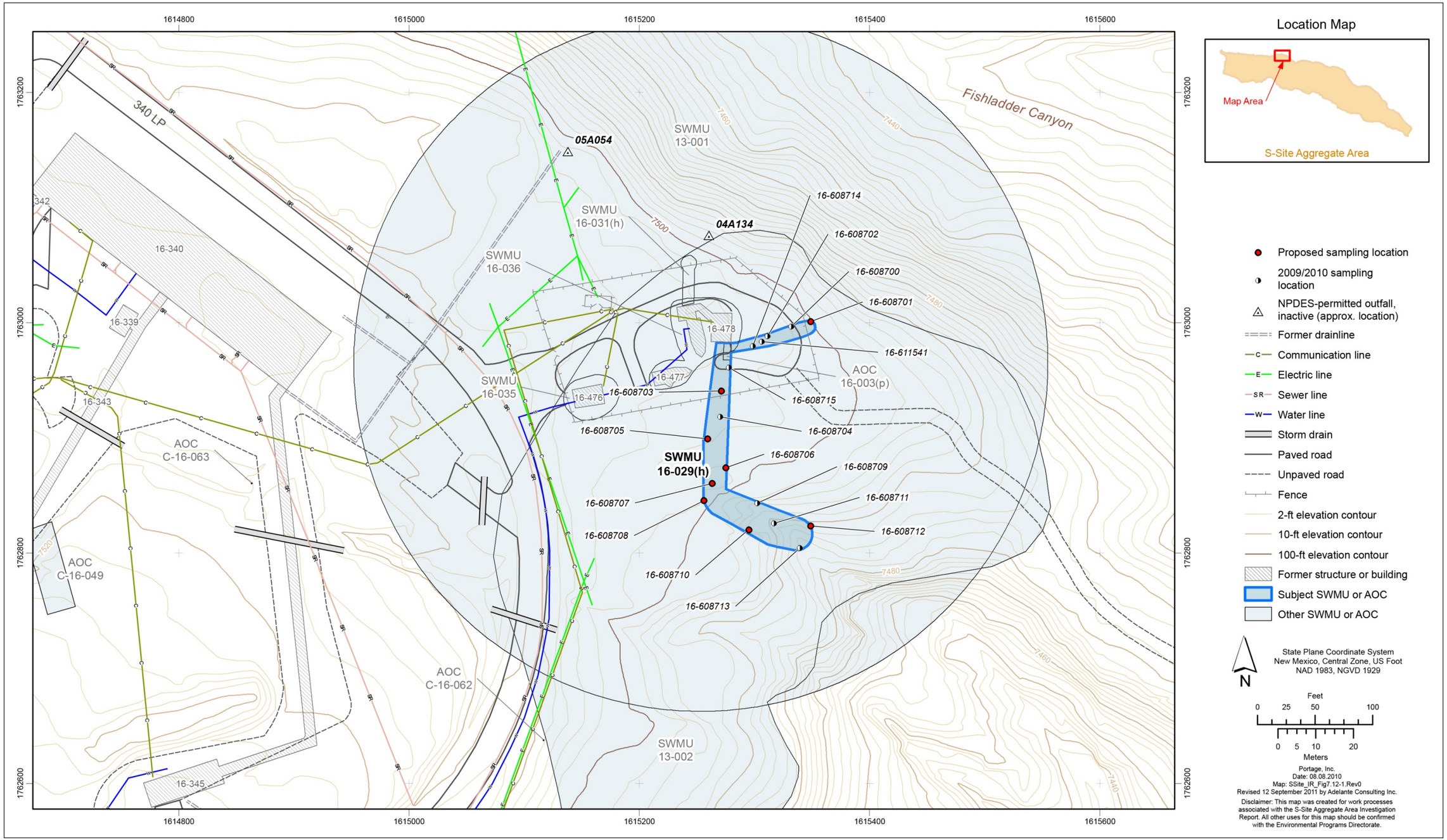


Figure 4.2-30 Proposed sampling locations at SWMU 16-029(h)

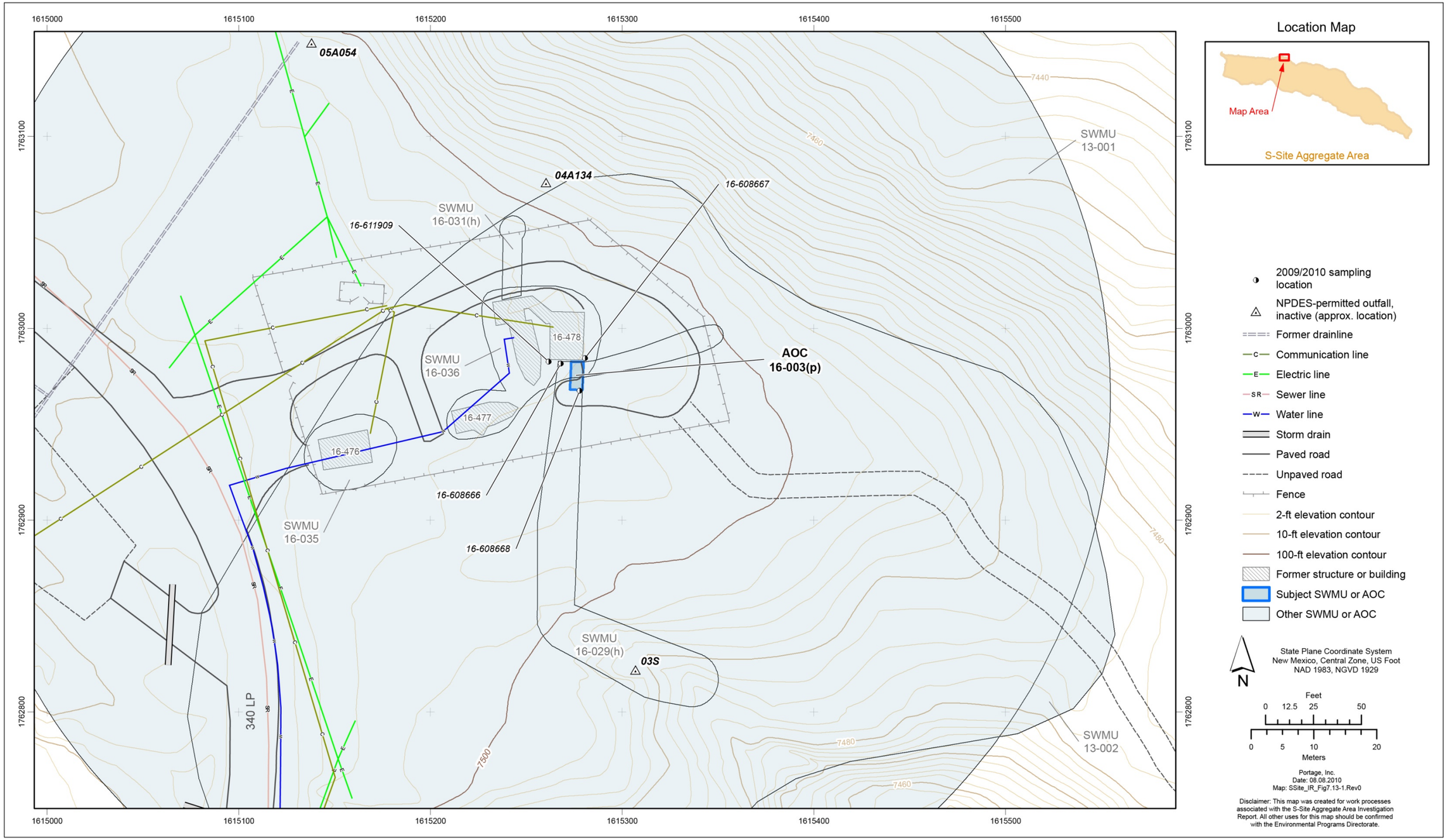


Figure 4.2-31 Site map and sampling locations at AOC 16-003(p)

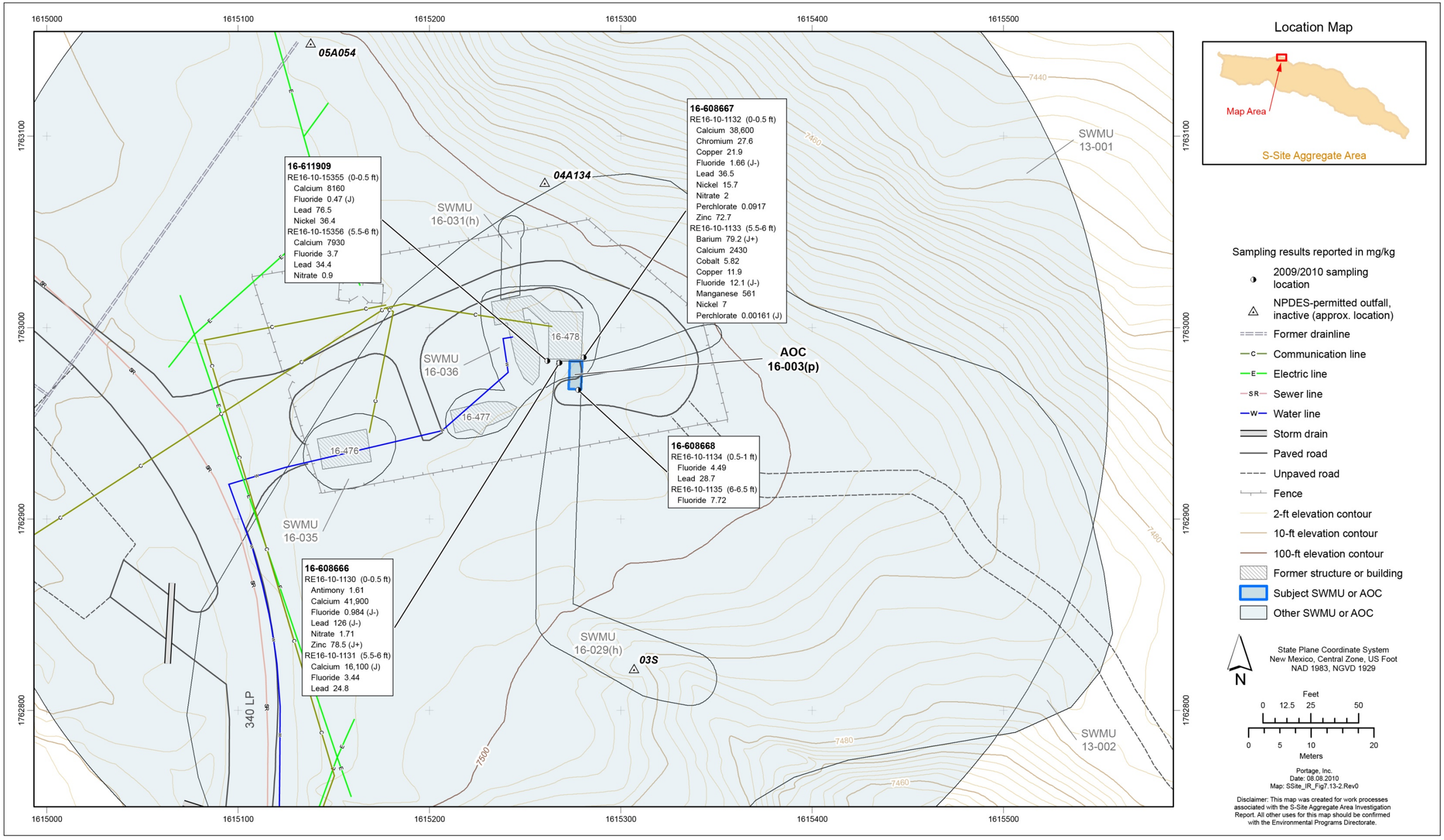


Figure 4.2-32 Inorganic chemicals detected or detected above BVs at AOC 16-003(p)

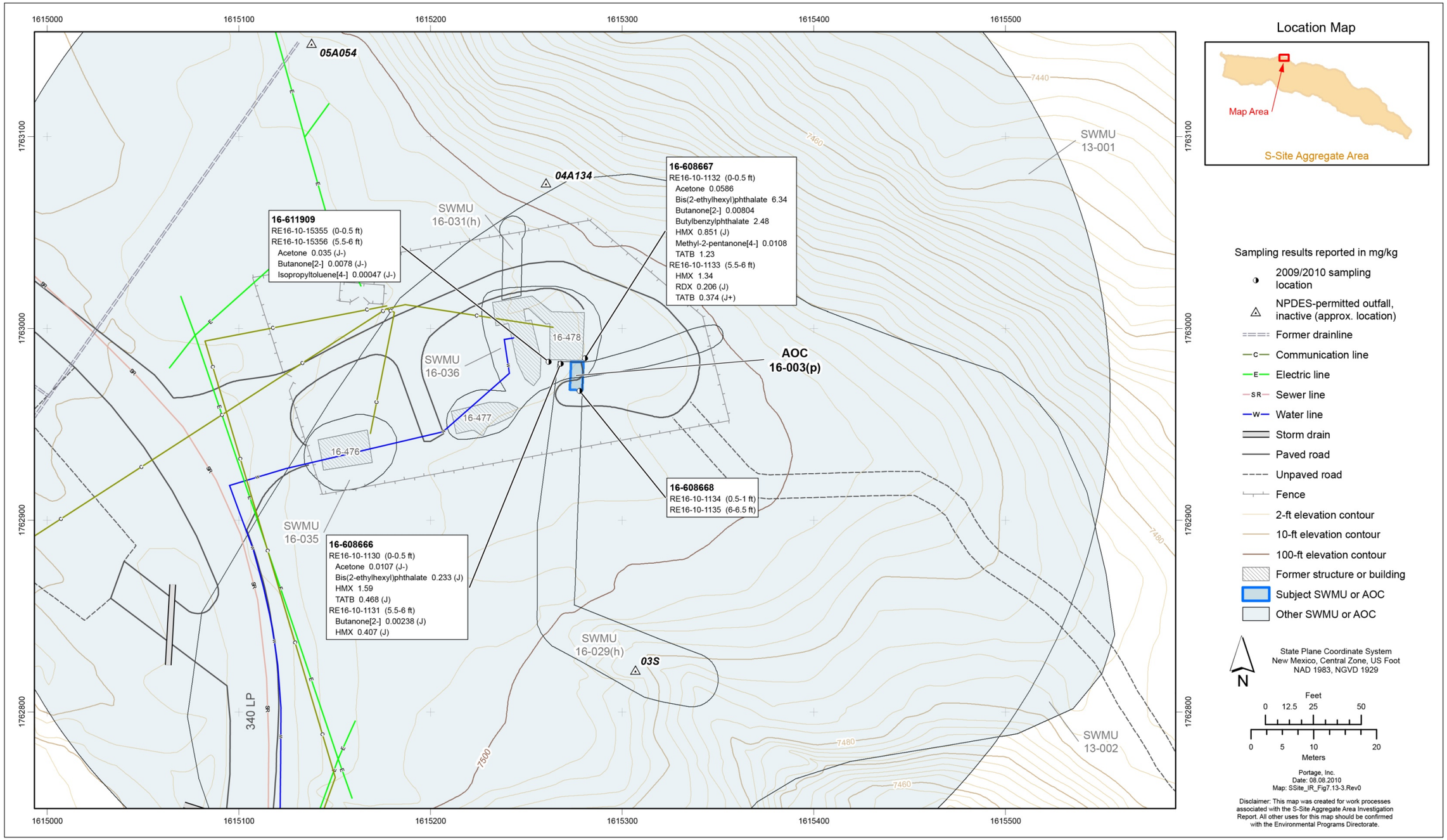


Figure 4.2-33 Organic chemicals detected at AOC 16-003(p)

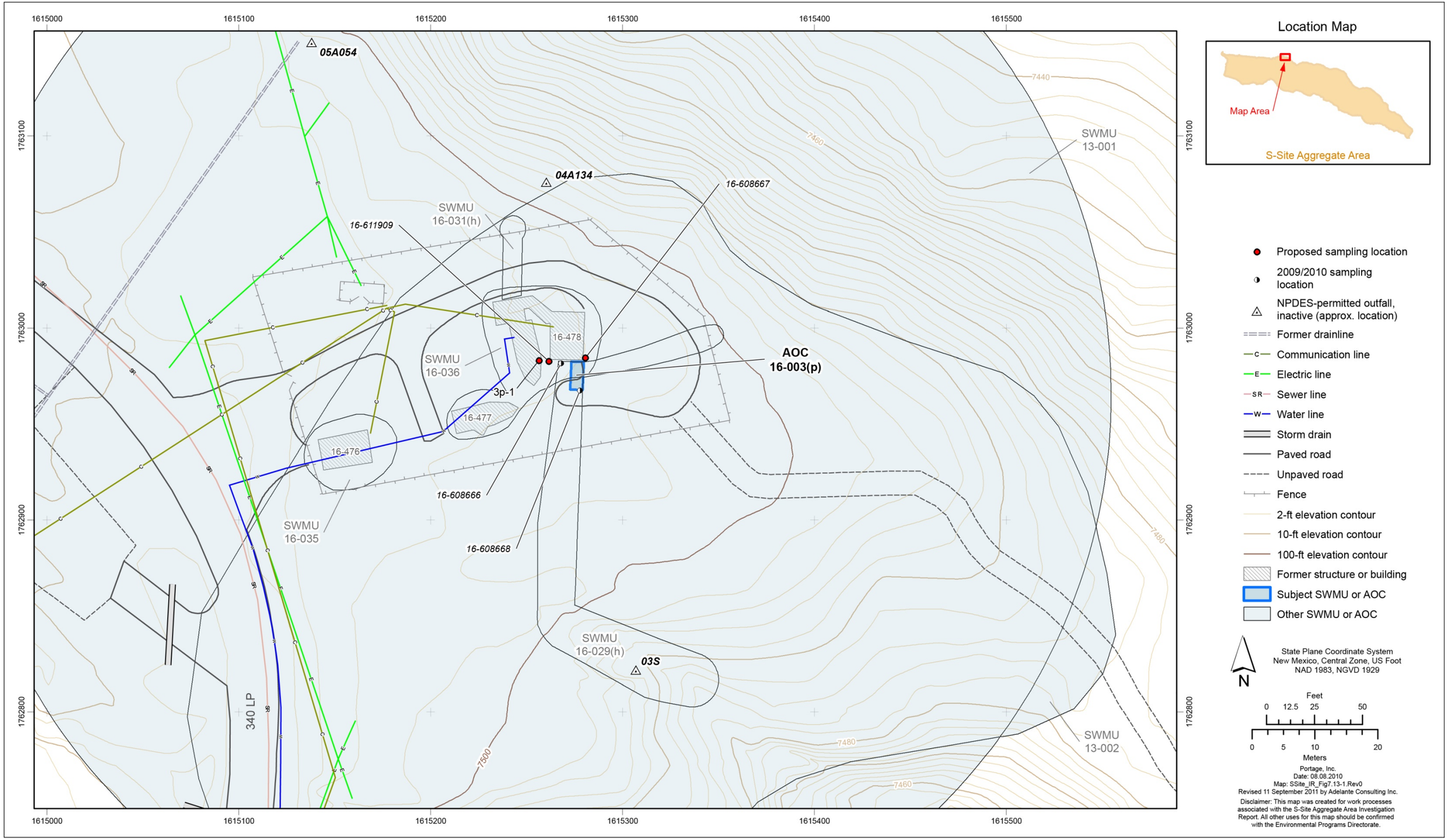


Figure 4.2-34 Proposed sampling locations at AOC 16-003(p)

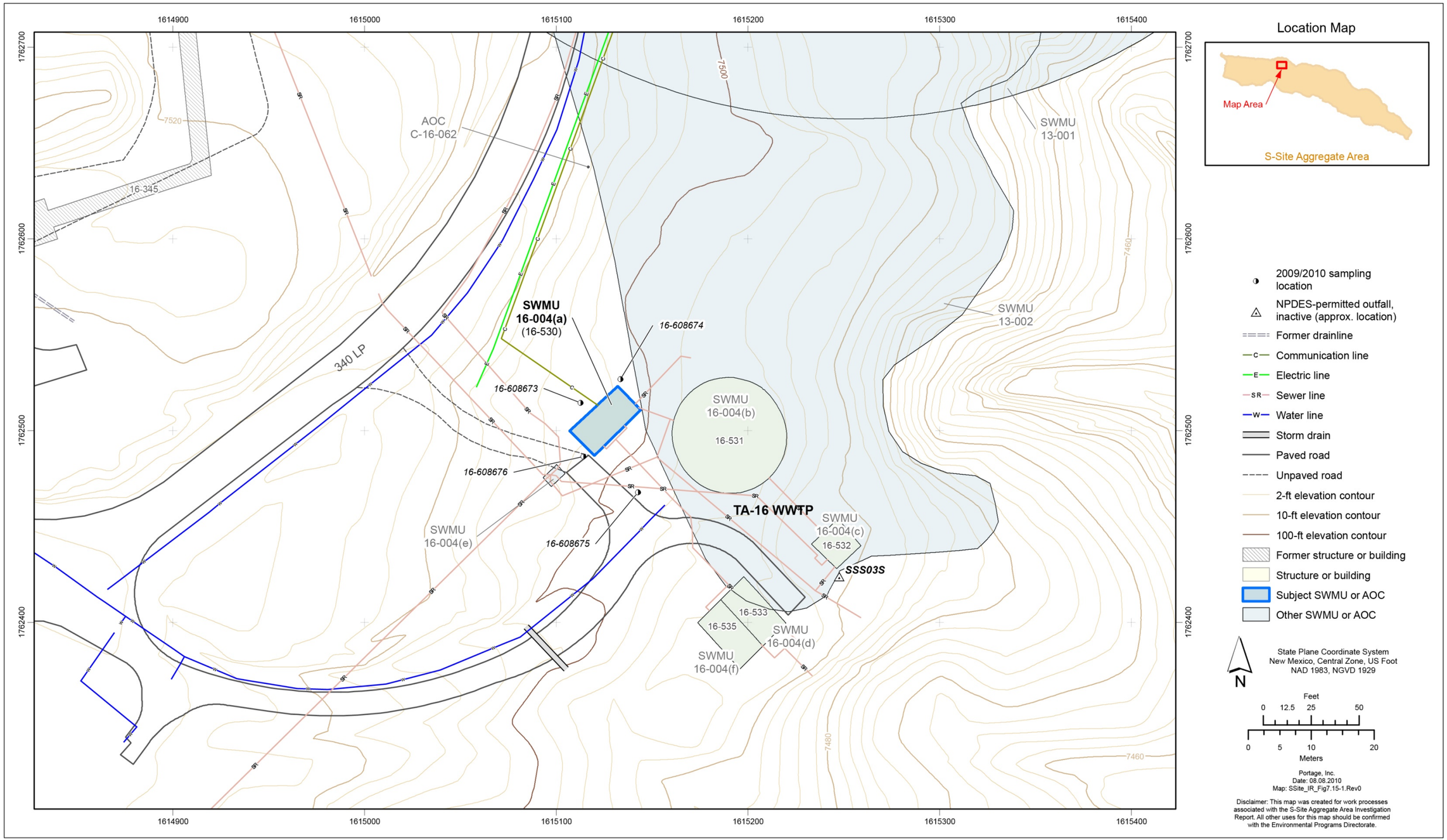


Figure 4.2-35 Site map and sampling locations at SWMU 16-004(a)

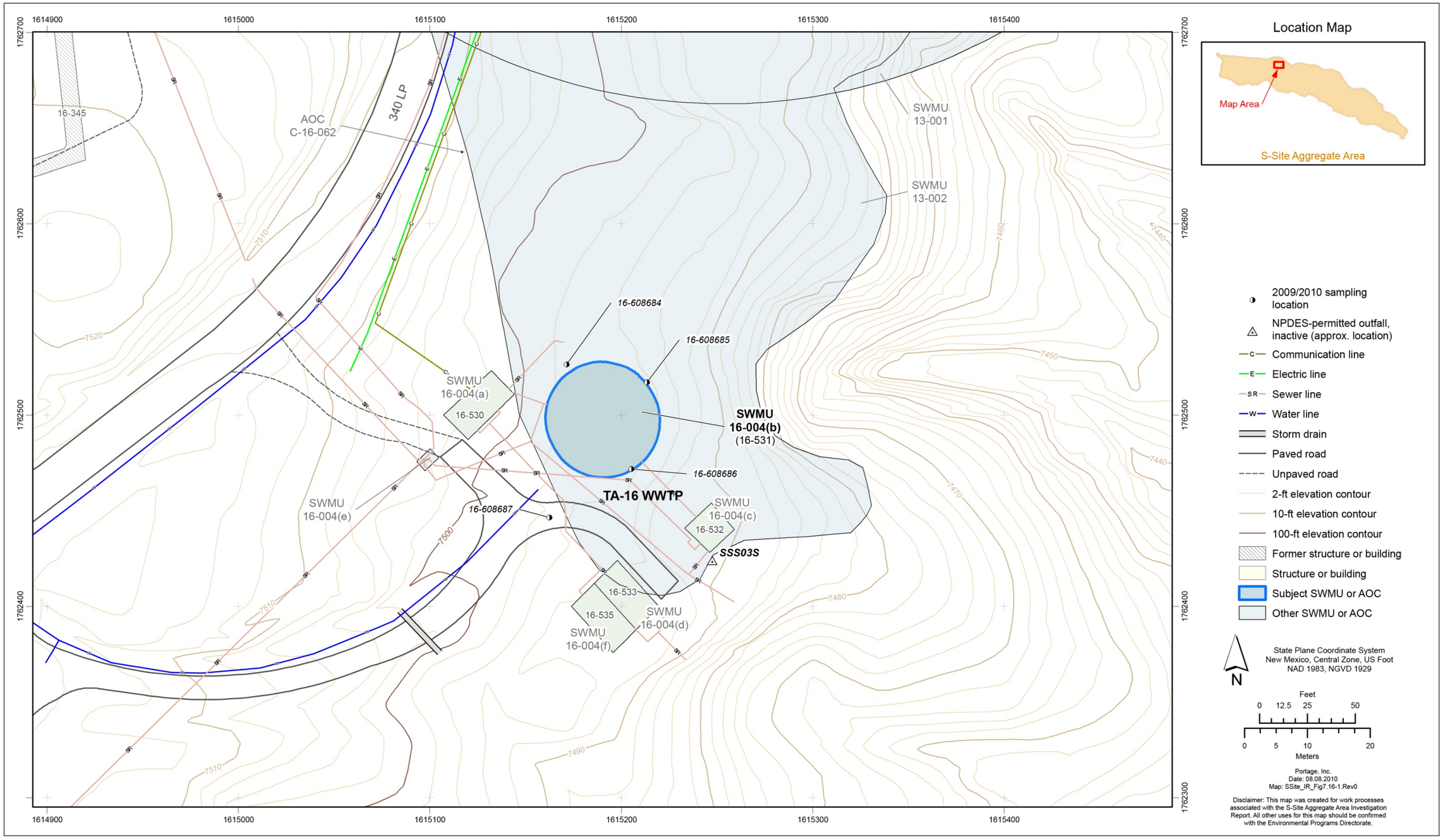


Figure 4.2-36 Site map and sampling locations at SWMU 16-004(b)

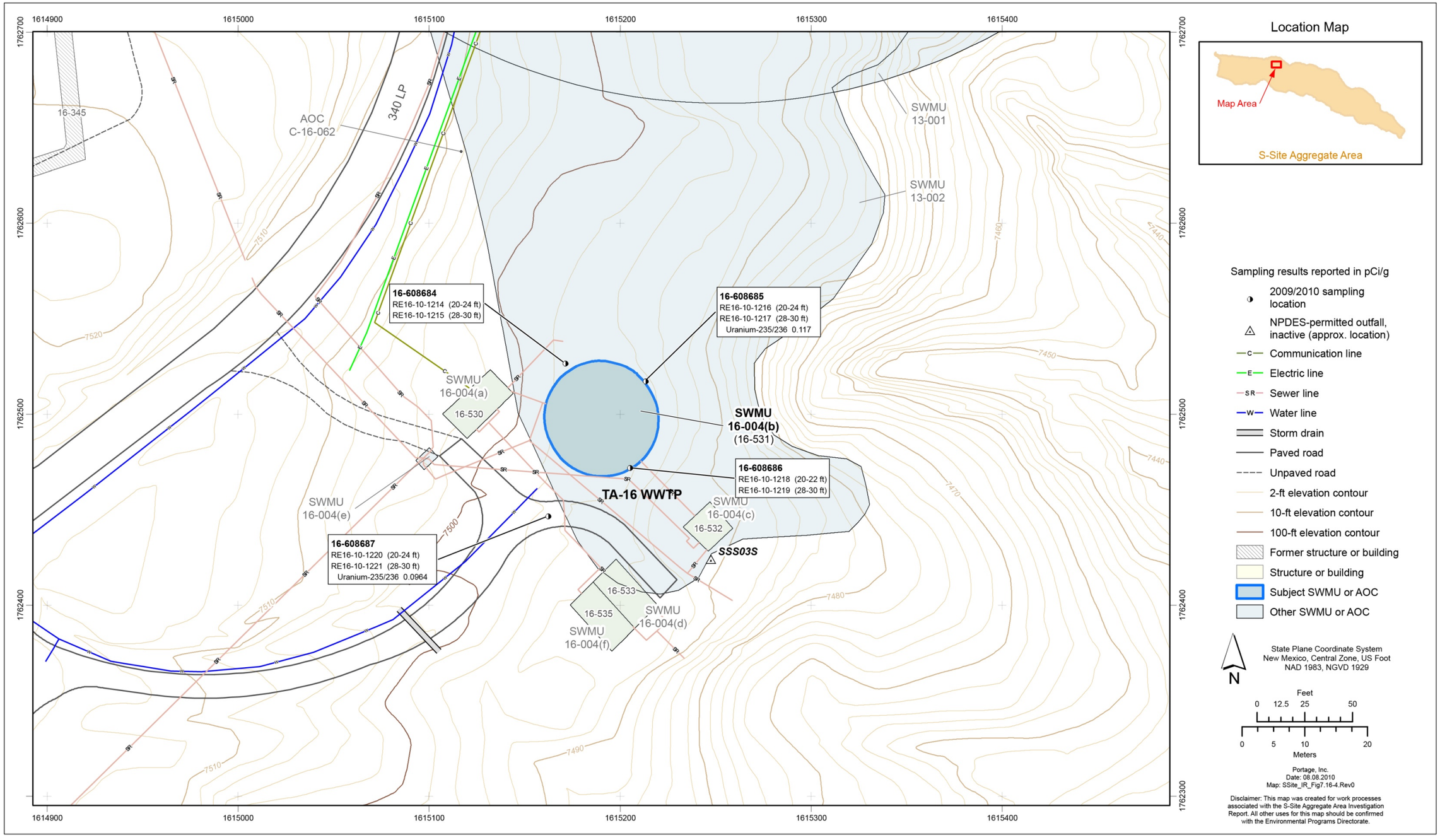


Figure 4.2-37 Radionuclides detected or detected above BVs/FVs at SWMU 16-004(b)

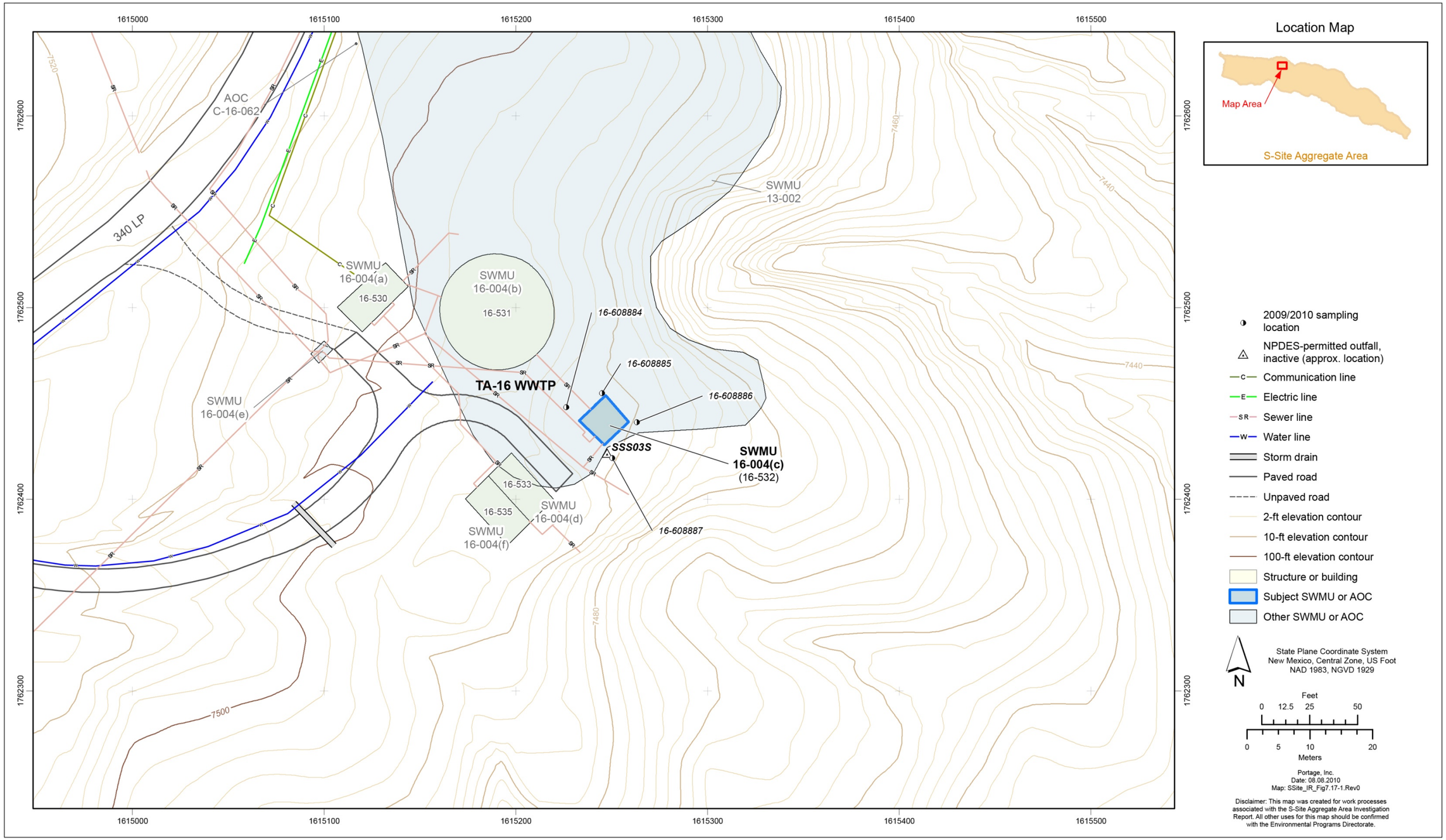


Figure 4.2-38 Site map and sampling locations at SWMU 16-004(c)

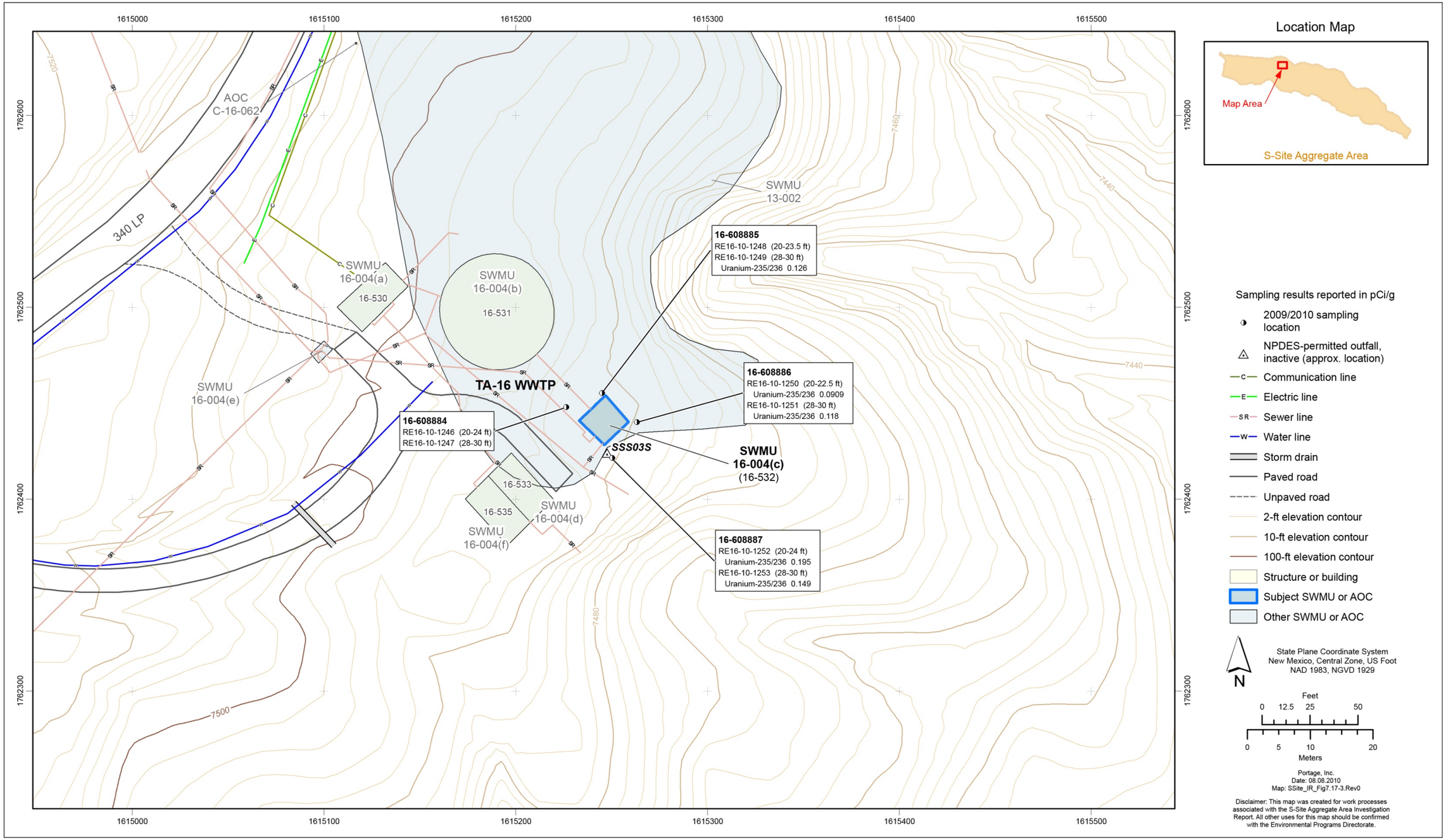


Figure 4.2-39 Radionuclides detected or detected above BVs/FVs at SWMU 16-004(c)

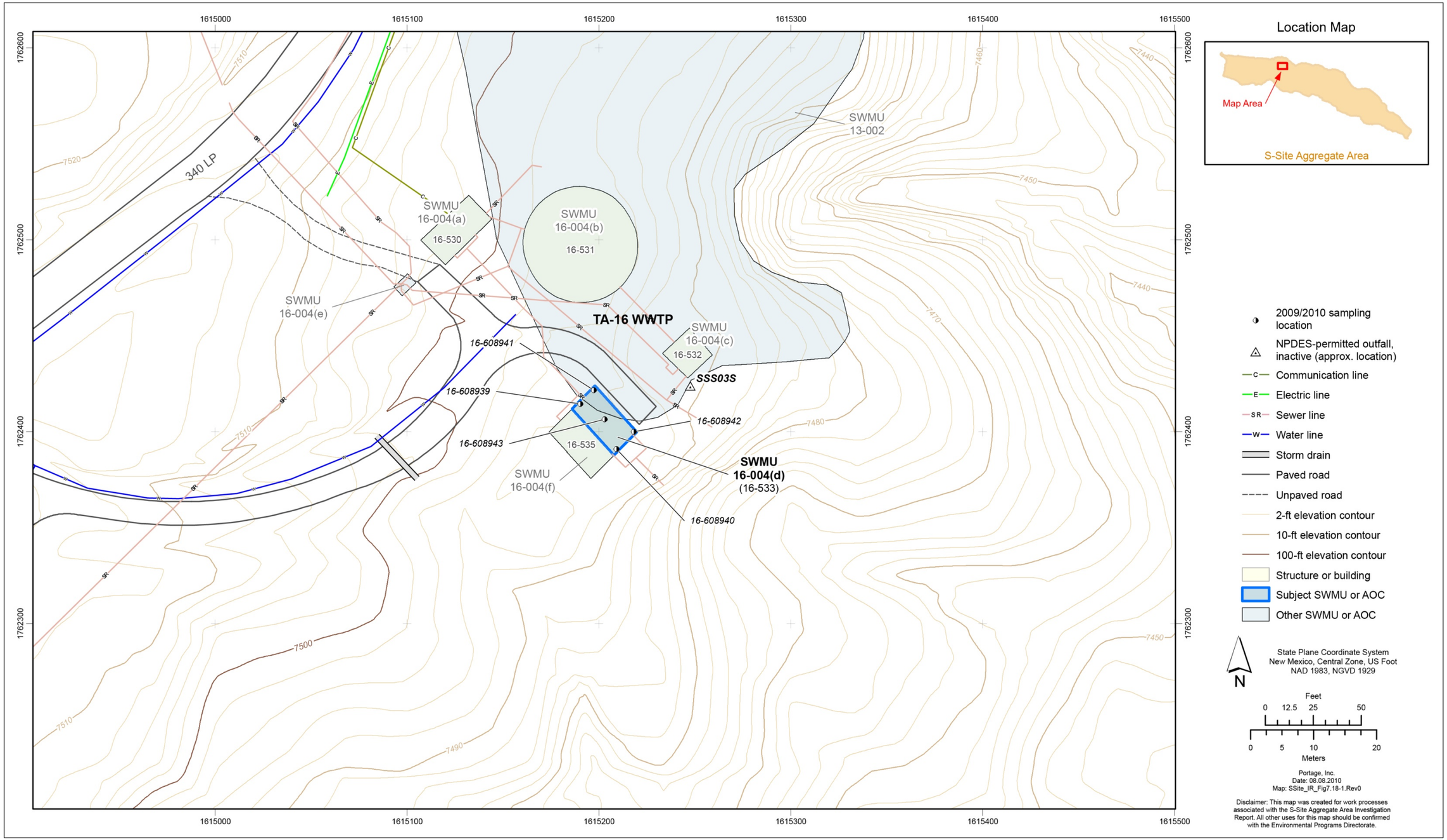


Figure 4.2-40 Site map and sampling locations at SWMU 16-004(d)

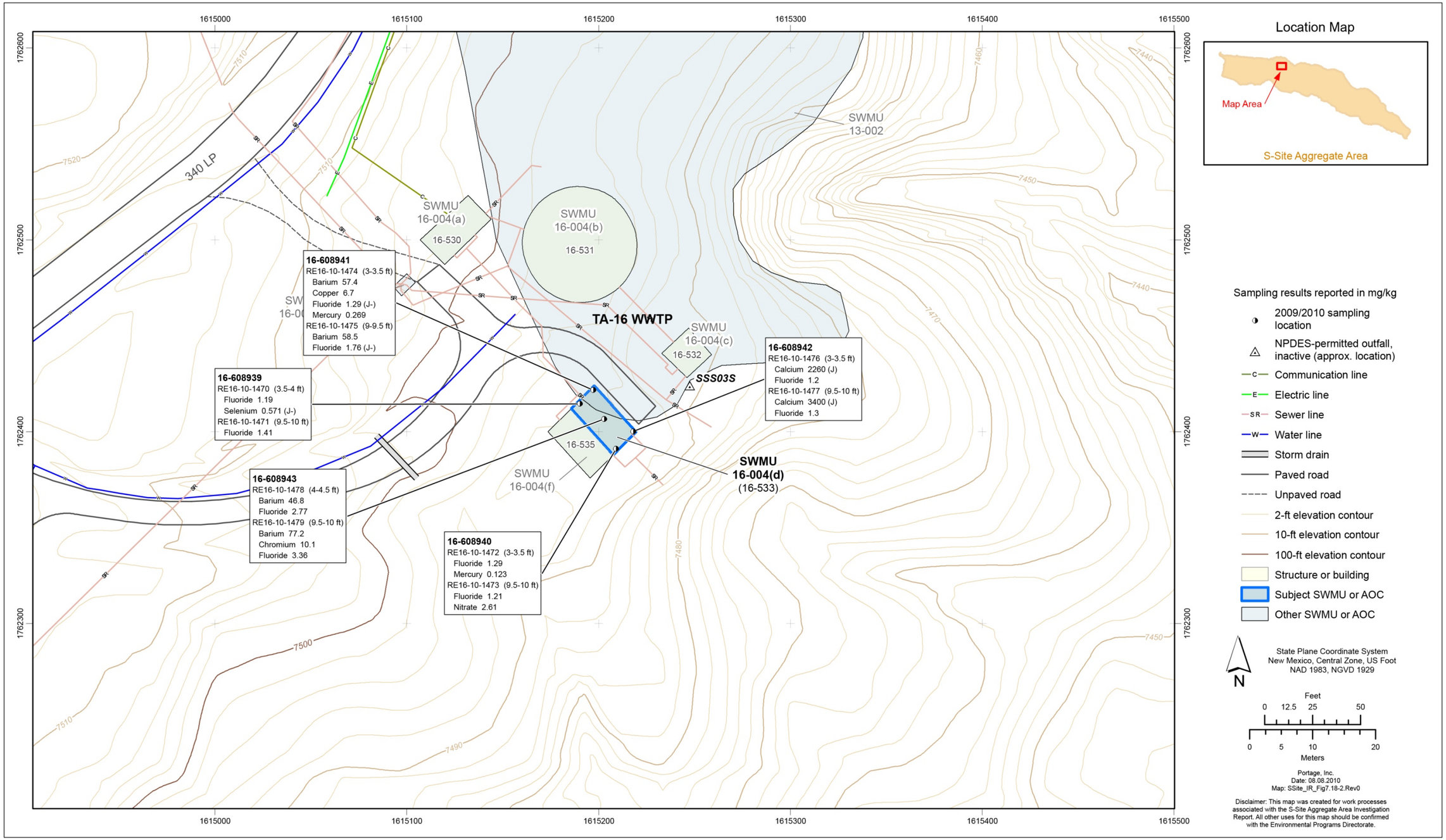


Figure 4.2-41 Inorganic chemicals detected or detected above BVs at SWMU 16-004(d)

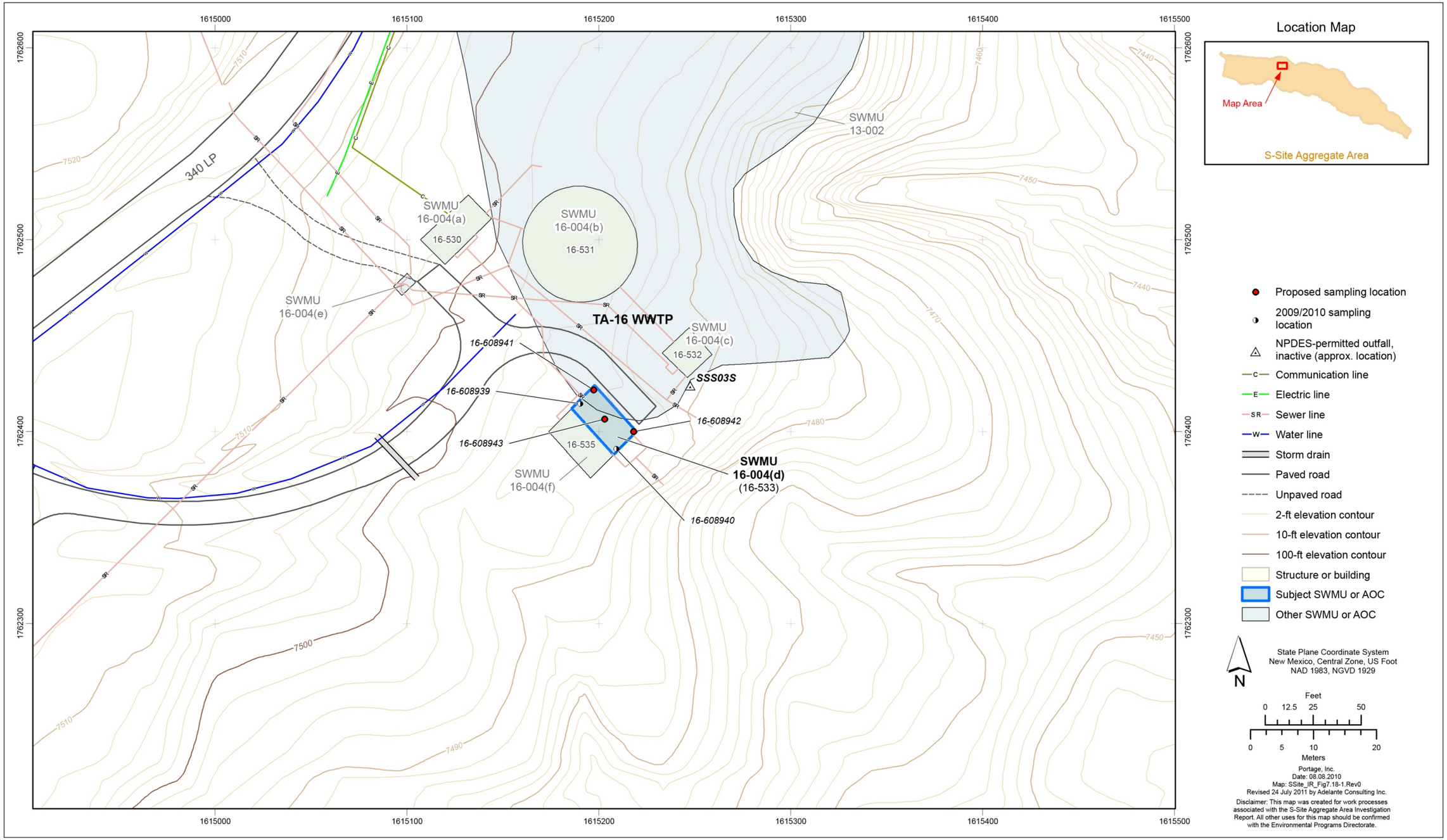


Figure 4.2-42 Proposed sampling locations at SWMU 16-004(d)

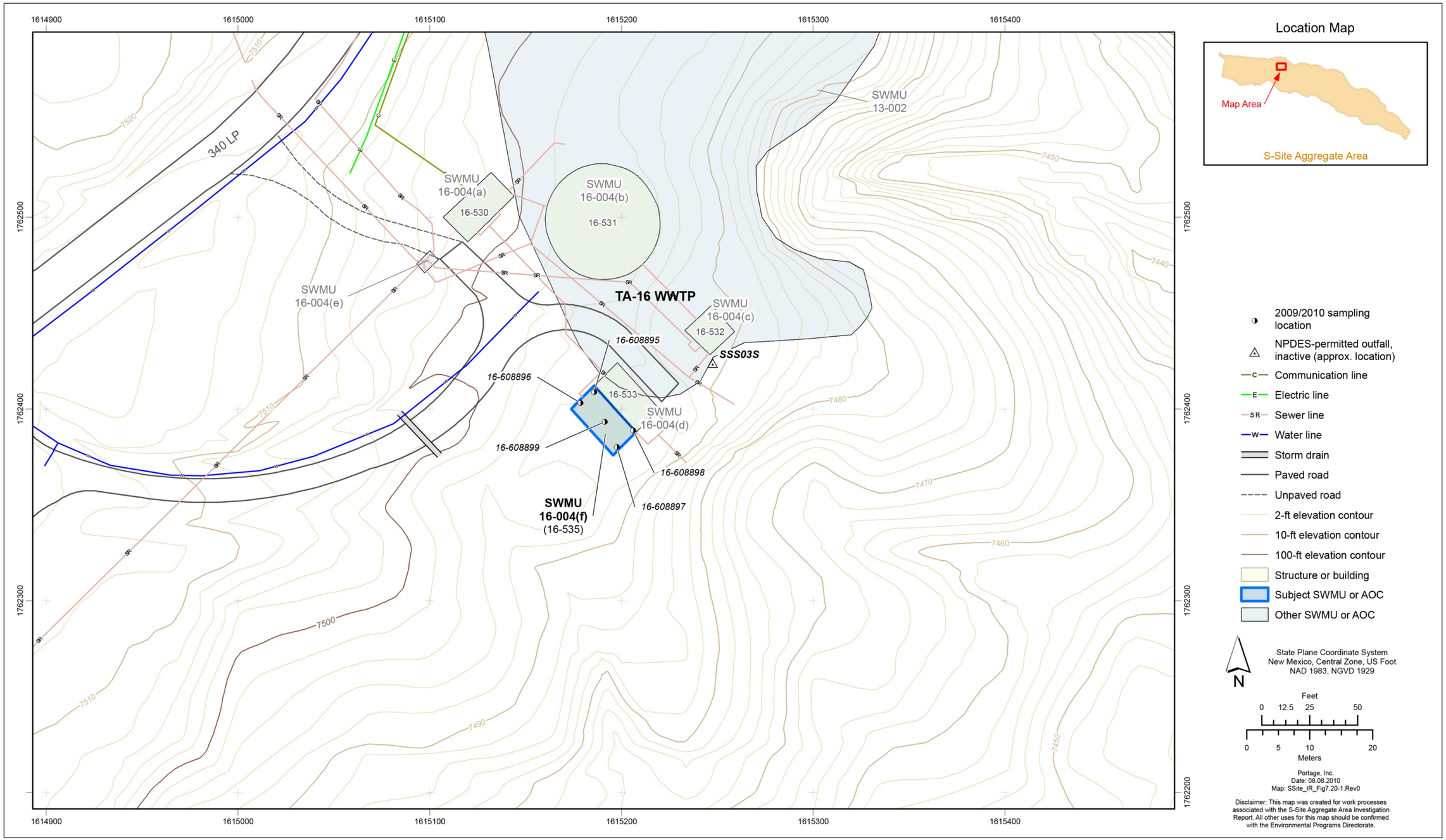


Figure 4.2-43 Site map and sampling locations at SWMU 16-004(f)

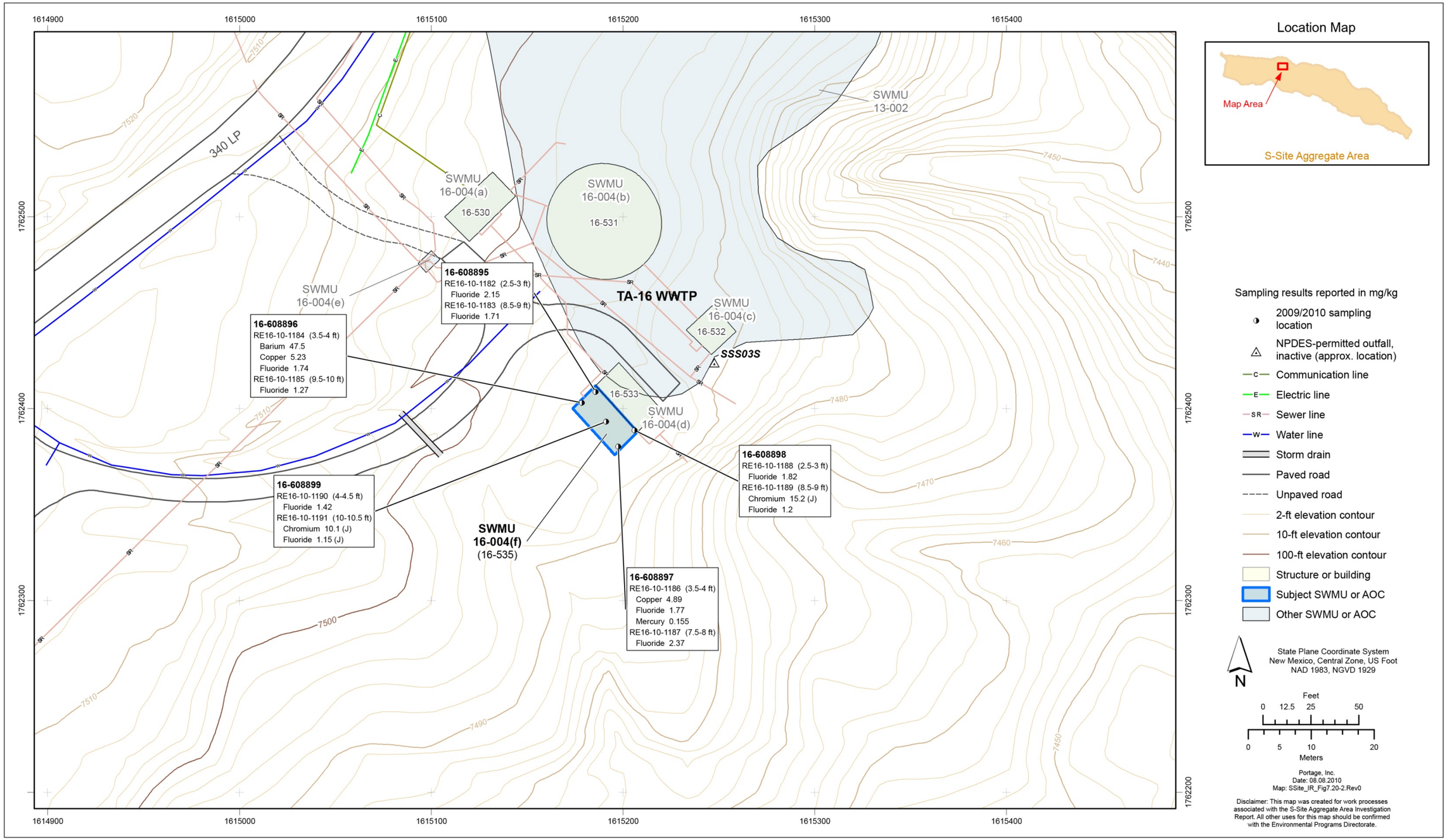


Figure 4.2-44 Inorganic chemicals detected or detected above BVs at SWMU 16-004(f)

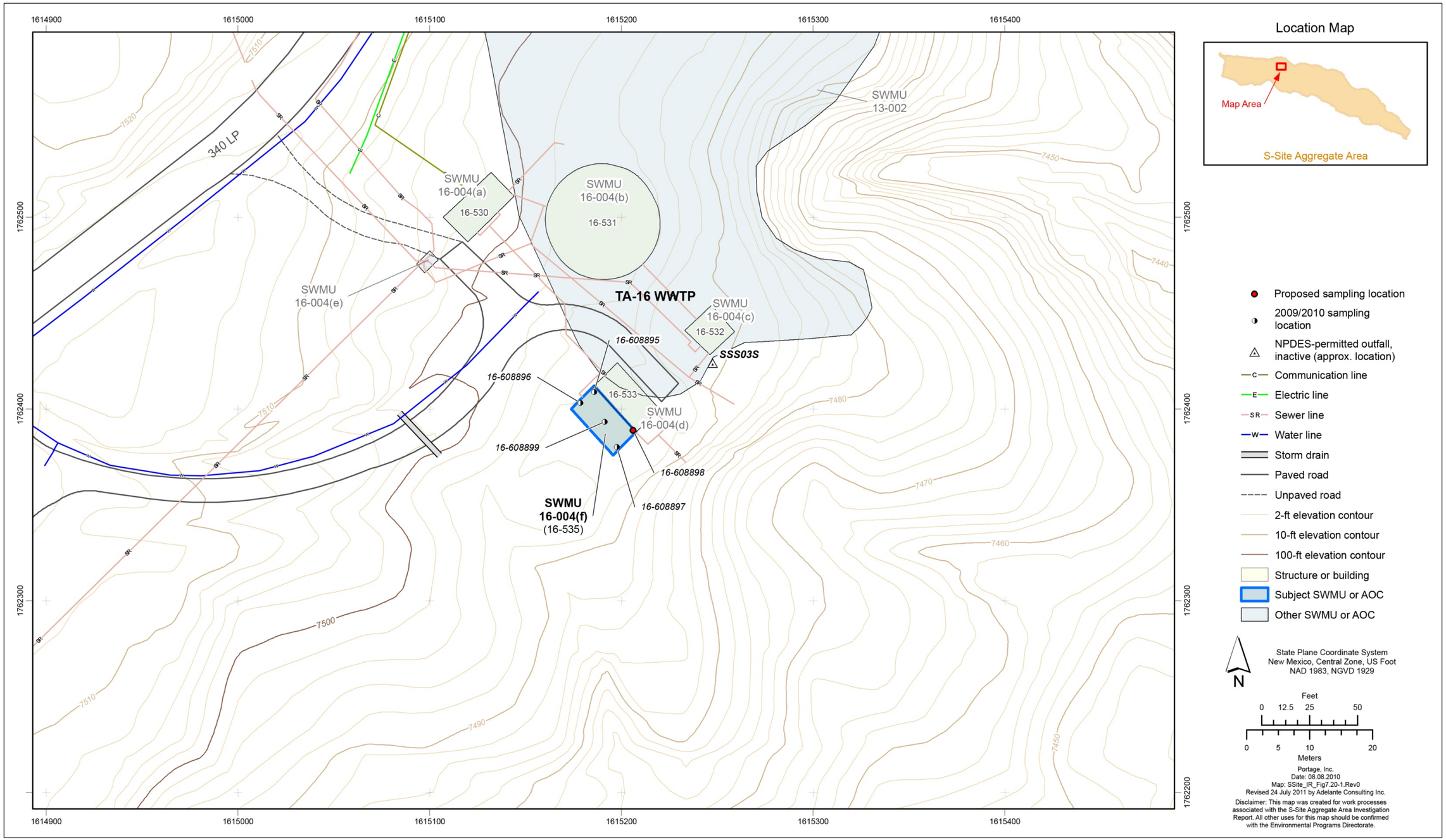


Figure 4.2-45 Proposed sampling locations at SWMU 16-004(f)

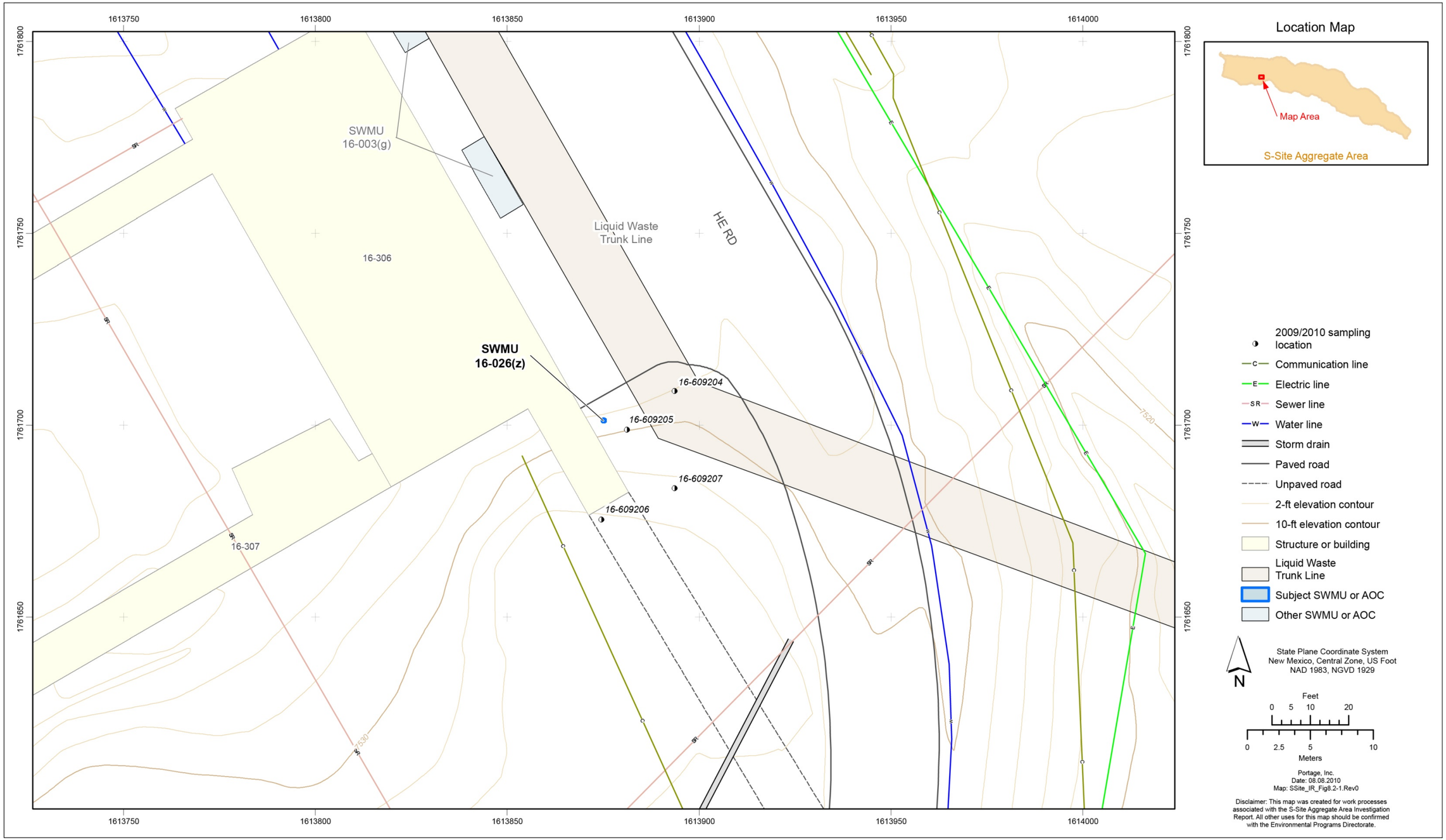


Figure 4.3-1 Site map and sampling locations at SWMU16-026(z)

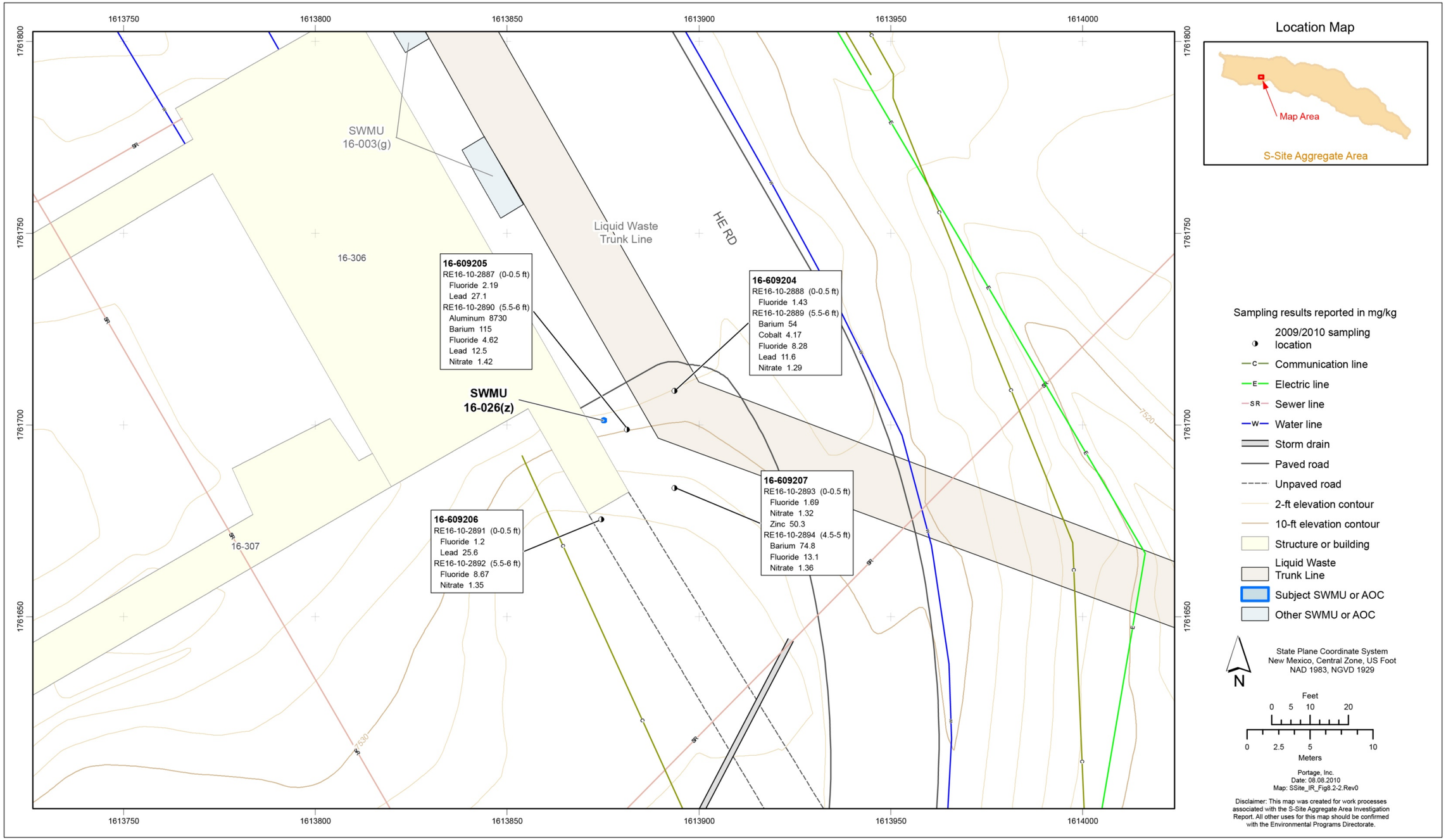


Figure 4.3-2 Inorganic chemicals detected or detected above BVs at SWMU 16-026(z)

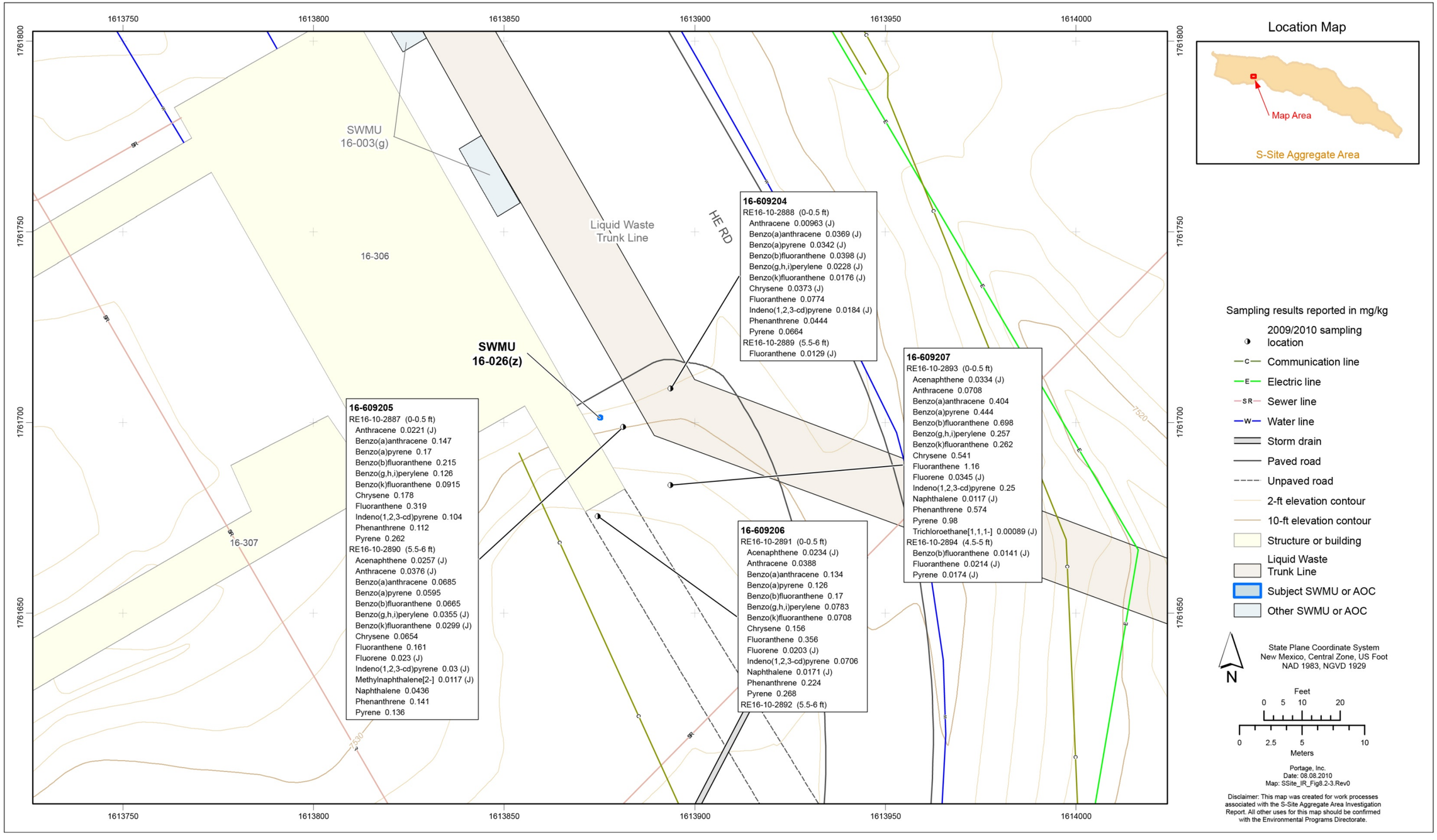


Figure 4.3-3 Organic chemicals detected at SWMU 16-026(z)

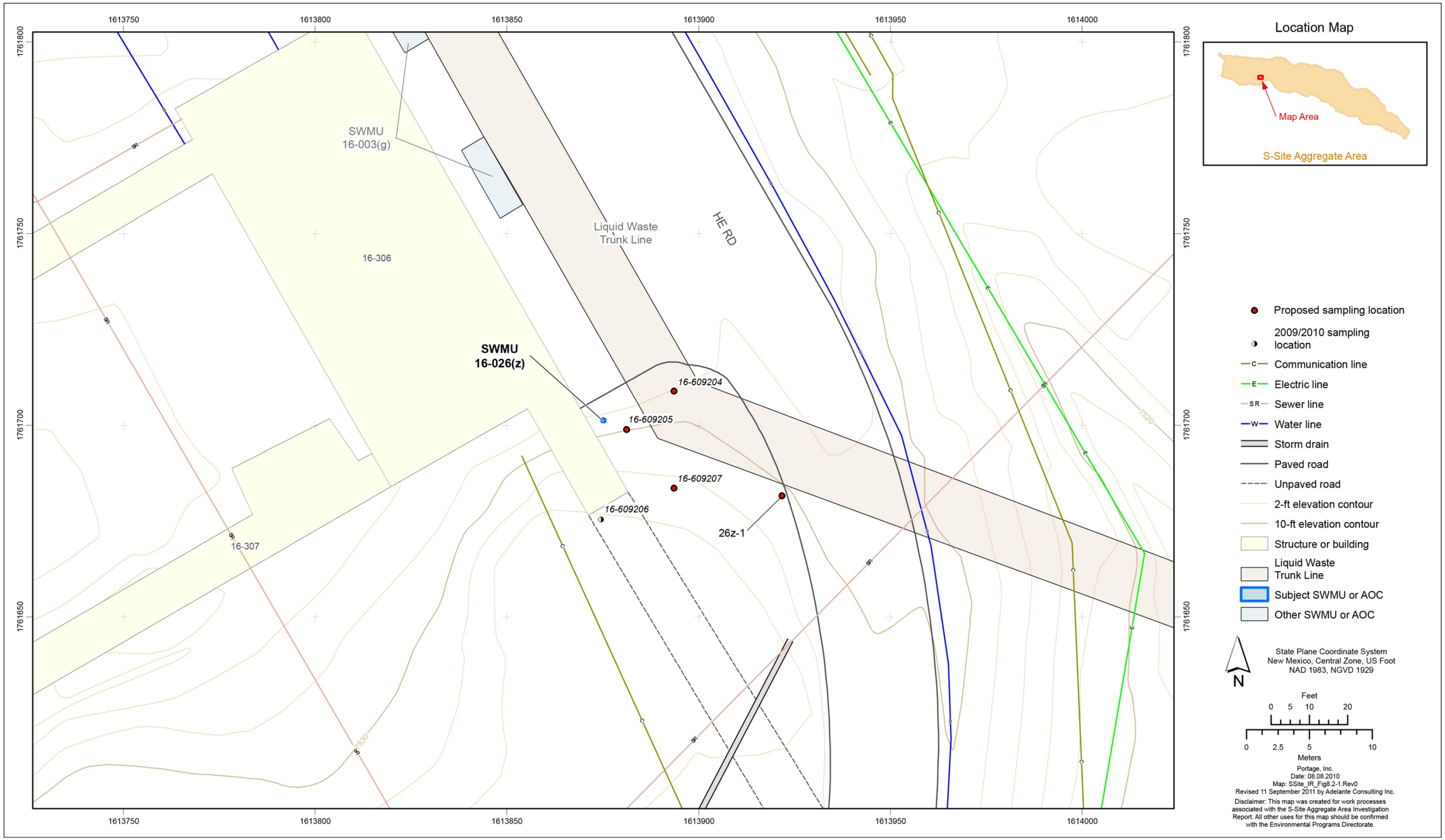


Figure 4.3-4 Proposed sampling locations at SWMU 16-026(z)

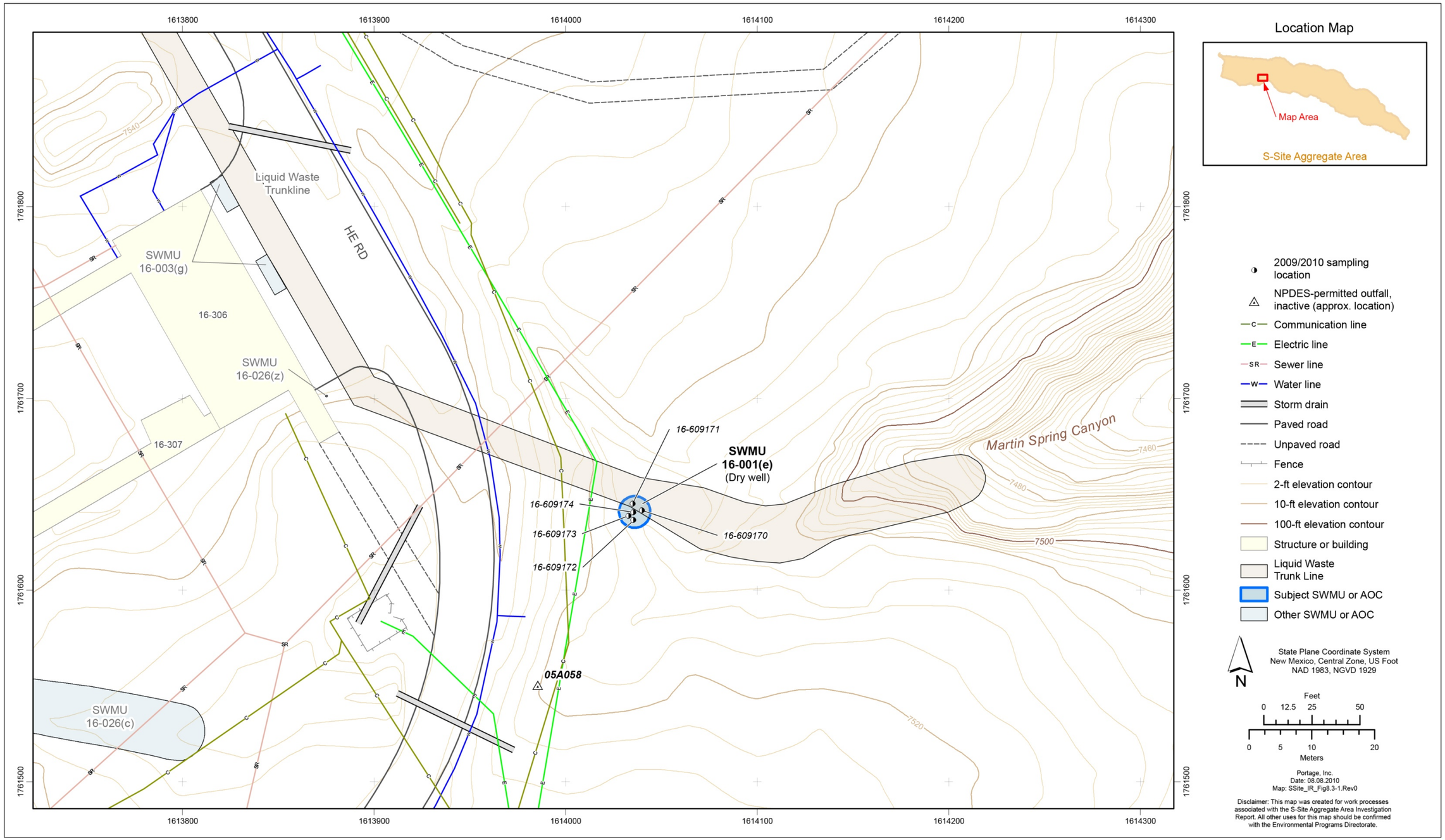


Figure 4.3-5 Site map and proposed sampling locations at SWMU 16-001(e)

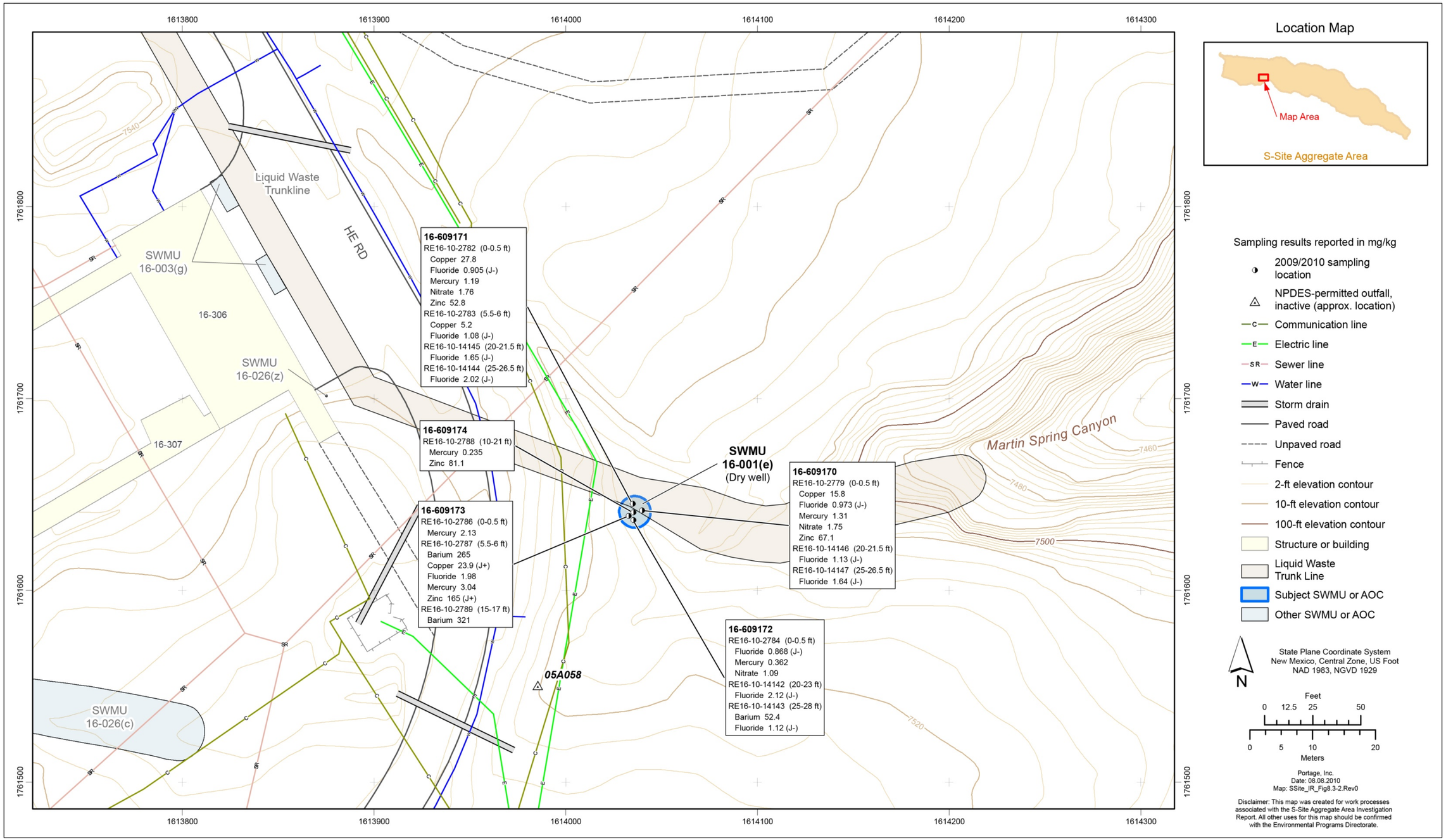


Figure 4.3-6 Inorganic chemicals detected or detected above BVs at SWMU 16-001(e)

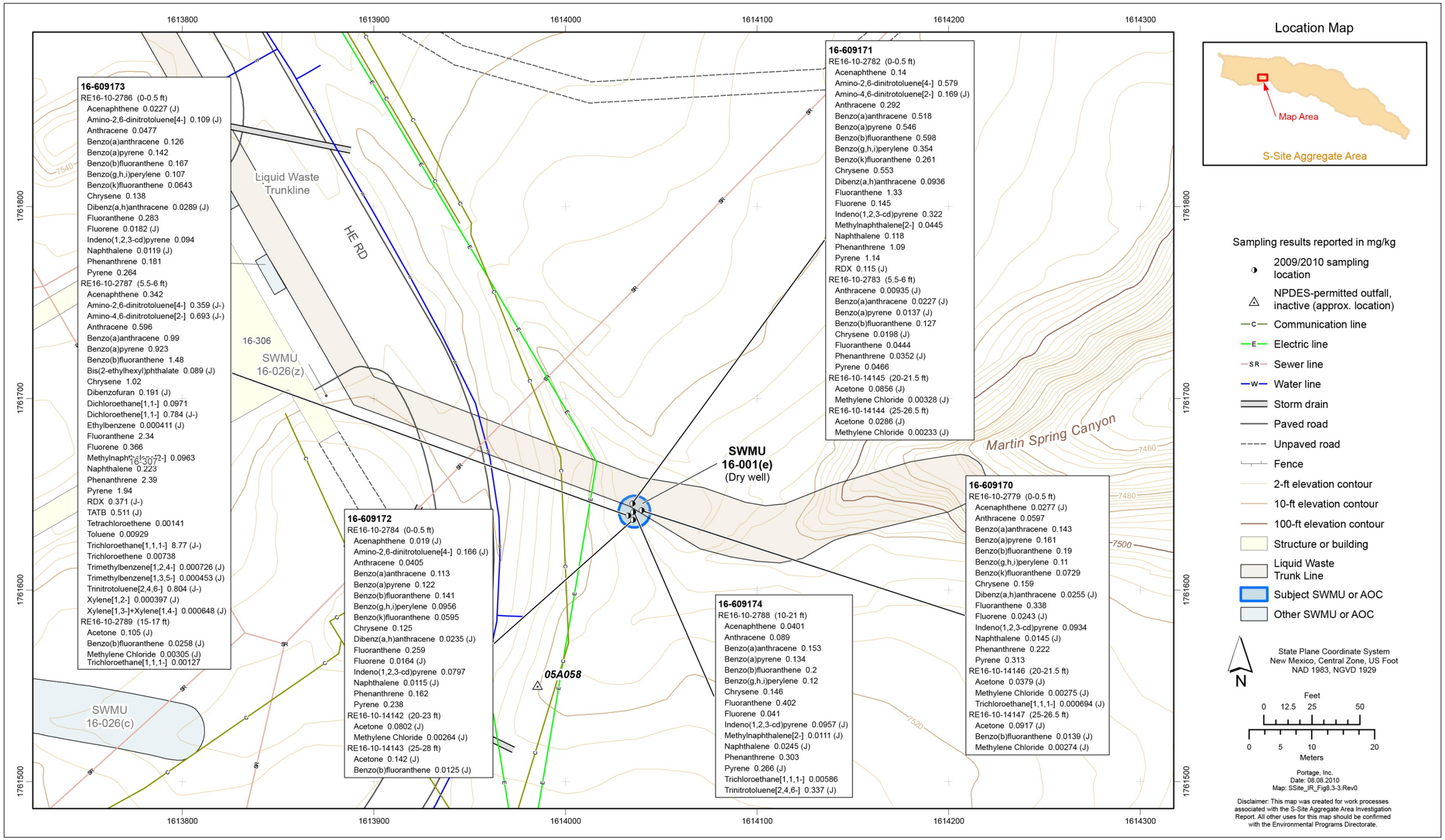


Figure 4.3-7 Organic chemicals detected at SWMU 16-001(e)

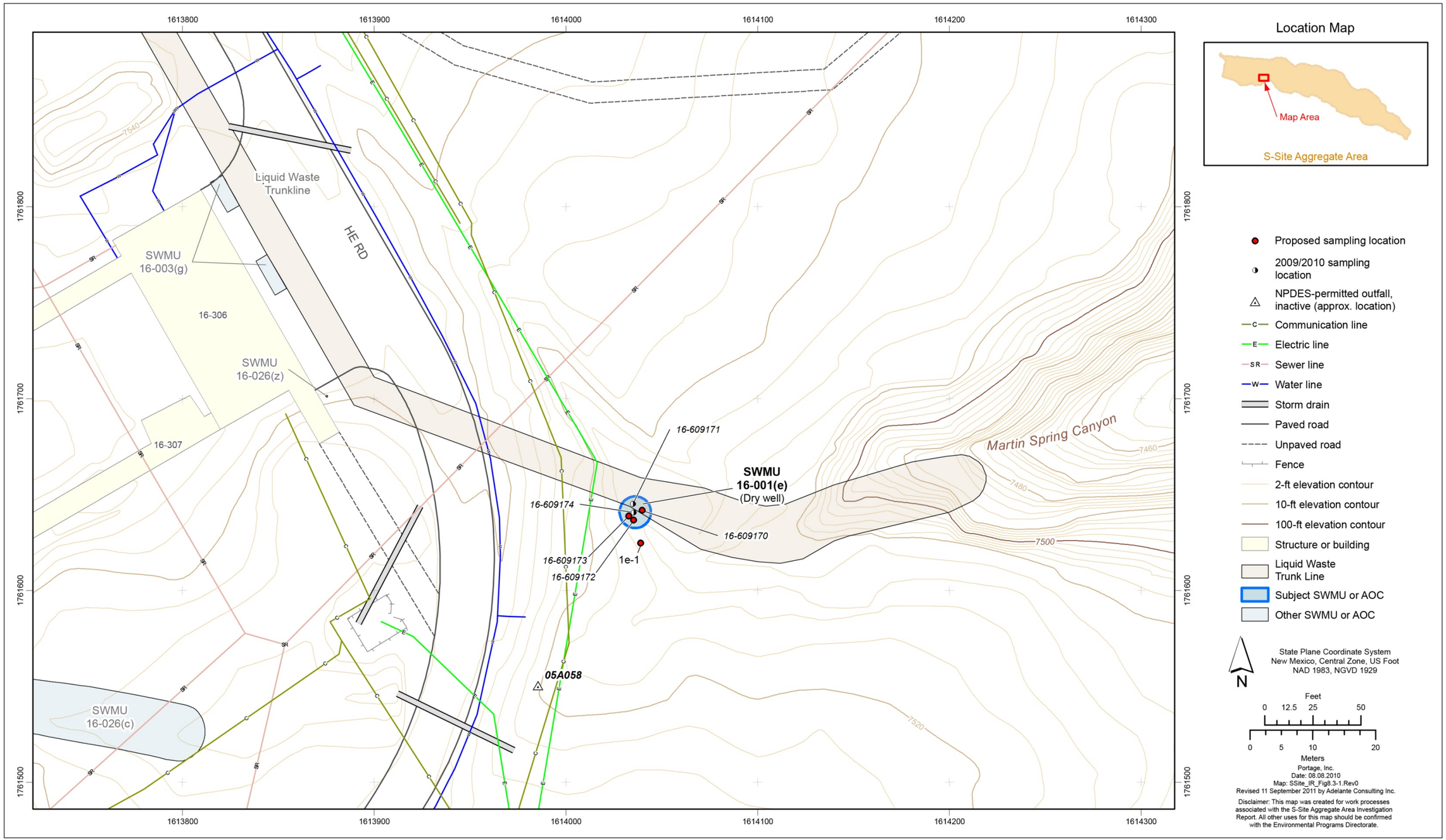


Figure 4.3-8 Proposed sampling locations at SWMU 16-001(e)

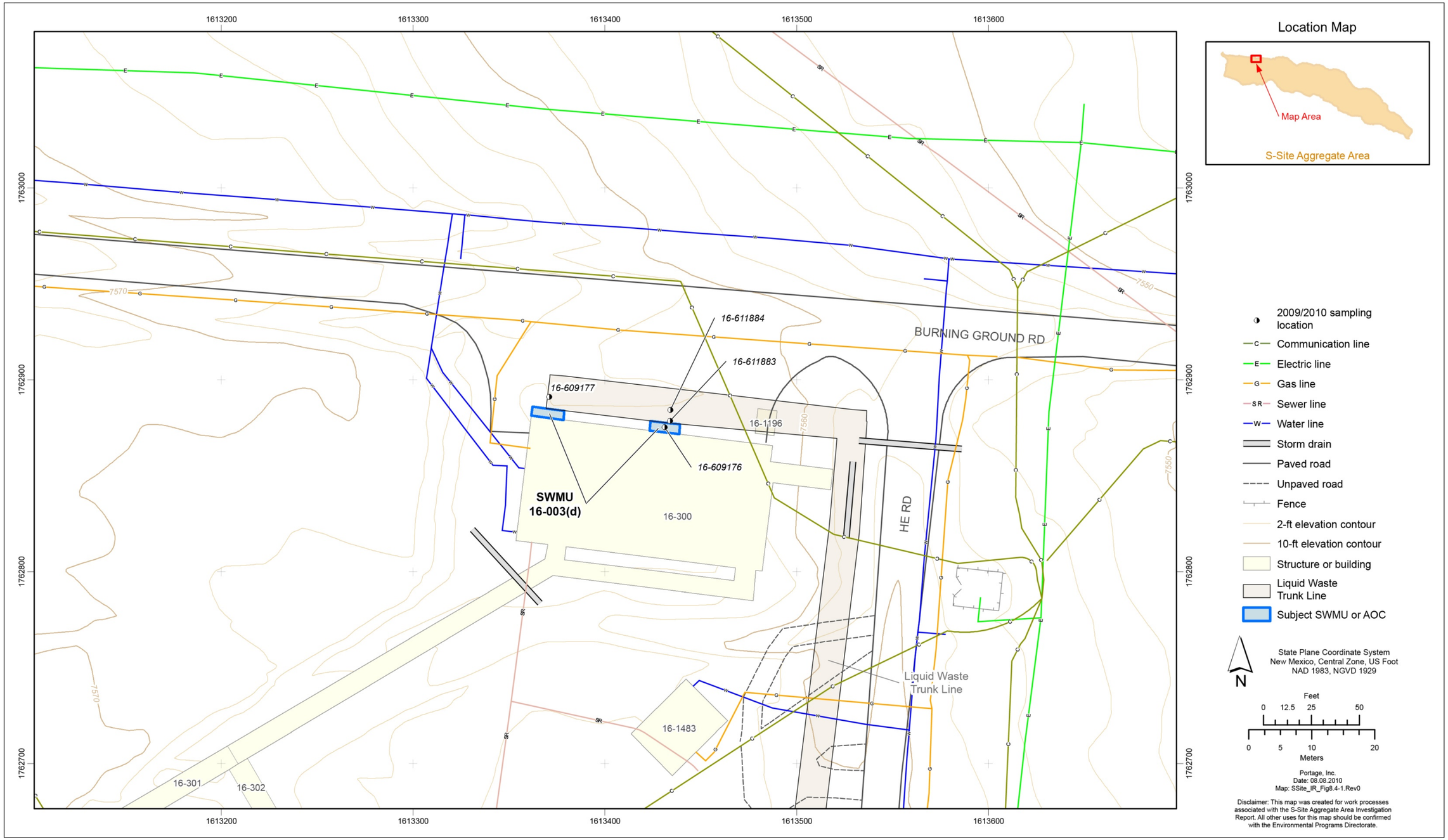


Figure 4.3-9 Site map and sampling locations at SWMU 16-003(d)

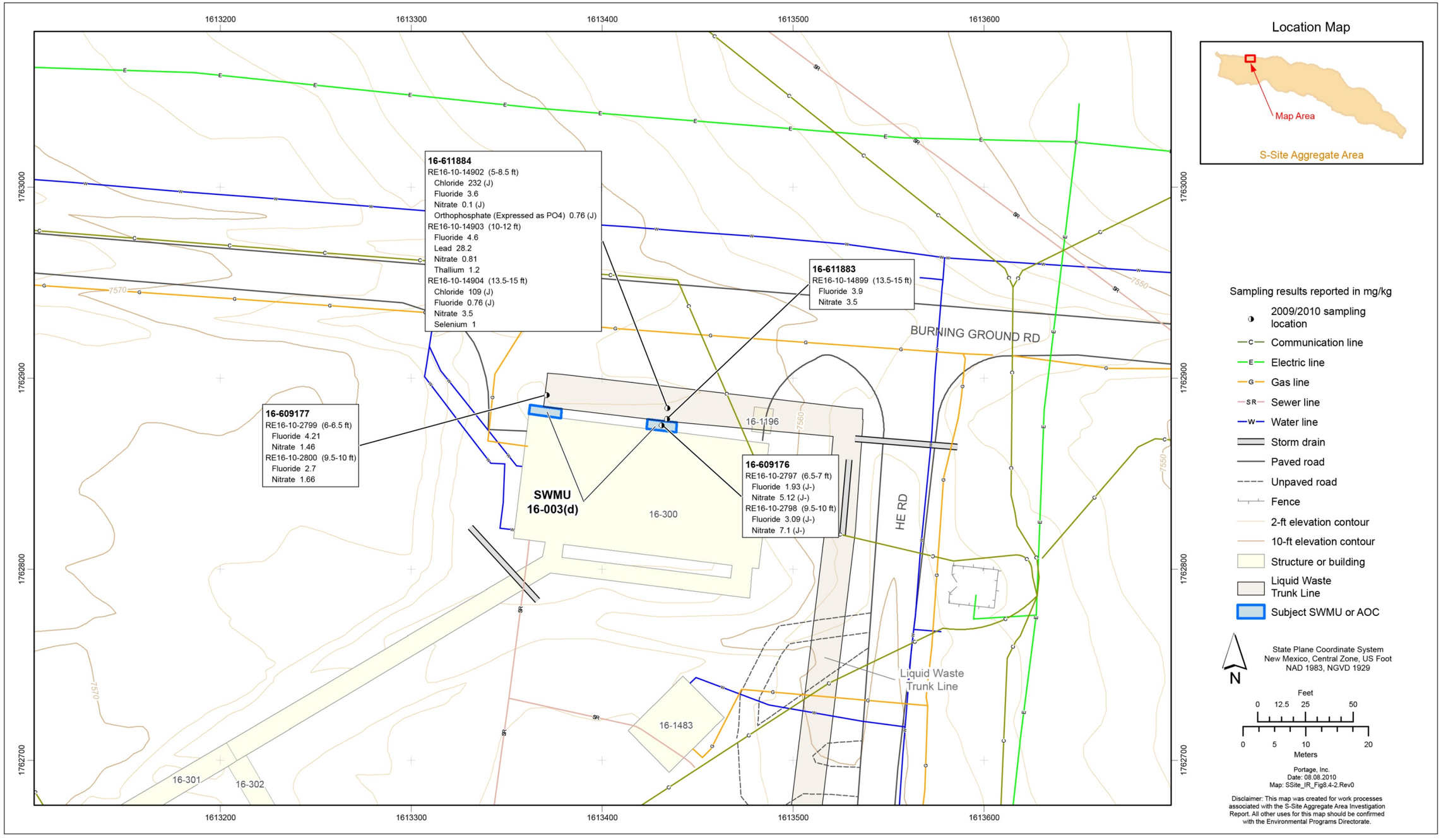


Figure 4.3-10 Inorganic chemicals detected or detected above BVs at SWMU 16-003(d)

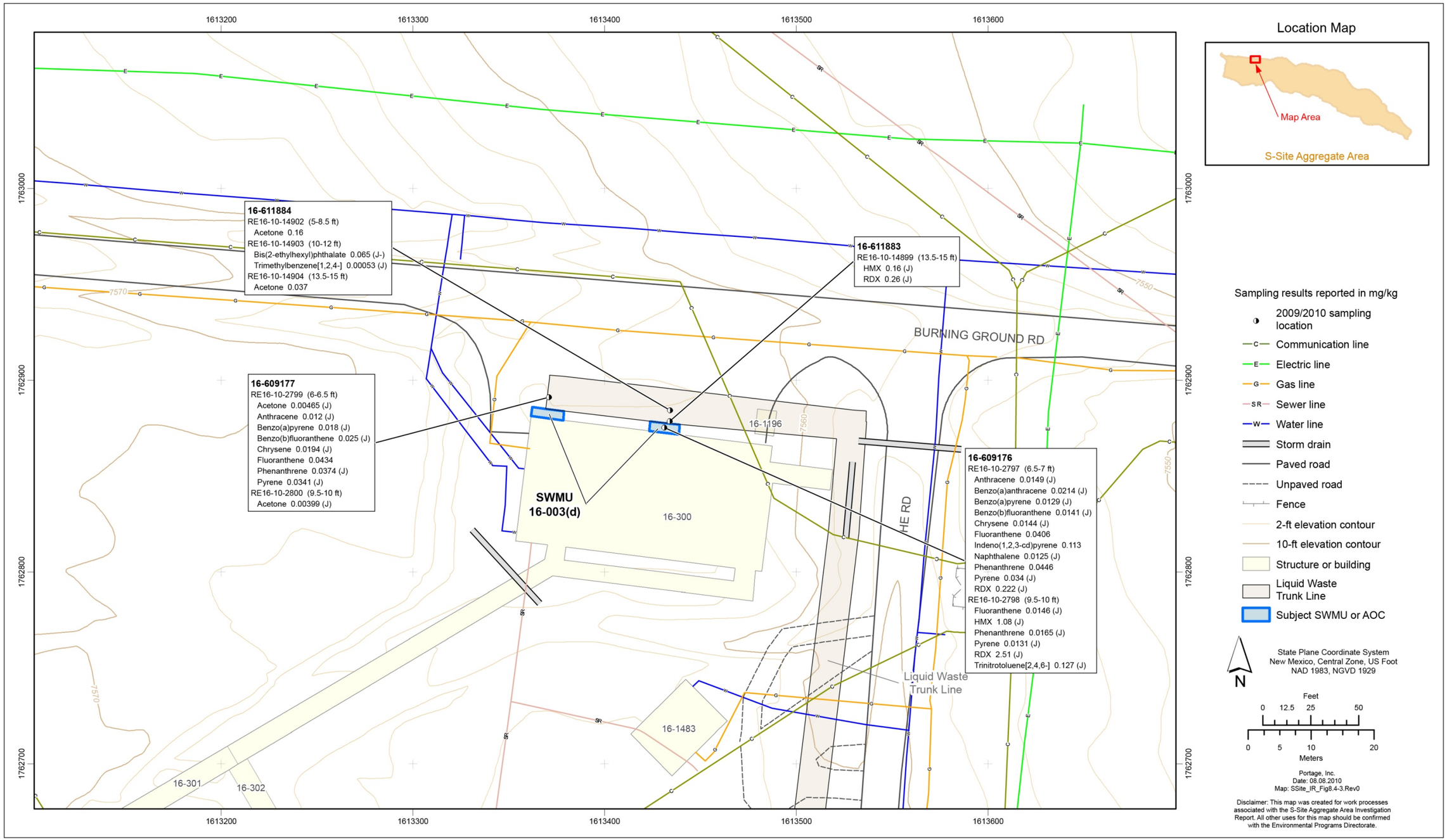


Figure 4.3-11 Organic chemicals detected at SWMU 16-003(d)

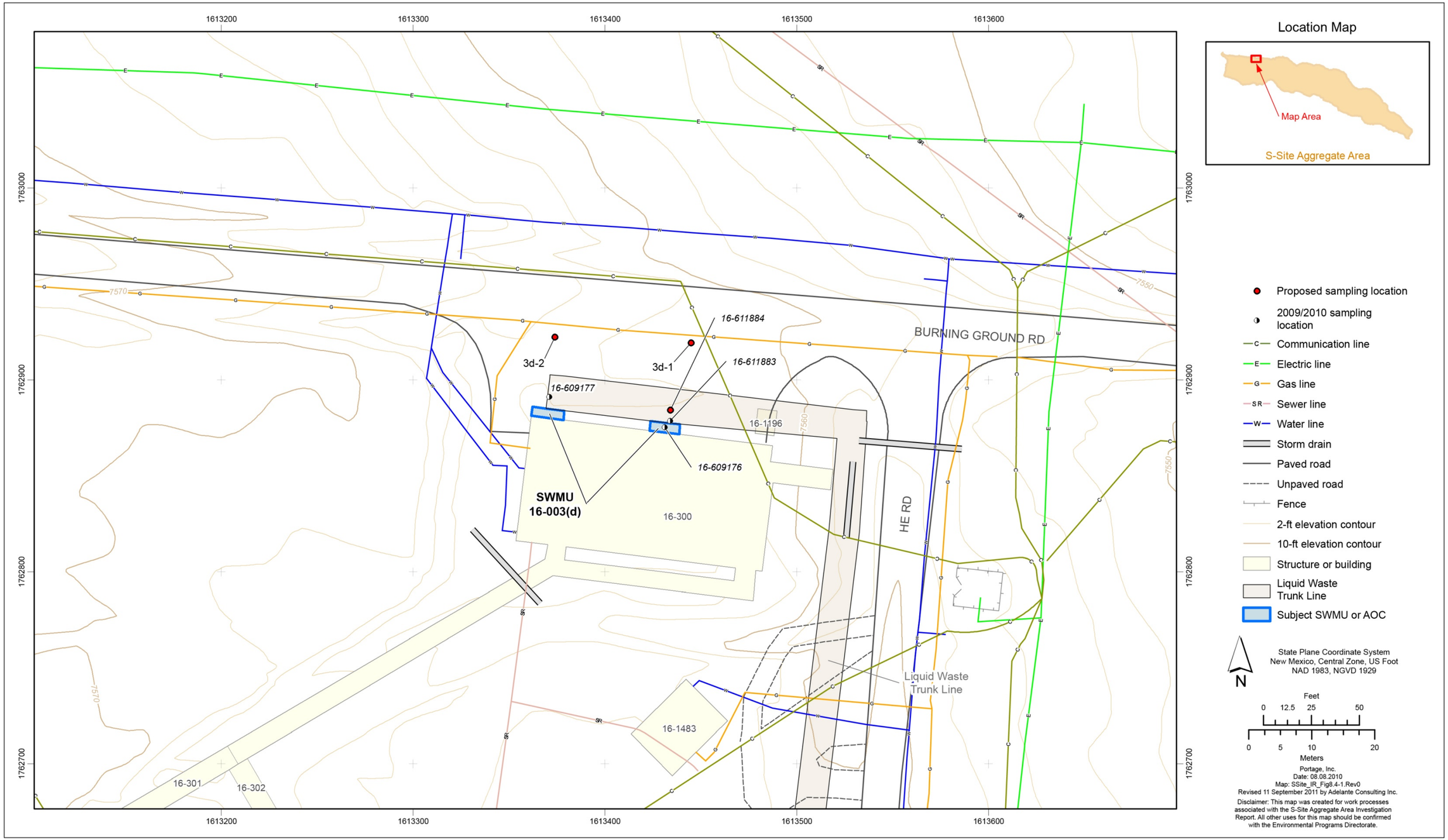


Figure 4.3-12 Proposed sampling locations at SWMU 16-003(d)

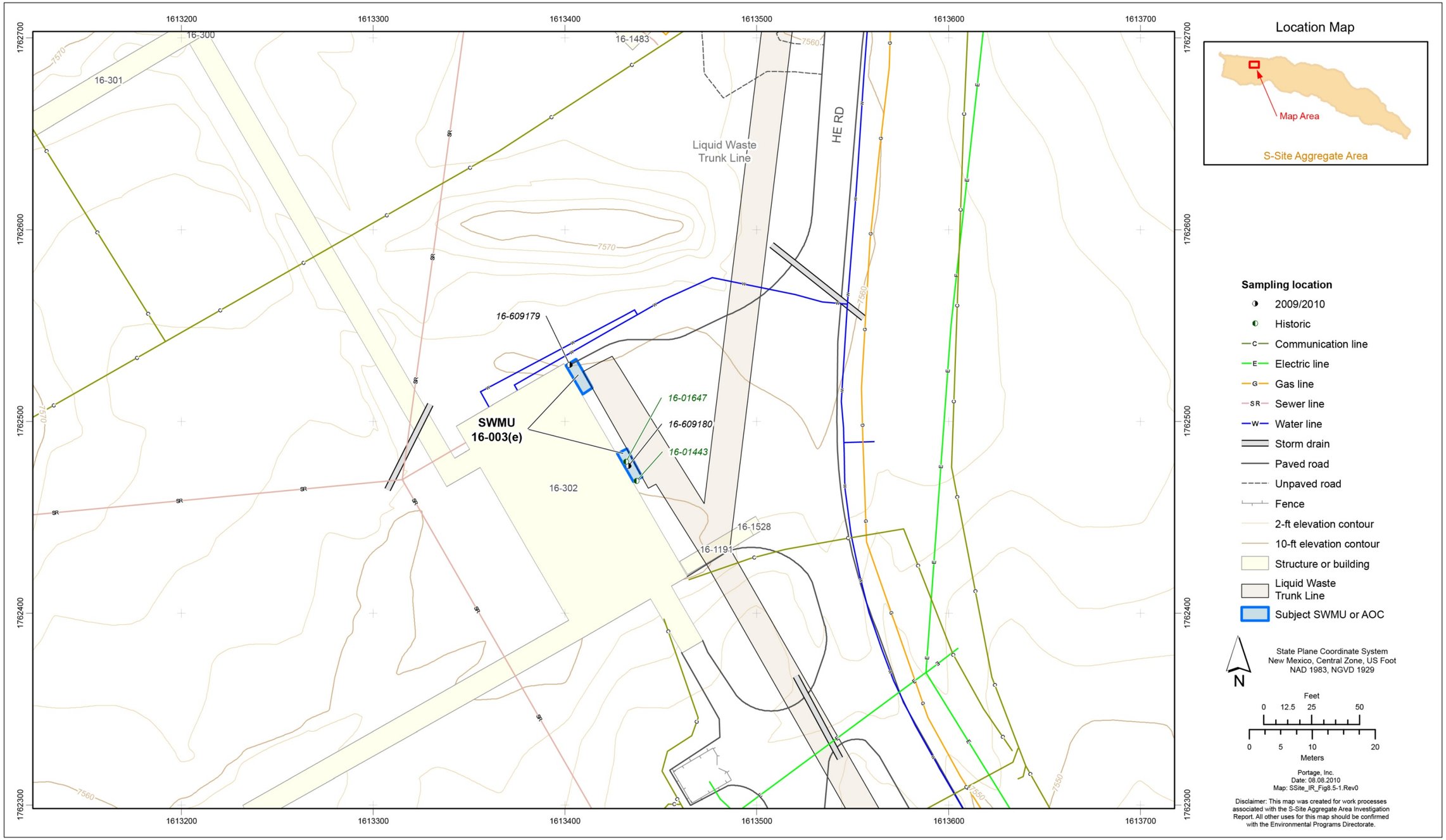


Figure 4.3-13 Site map and sampling locations at SWMU 16-003(e)

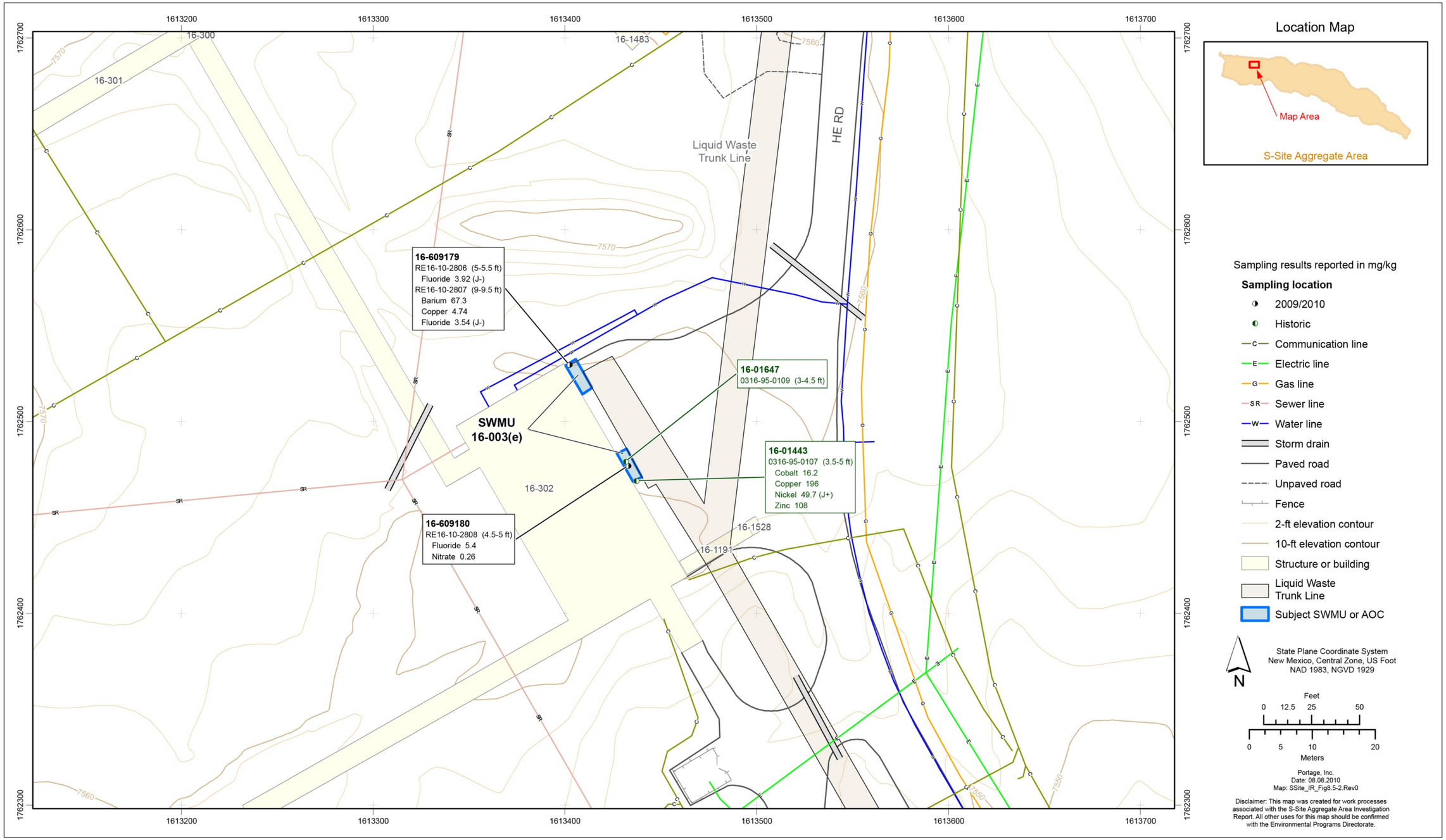


Figure 4.3-14 Inorganic chemicals detected or detected above BVs at SWMU 16-003(e)

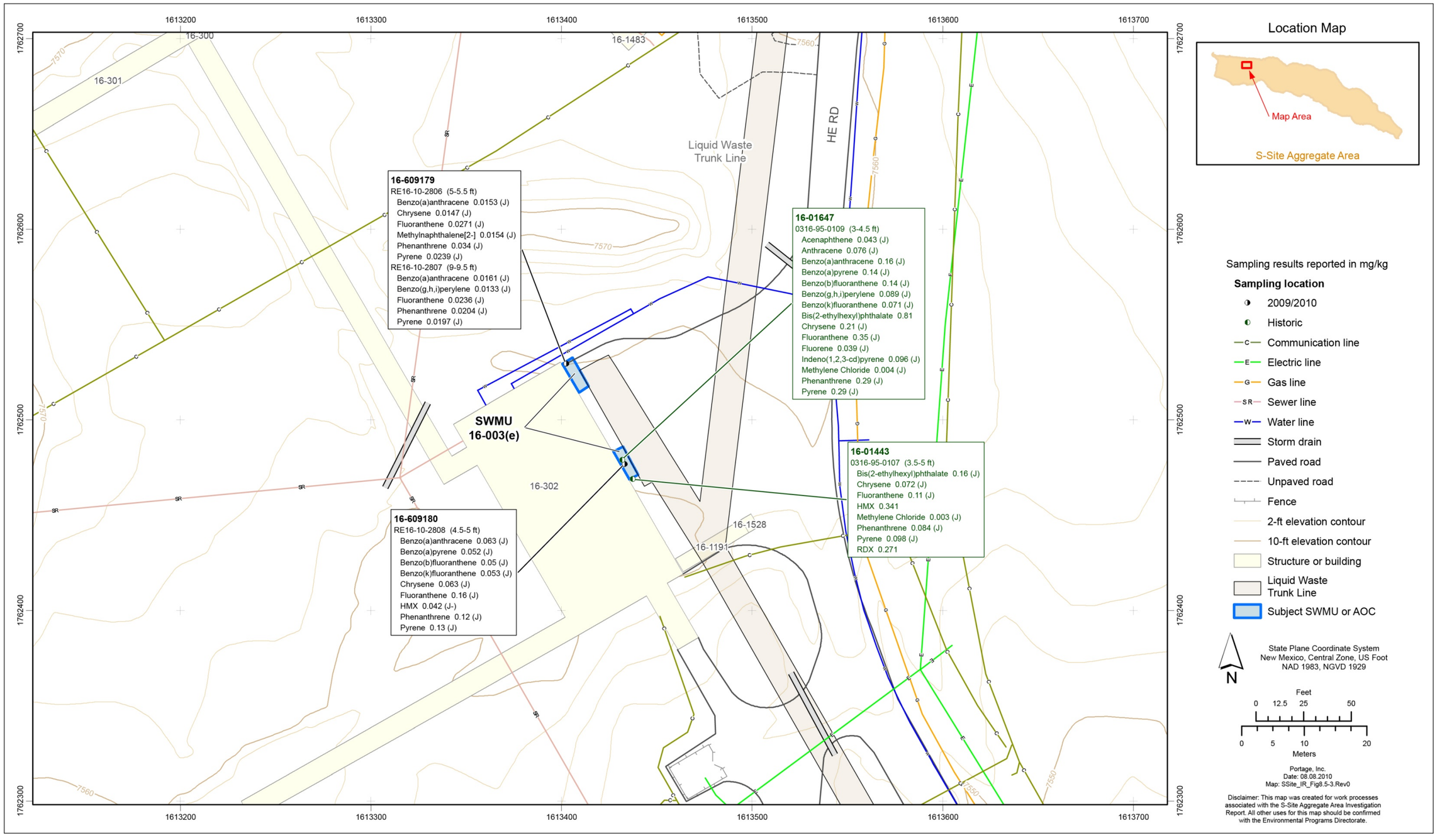


Figure 4.3-15 Organic chemicals detected at SWMU 16-003(e)

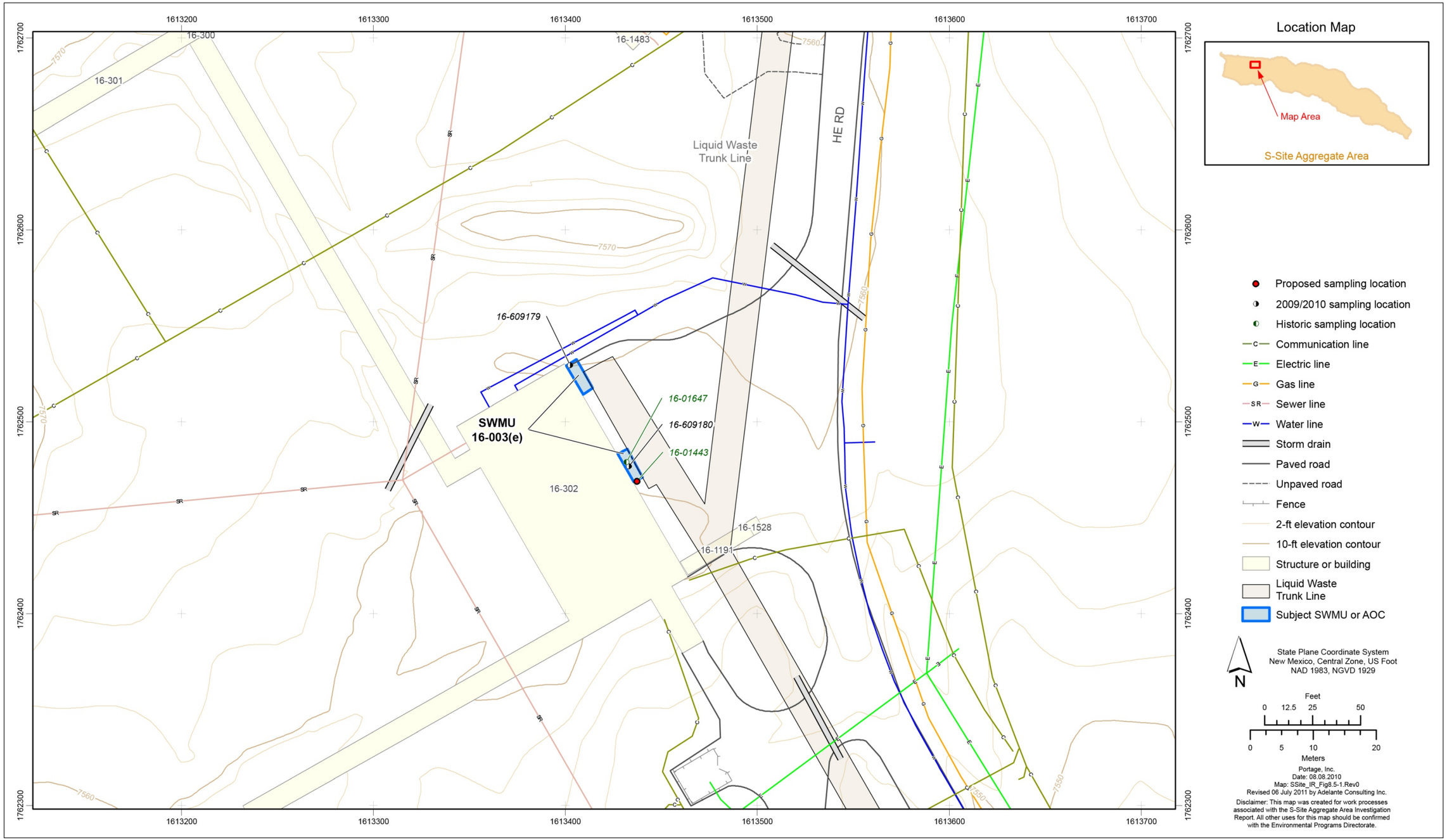


Figure 4.3-16 Proposed sampling locations at SWMU 16-003(e)

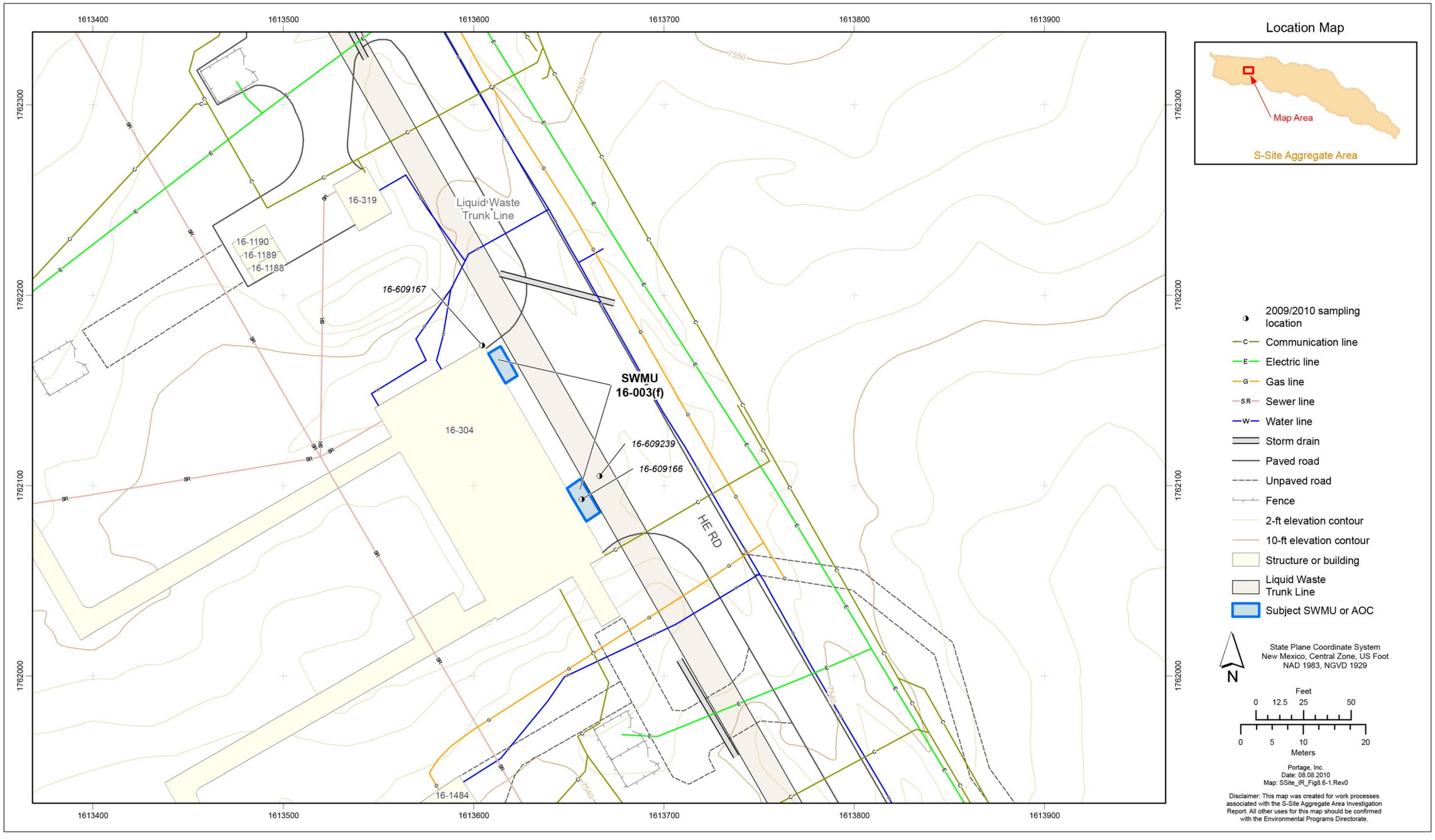


Figure 4.3-17 Site map and sampling locations at SWMU 16-003(f)

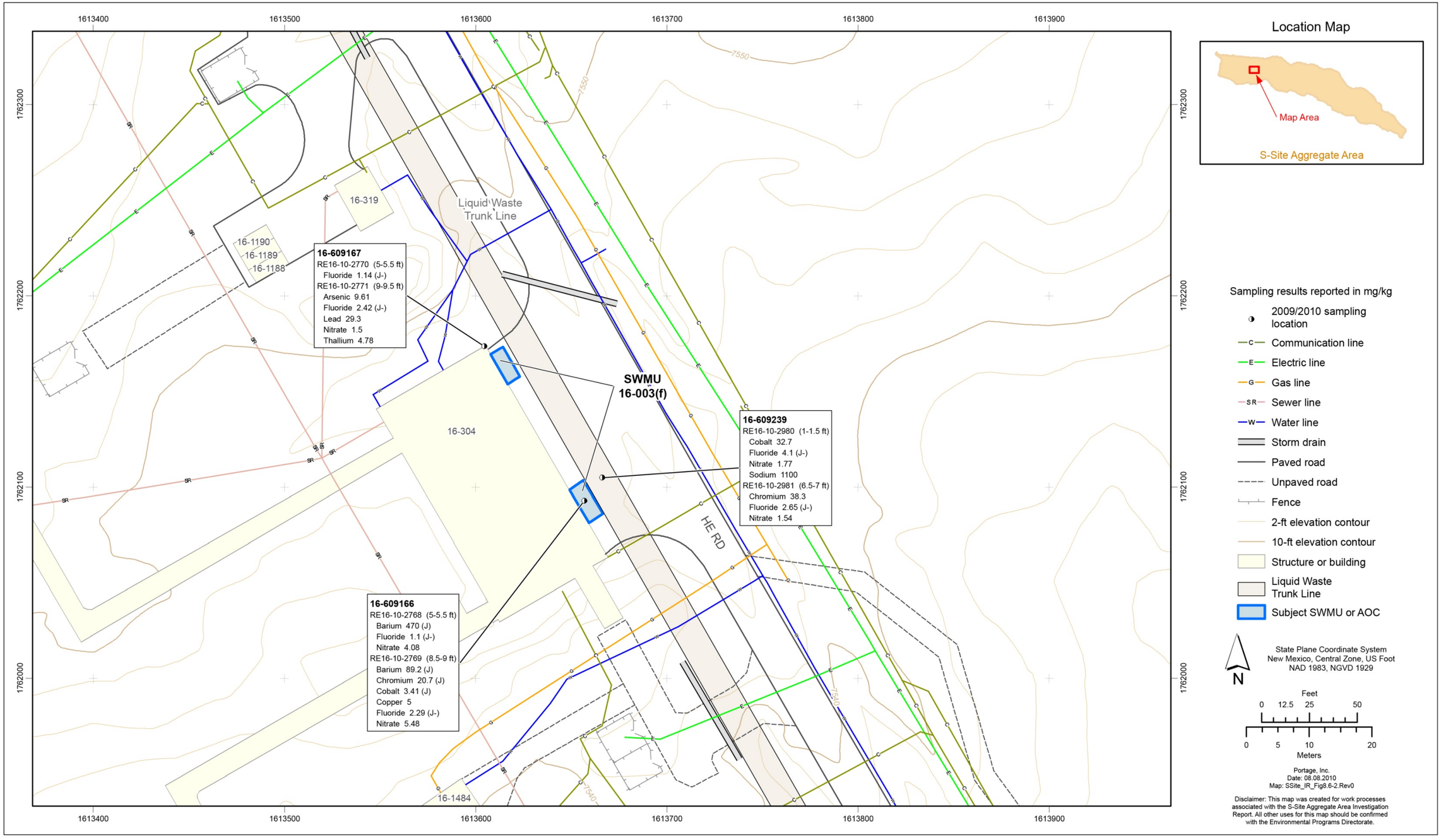


Figure 4.3-18 Inorganic chemicals detected or detected above BVs at SWMU 16-003(f)

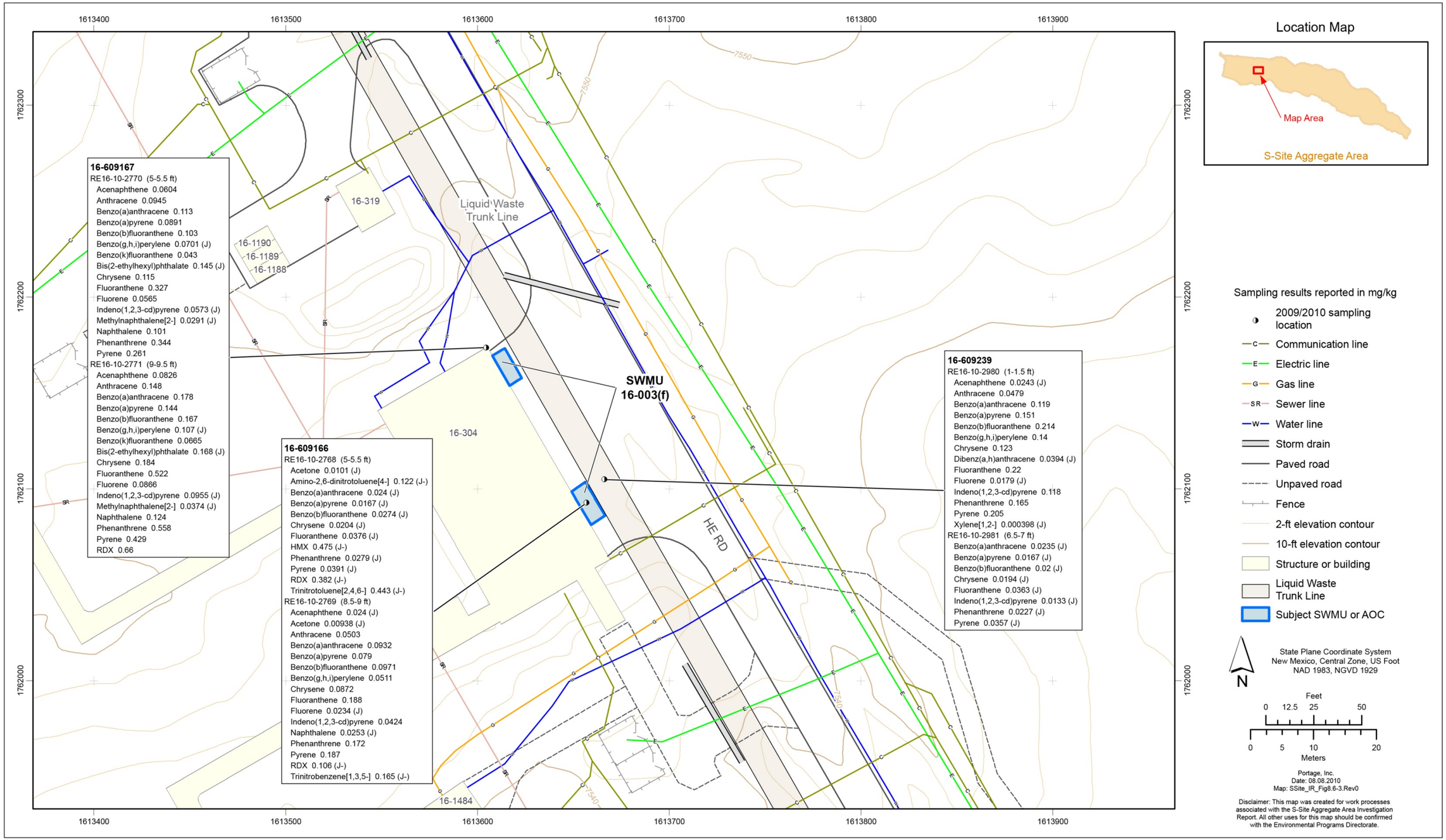


Figure 4.3-19 Organic chemicals detected at SWMU 16-003(f)

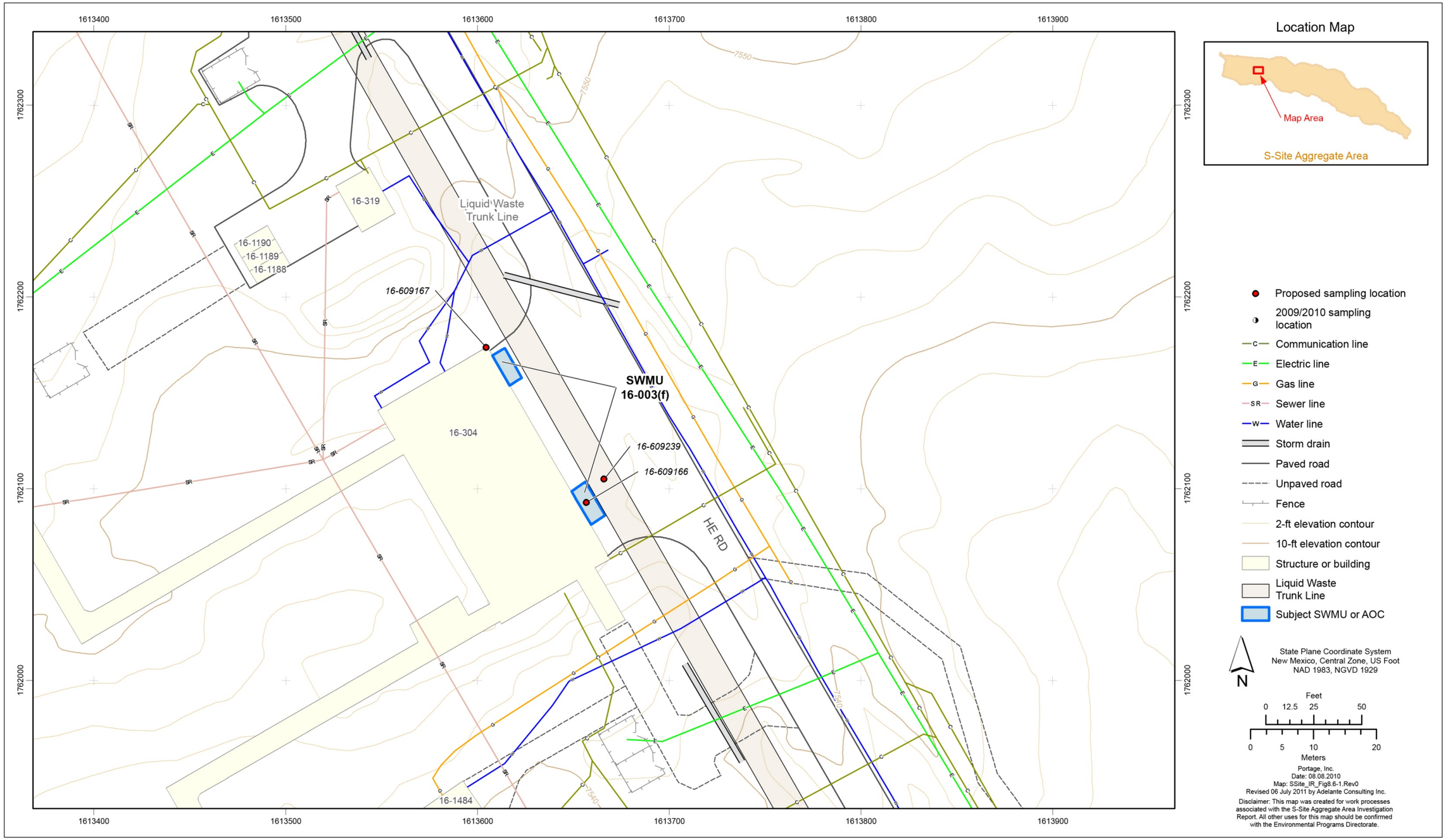


Figure 4.3-20 Proposed sampling locations at SWMU 16-003(f)

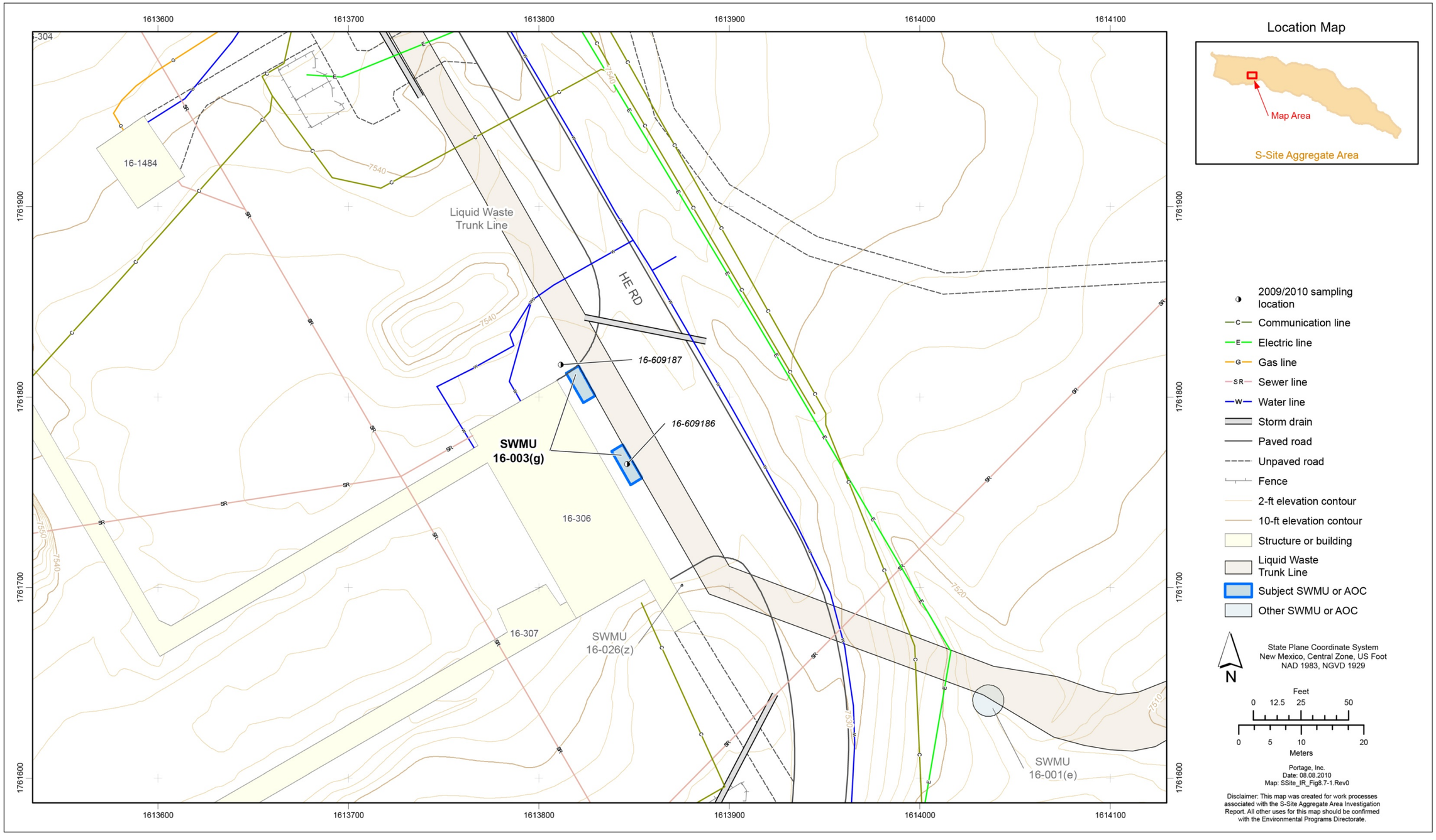


Figure 4.3-21 Site map and sampling locations at SWMU 16-003(g)

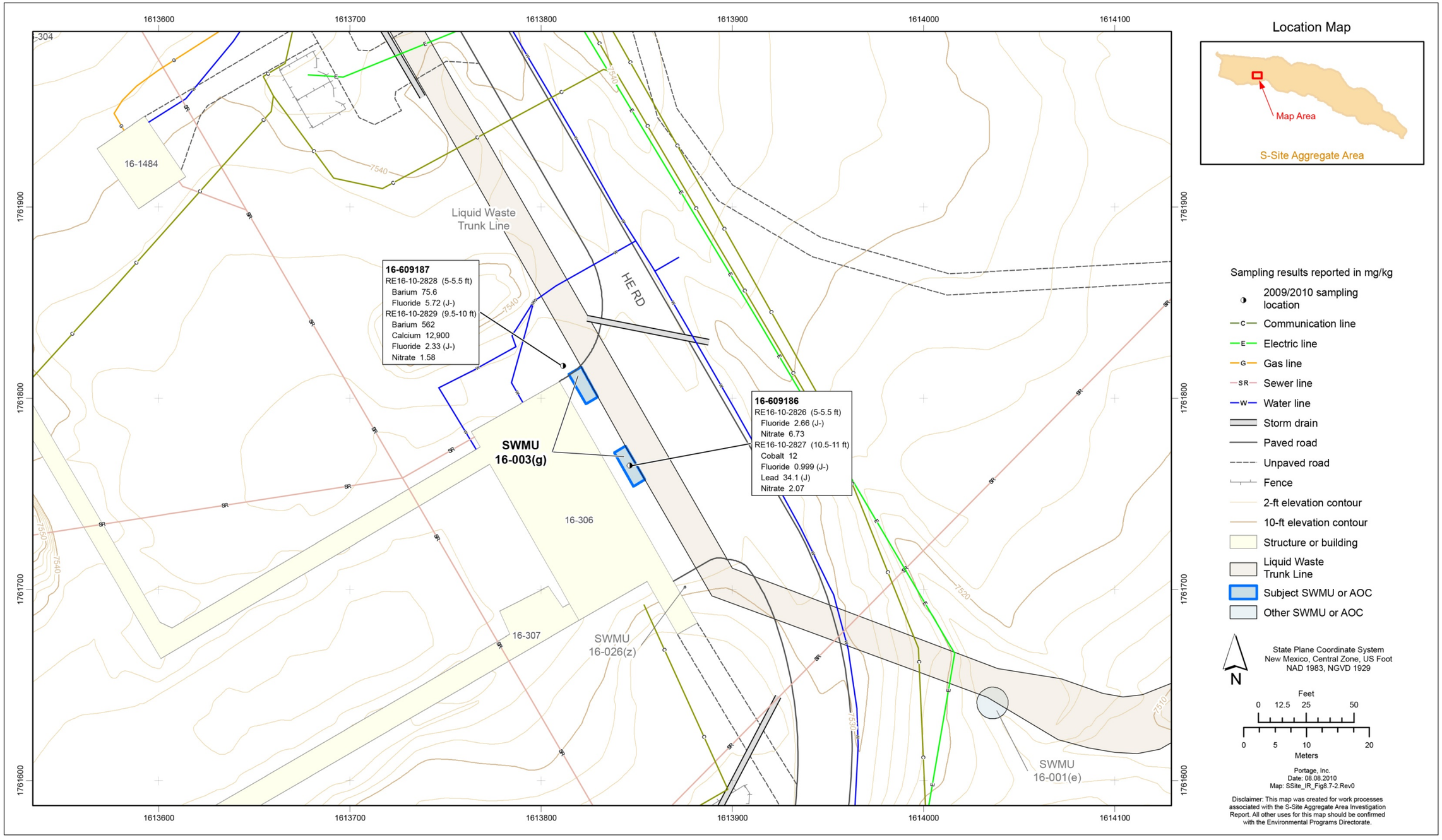


Figure 4.3-22 Inorganic chemicals detected or detected above BVs at SWMU 16-003(g)

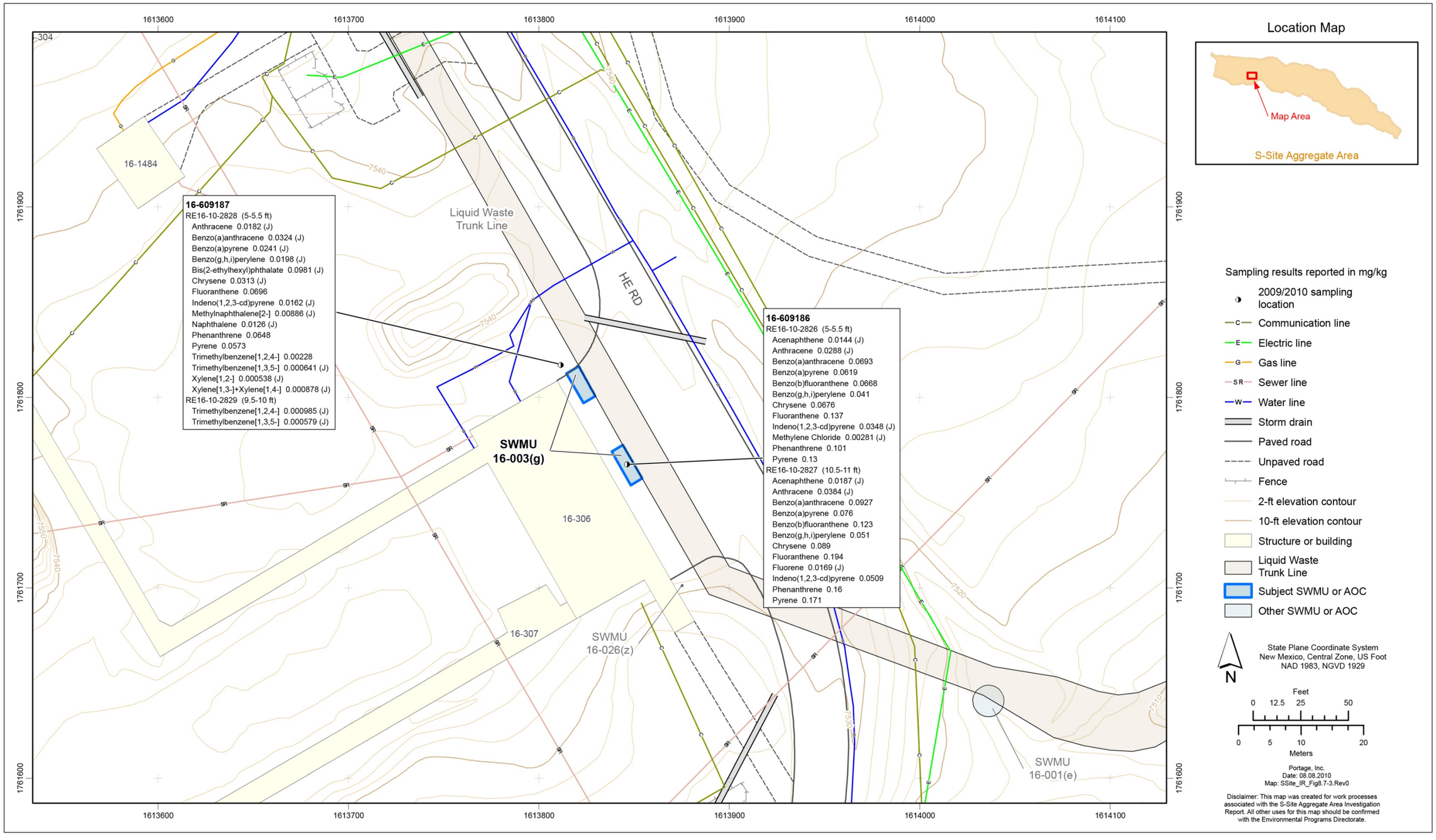


Figure 4.3-23 Organic chemicals detected at SWMU 16-003(g)

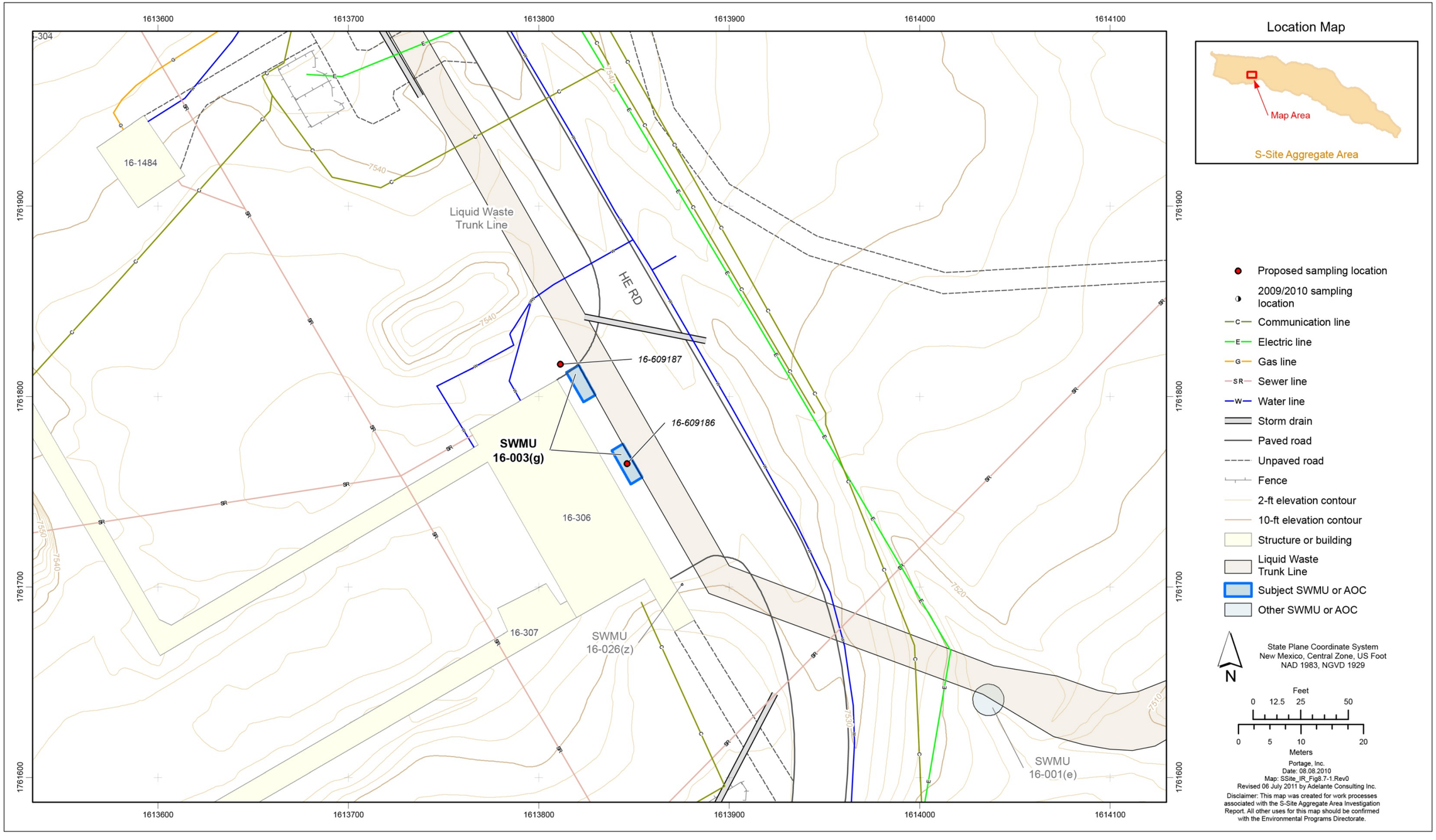


Figure 4.3-24 Proposed sampling locations at SWMU 16-003(g)

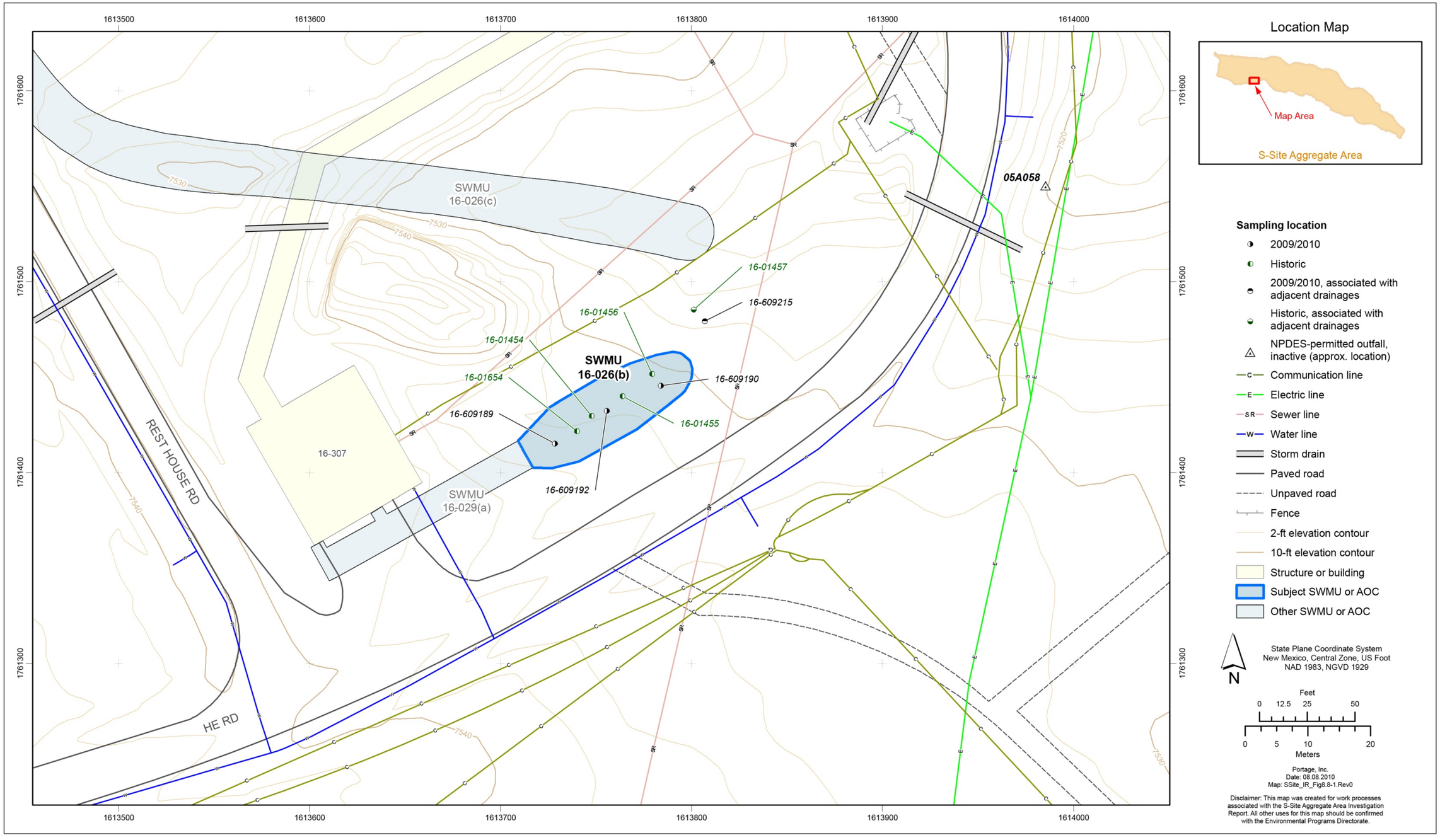


Figure 4.3-25 Site map and sampling locations at SWMU 16-026(b)

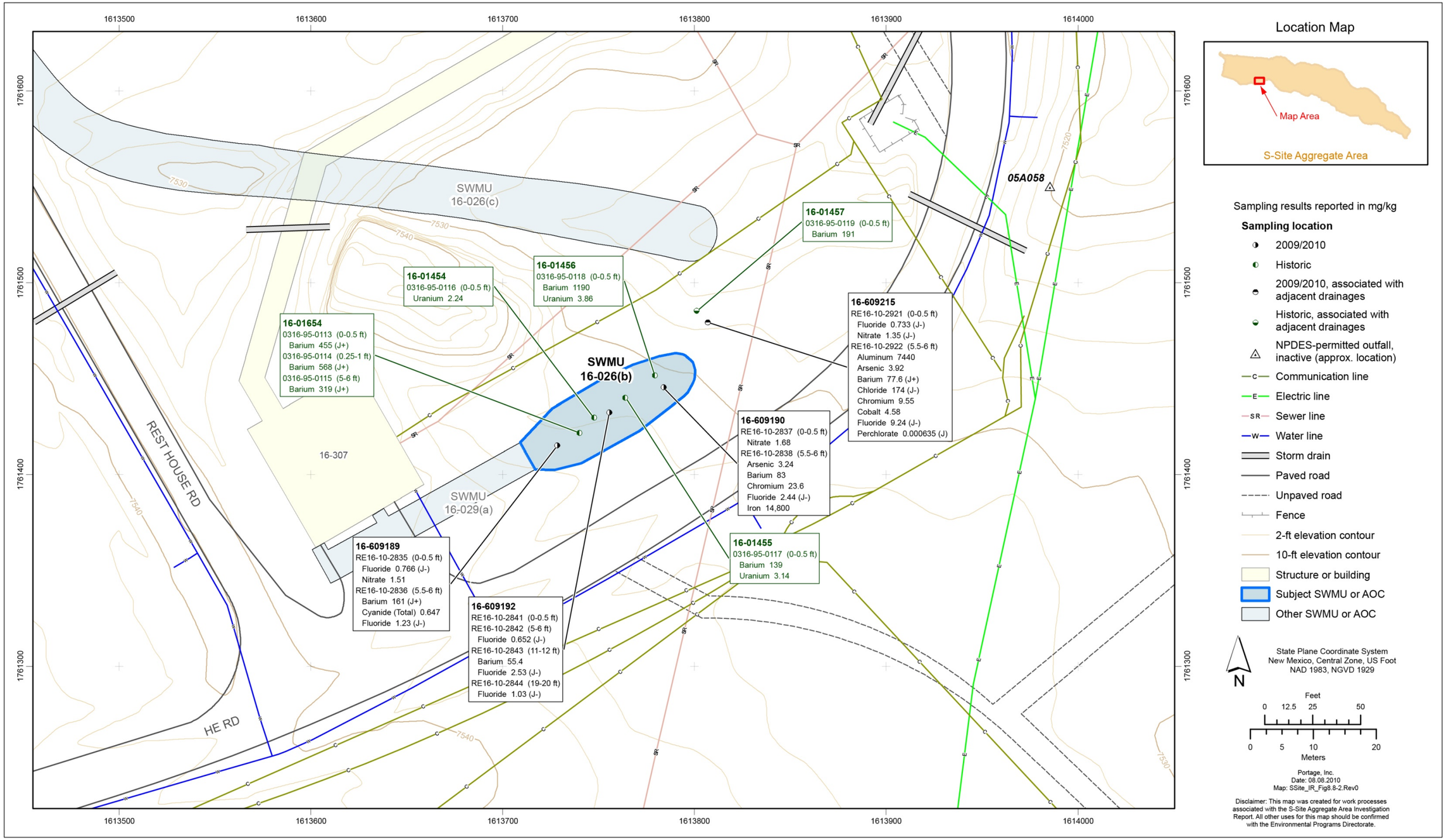


Figure 4.3-26 Inorganic chemicals detected or detected above BVs at SWMU 16-026(b)

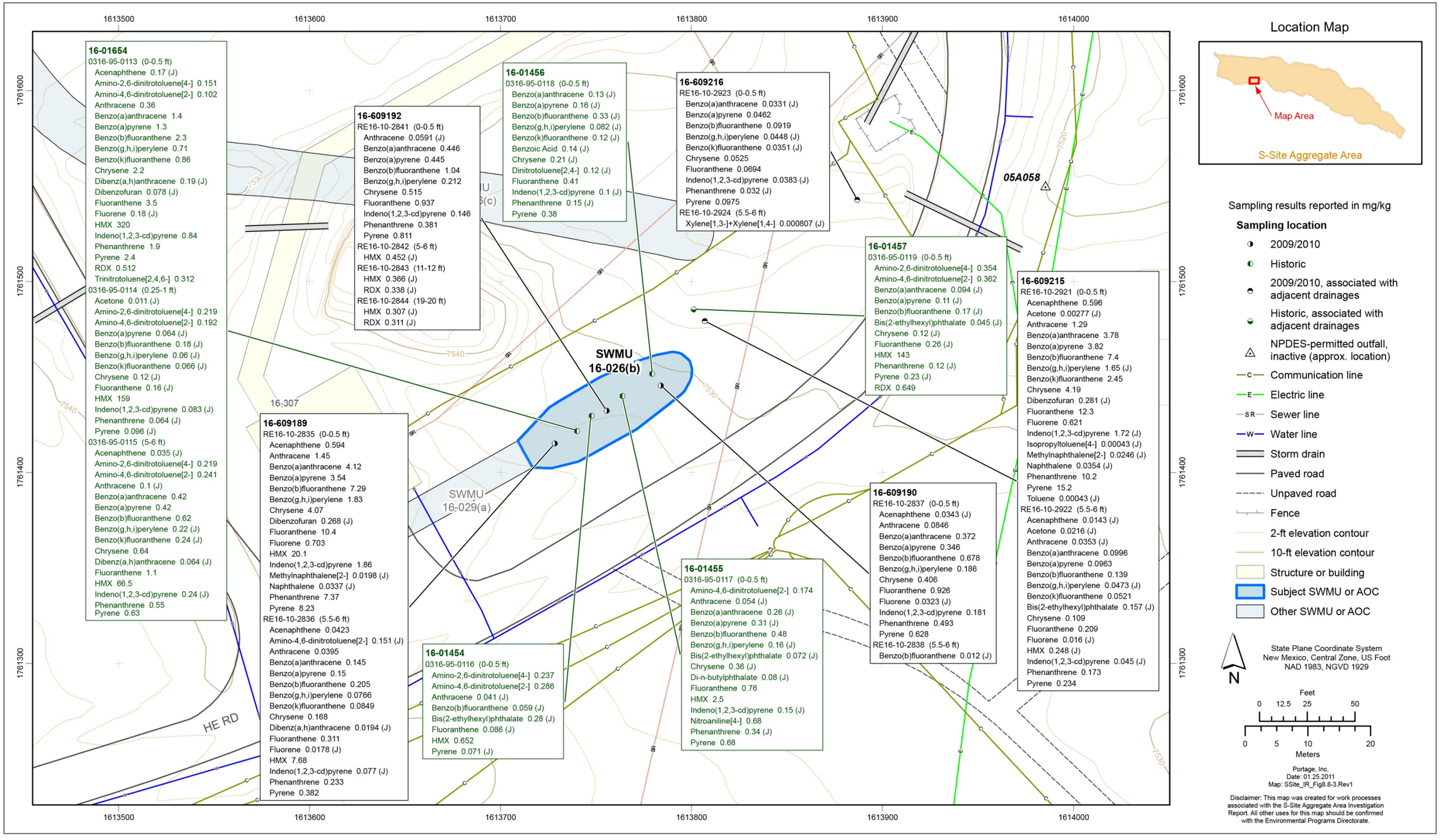


Figure 4.3-27 Organic chemicals detected at SWMU 16-026(b)

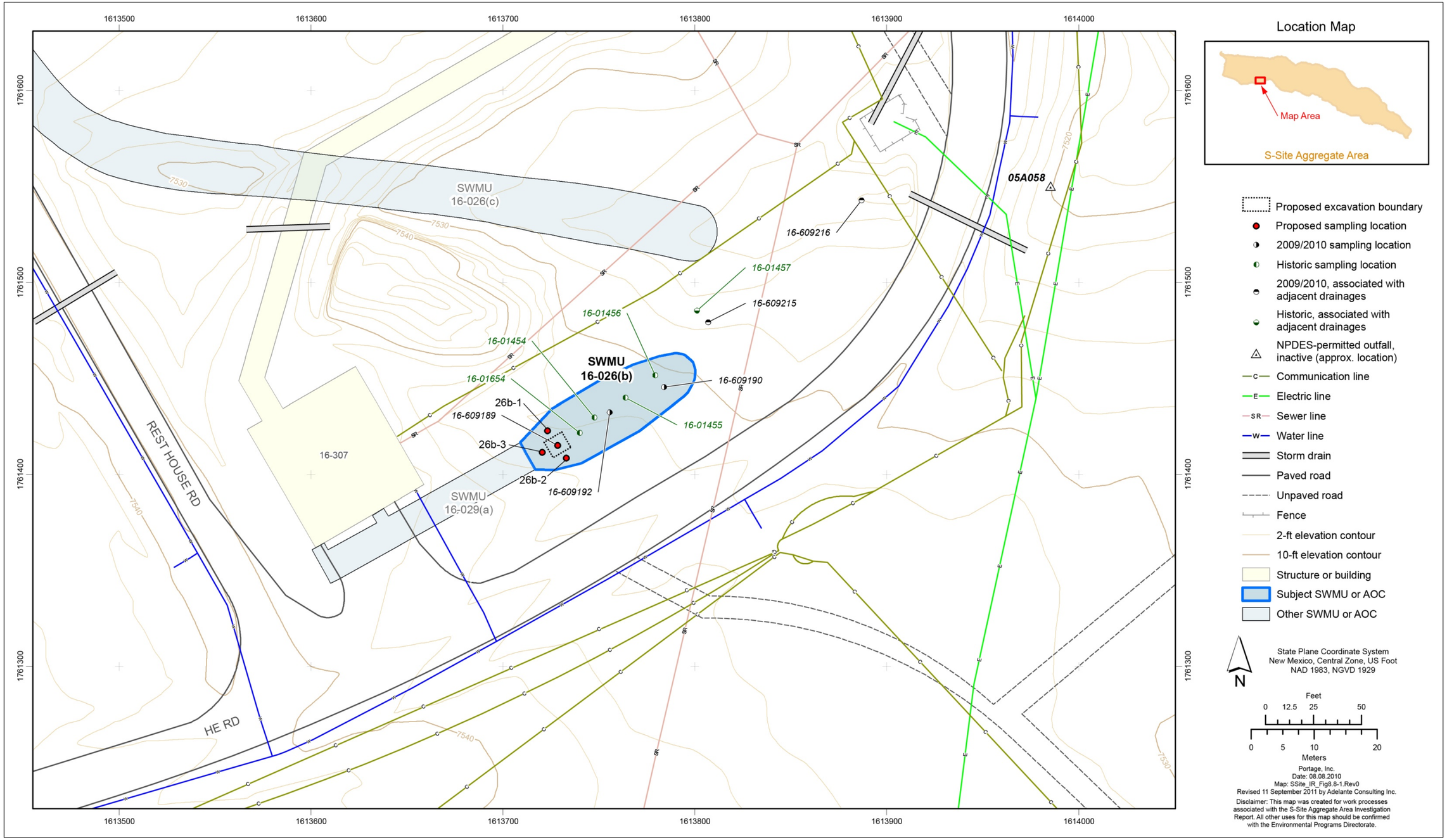


Figure 4.3-28 Proposed sampling locations at SWMU 16-026(b)

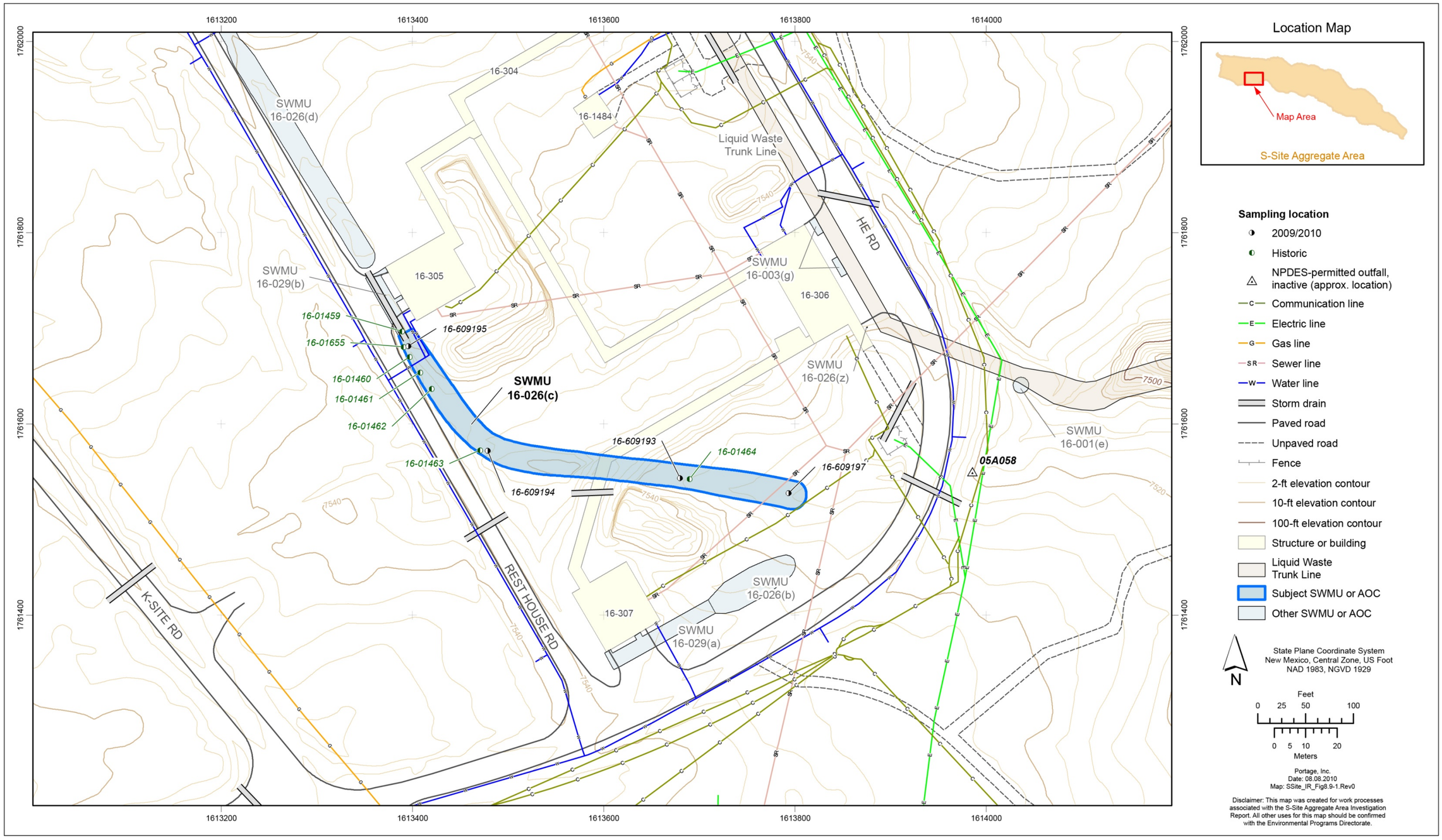


Figure 4.3-29 Site map and sampling locations at SWMU 16-026(c)

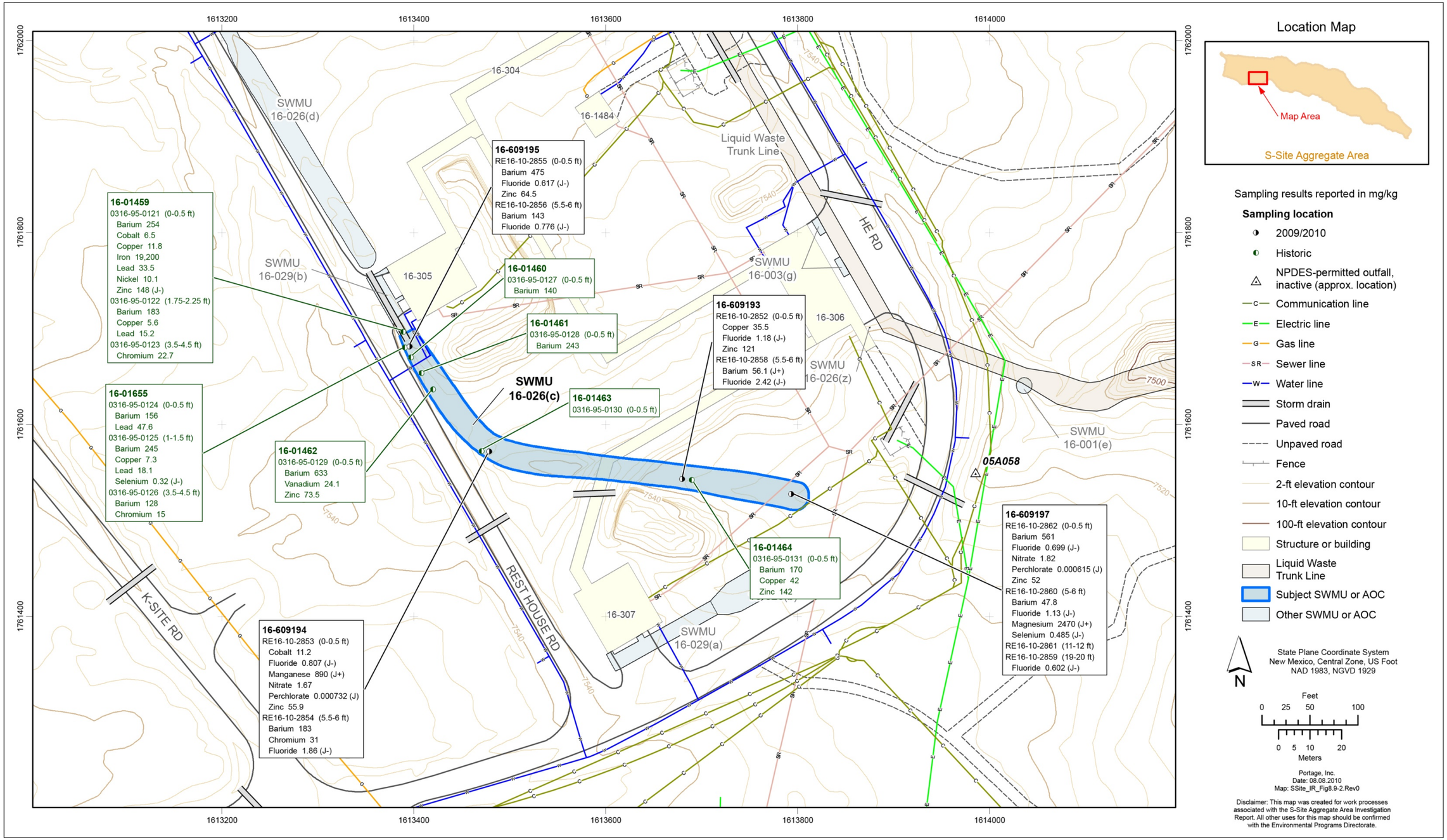


Figure 4.3-30 Inorganic chemicals detected or detected above BVs at SWMU 16-026(c)

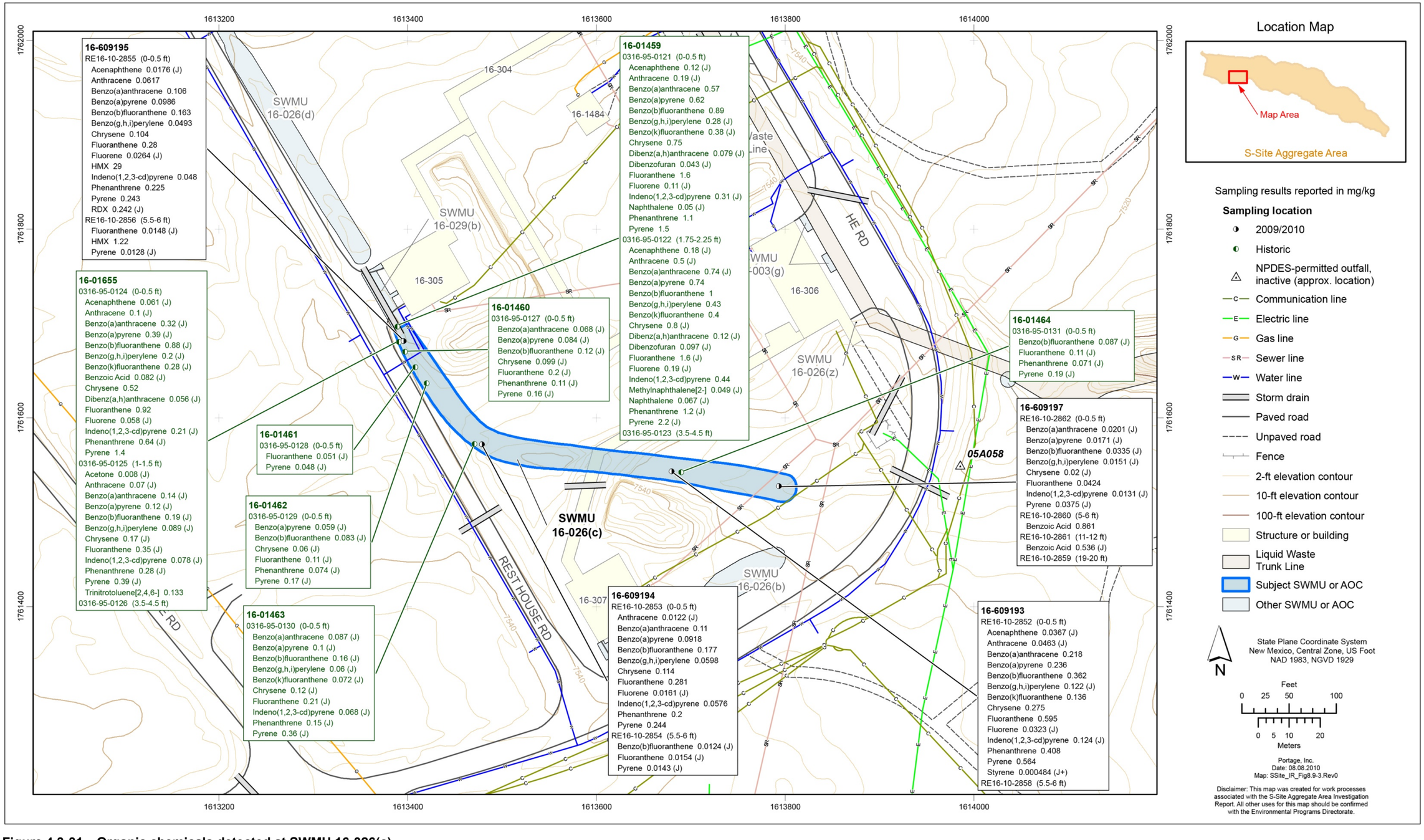


Figure 4.3-31 Organic chemicals detected at SWMU 16-026(c)

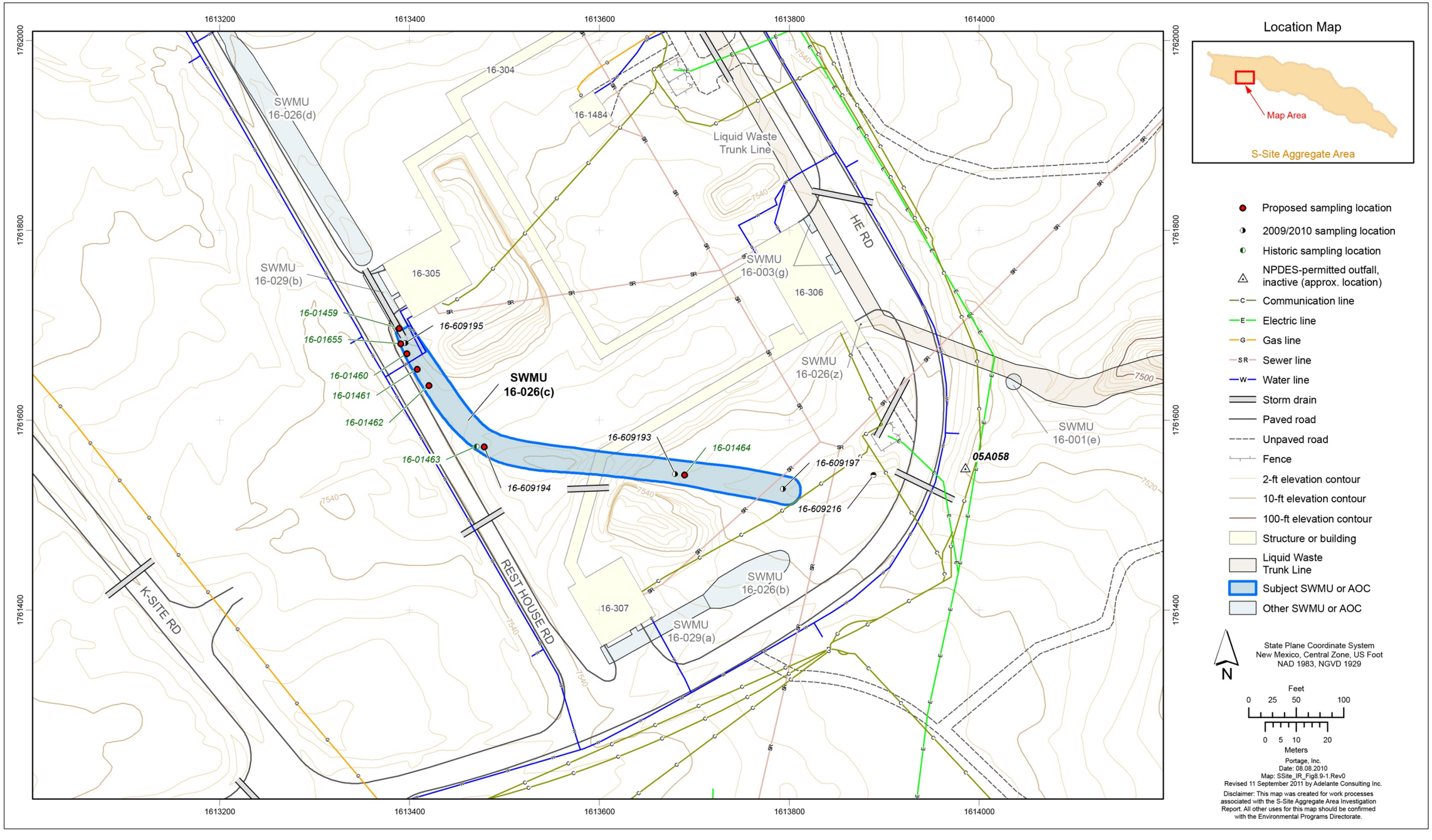


Figure 4.3-32 Proposed sampling locations at SWMU 16-026(c)

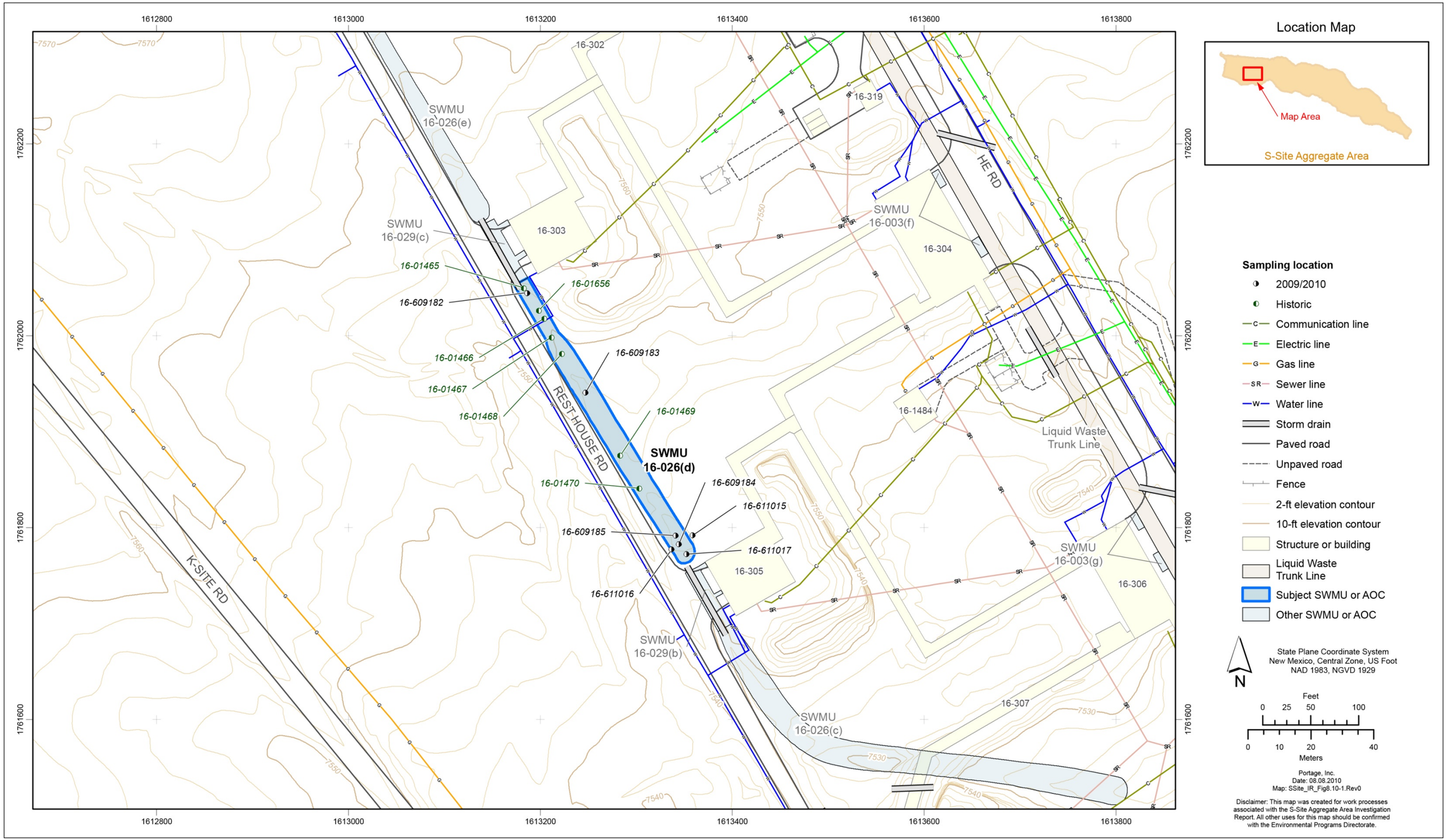


Figure 4.3-33 Site map and sampling locations at SWMU 16-026(d)

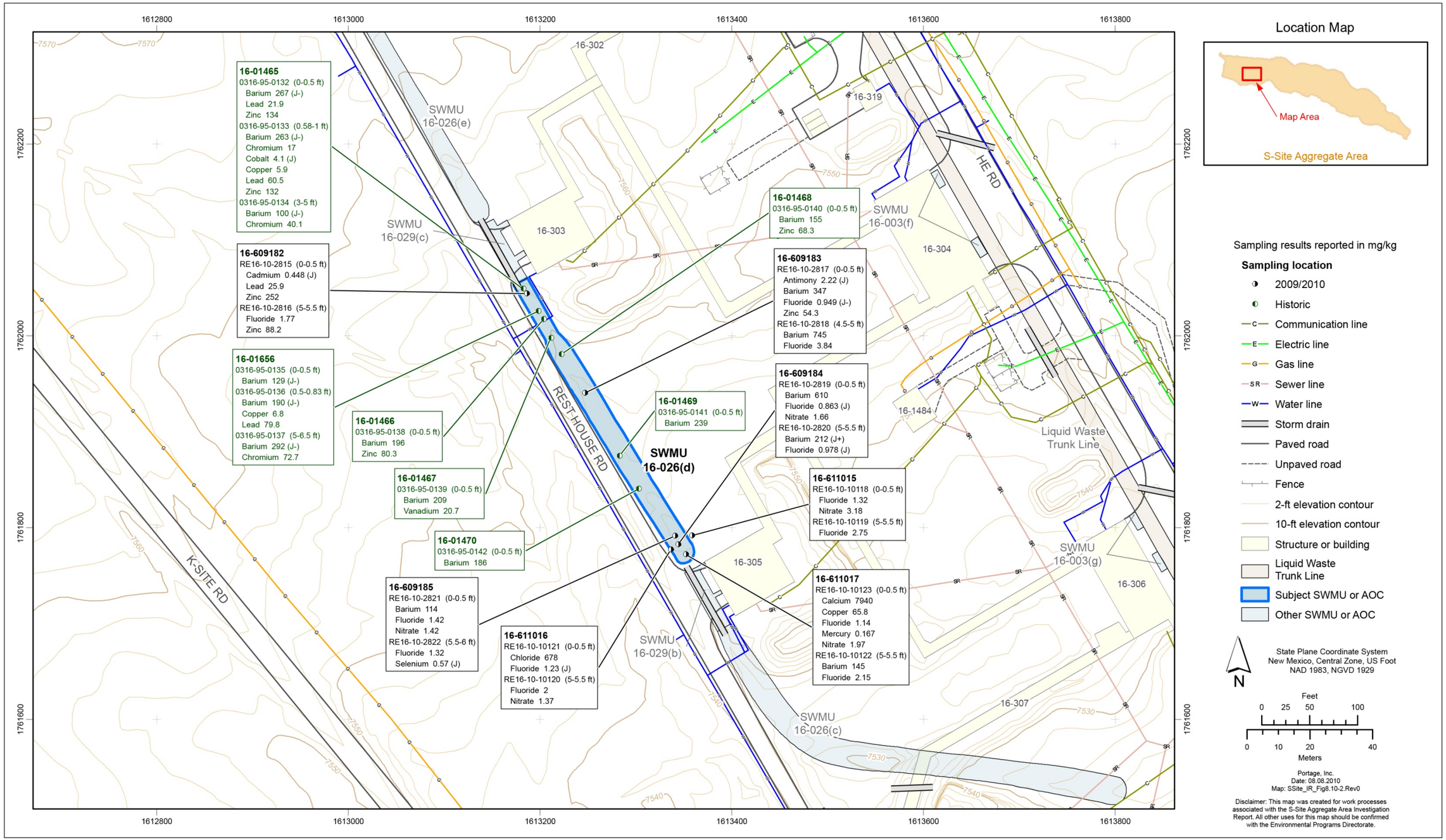


Figure 4.3-34 Inorganic chemicals detected or detected above BVs at SWMU 16-026(d)

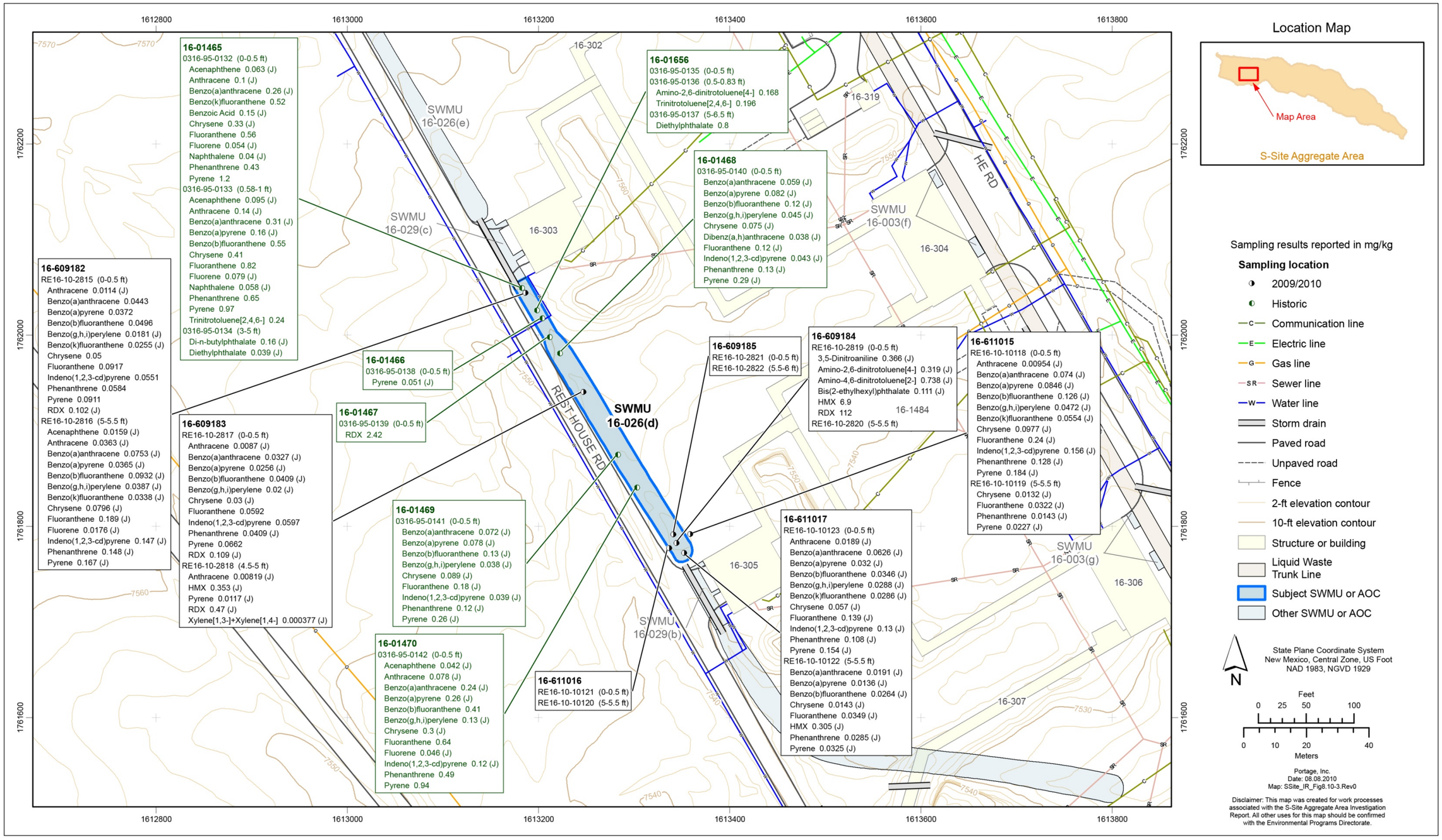


Figure 4.3-35 Organic chemicals detected at SWMU 16-026(d)

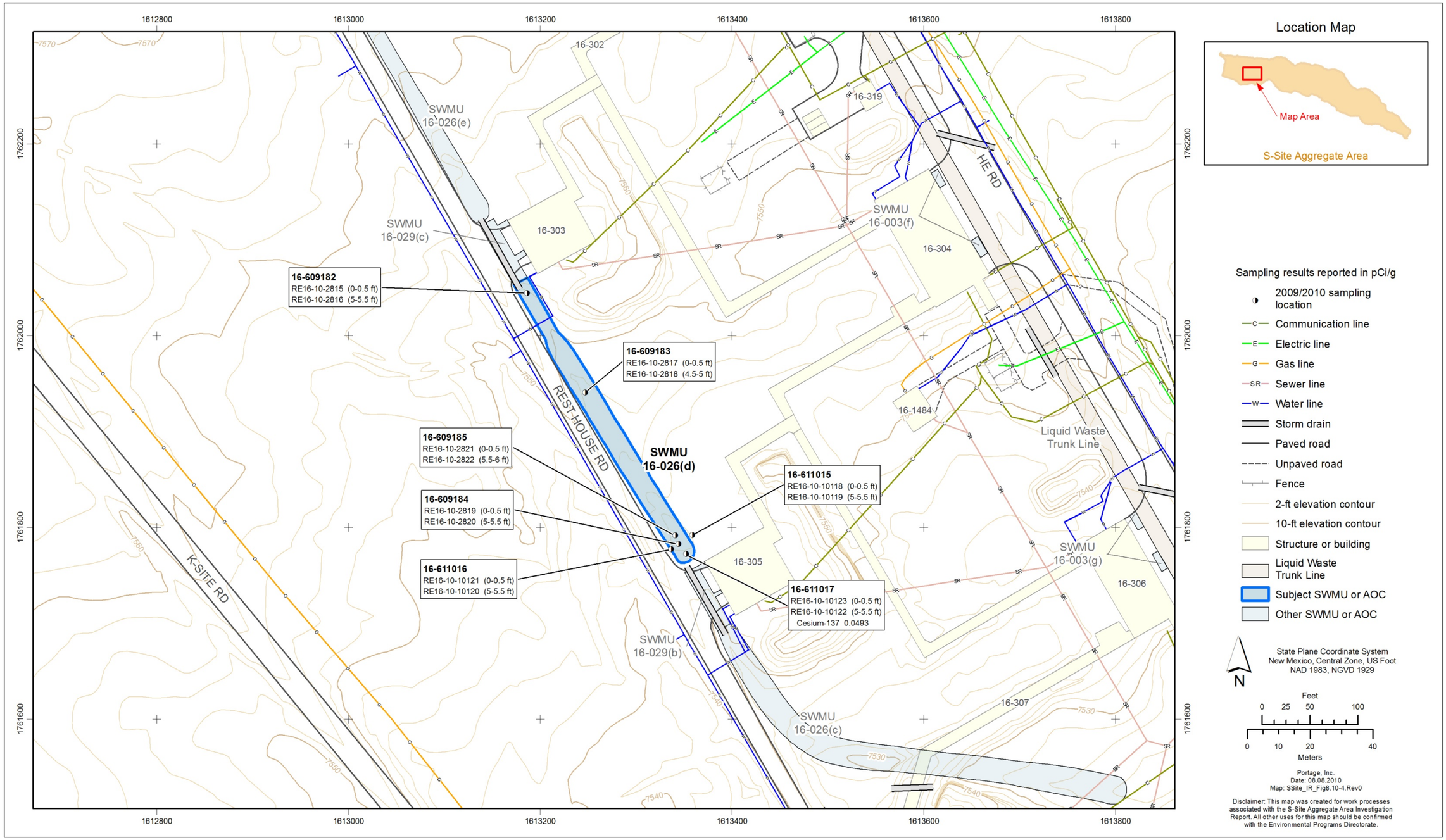


Figure 4.3-36 Radionuclides detected or detected above BVs/FVs at SWMU 16-026(d)

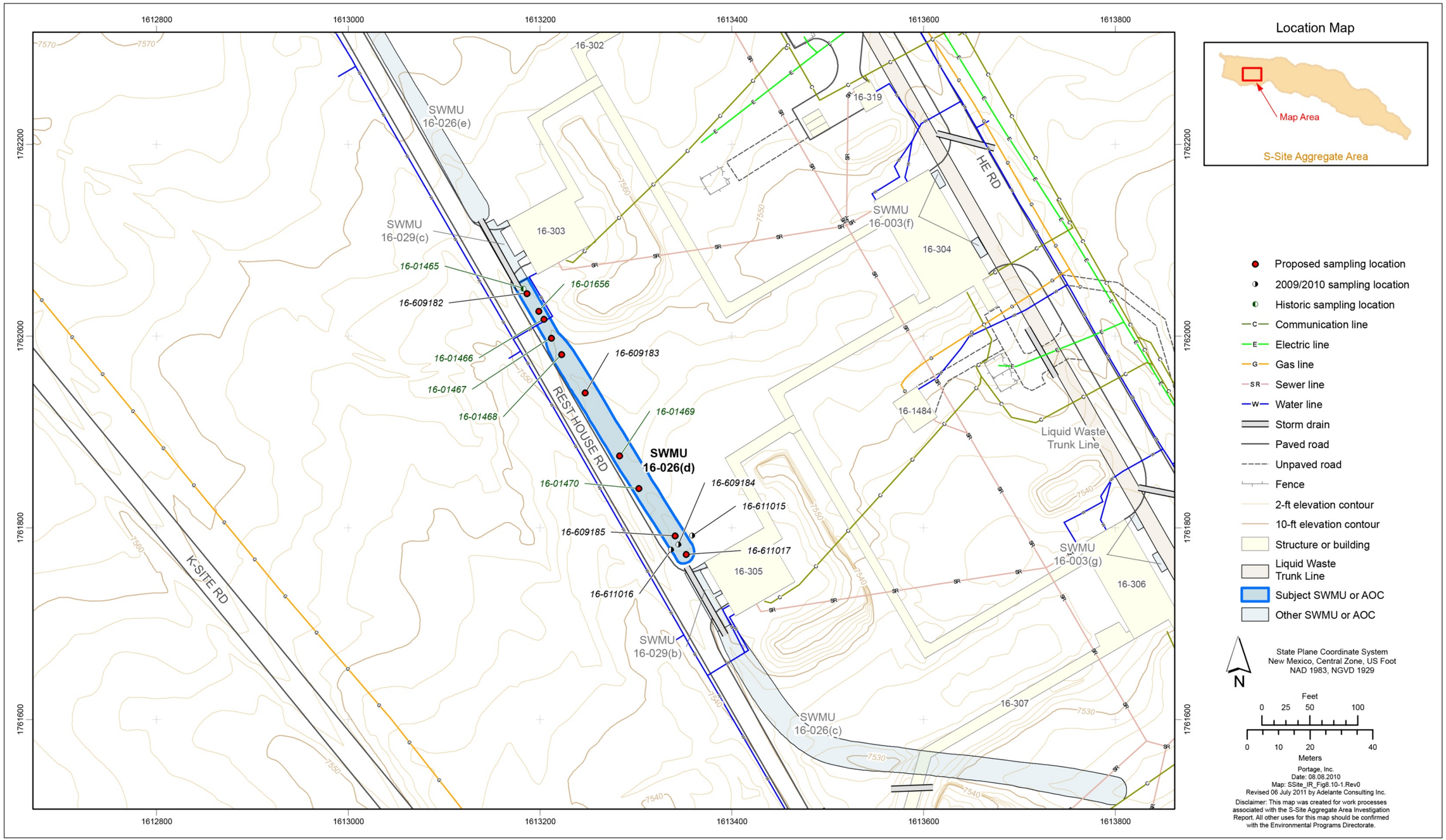


Figure 4.3-37 Proposed sampling locations at SWMU 16-026(d)

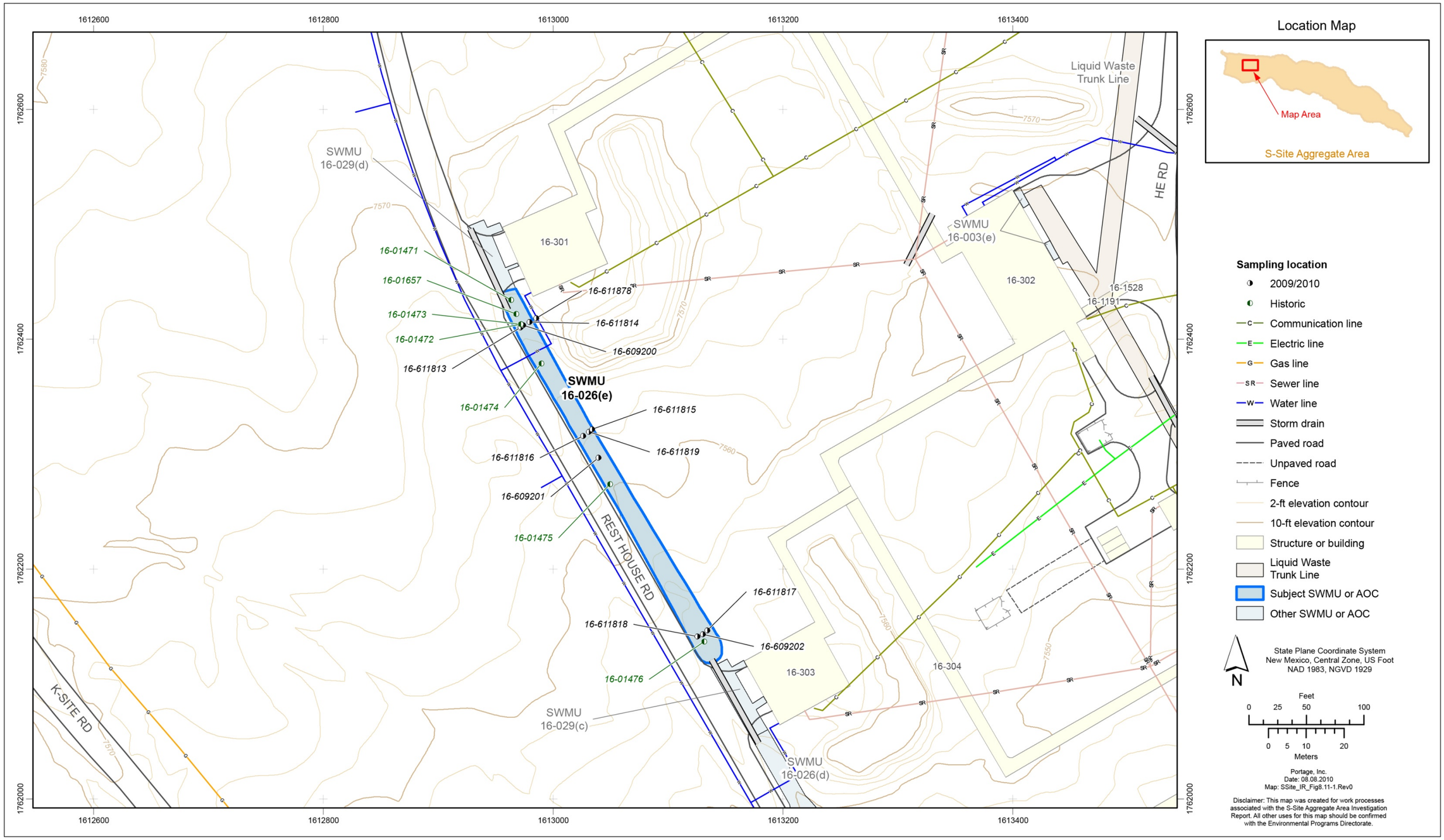


Figure 4.3-38 Site map and sampling locations at SWMU 16-026(e)

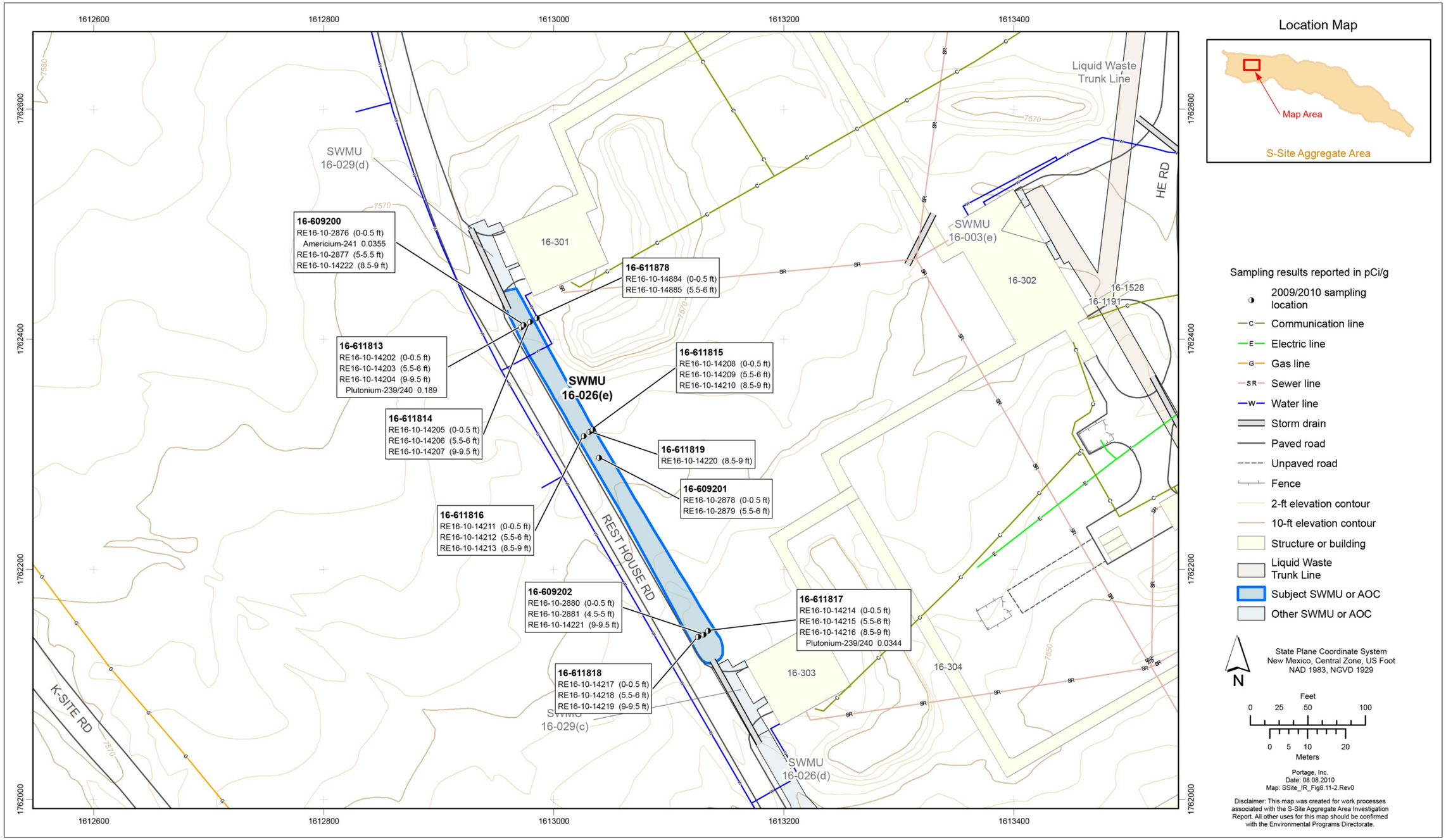


Figure 4.3-39 Radionuclides detected or detected above BVs/FVs at SWMU 16-026(e)

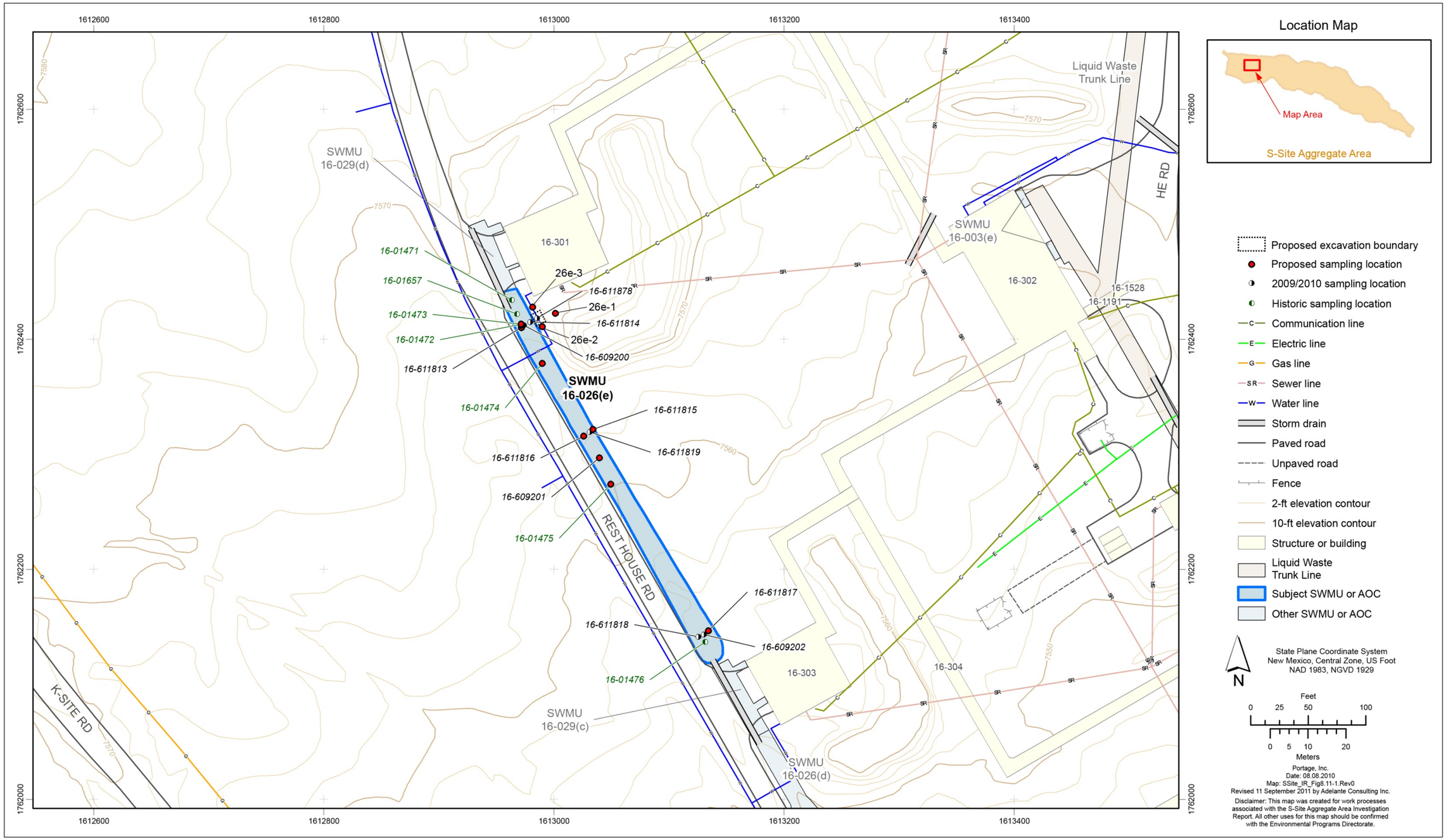


Figure 4.3-40 Proposed sampling locations at SWMU 16-026(e)

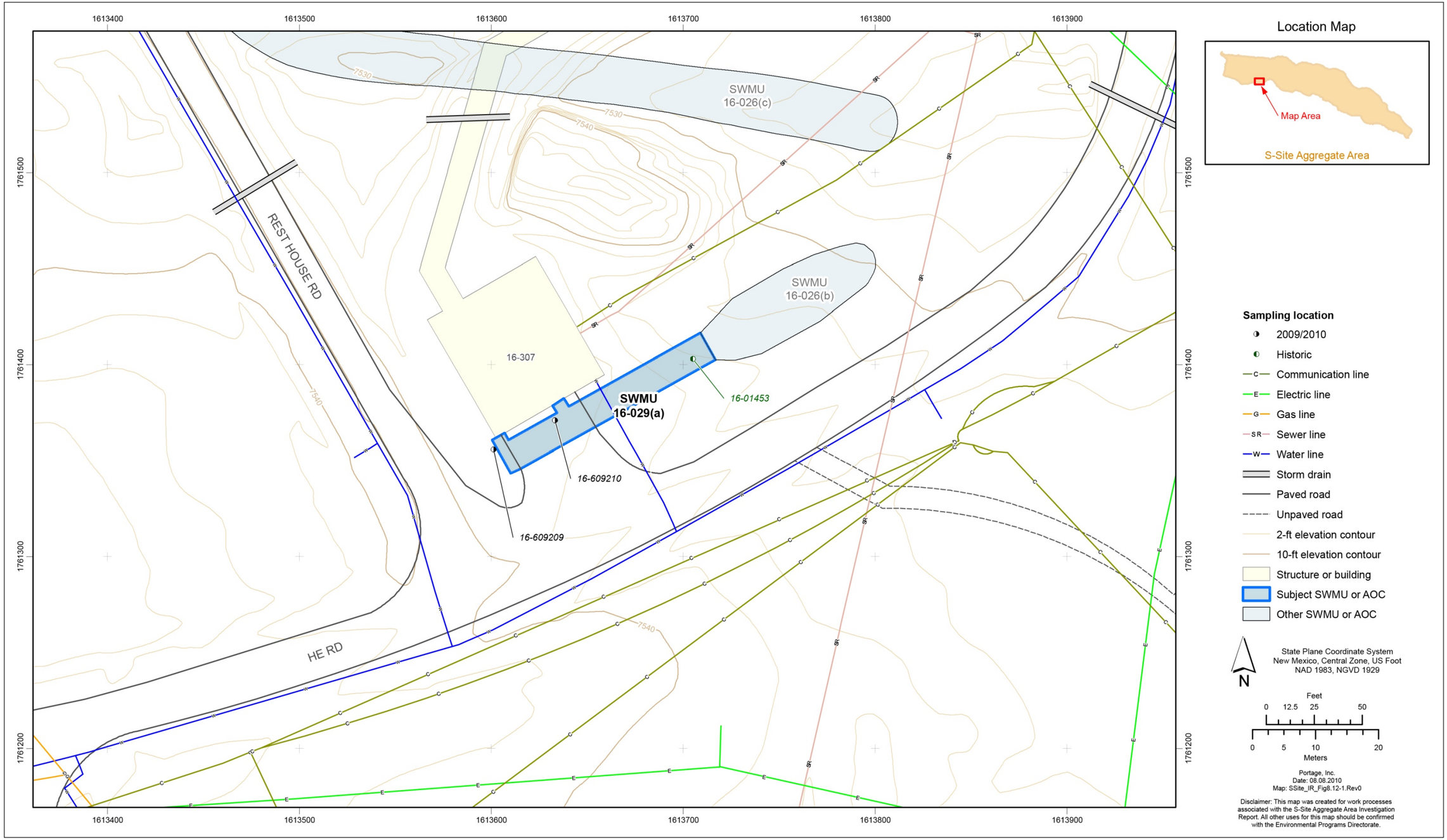


Figure 4.3-41 Site map and sampling locations at SWMU 16-029(a)

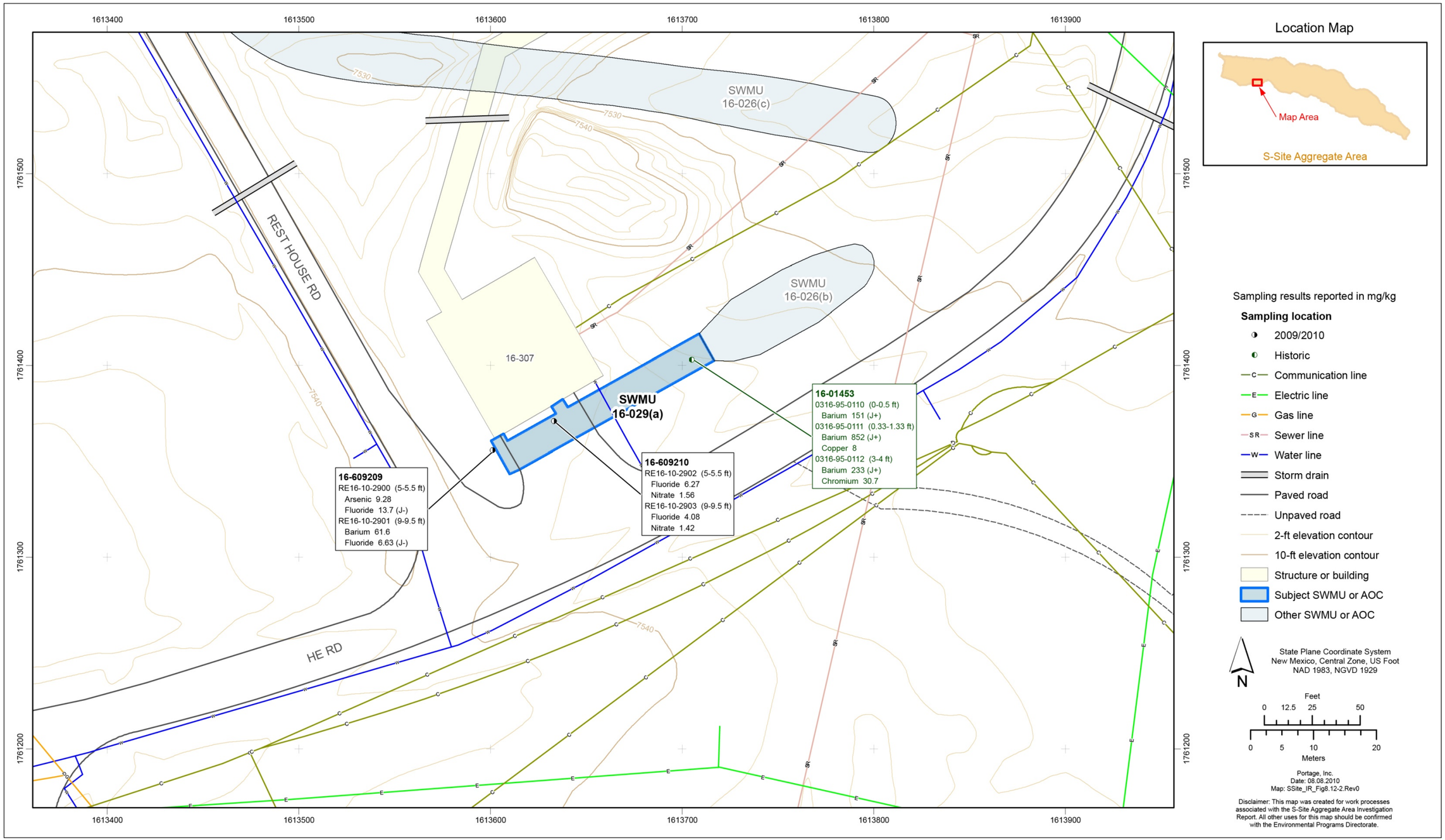


Figure 4.3-42 Inorganic chemicals detected or detected above BVs at SWMU 16-029(a)

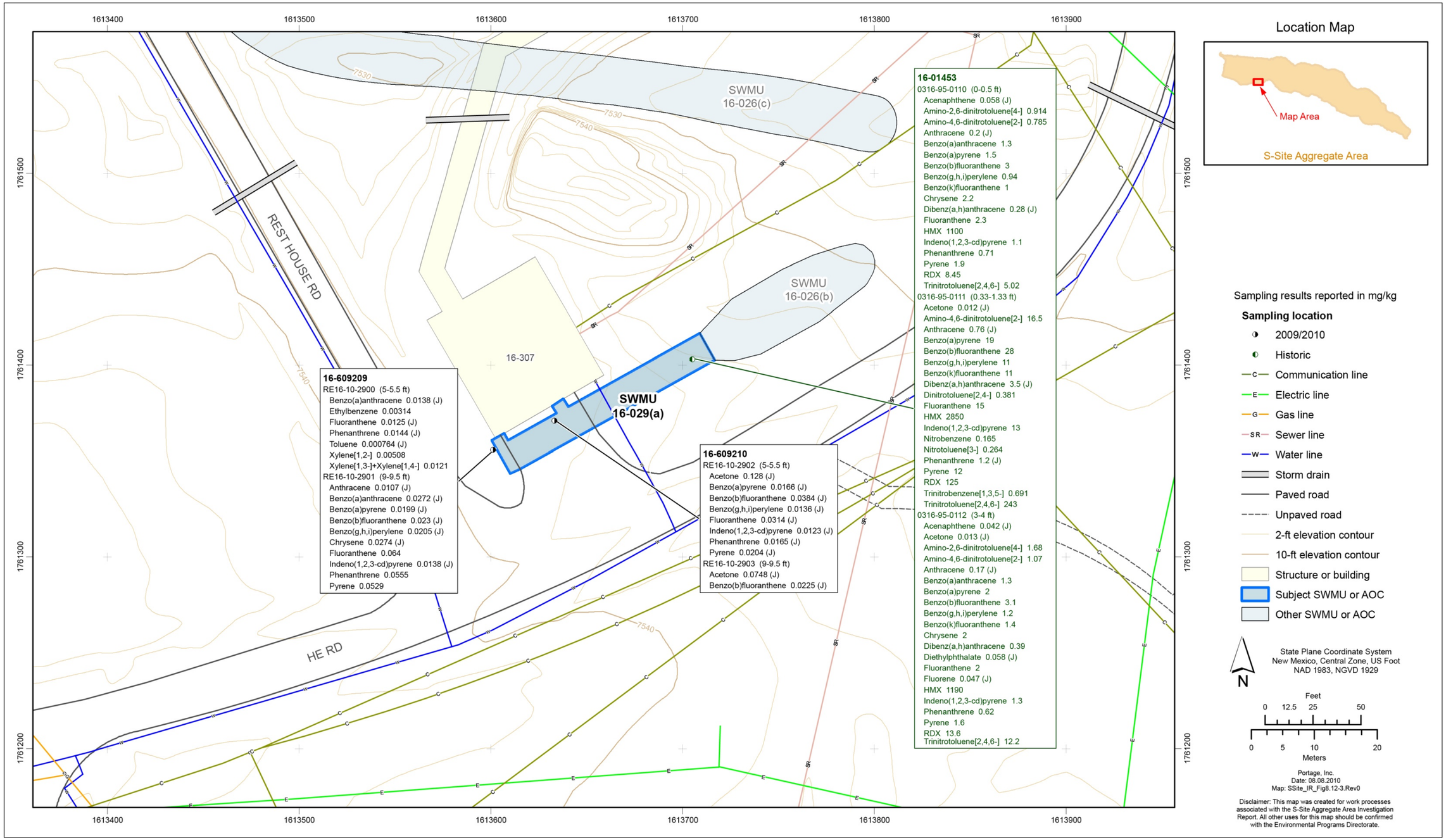


Figure 4.3-43 Organic chemicals detected at SWMU 16-029(a)

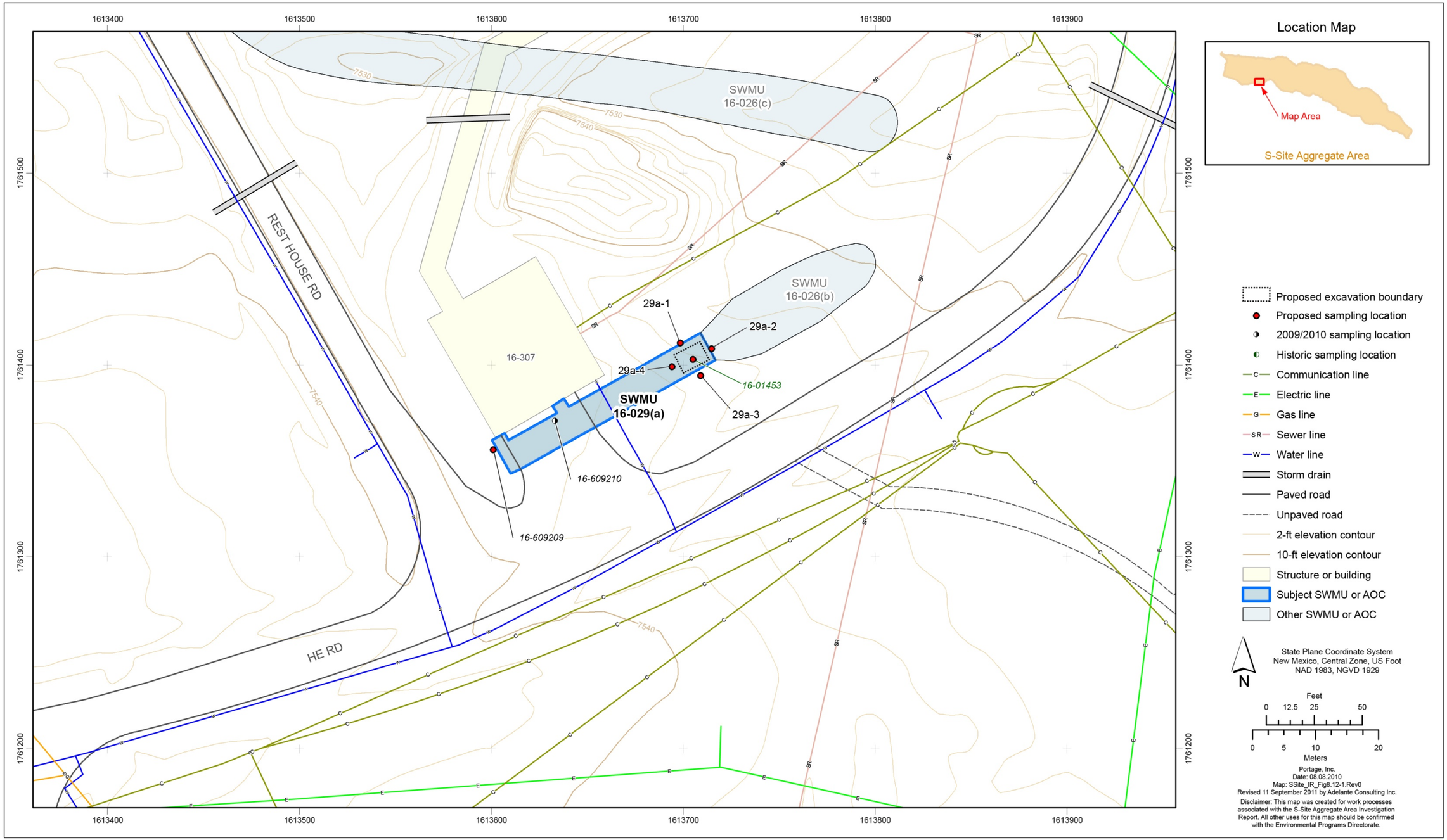


Figure 4.3-44 Proposed sampling locations at SWMU 16-029(a)

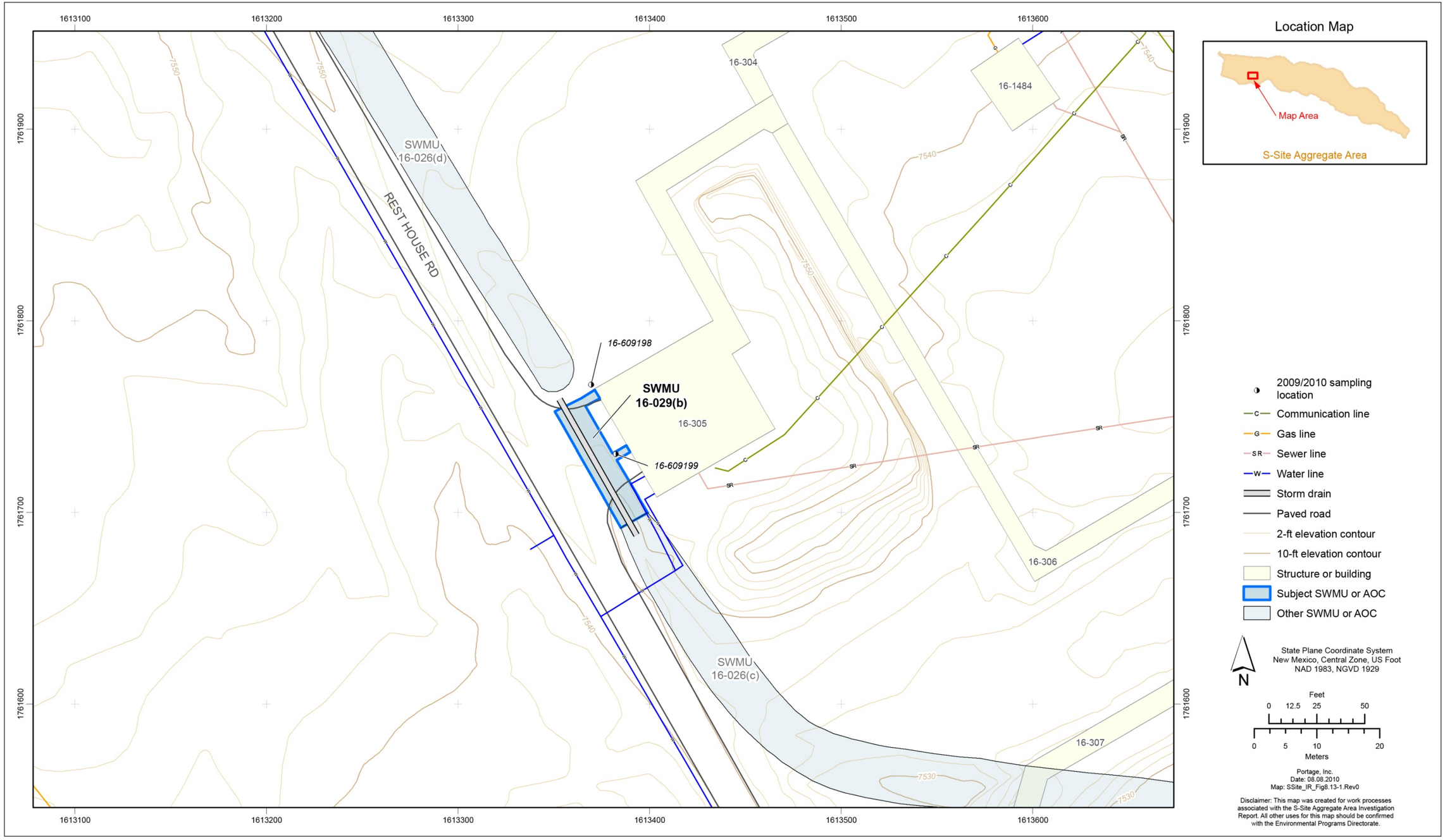


Figure 4.3-45 Site map and sampling locations at SWMU 16-029(b)

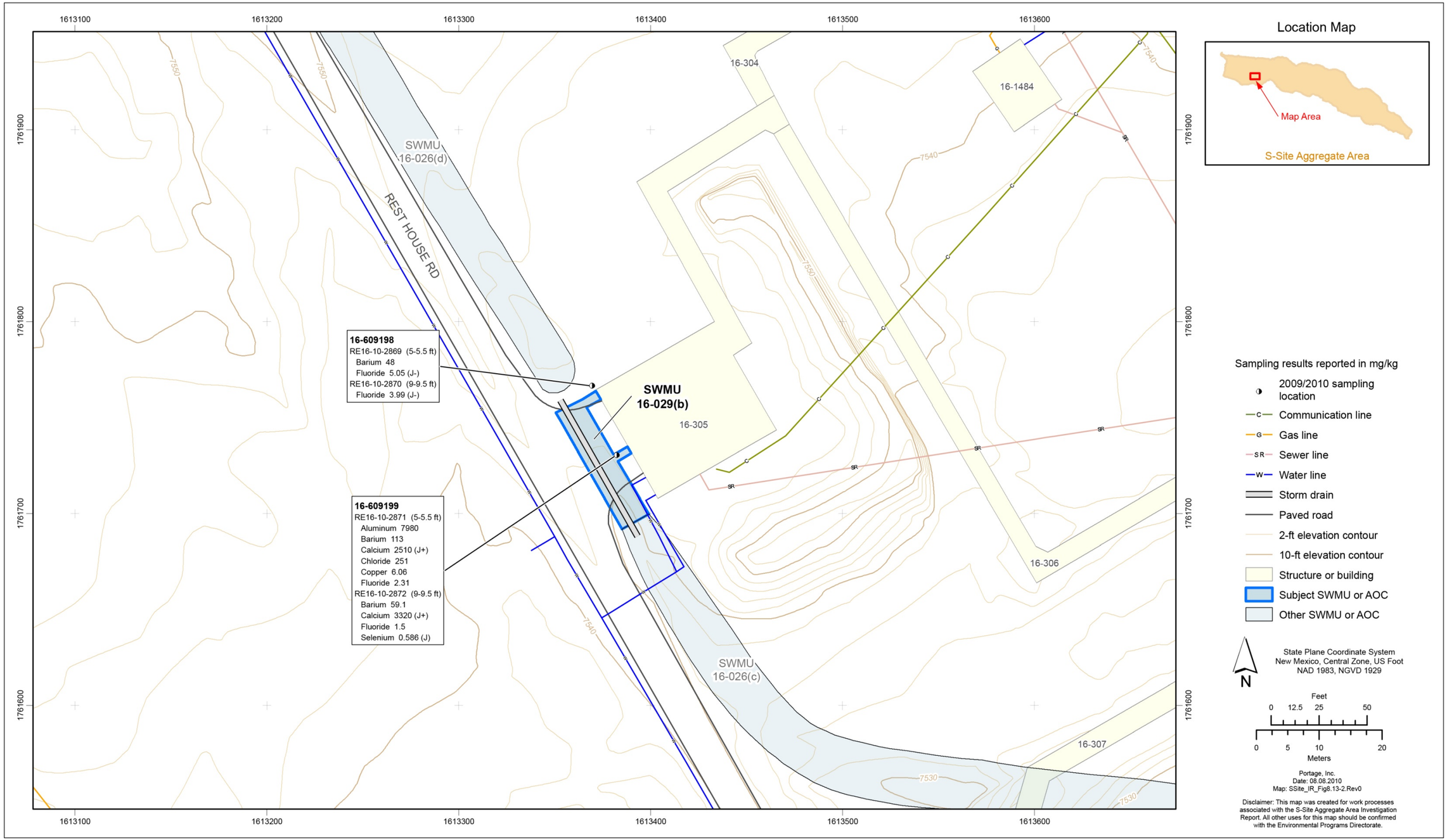


Figure 4.3-46 Inorganic chemicals detected or detected above BVs at SWMU 16-029(b)

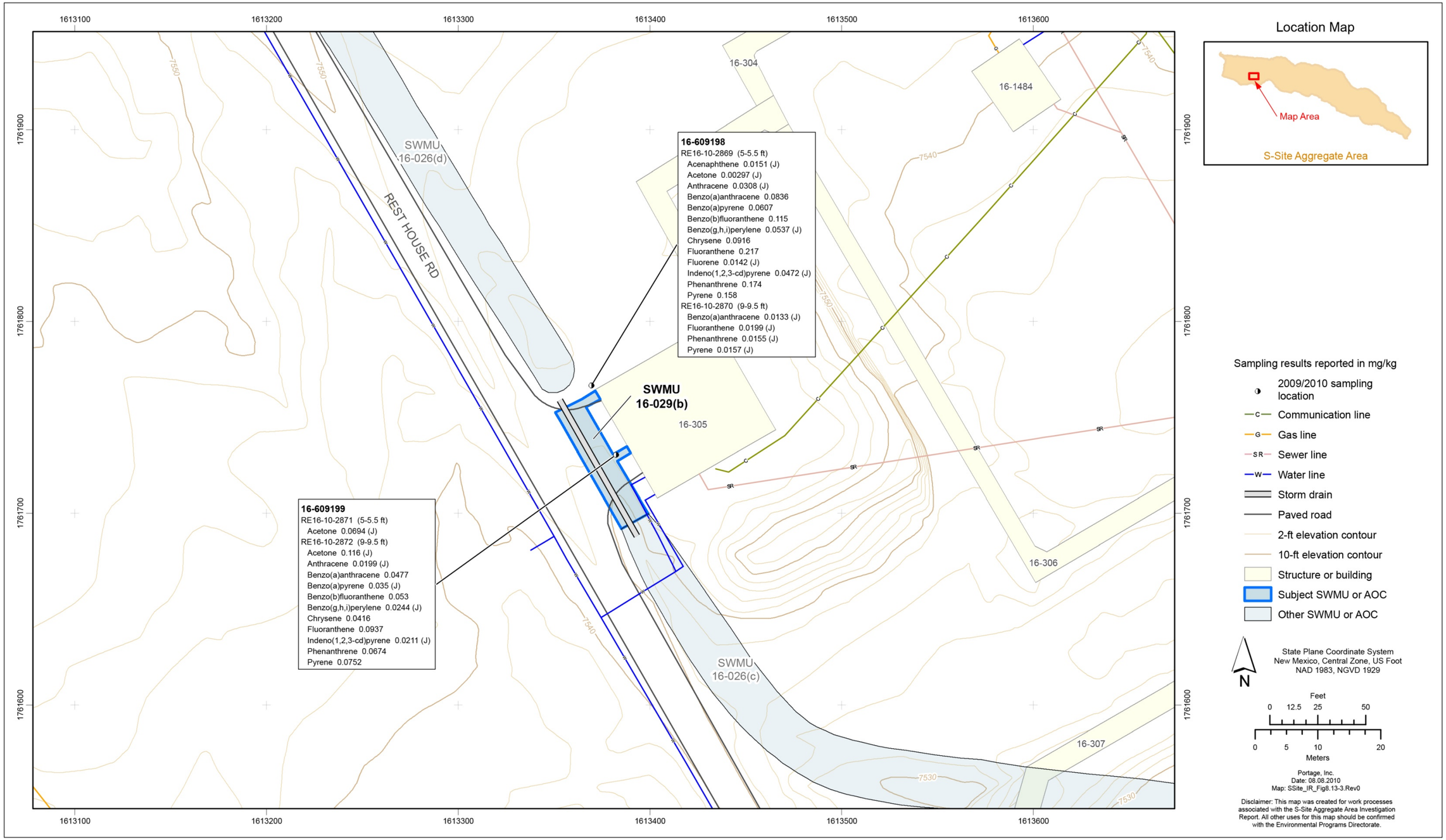


Figure 4.3-47 Organic chemicals detected at SWMU 16-029(b)

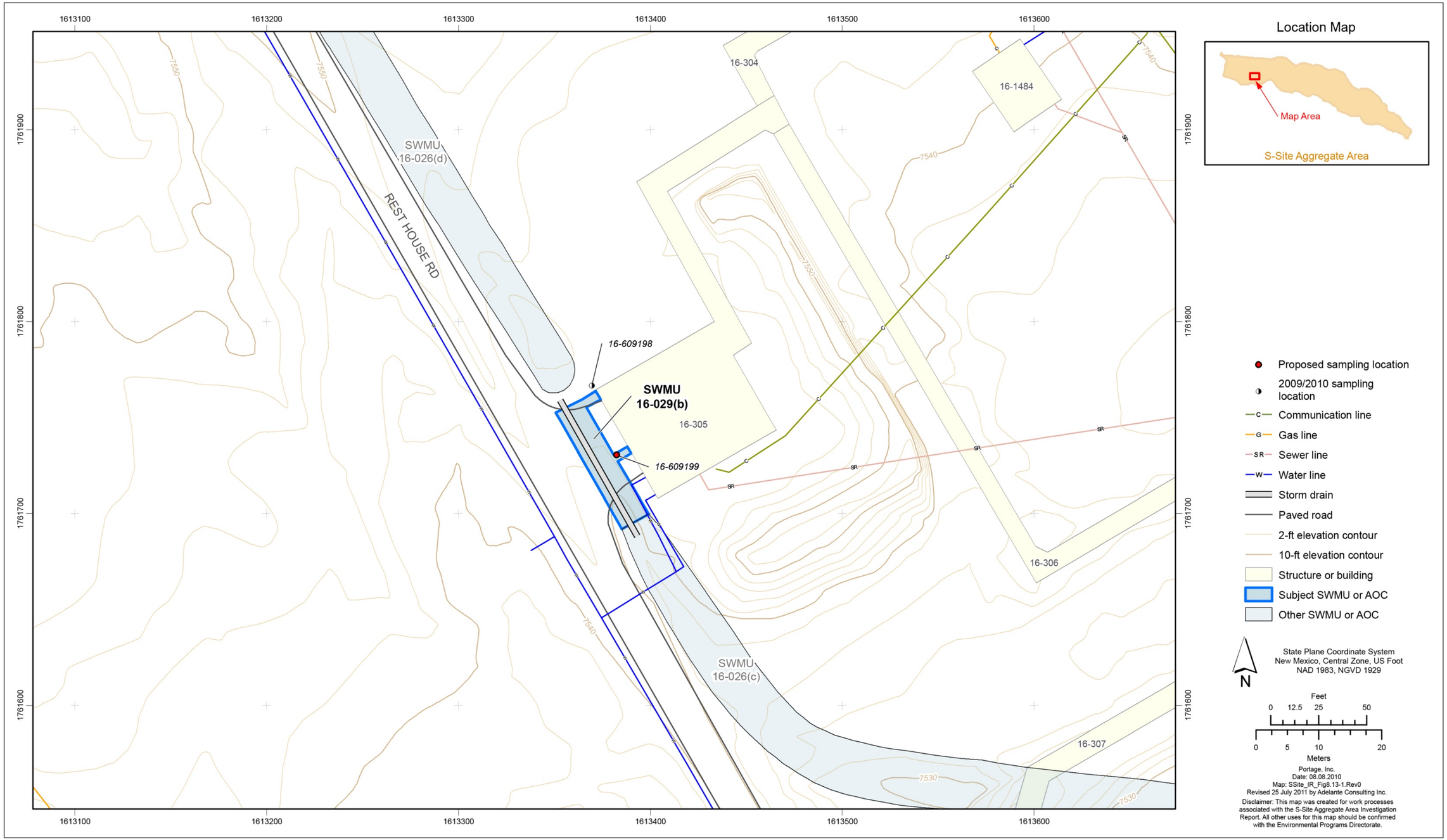


Figure 4.3-48 Proposed sampling locations at SWMU 16-029(b)

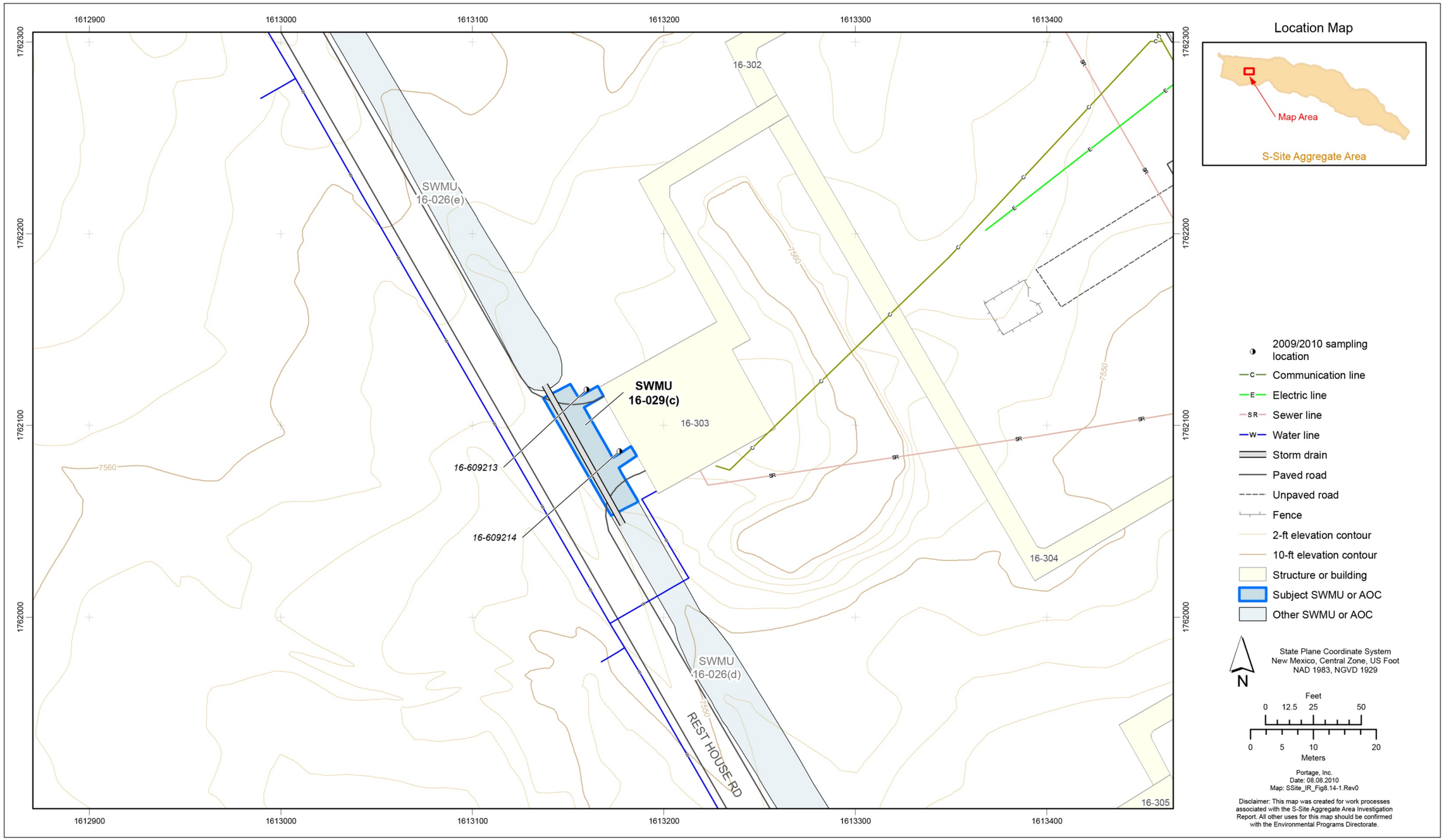


Figure 4.3-49 Site map and sampling locations at SWMU 16-029(c)

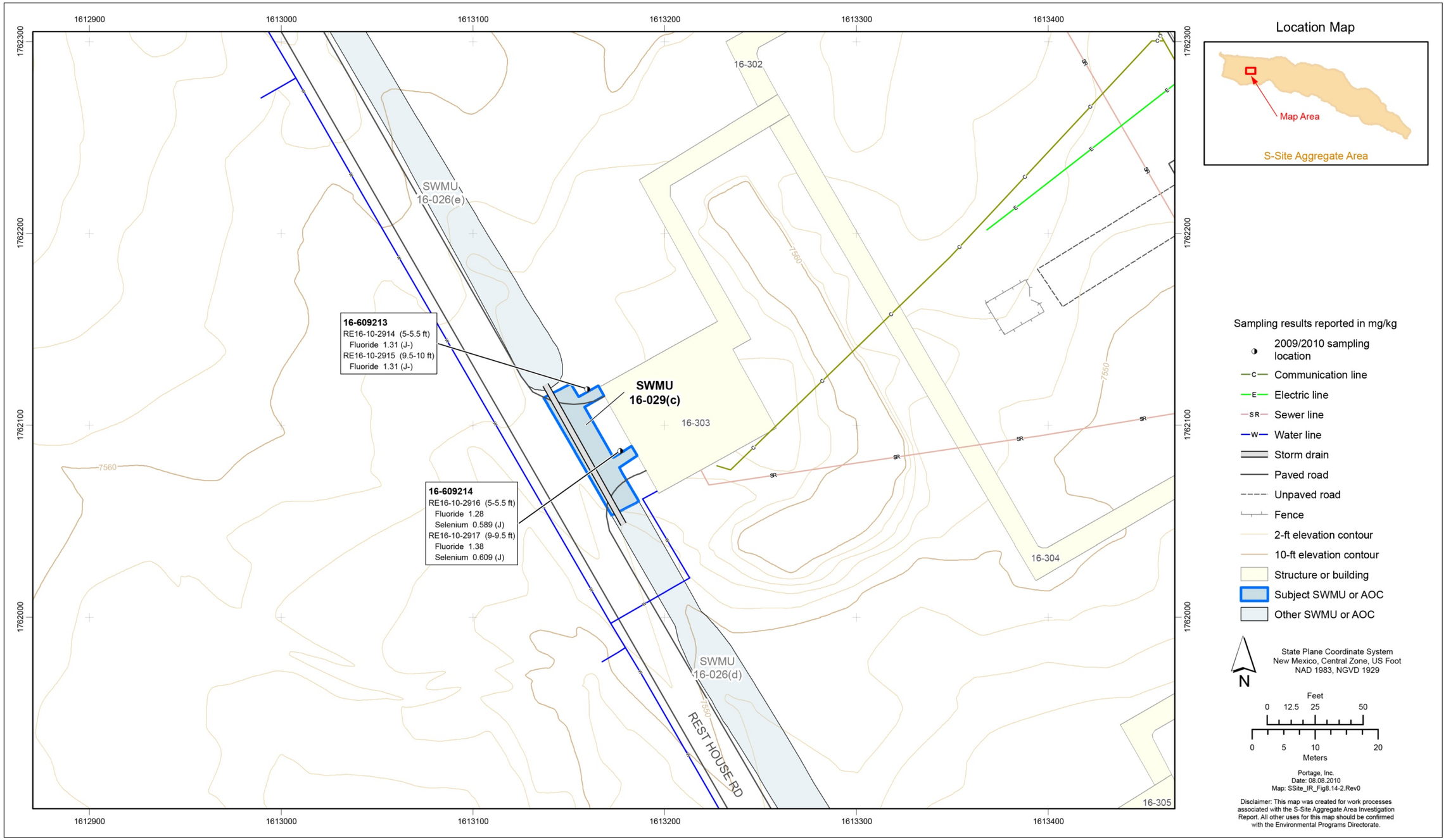


Figure 4.3-50 Inorganic chemicals detected or detected above BVs at SWMU 16-029(c)

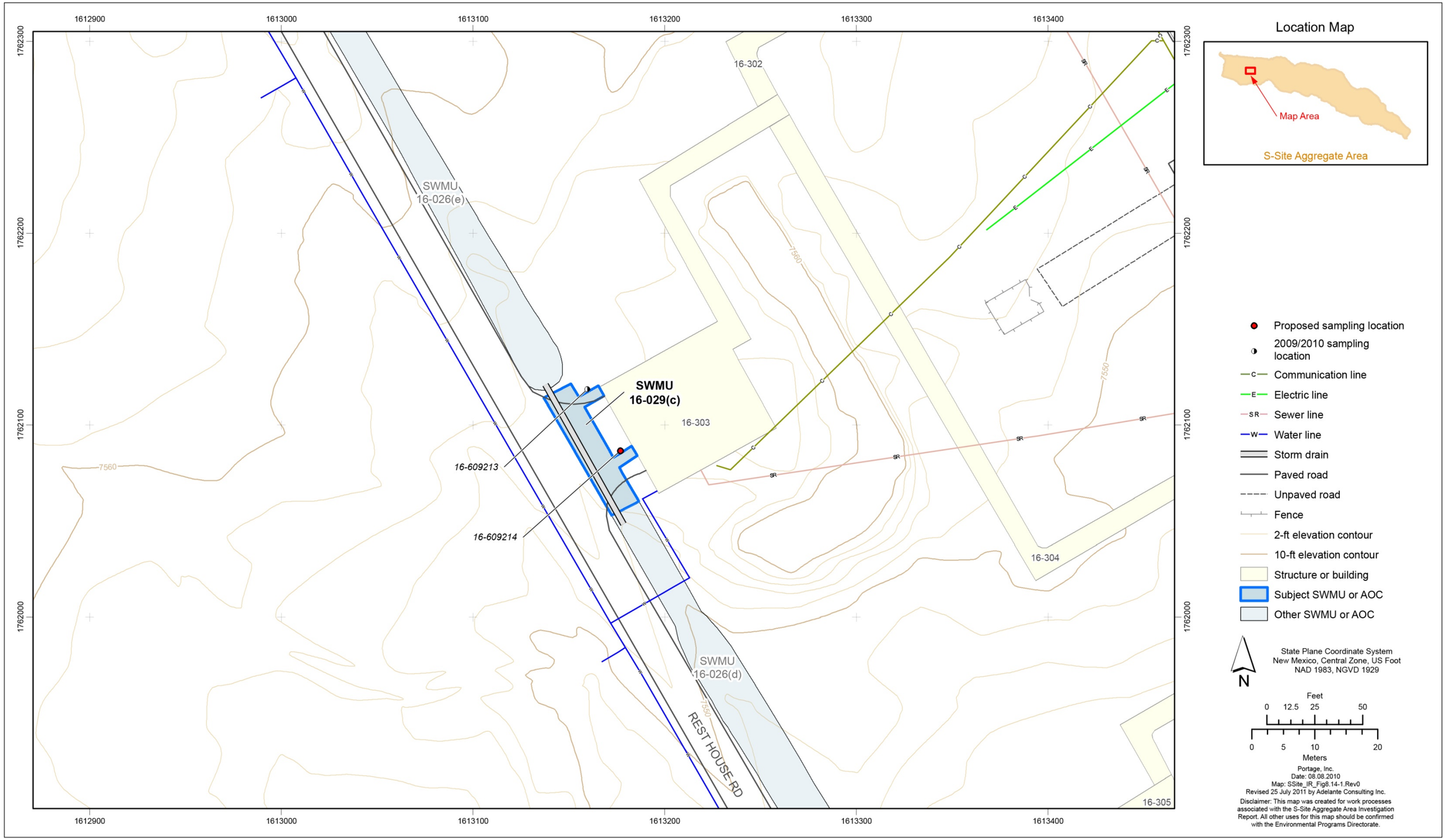


Figure 4.3-51 Proposed sampling locations at SWMU 16-029(c)

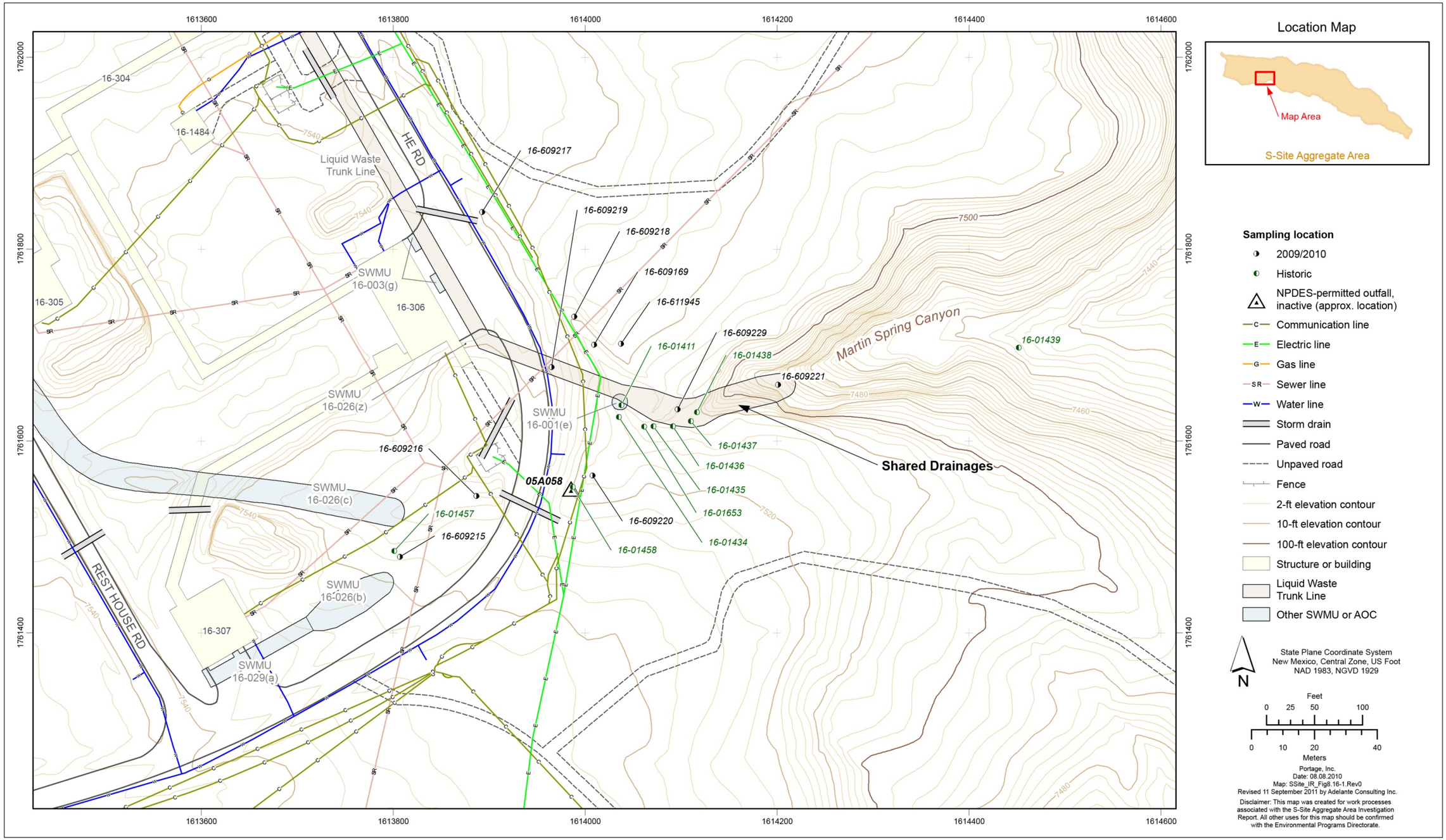


Figure 4.3-52 Site map and sampling locations at the Shared Drainages

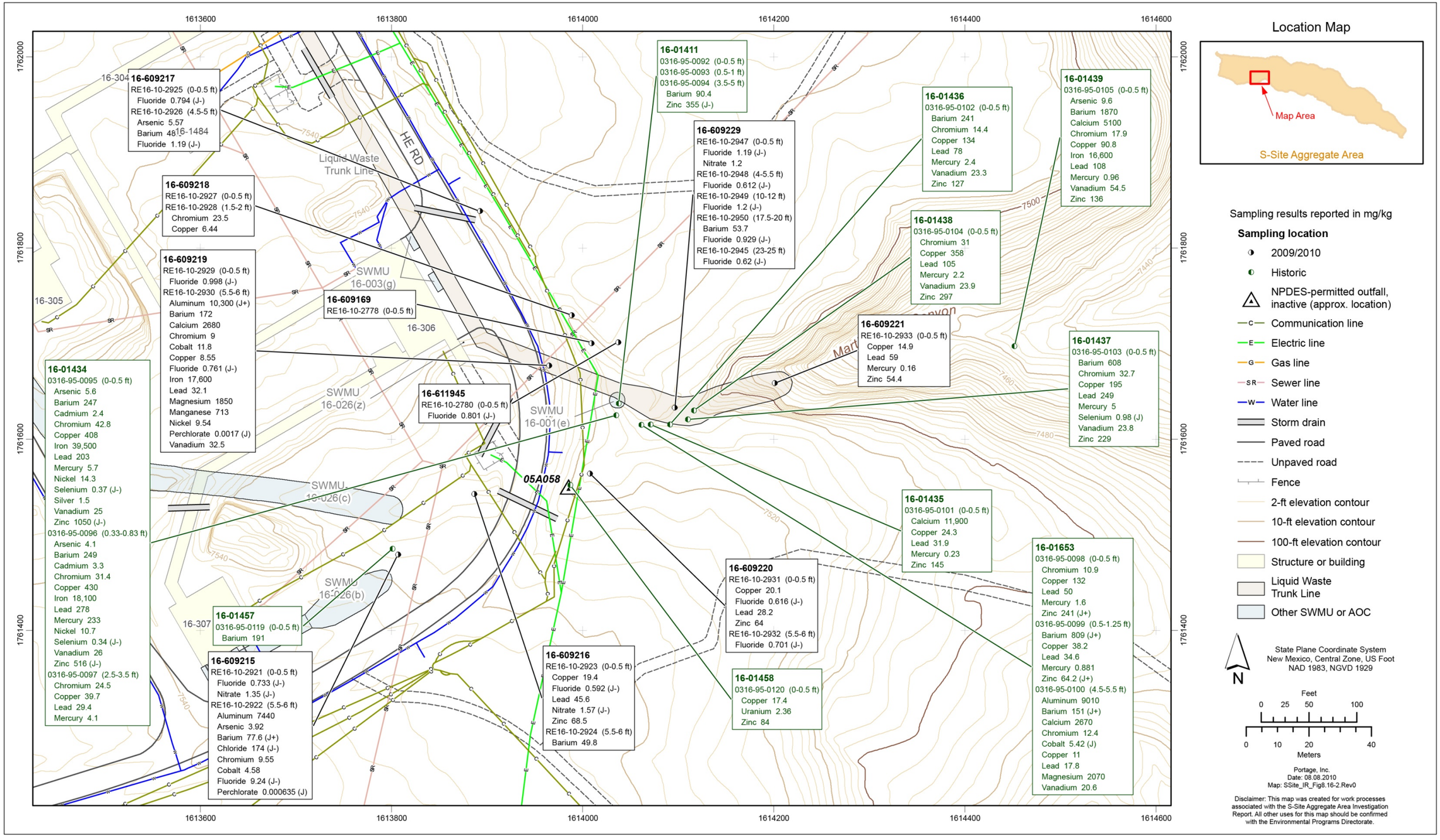


Figure 4.3-53 Inorganic chemicals detected or detected above BVs at the Shared Drainages

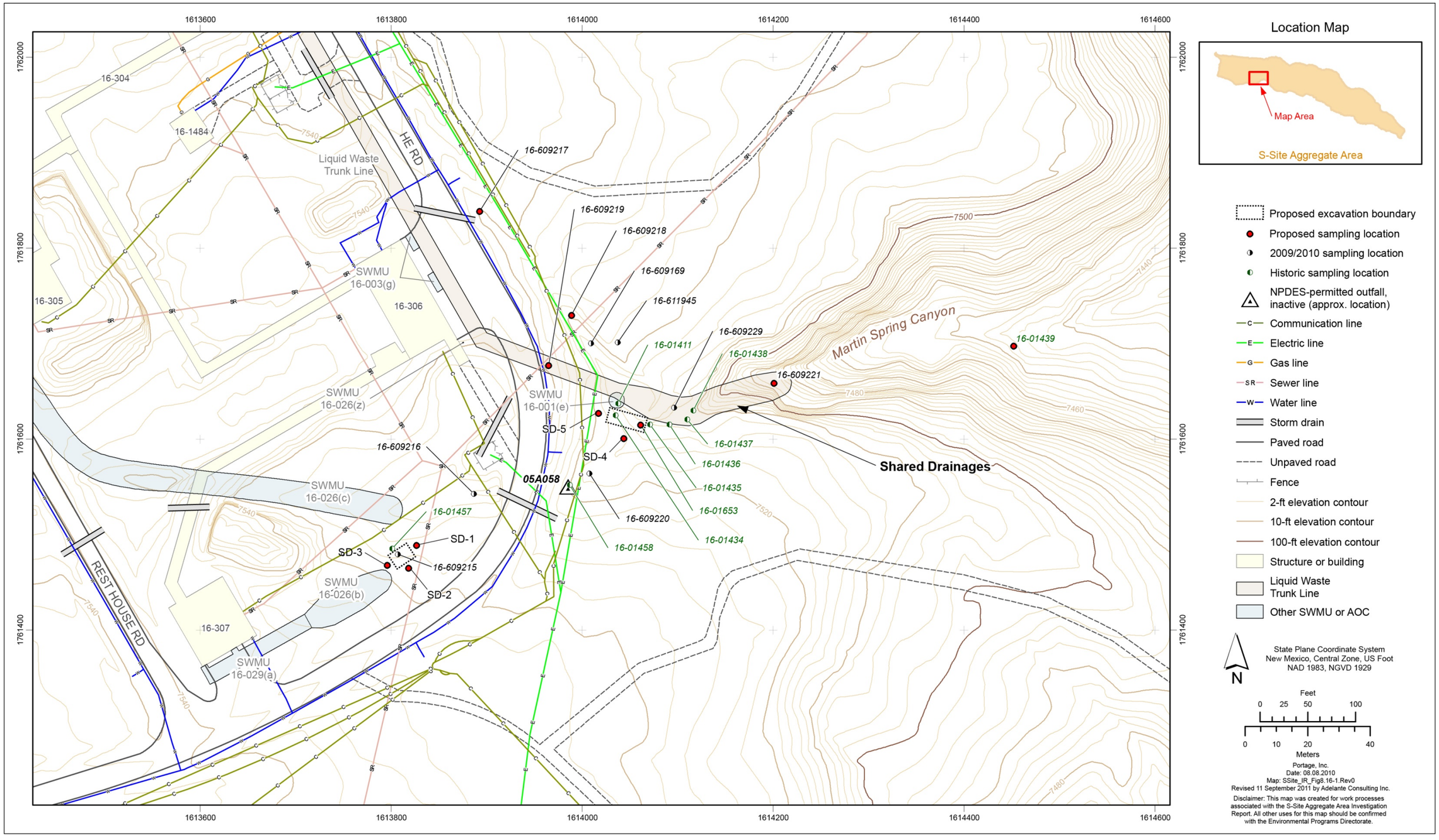


Figure 4.3-54 Proposed sampling locations at the Shared Drainages

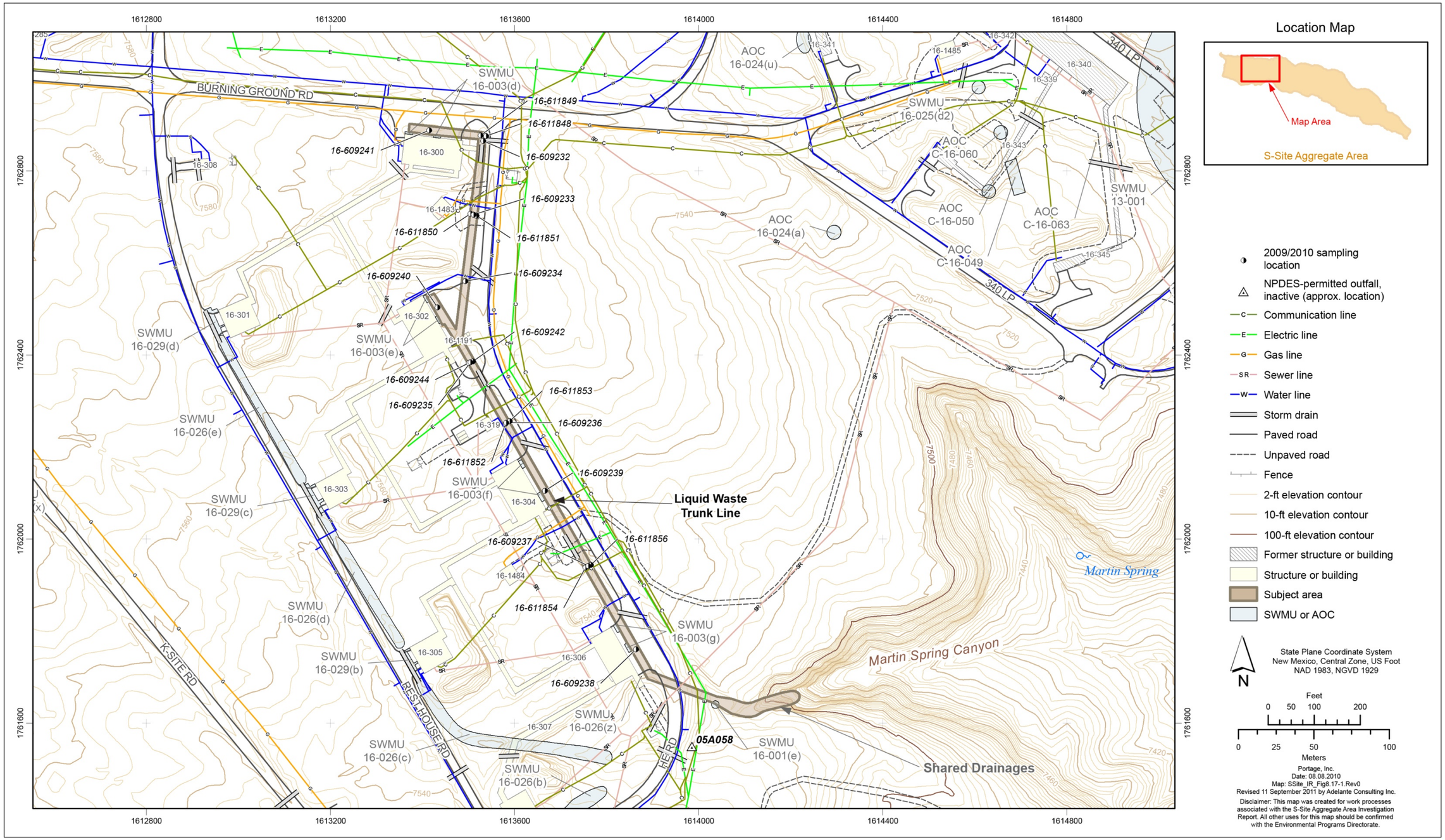


Figure 4.3-55 Site map and sampling locations at the Liquid Waste Trunk Line

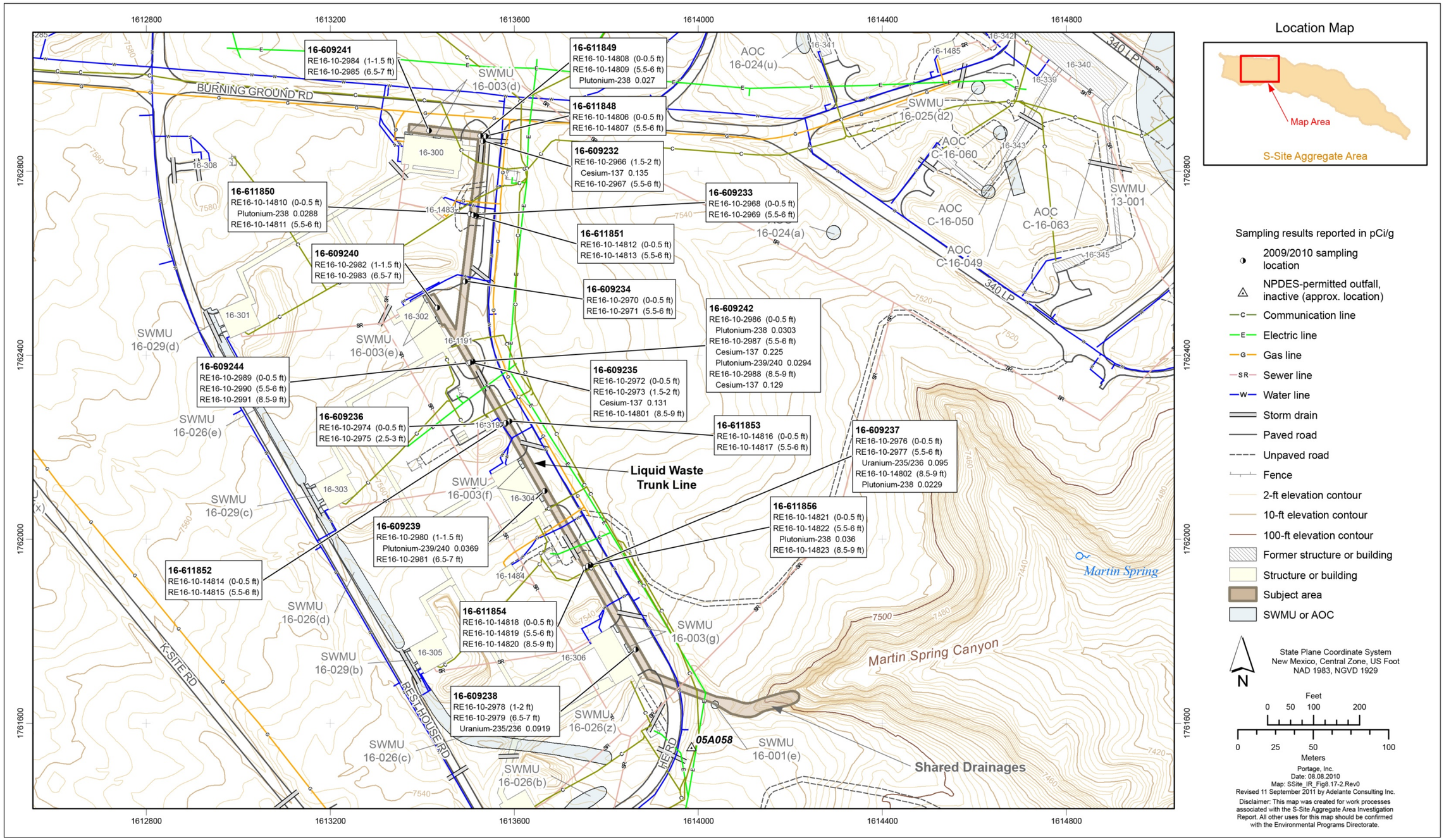


Figure 4.3-56 Radionuclides detected or detected above BVs/FVs at the Liquid Waste Trunk Line

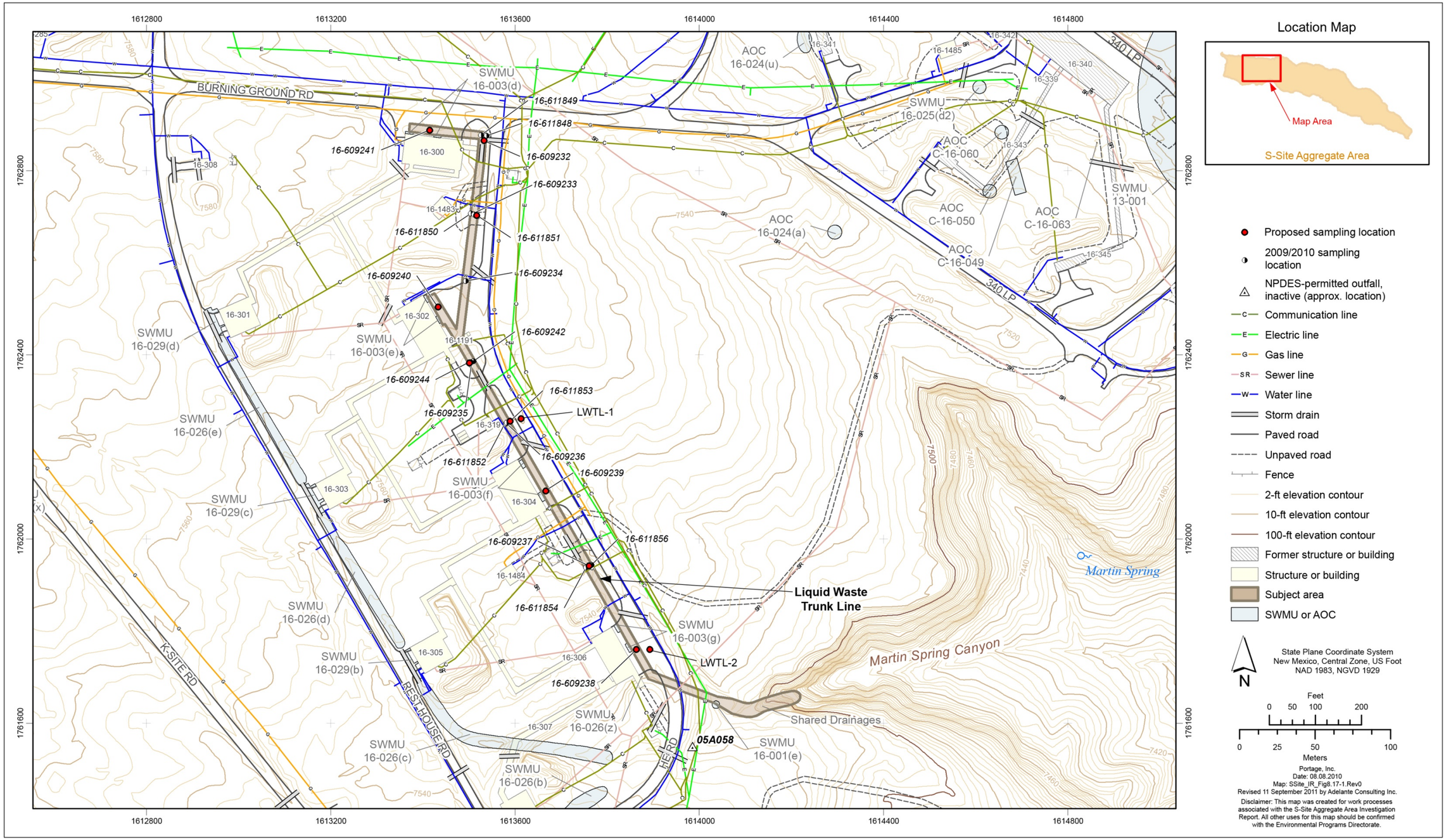


Figure 4.3-57 Proposed sampling locations at the Liquid Waste Trunk Line

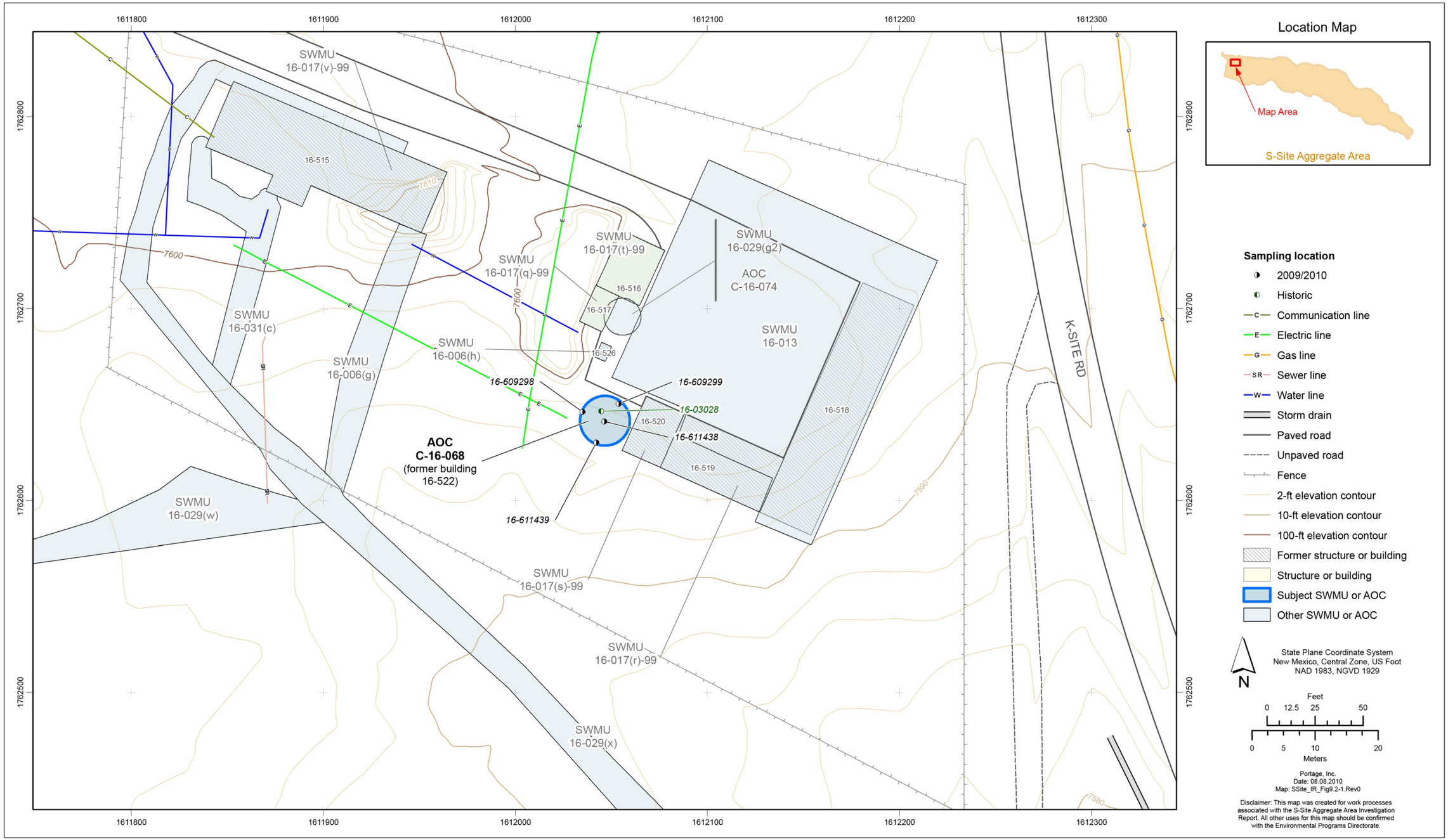


Figure 4.4-1 Site map and sampling locations at AOC C-16-068

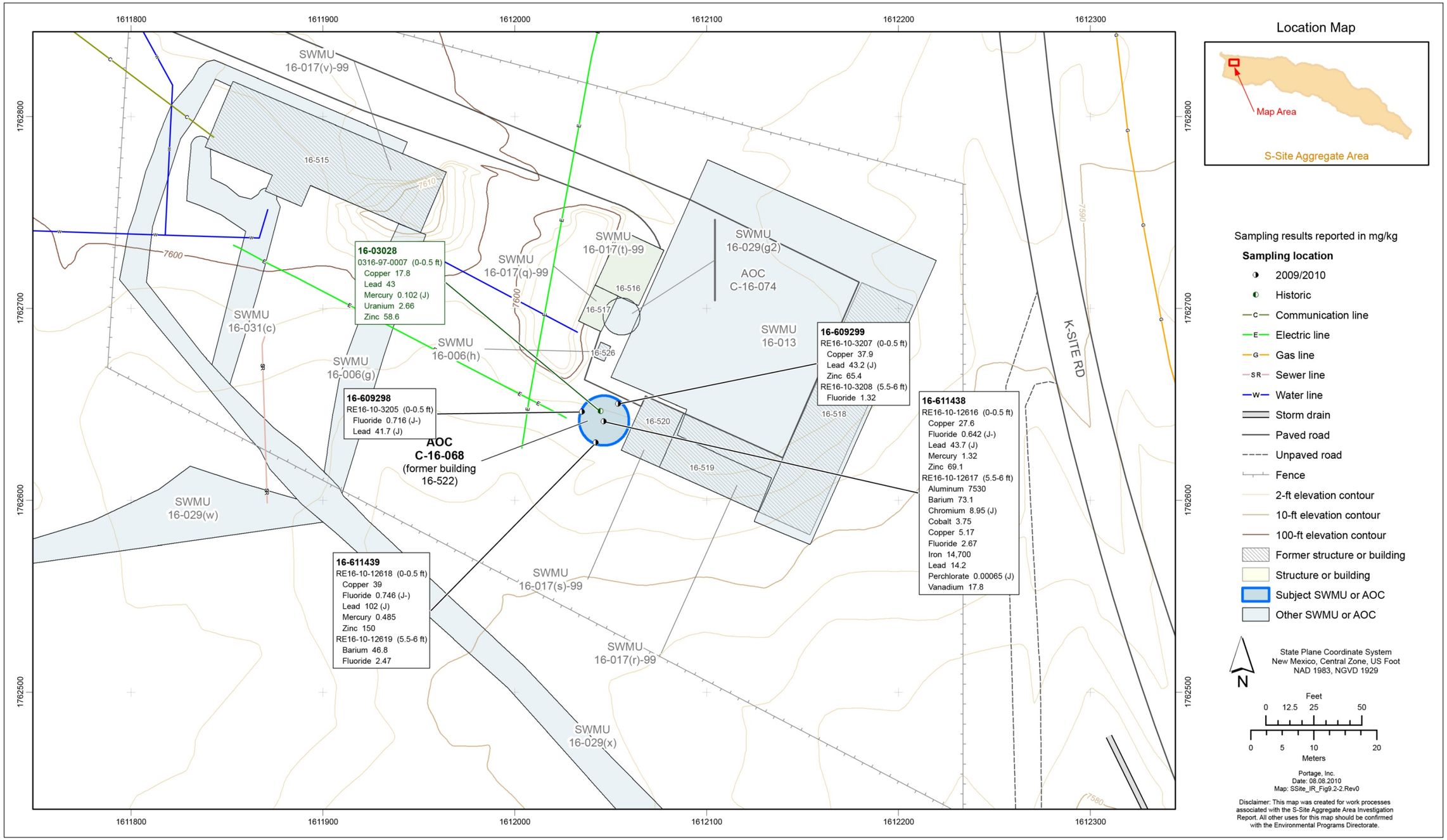


Figure 4.4-2 Inorganic chemicals detected or detected above BVs at AOC C-16-068

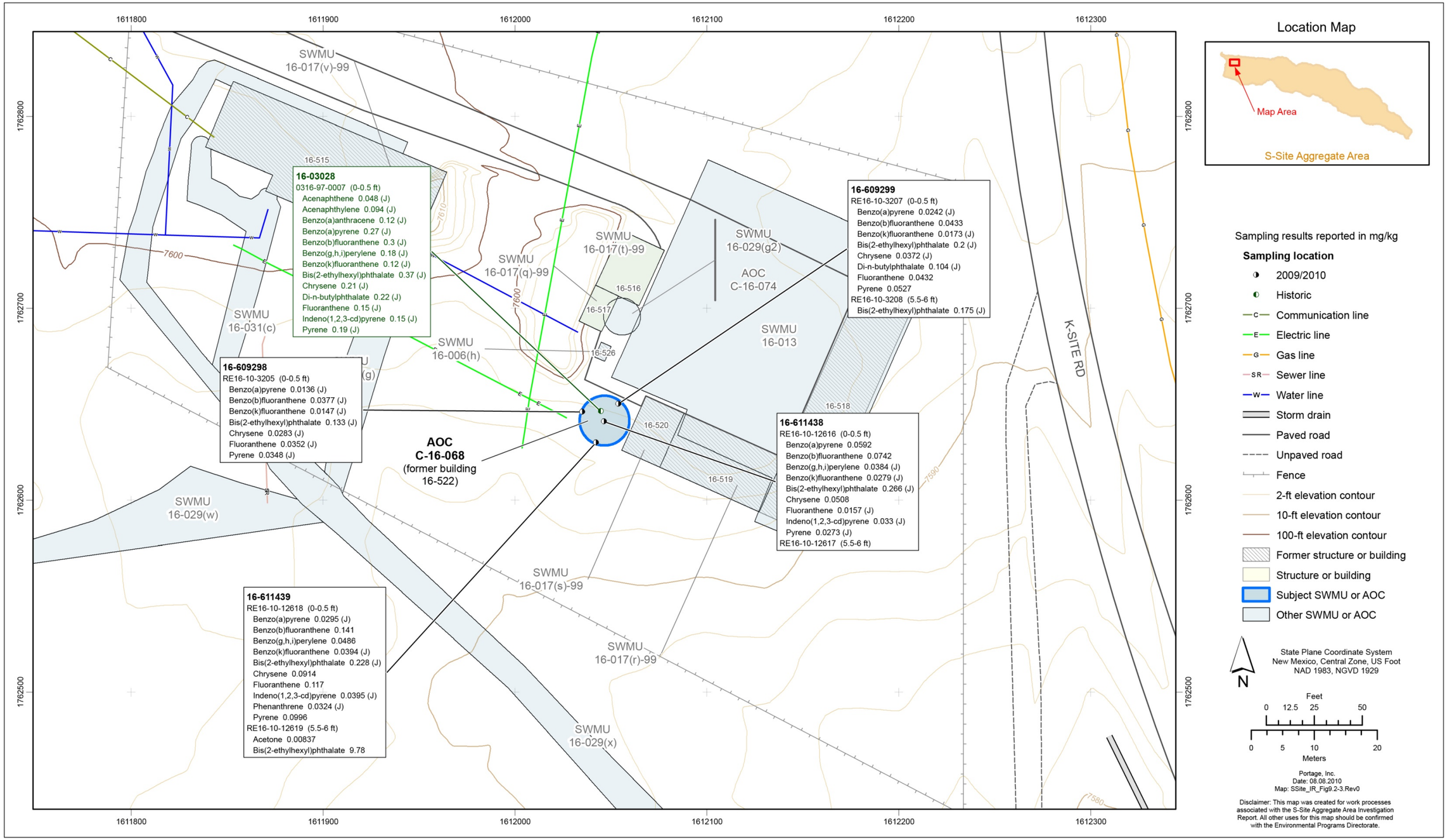


Figure 4.4-3 Organic chemicals detected at AOC C-16-068

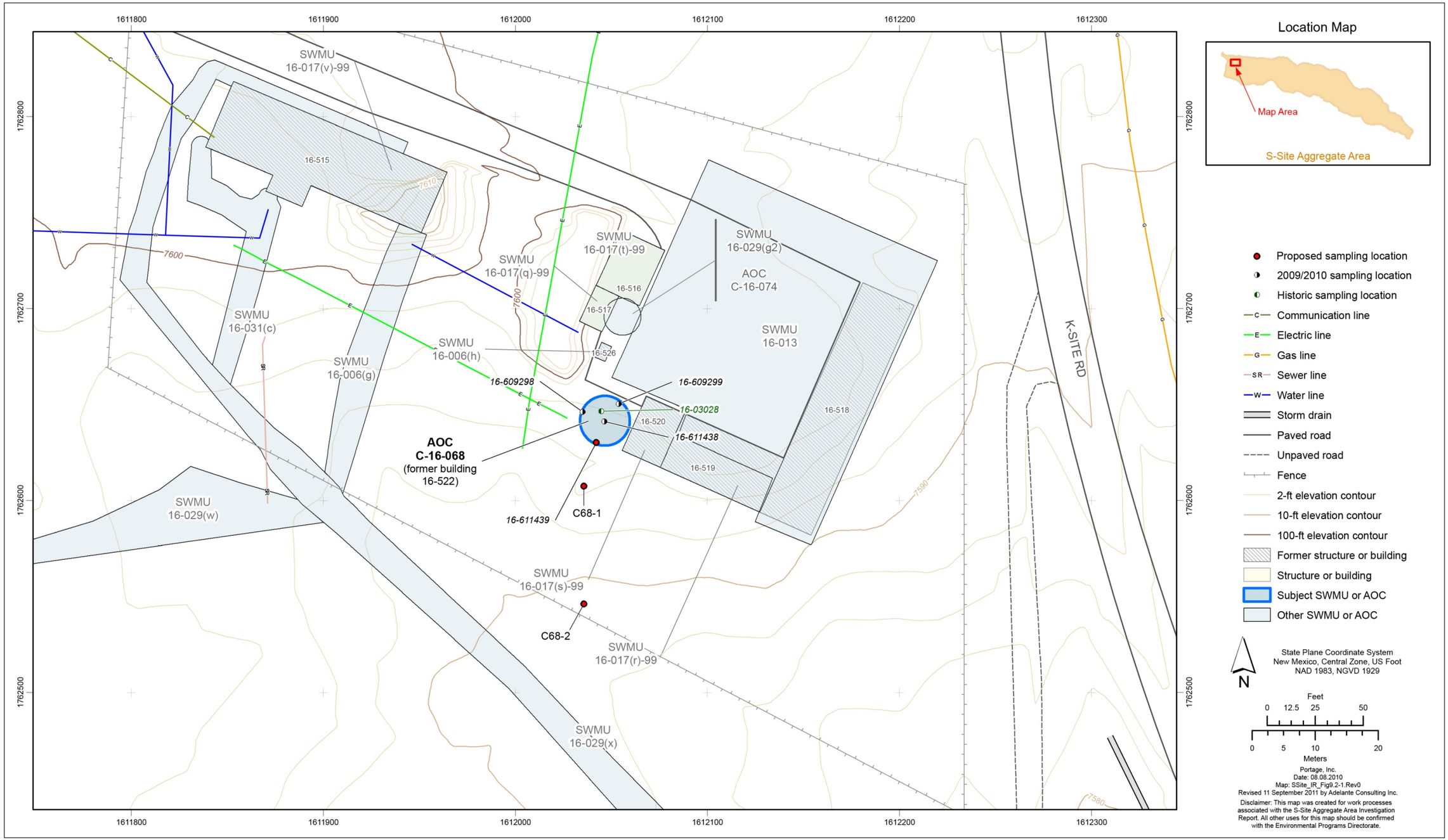


Figure 4.4-4 Proposed sampling locations at AOC C-16-068

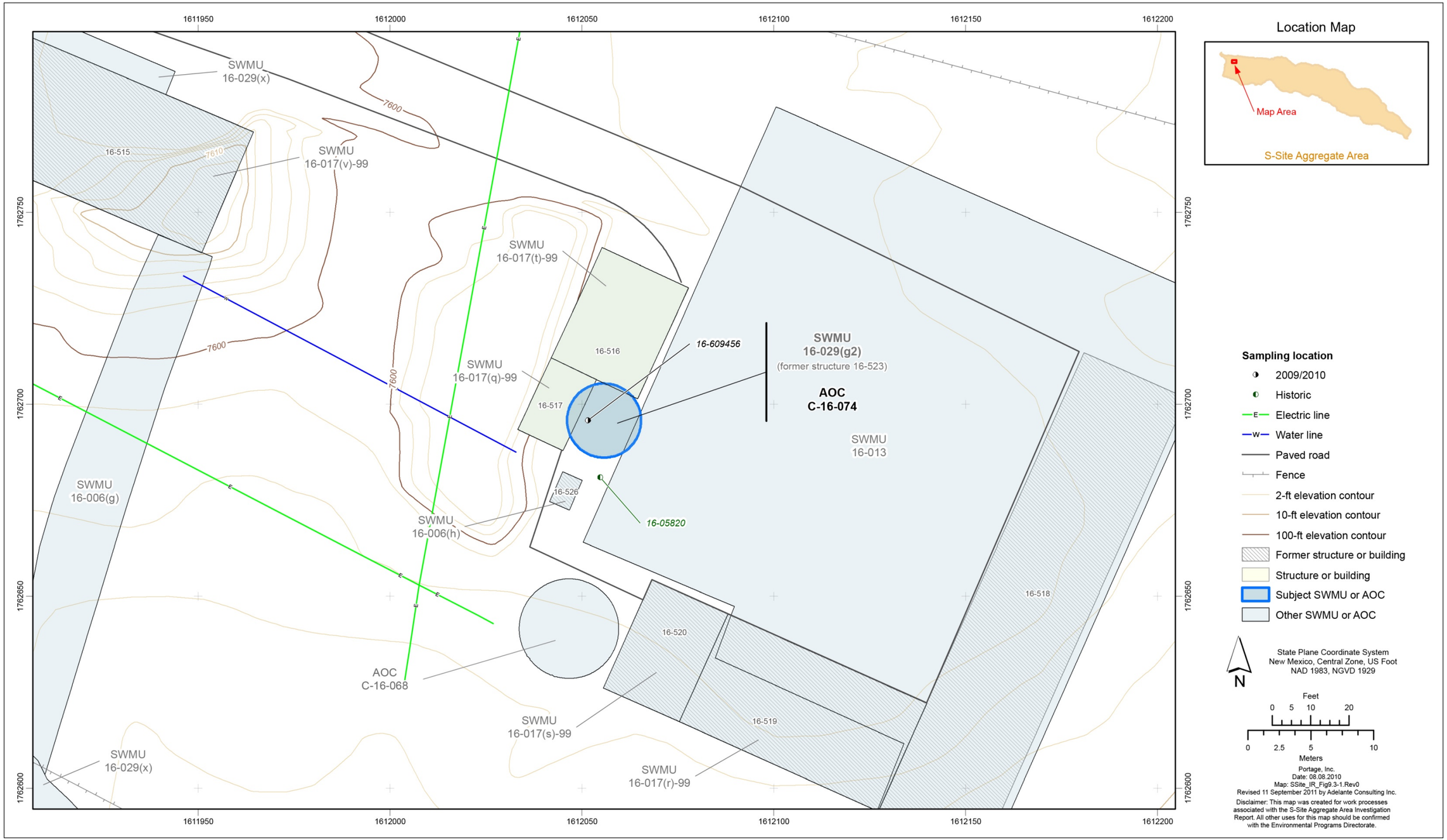


Figure 4.4-5 Site map and sampling locations at AOC C-16-074

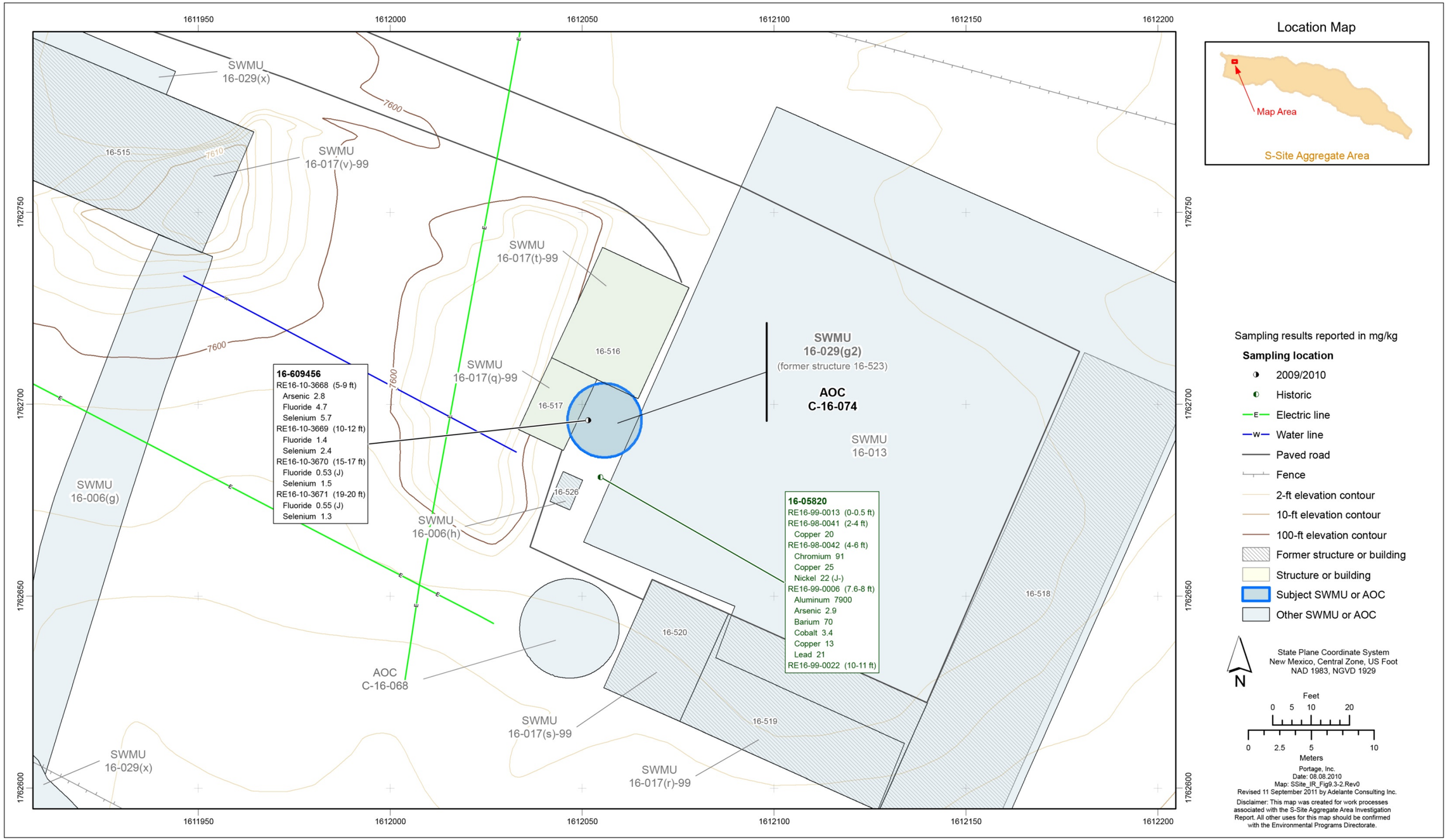


Figure 4.4-6 Inorganic chemicals detected or detected above BVs at AOC C-16-074

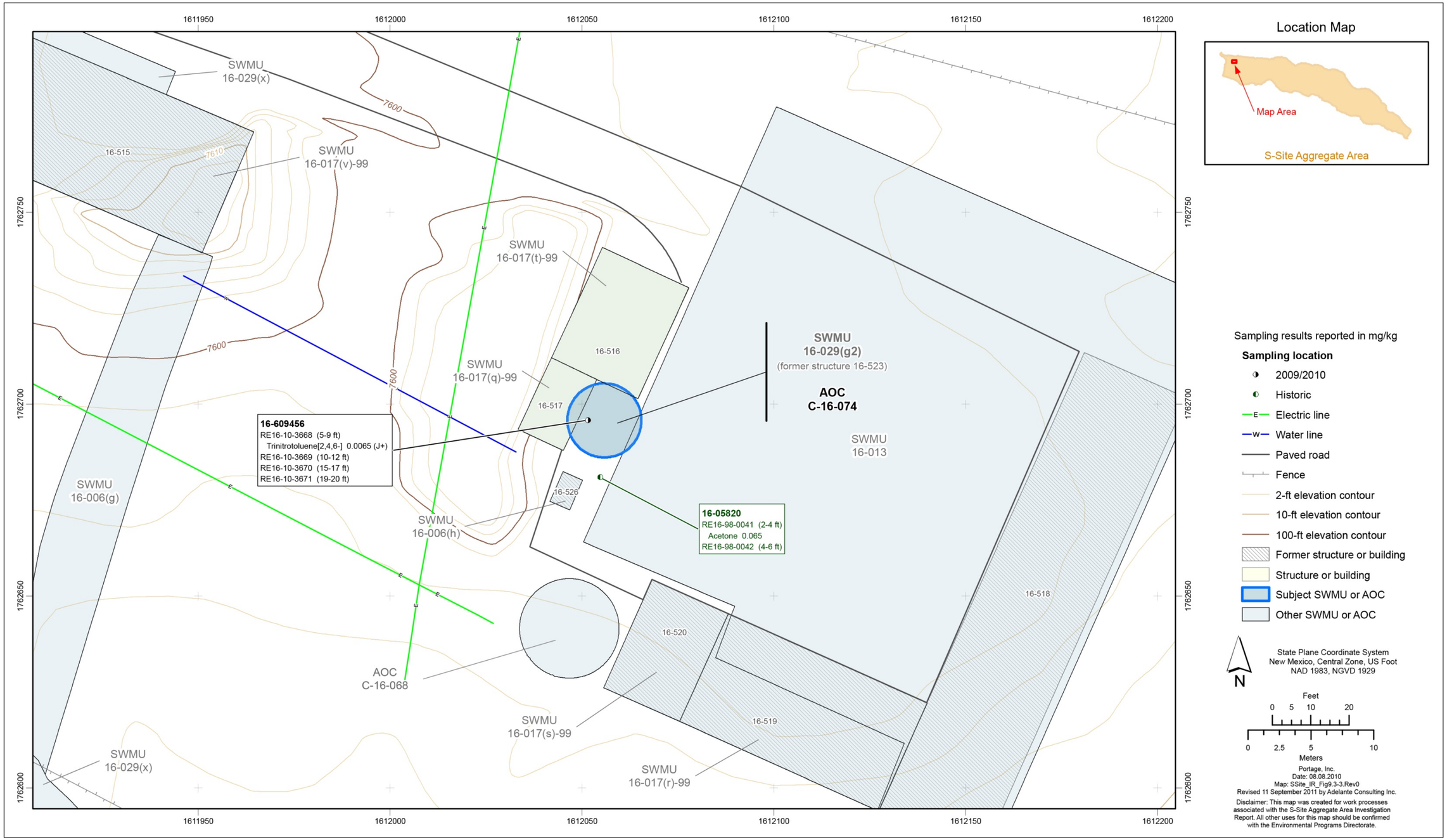


Figure 4.4-7 Organic chemicals detected at AOC C-16-074

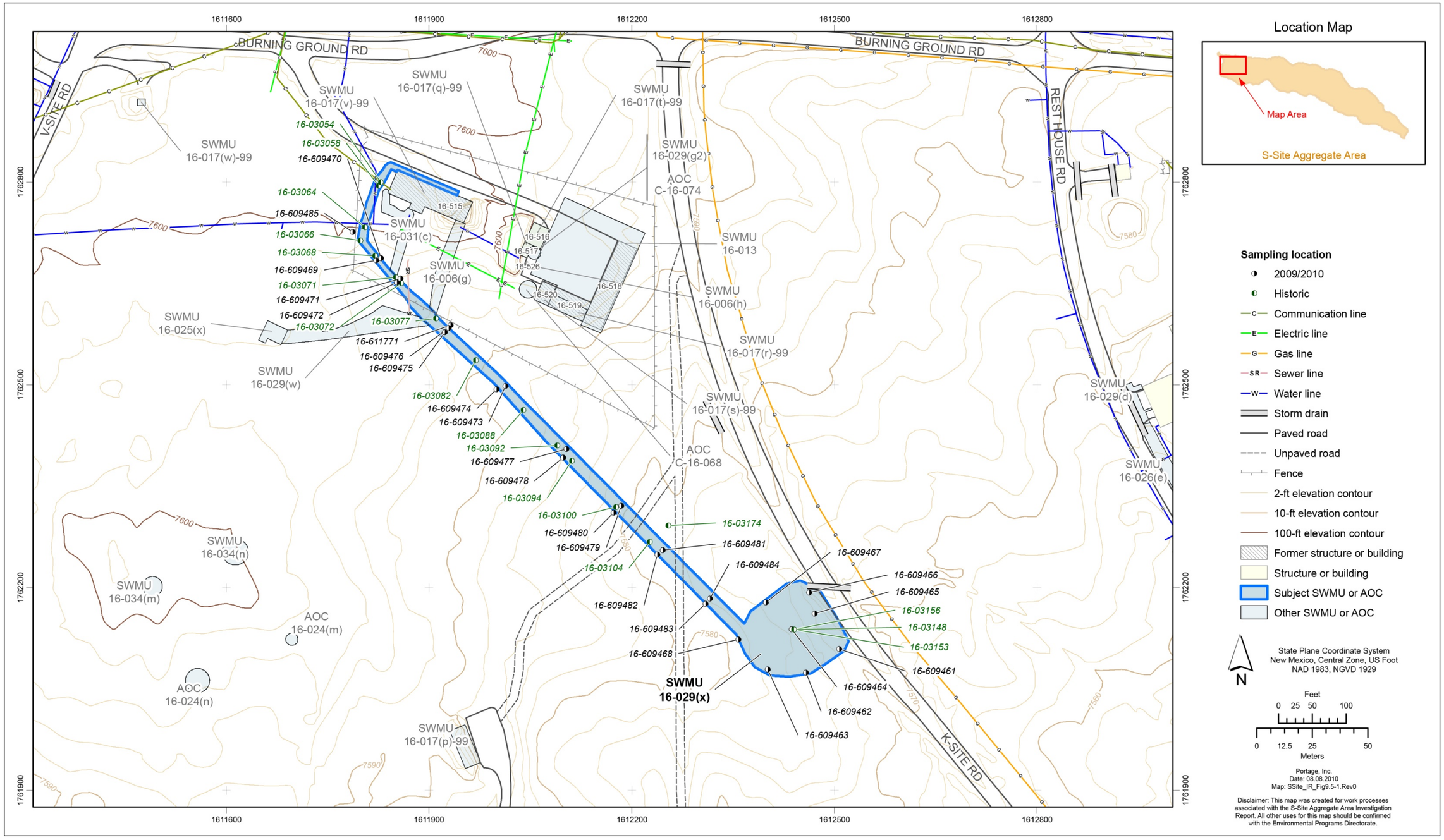


Figure 4.4-8 Site map and sampling locations at SWMU 16-029(x)

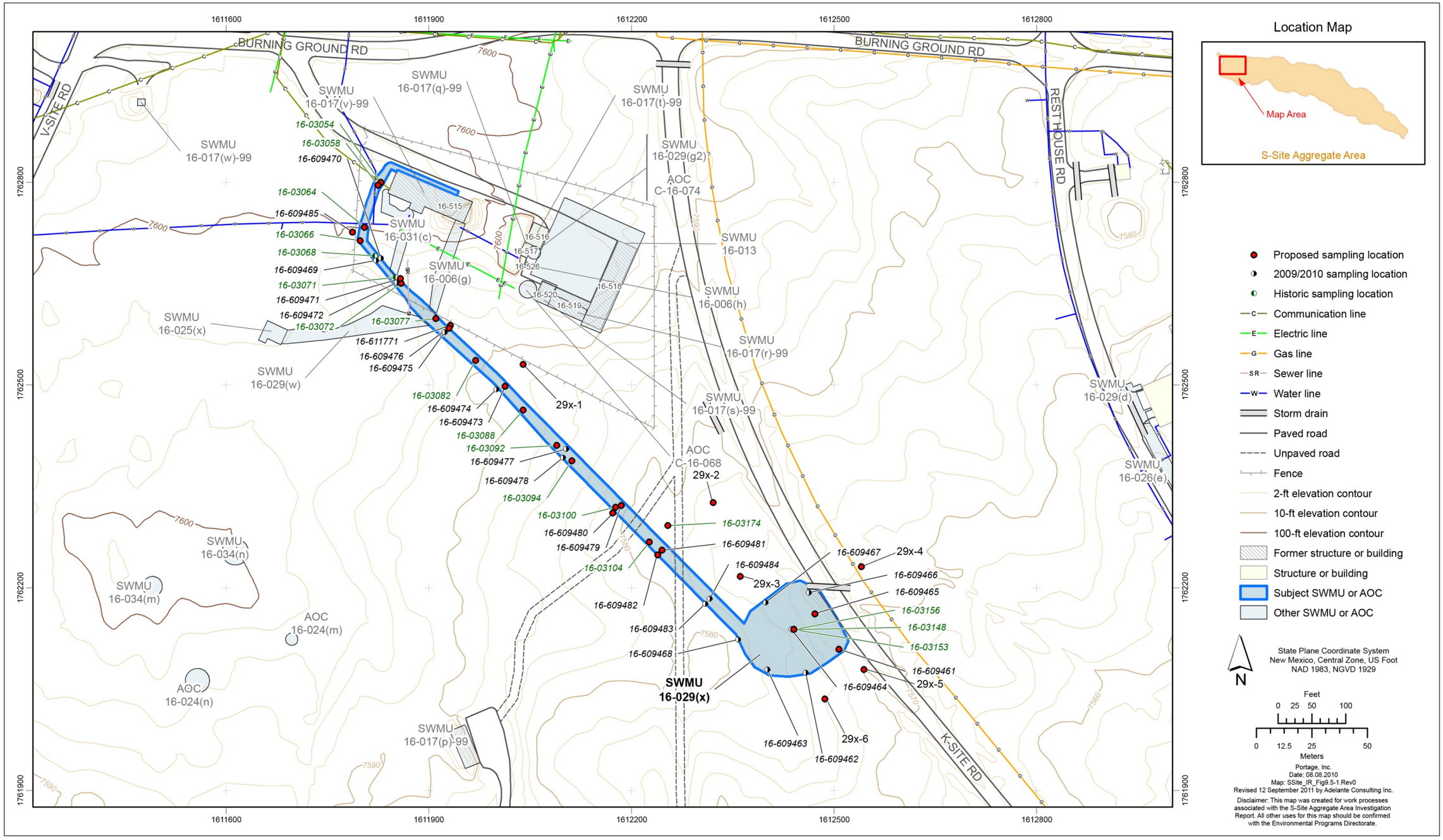


Figure 4.4-9 Proposed sampling locations at SWMU 16-029(x)

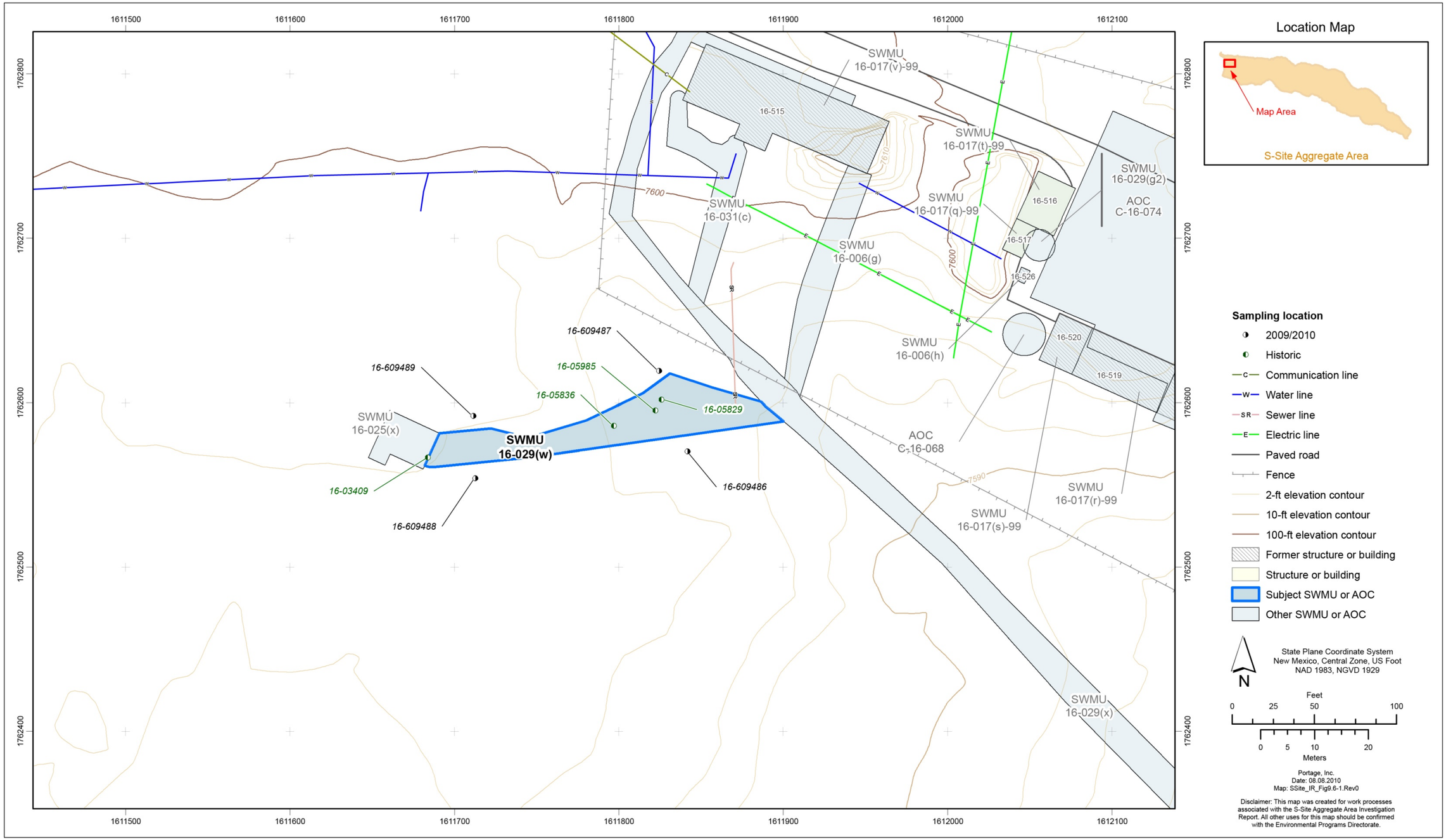


Figure 4.4-10 Site map and sampling locations at SWMU 16-029(w)

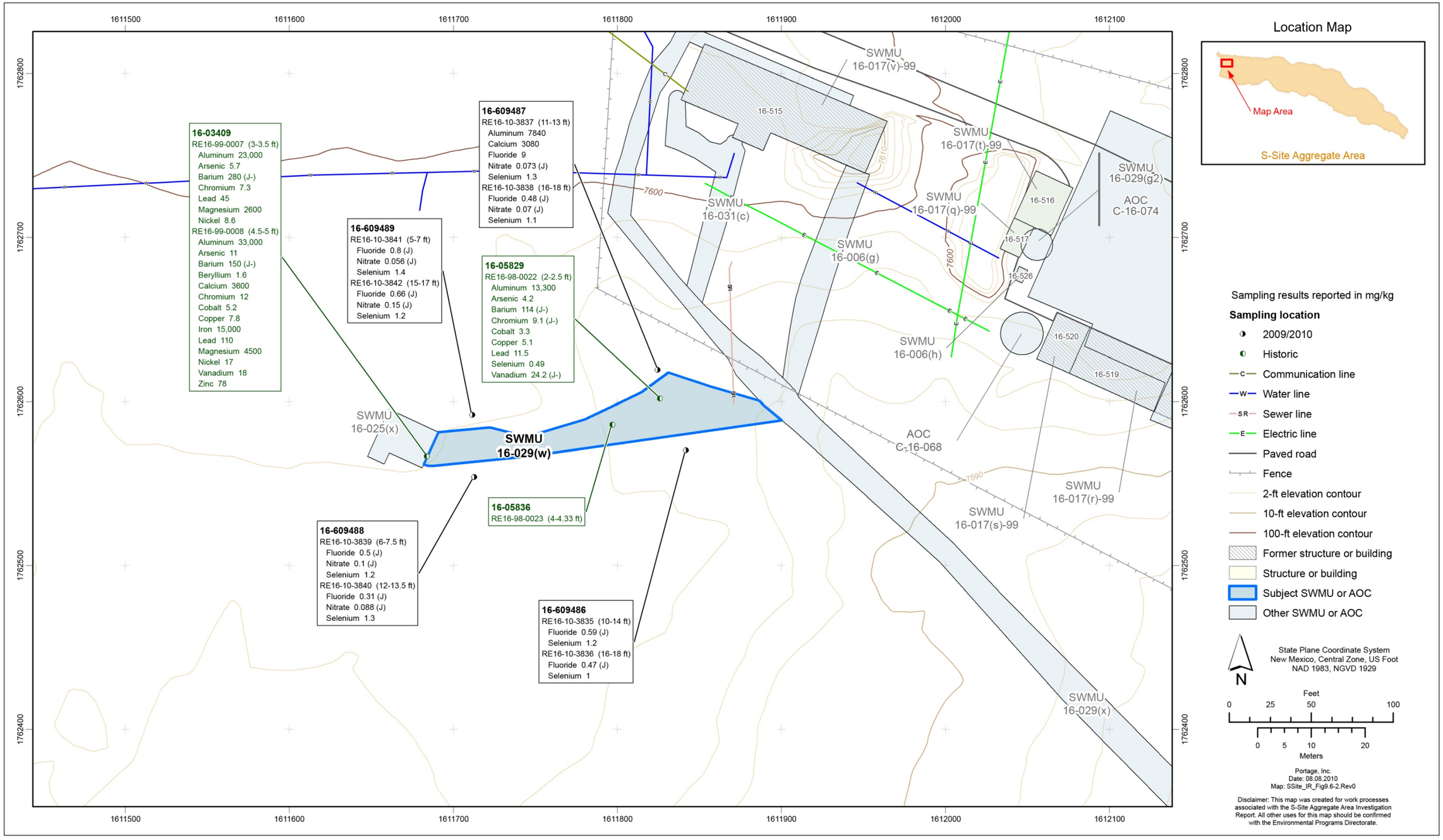


Figure 4.4-11 Inorganic chemicals detected or detected above BVs at SWMU 16-029(w)

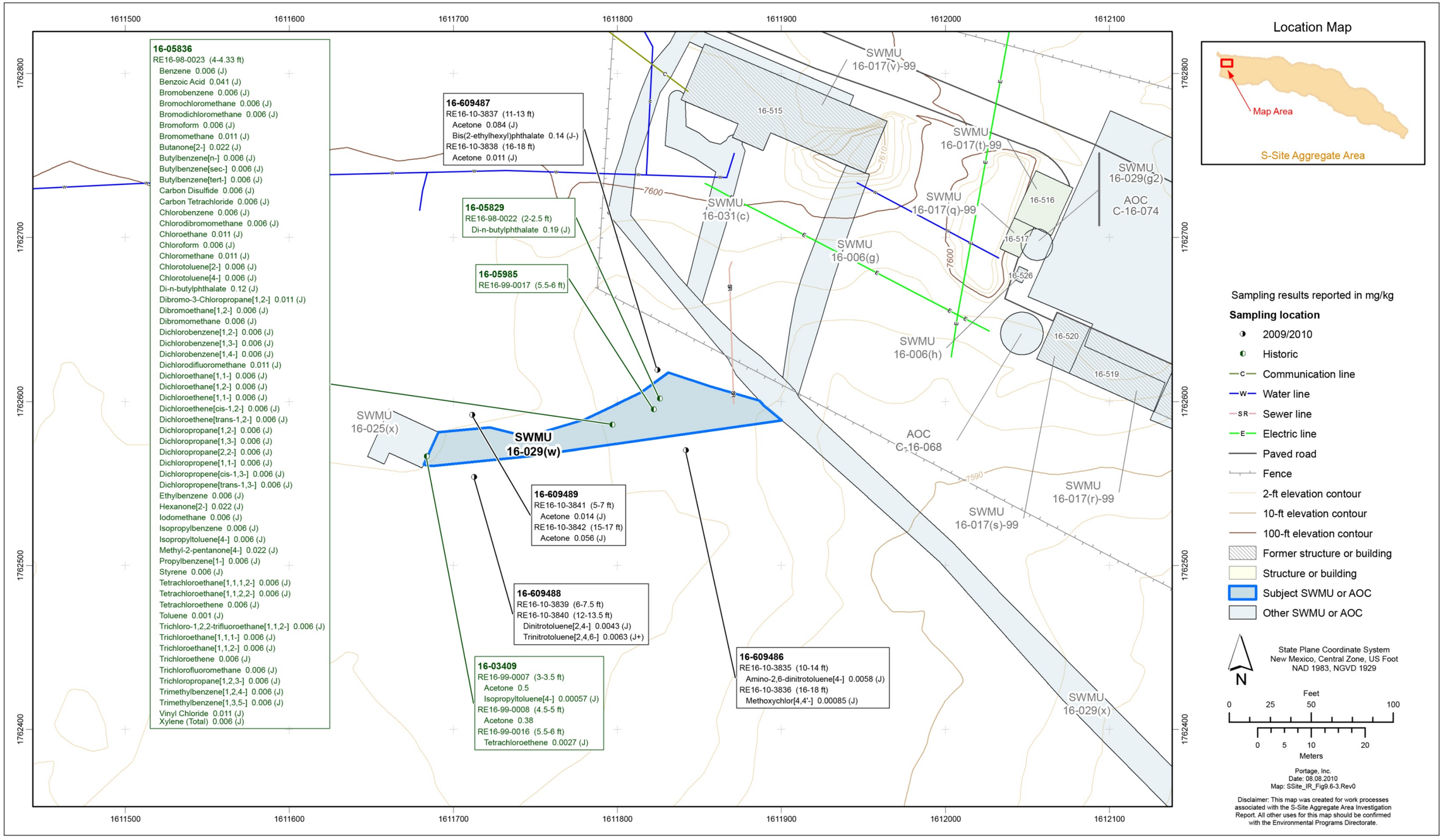


Figure 4.4-12 Organic chemicals detected at SWMU 16-029(w)

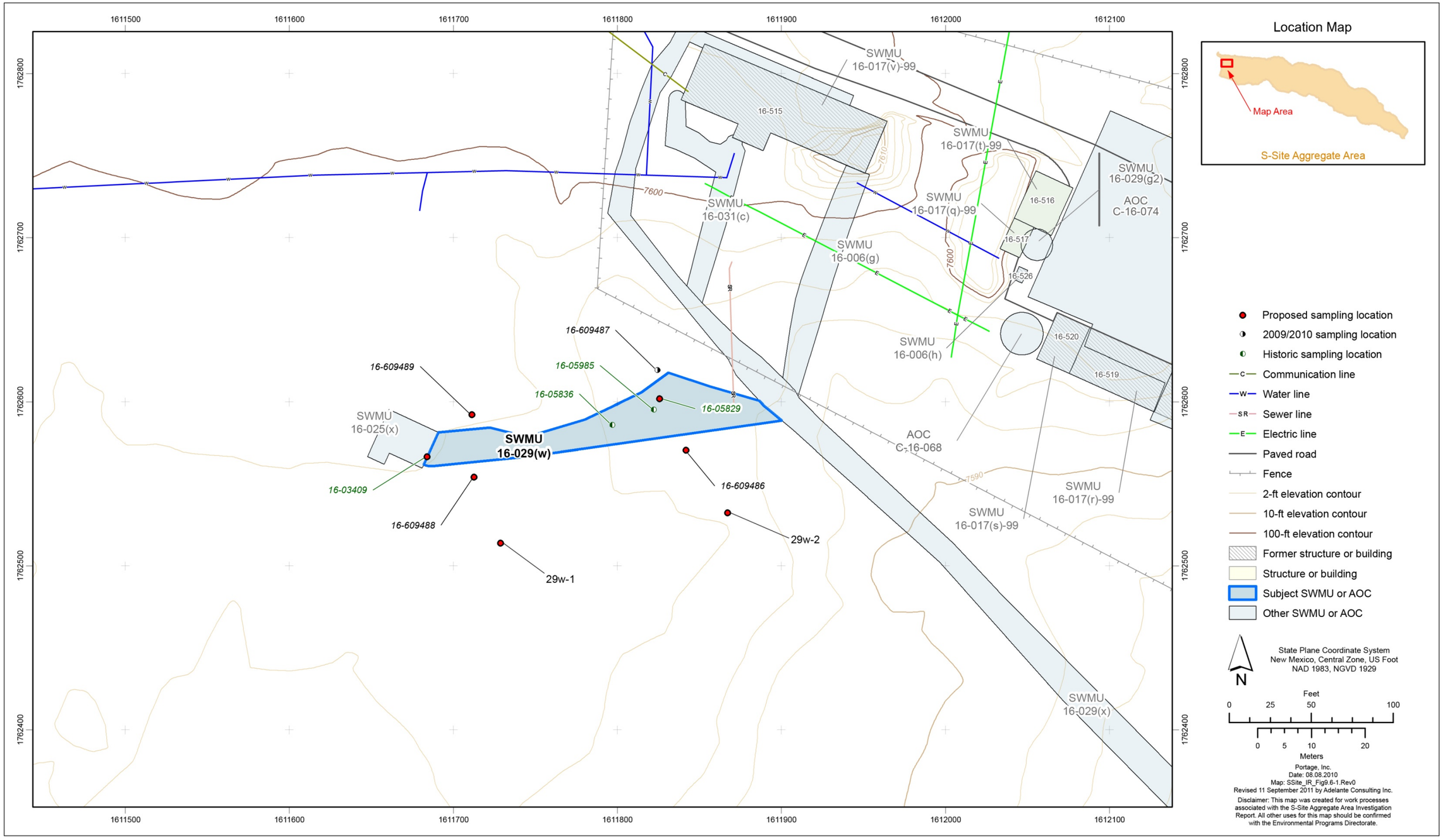


Figure 4.4-13 Proposed sampling locations at SWMU 16-029(w)

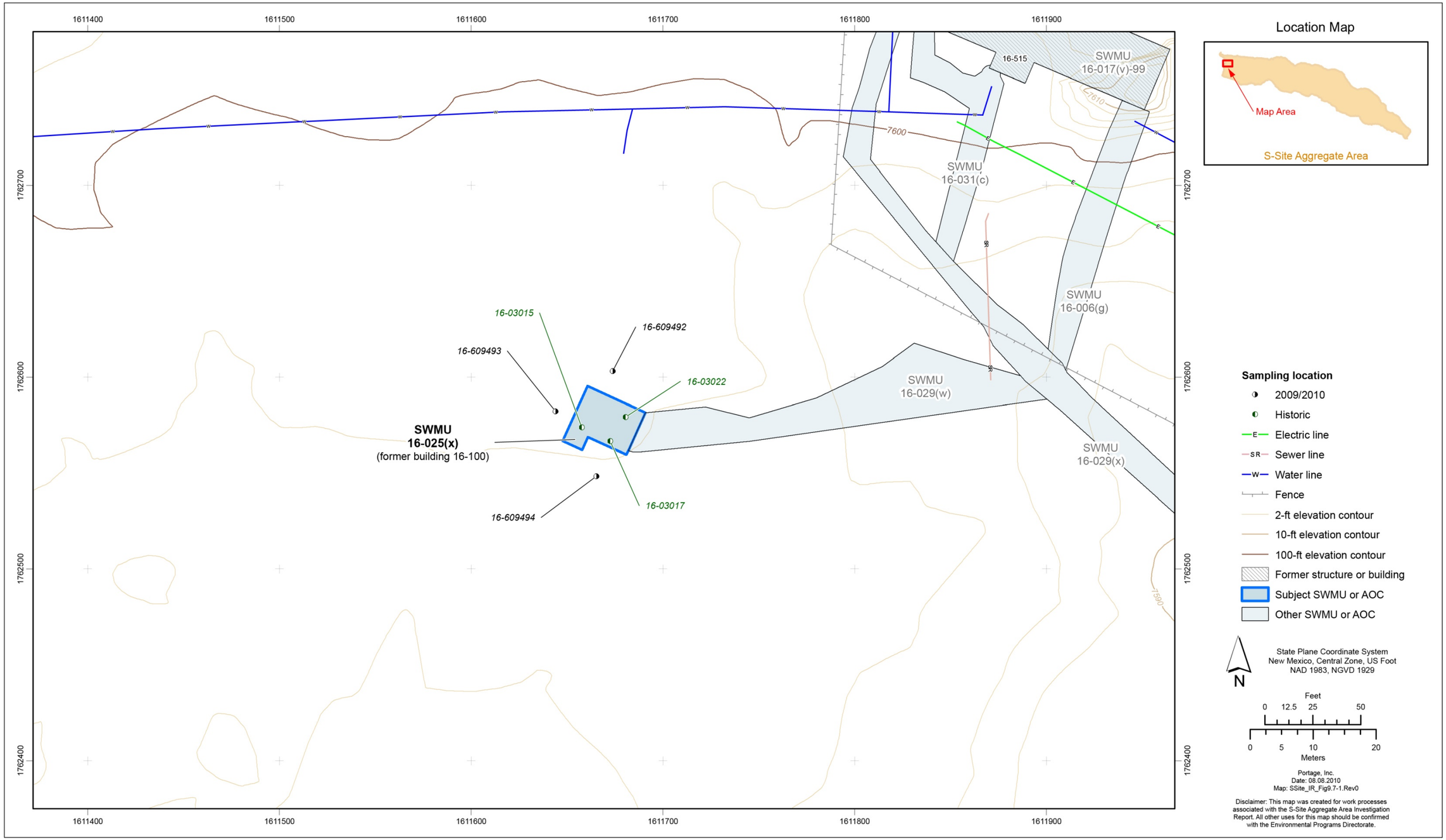


Figure 4.4-14 Site map and sampling locations at SWMU 16-025(x)

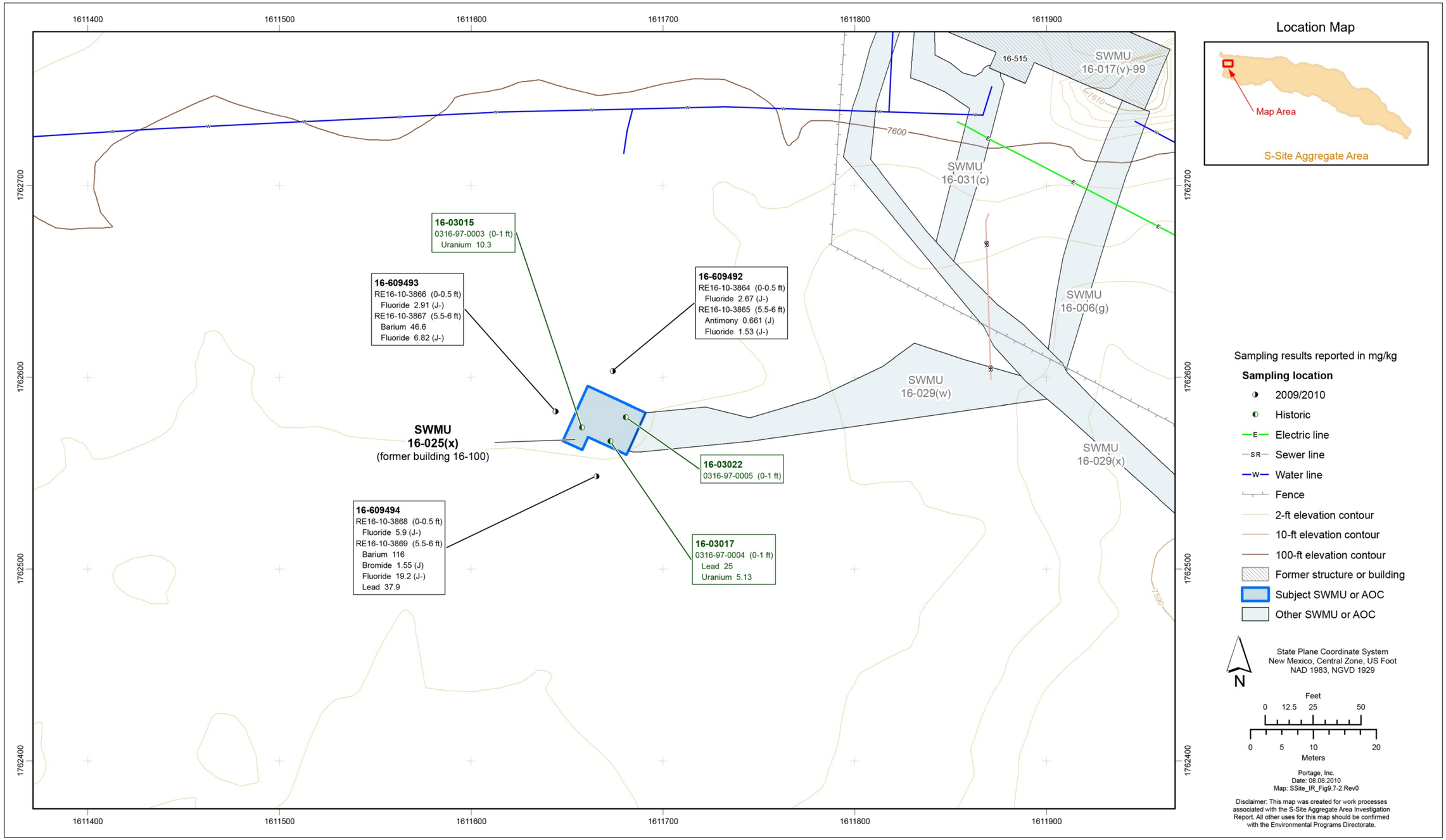


Figure 4.4-15 Inorganic chemicals detected or detected above BVs at SWMU 16-025(x)

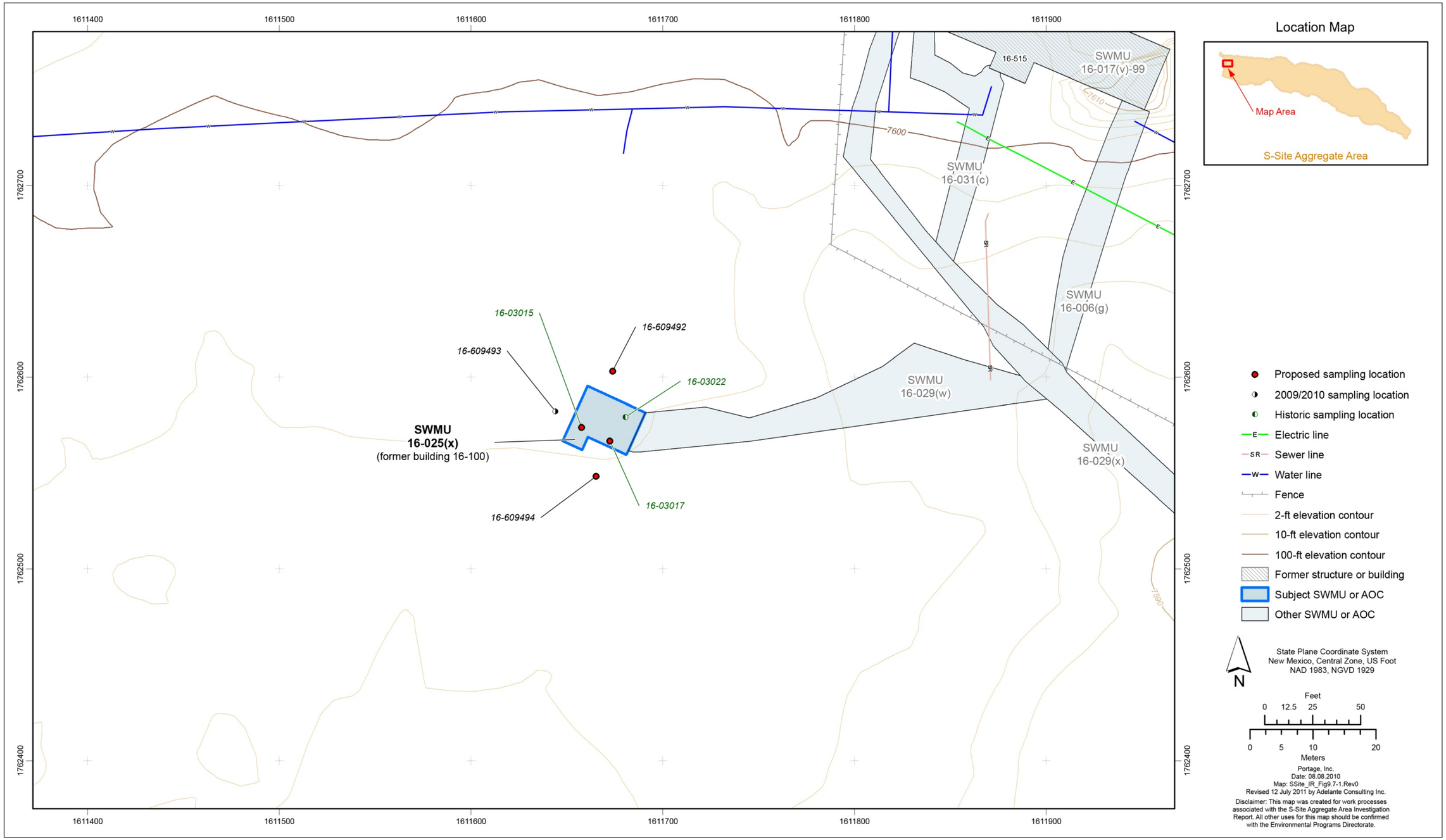


Figure 4.4-16 Proposed sampling locations at SWMU 16-025(x)

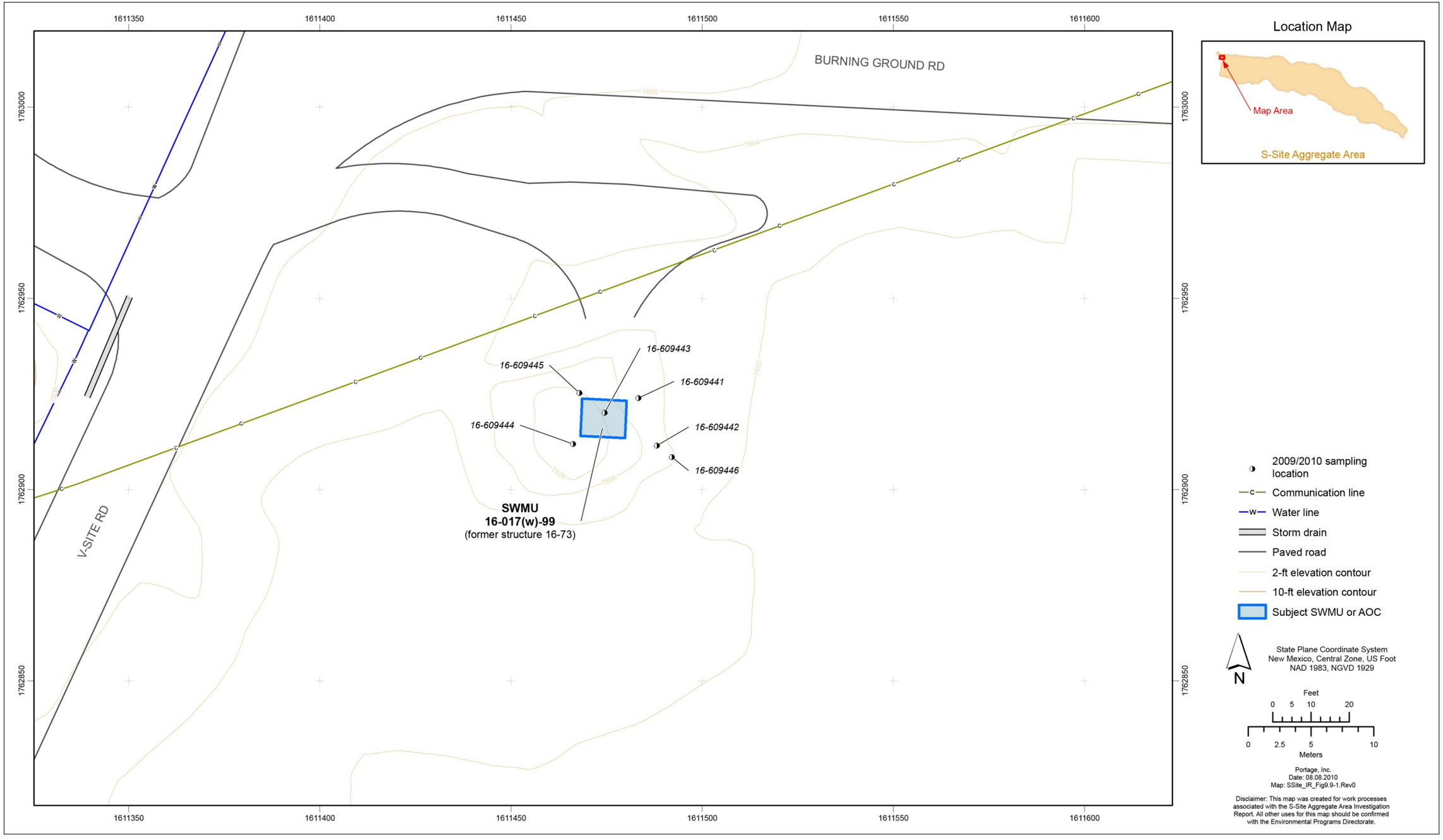


Figure 4.4-17 Site map and sampling locations at SWMU 16-017(w)-99

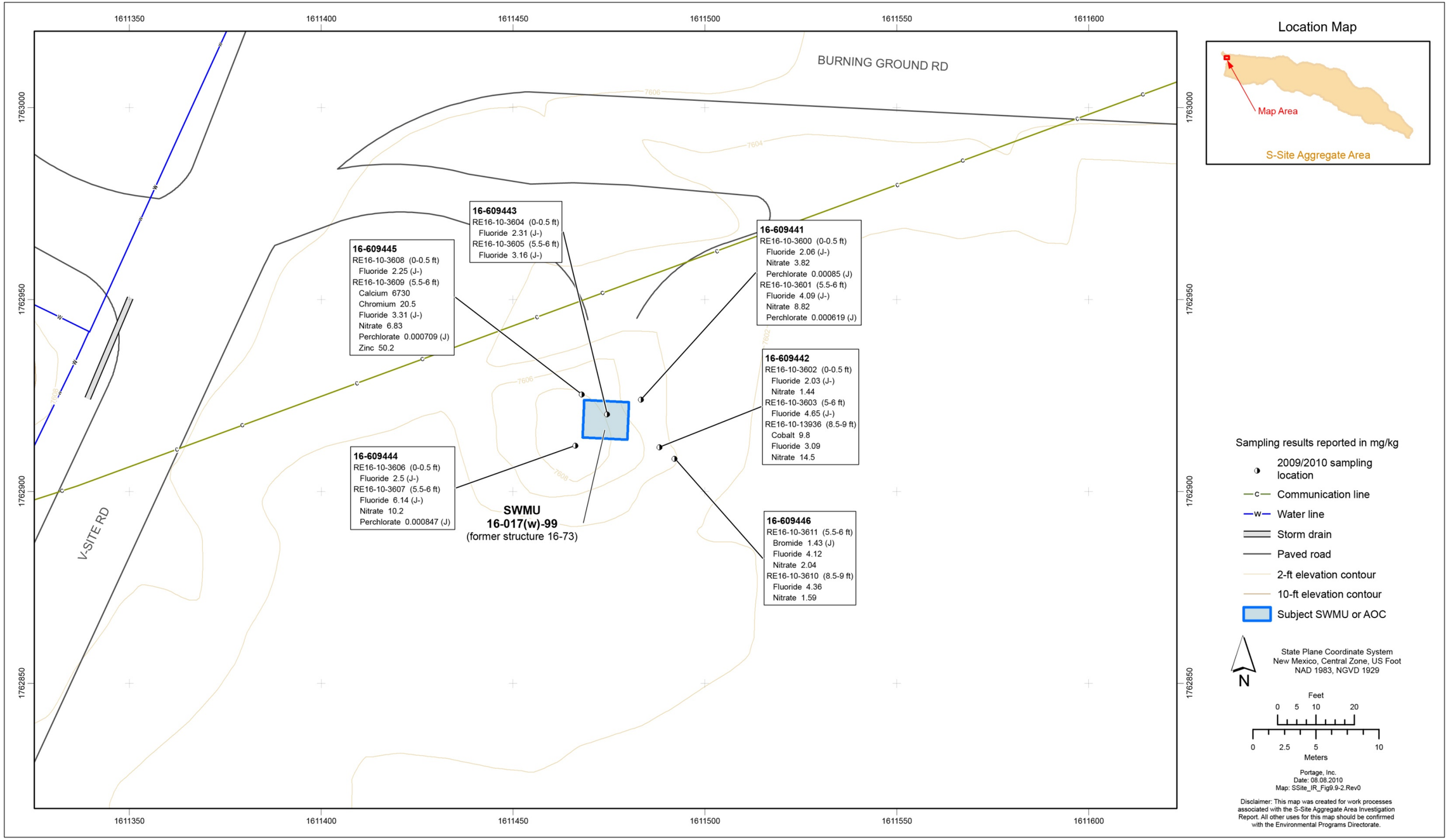


Figure 4.4-18 Inorganic chemicals detected or detected above BVs at SWMU 16-017(w)-99

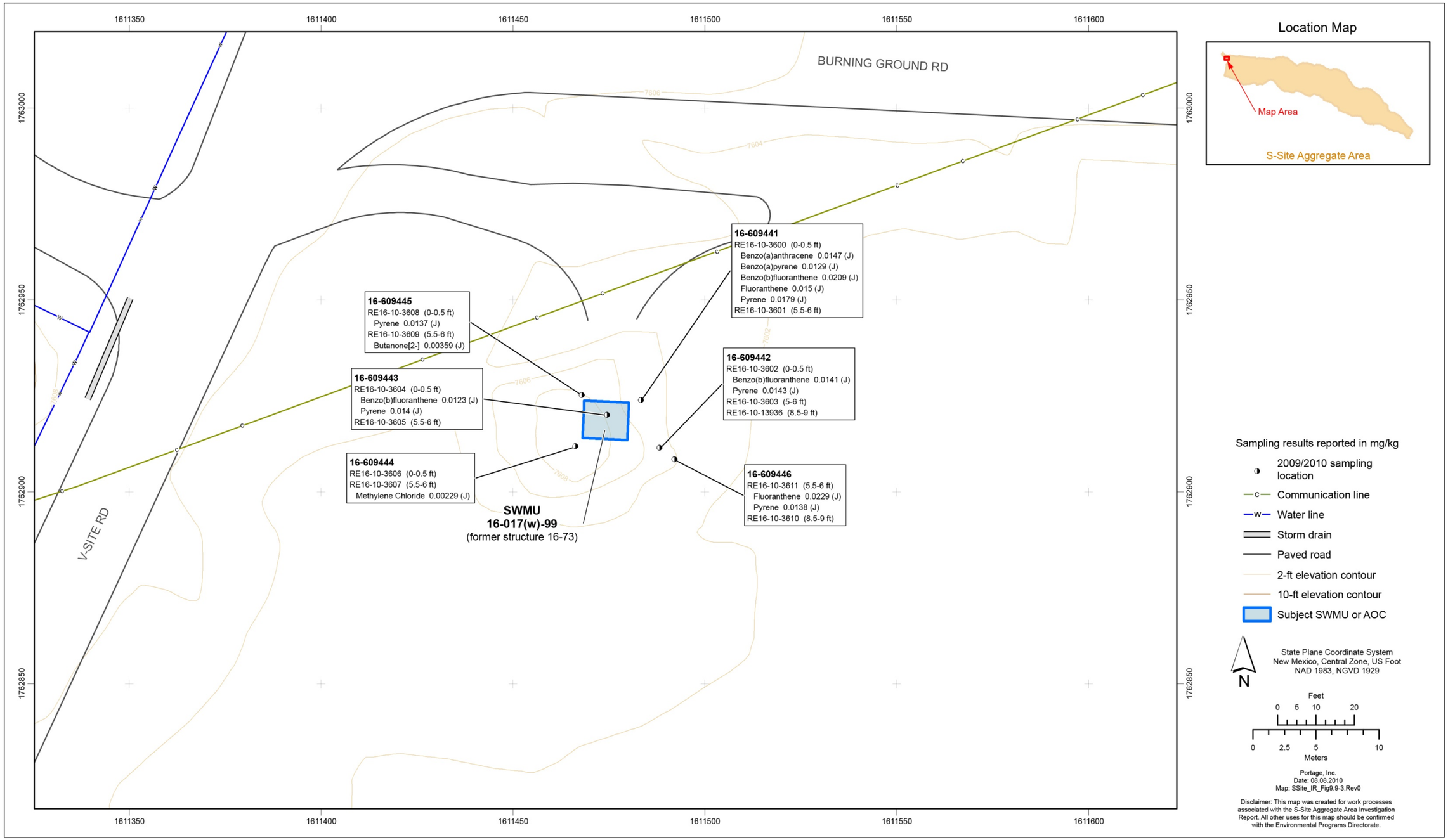


Figure 4.4-19 Organic chemicals detected at SWMU 16-017(w)-99

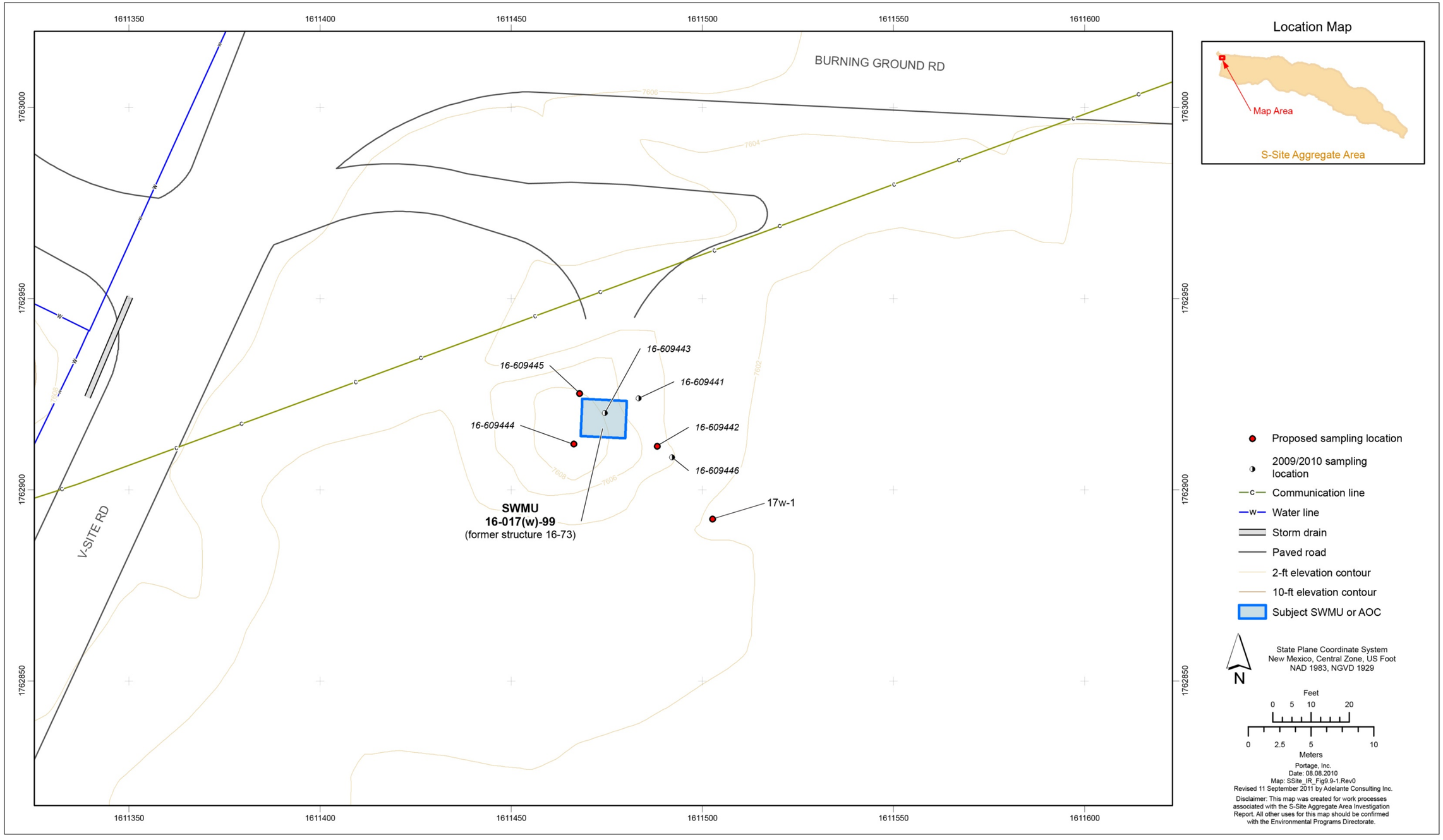


Figure 4.4-20 Proposed sampling locations at SWMU 16-017(w)-99

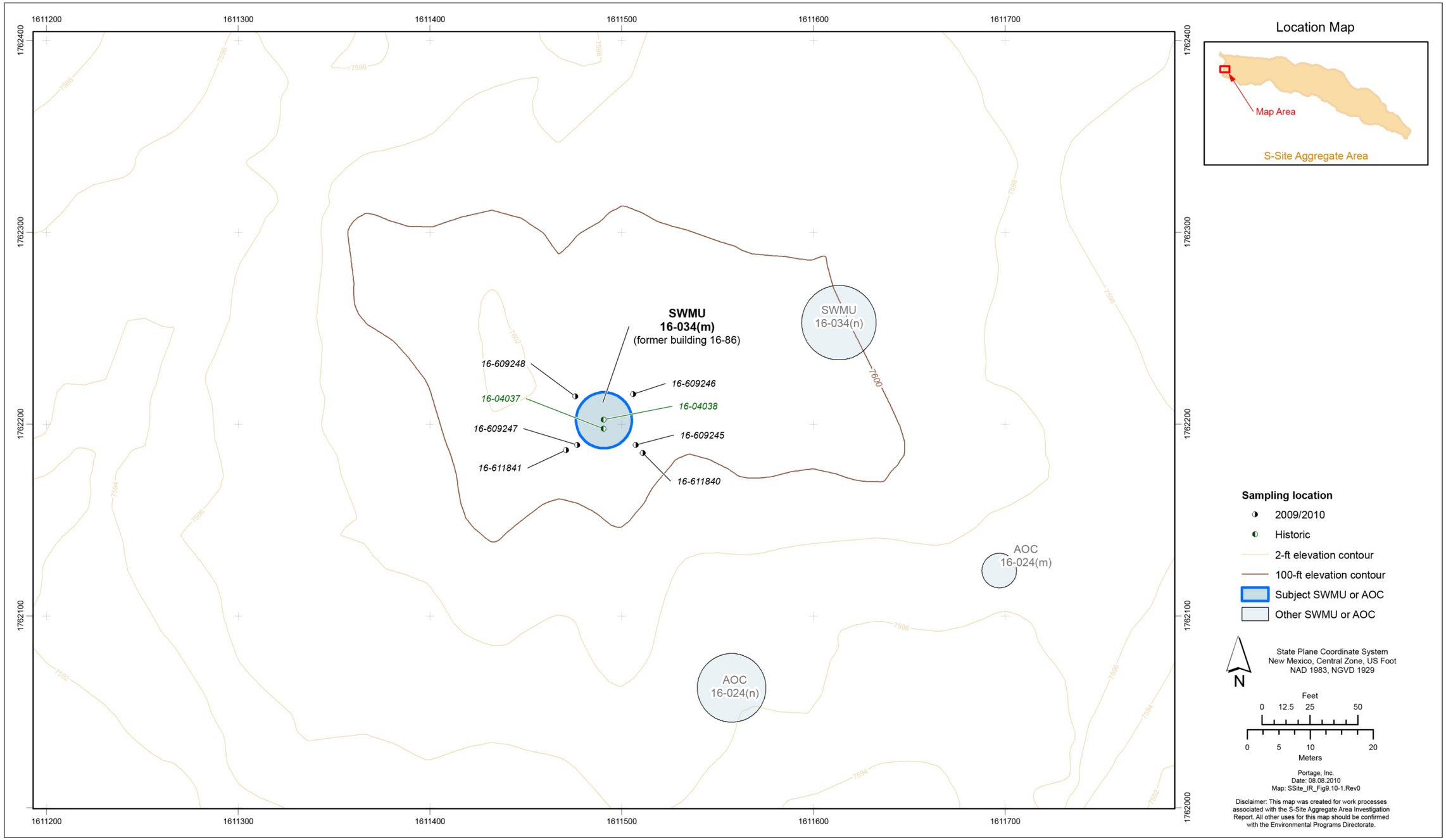


Figure 4.4-21 Site map and sampling locations at SWMU 16-034(m)

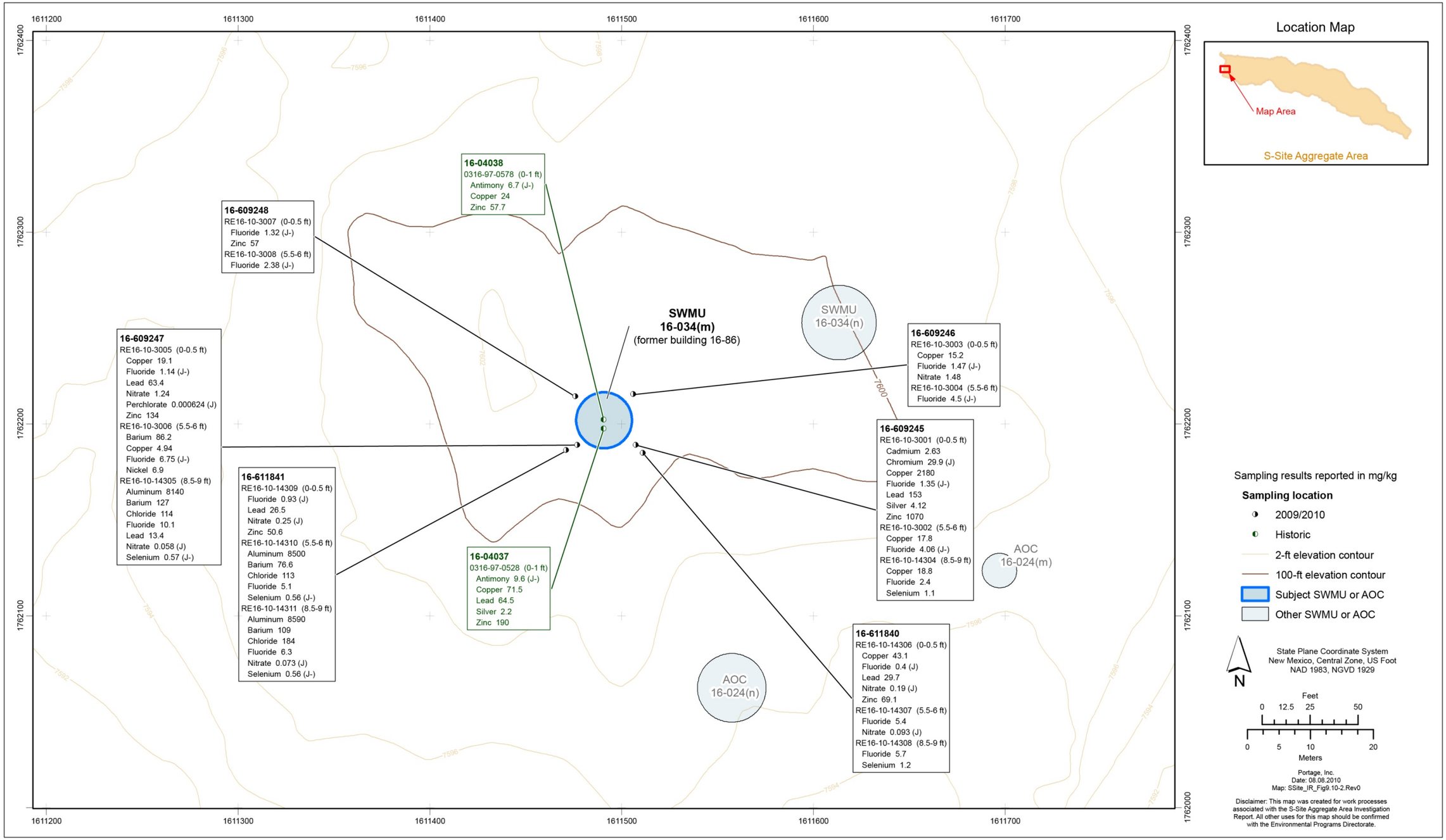


Figure 4.4-22 Inorganic chemicals detected or detected above BVs at SWMU 16-034(m)

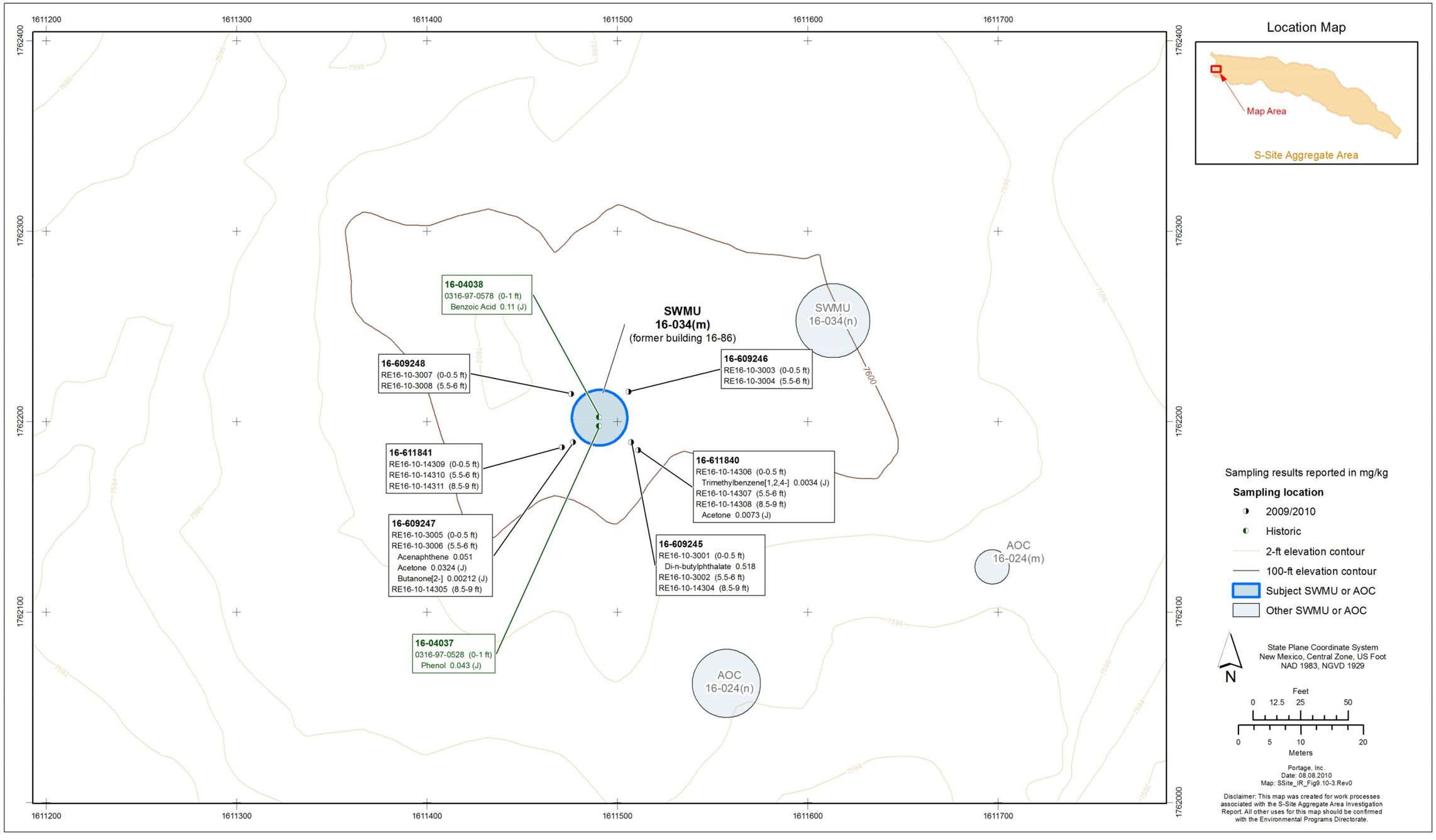


Figure 4.4-23 Organic chemicals detected at SWMU 16-034(m)

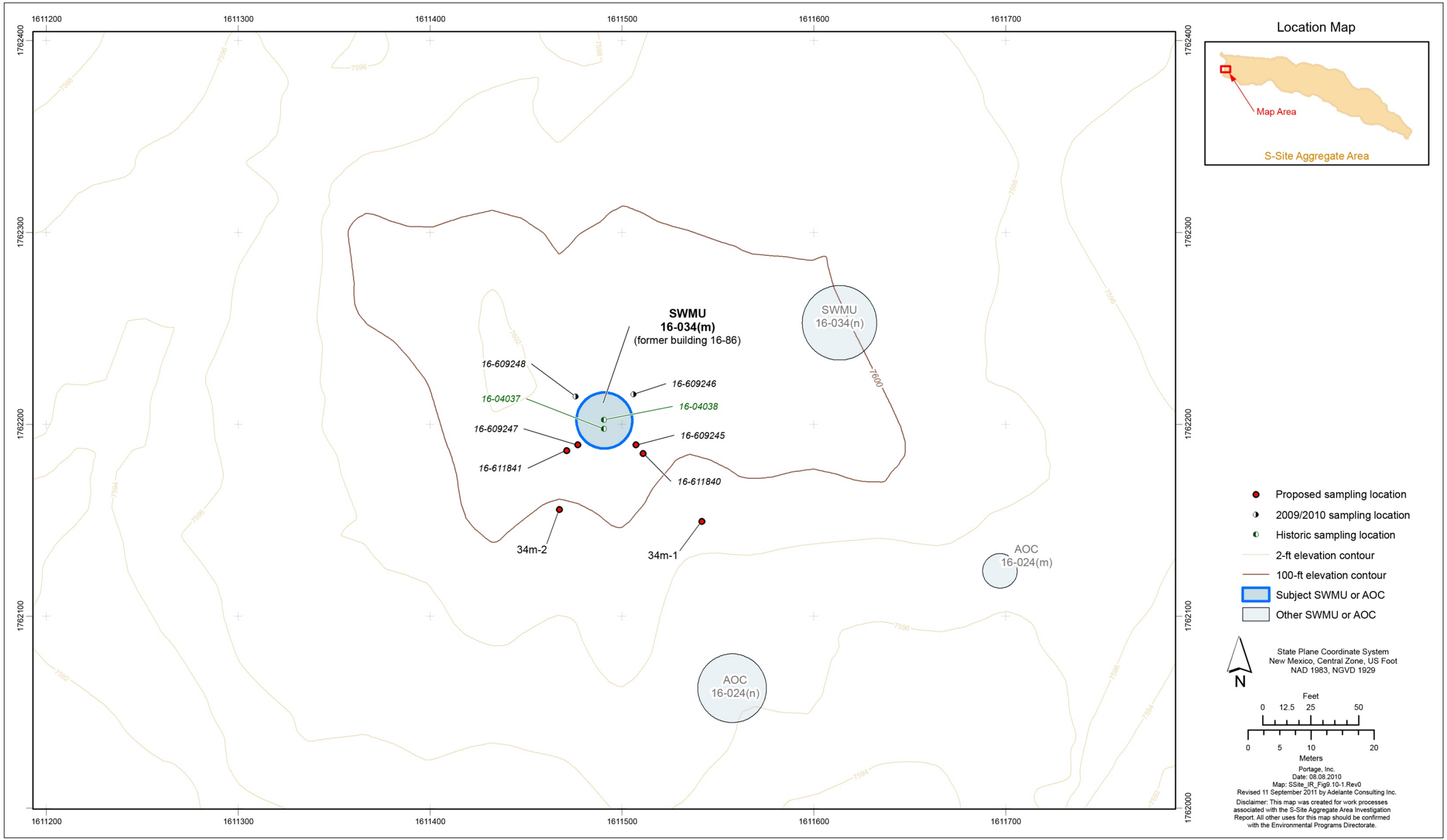


Figure 4.4-24 Proposed sampling locations at SWMU 16-034(m)

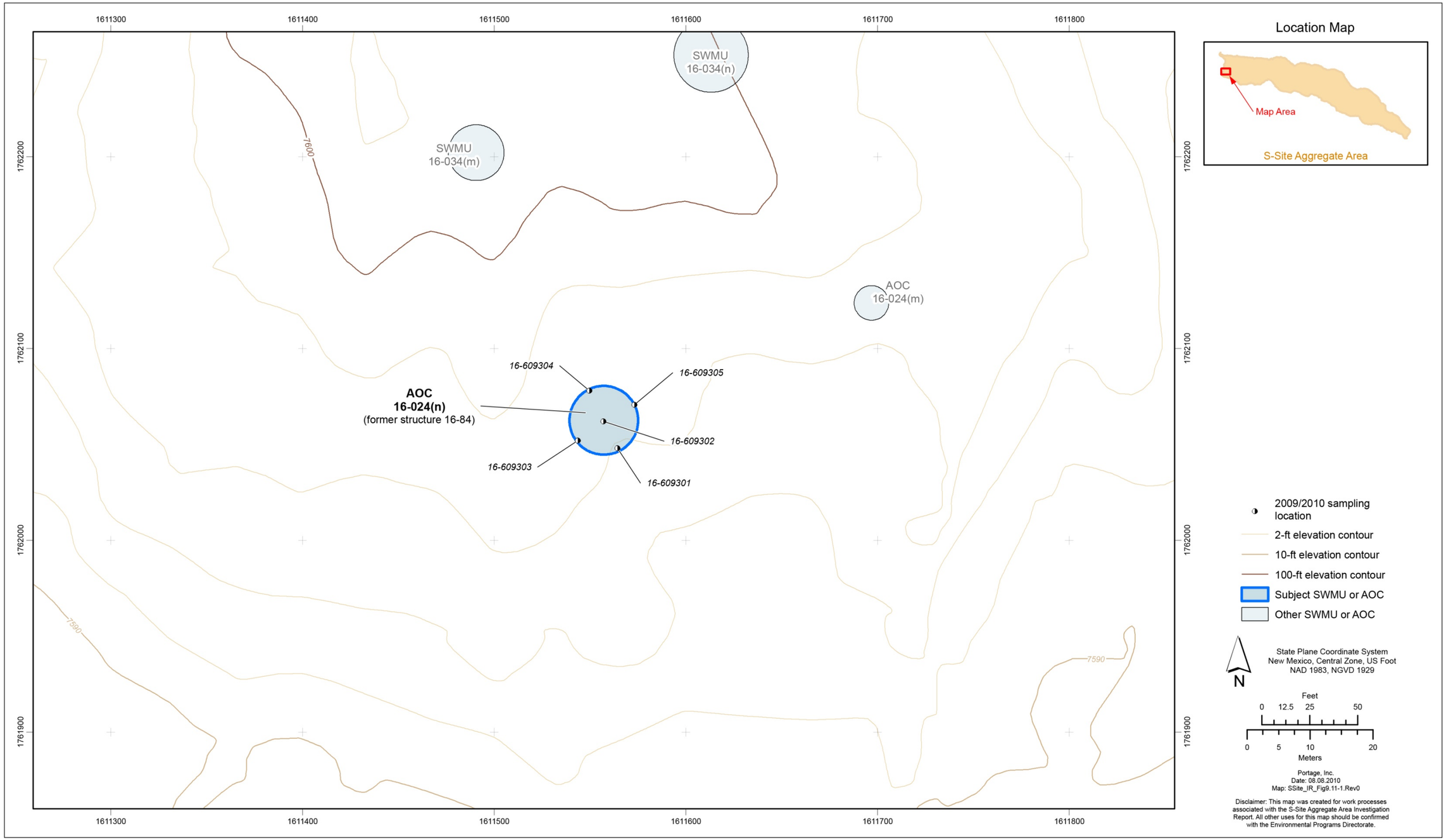


Figure 4.4-25 Site map and sampling locations at AOC 16-024(n)

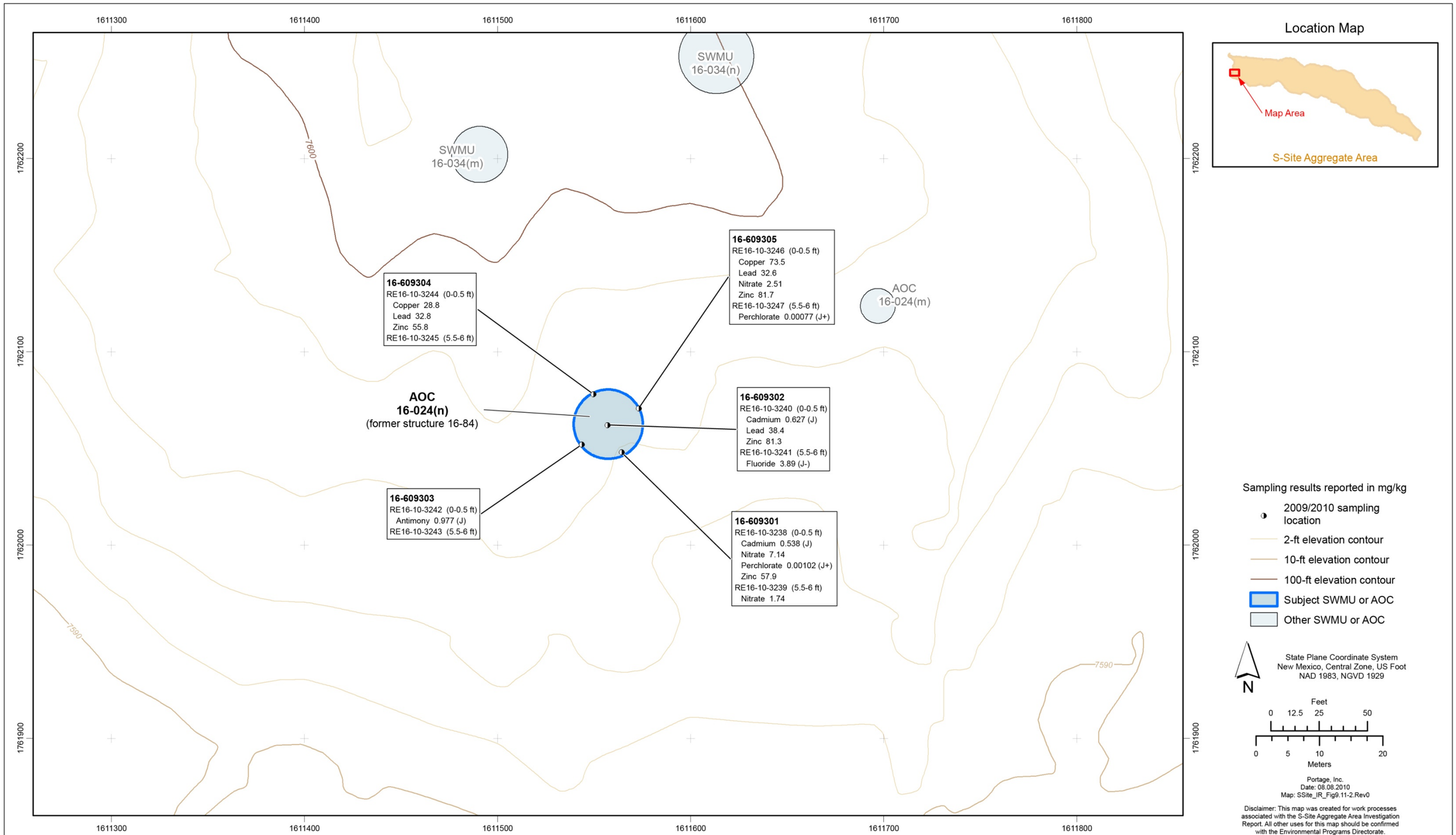


Figure 4.4-26 Inorganic chemicals detected or detected above BVs at AOC 16-024(n)

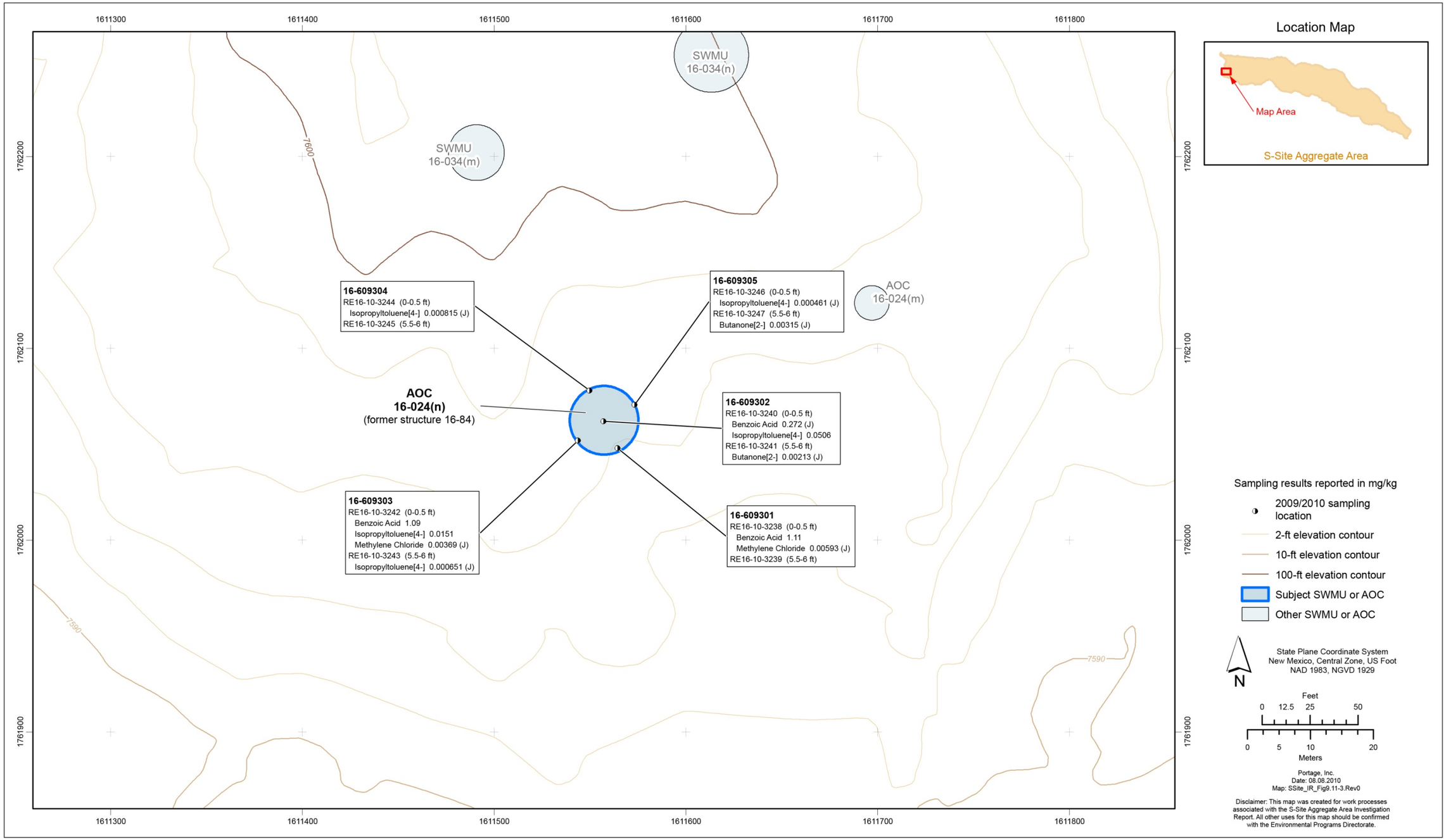


Figure 4.4-27 Organic chemicals detected at AOC 16-024(n)

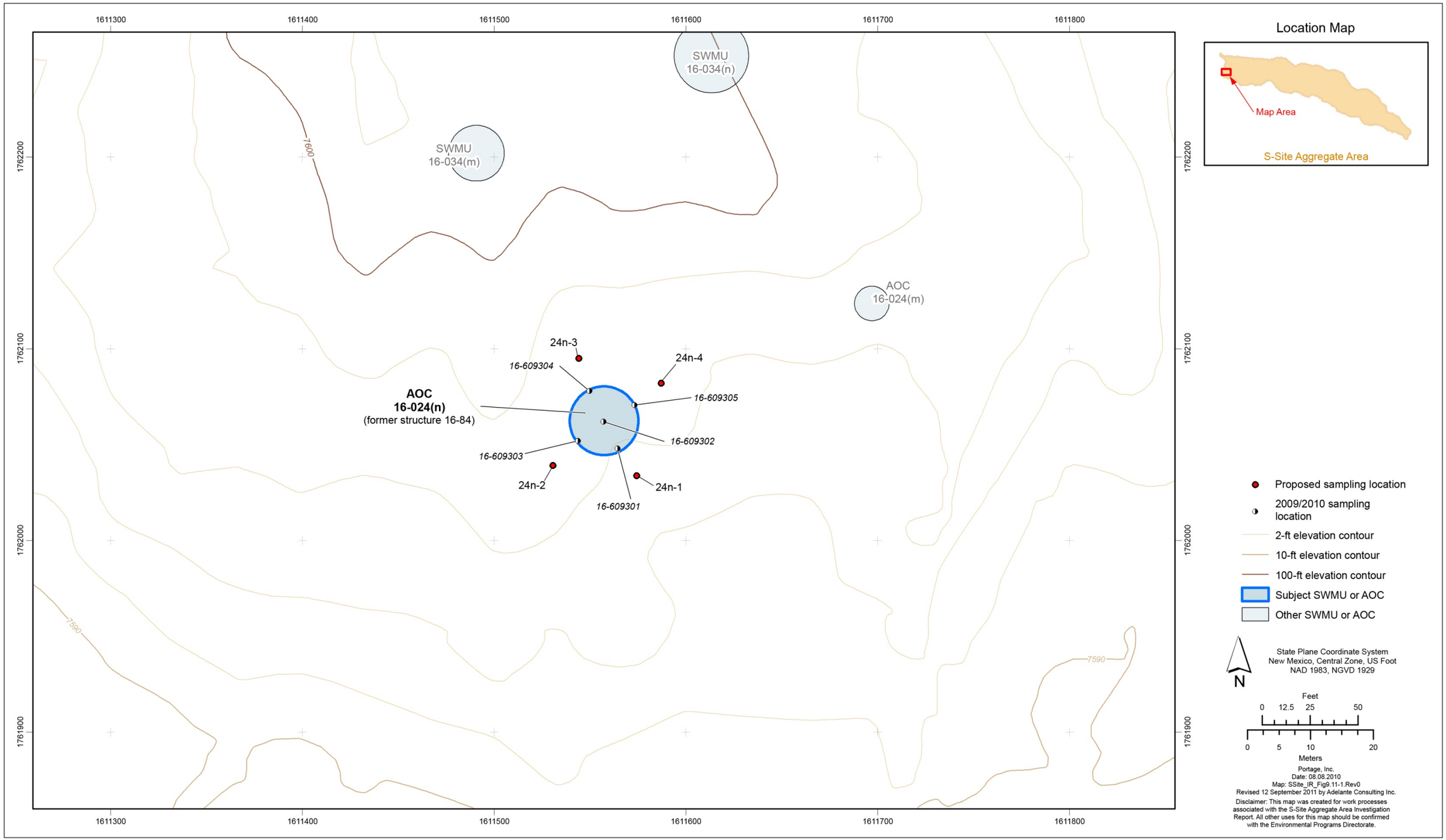


Figure 4.4-28 Proposed sampling locations at AOC 16-024(n)

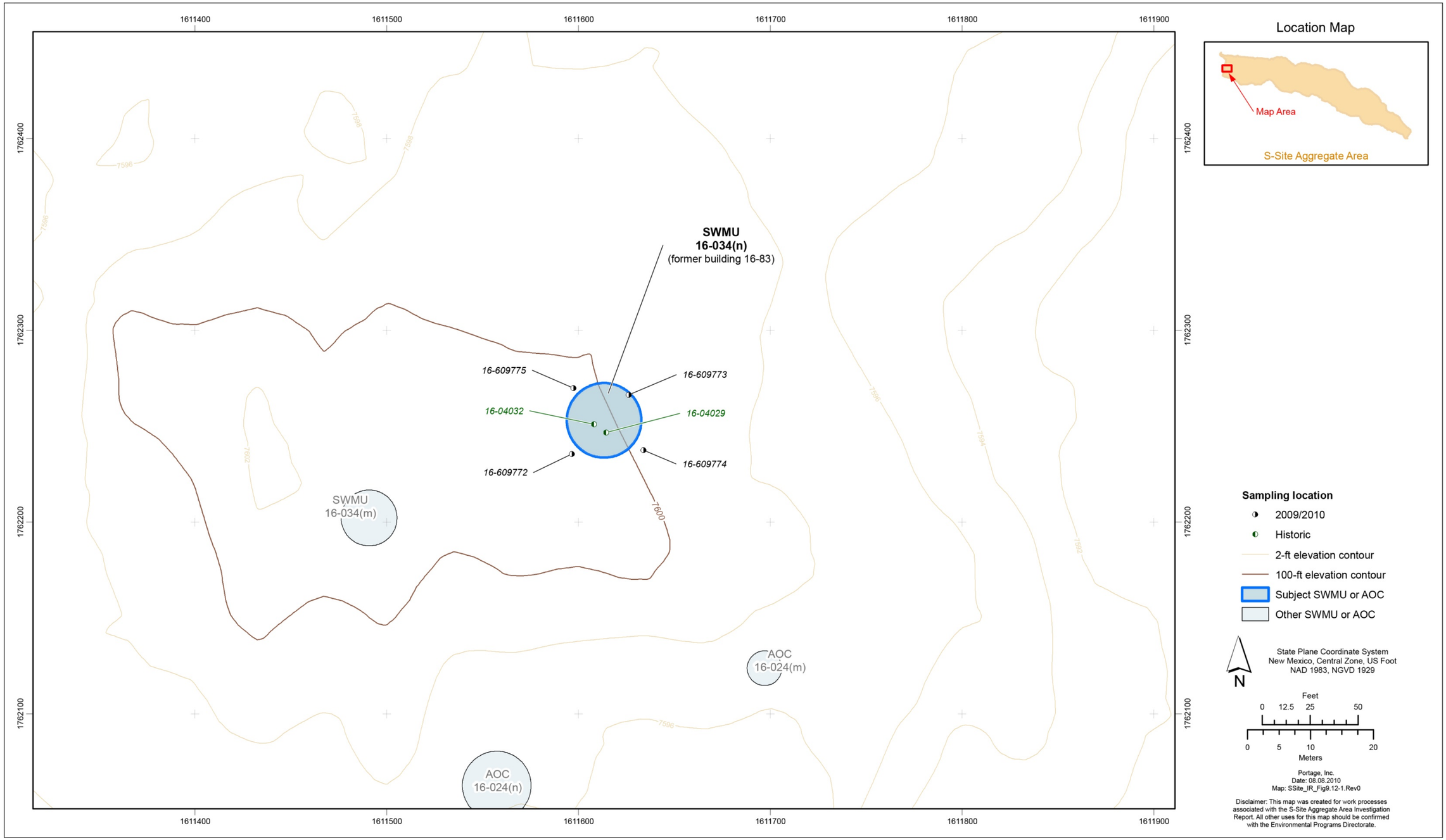


Figure 4.4-29 Site map and sampling locations at SWMU 16-034(n)

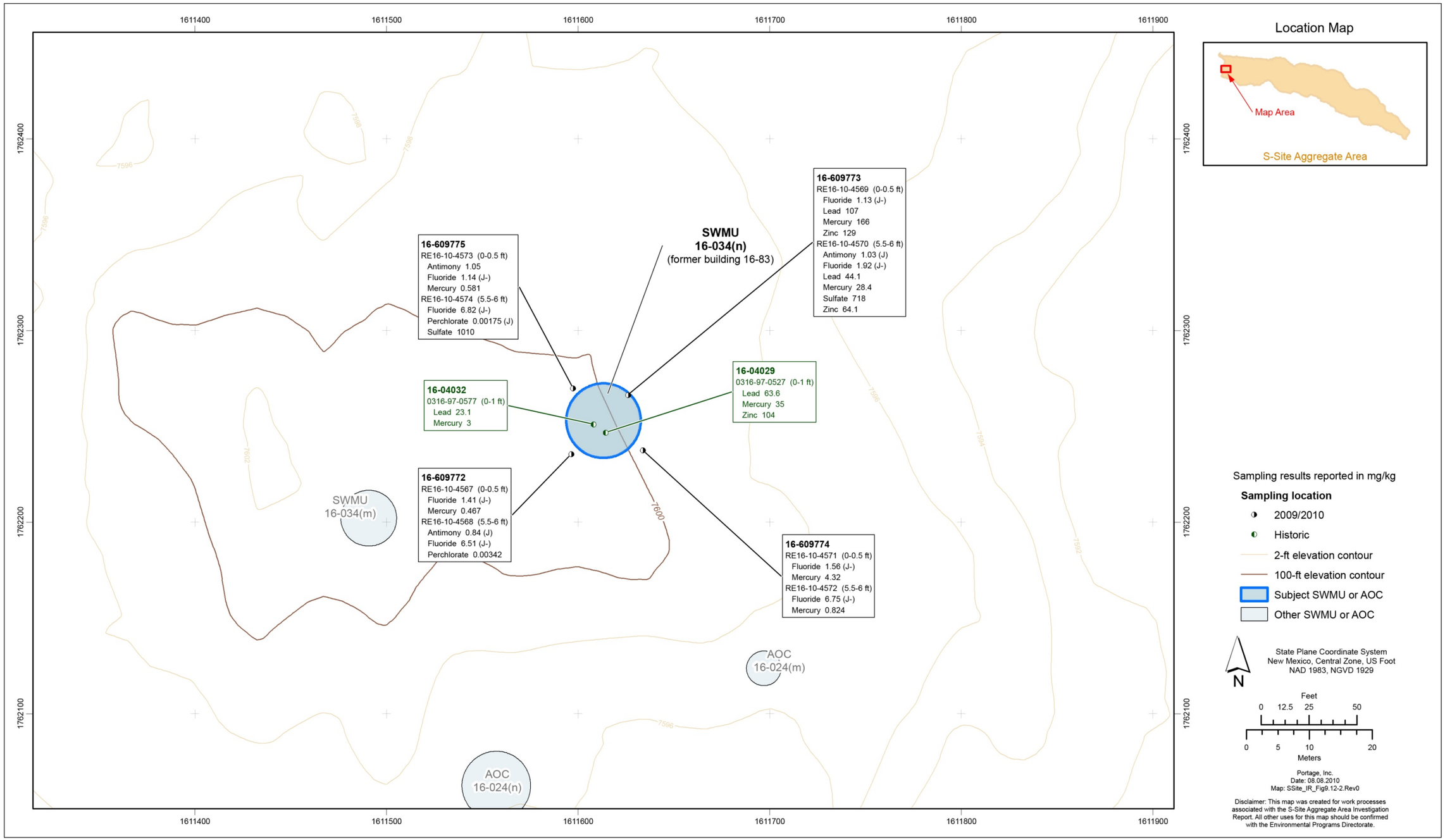


Figure 4.4-30 Inorganic chemicals detected or detected above BVs at SWMU 16-034(n)

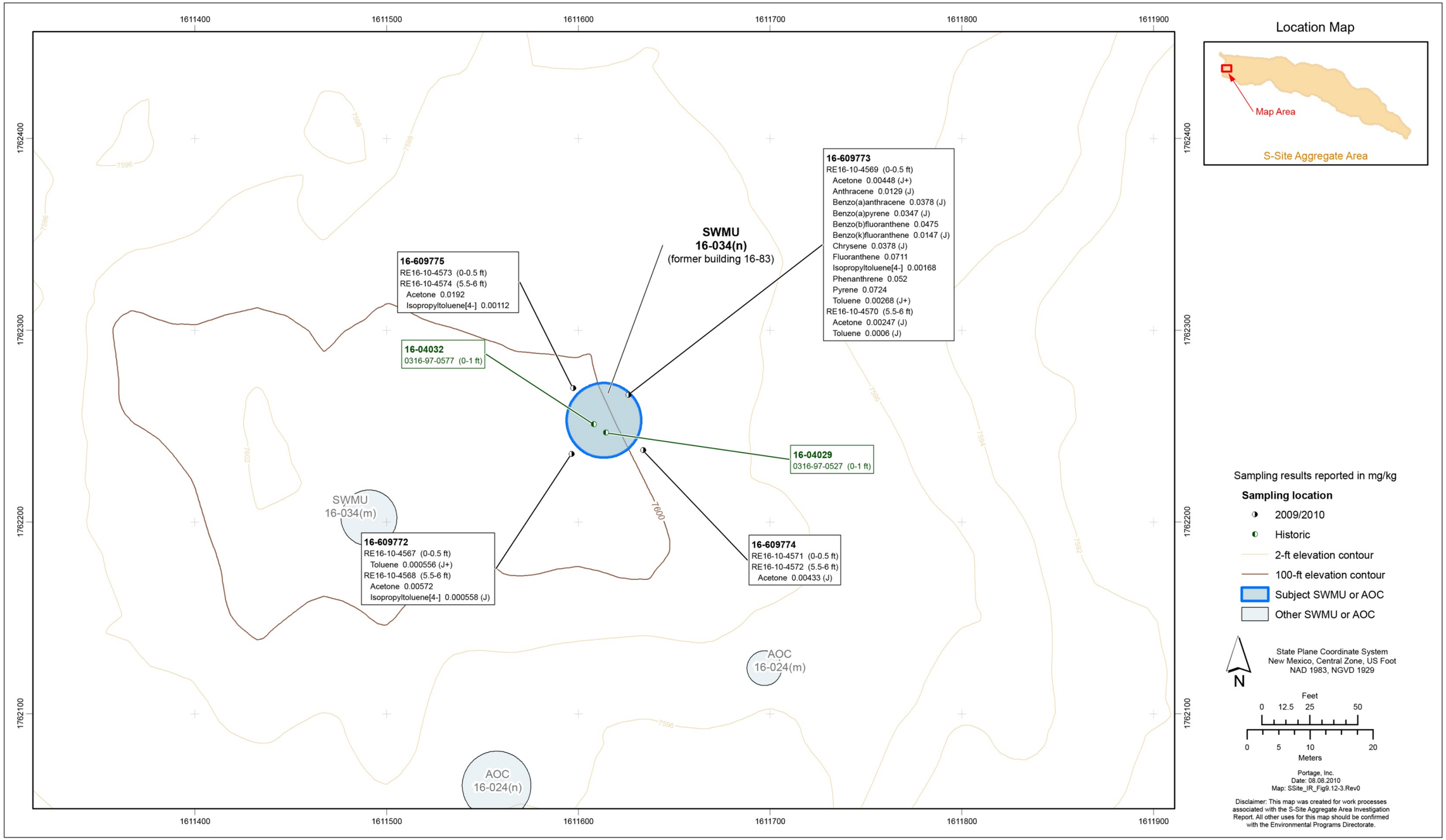


Figure 4.4-31 Organic chemicals detected at SWMU 16-034(n)

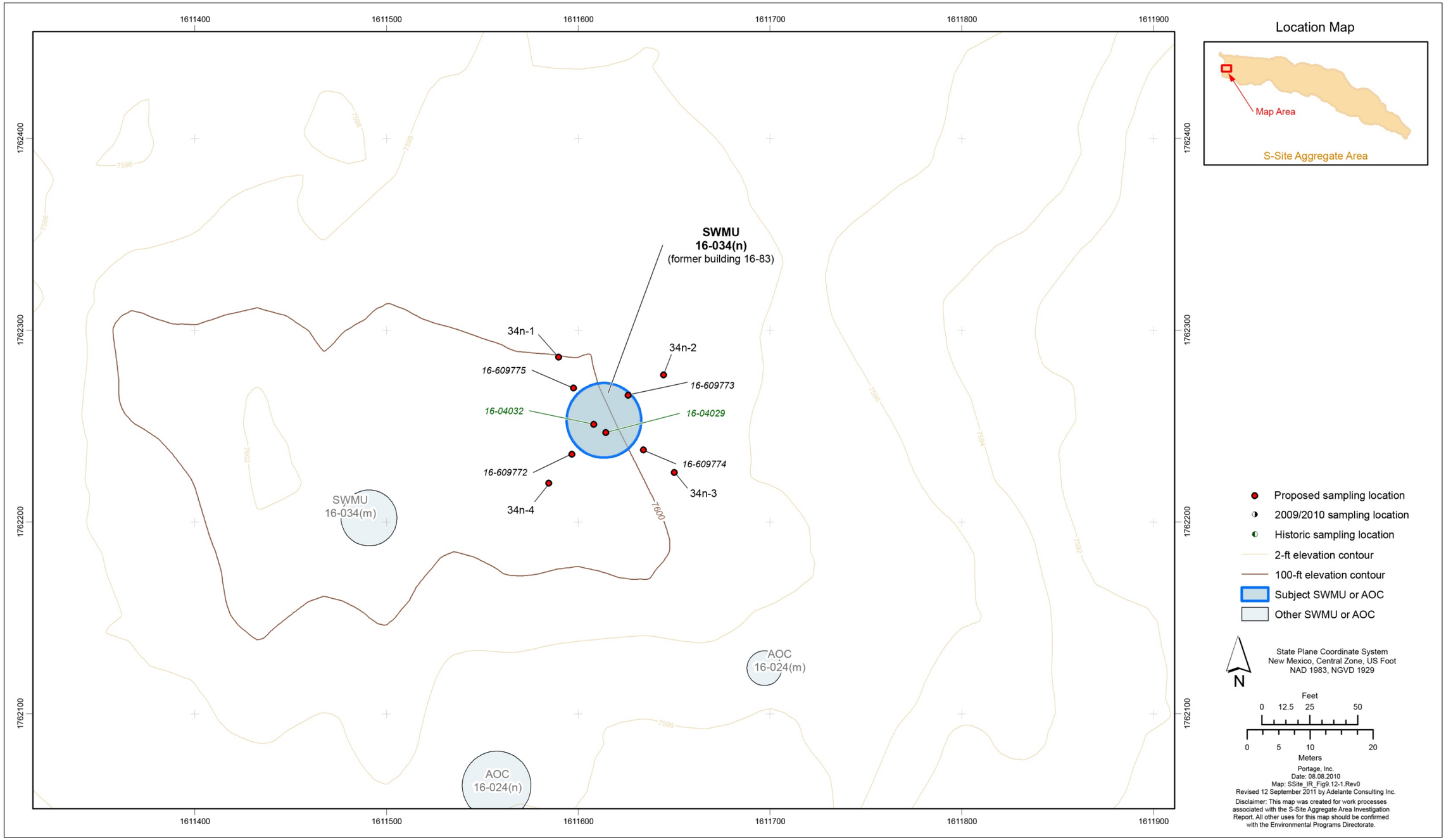


Figure 4.4-32 Proposed sampling locations at SWMU 16-034(n)

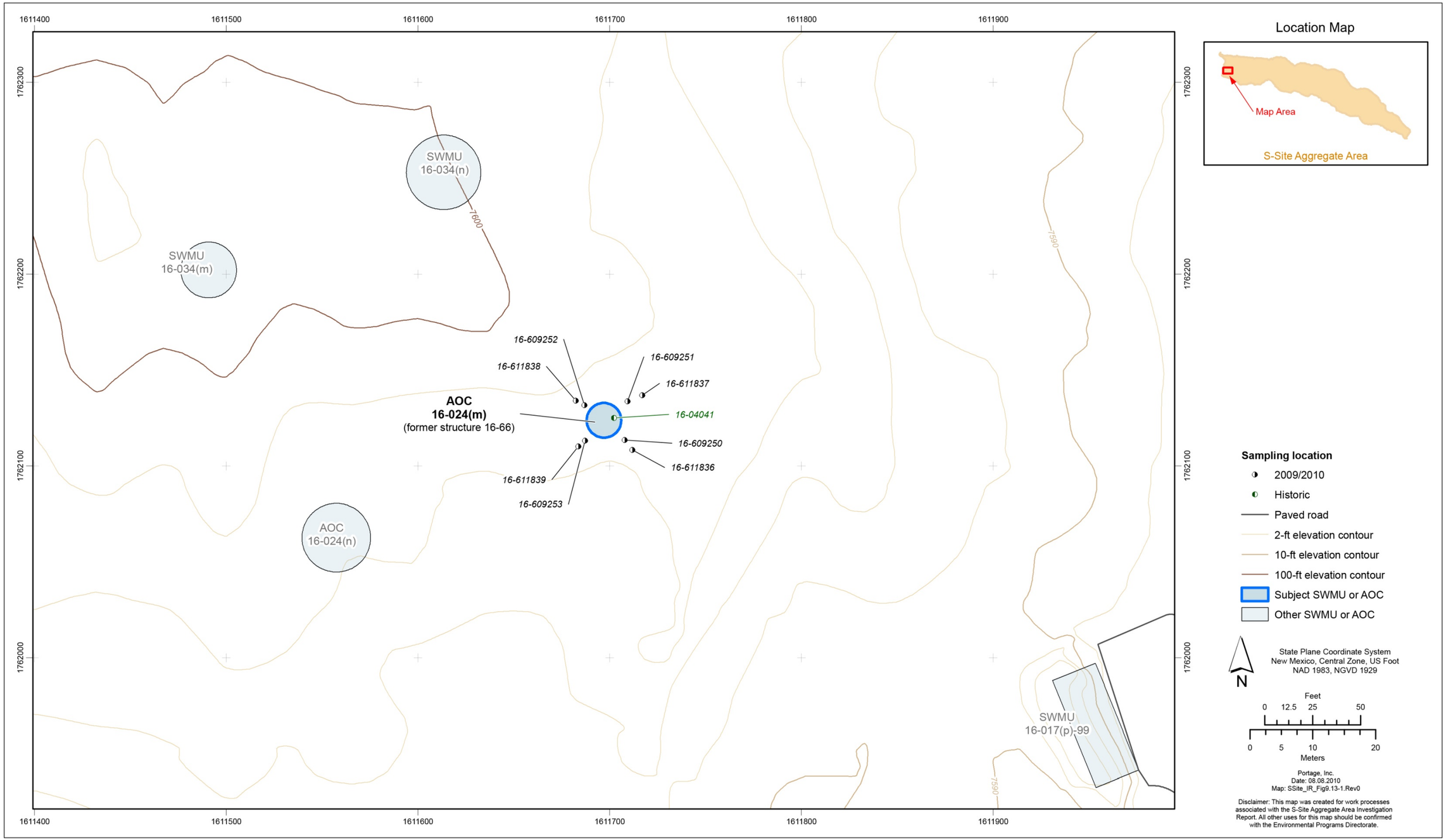


Figure 4.4-33 Site map and sampling locations at AOC 16-024(m)

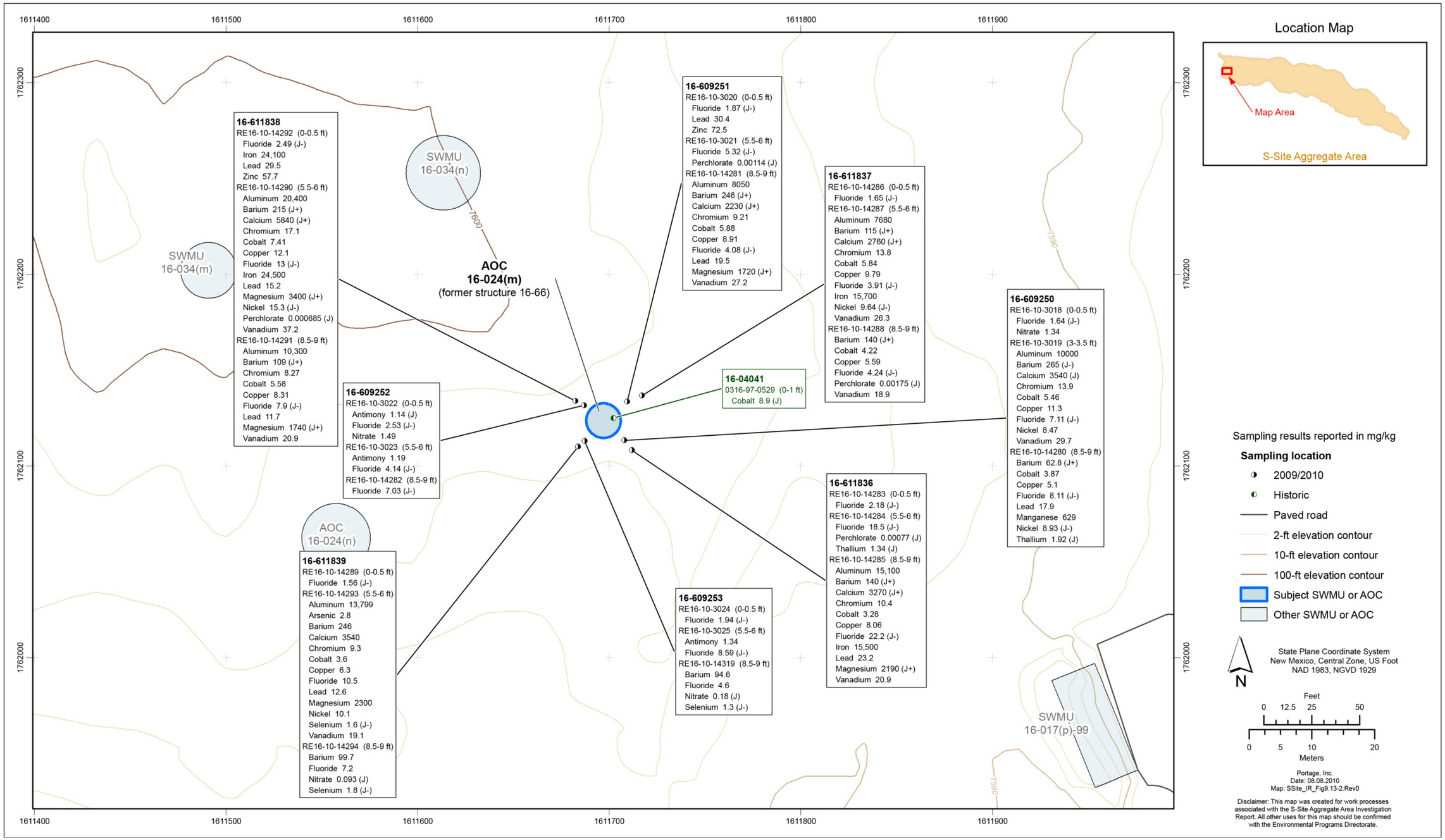


Figure 4.4-34 Inorganic chemicals detected or detected above BVs at AOC 16-024(m)

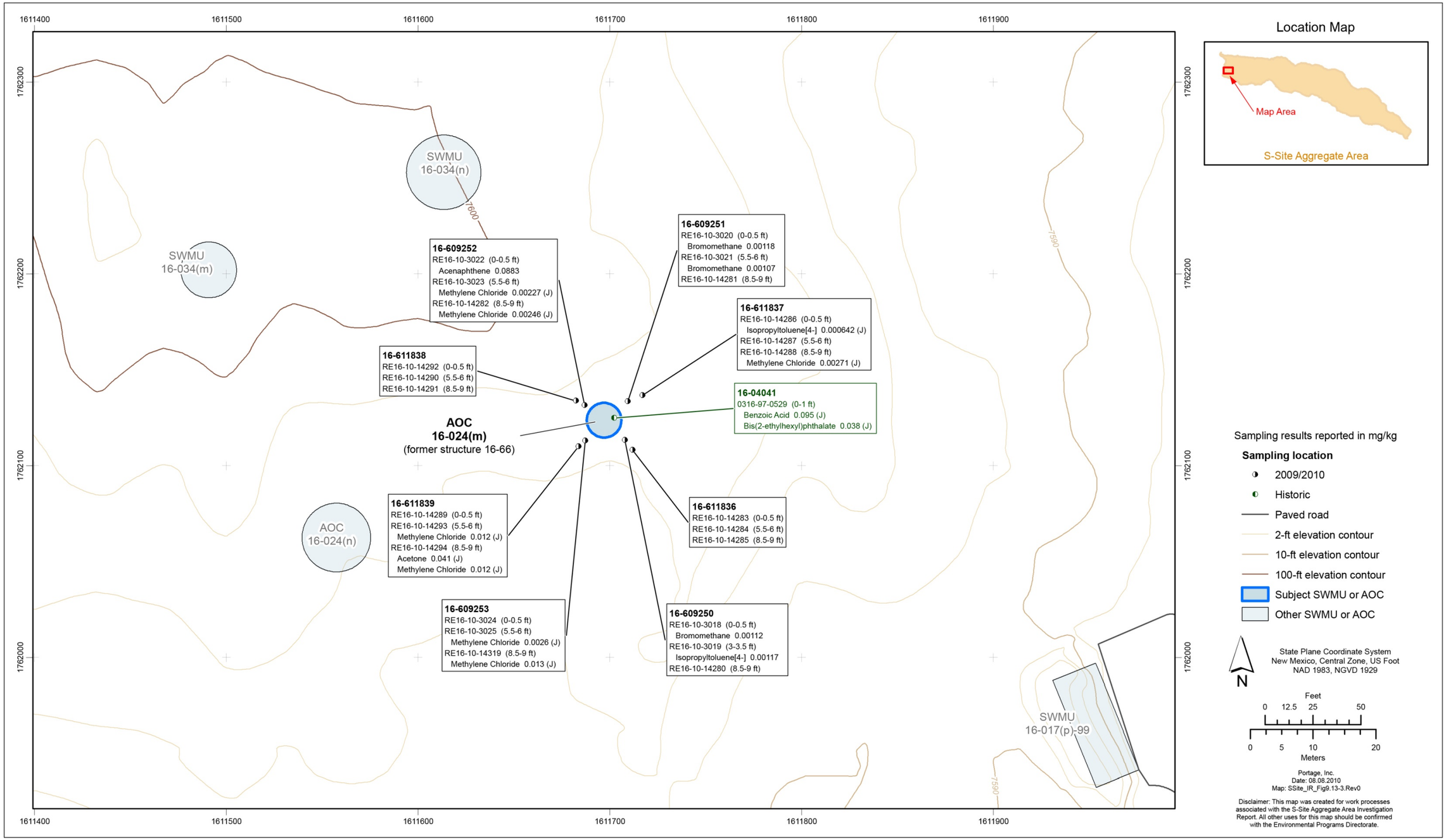


Figure 4.4-35 Organic chemicals detected at AOC 16-024(m)

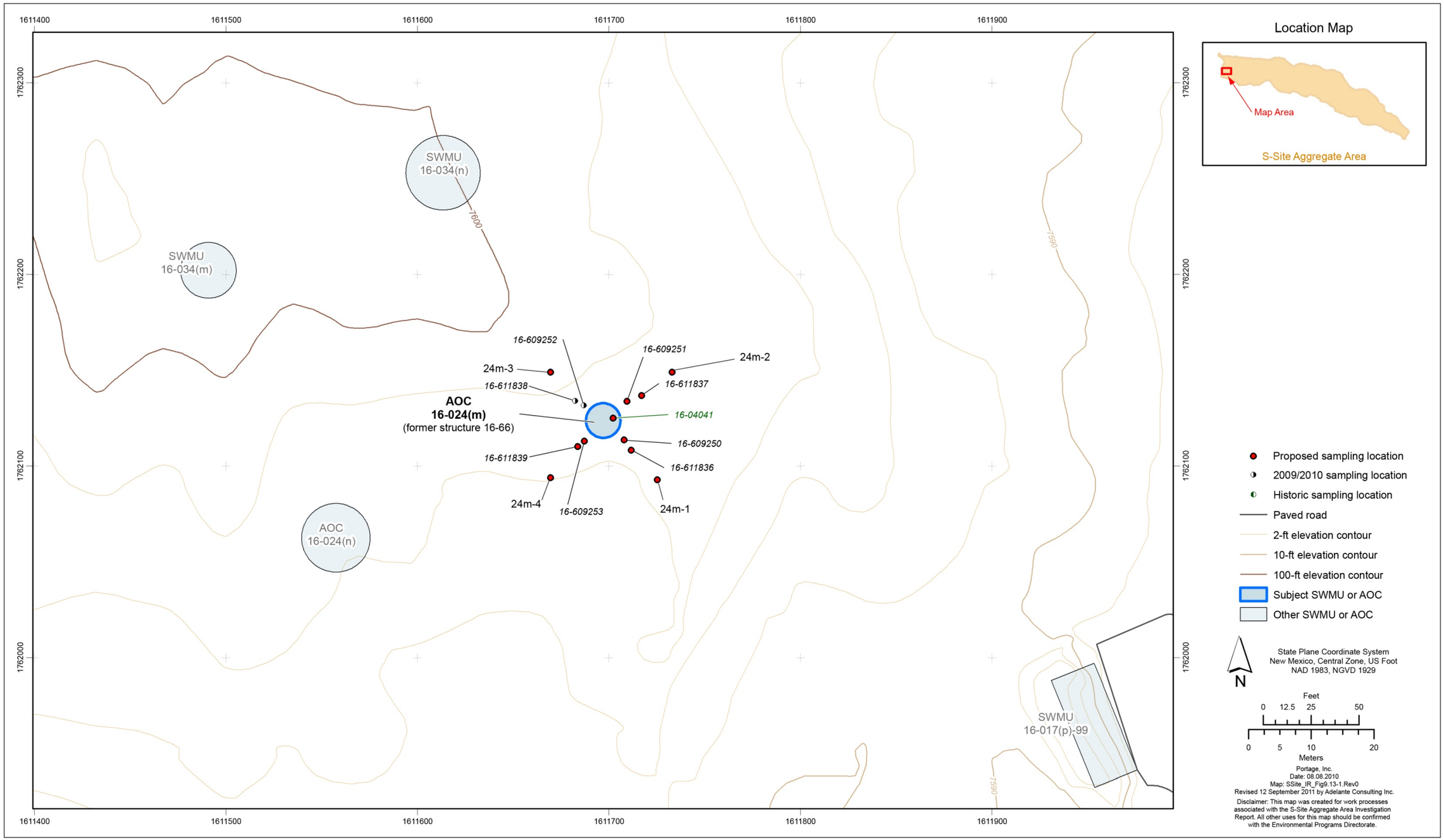


Figure 4.4-36 Proposed sampling locations at AOC 16-024(m)

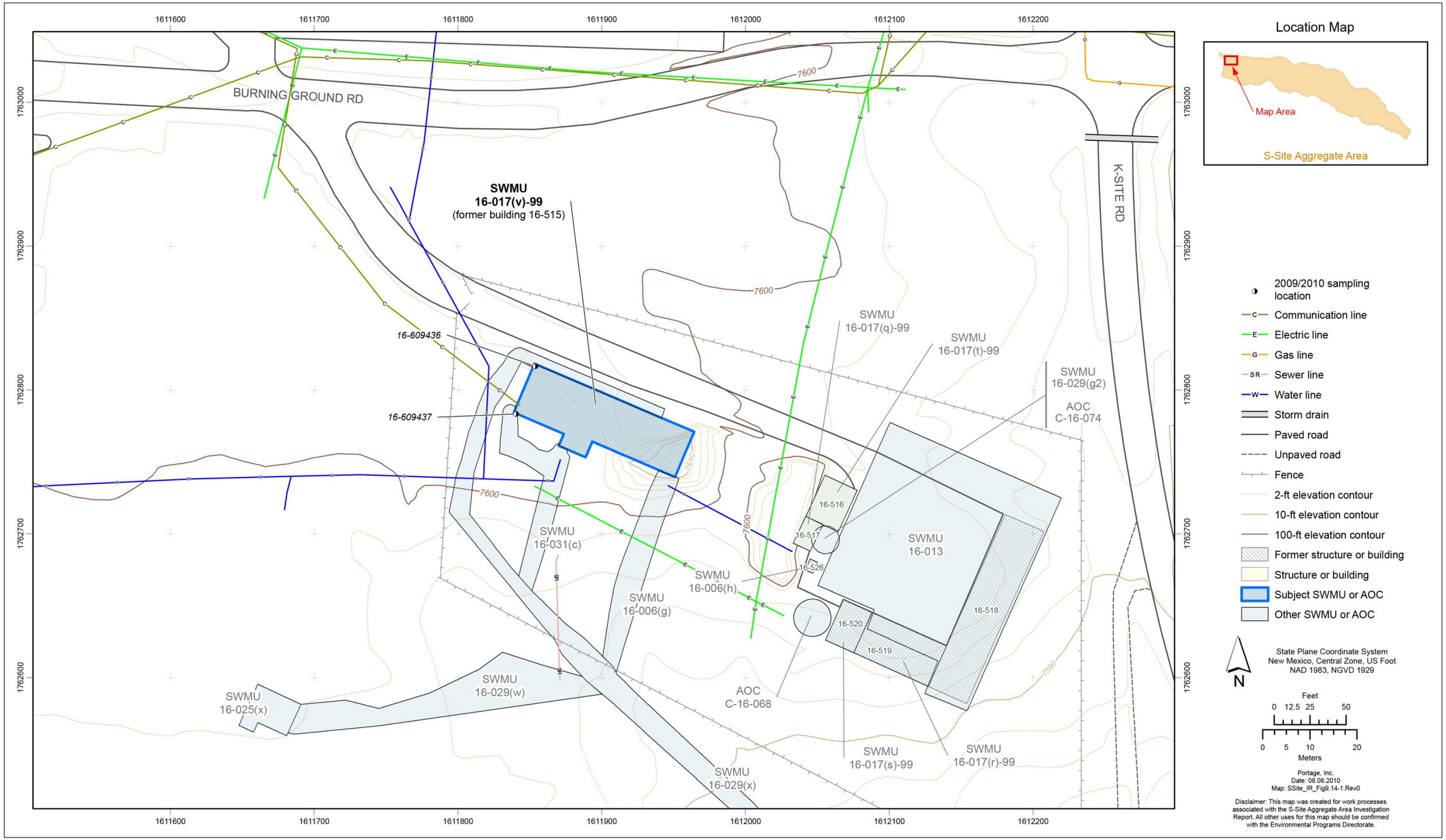


Figure 4.4-37 Site map and sampling locations at SWMU 16-017(v)-99

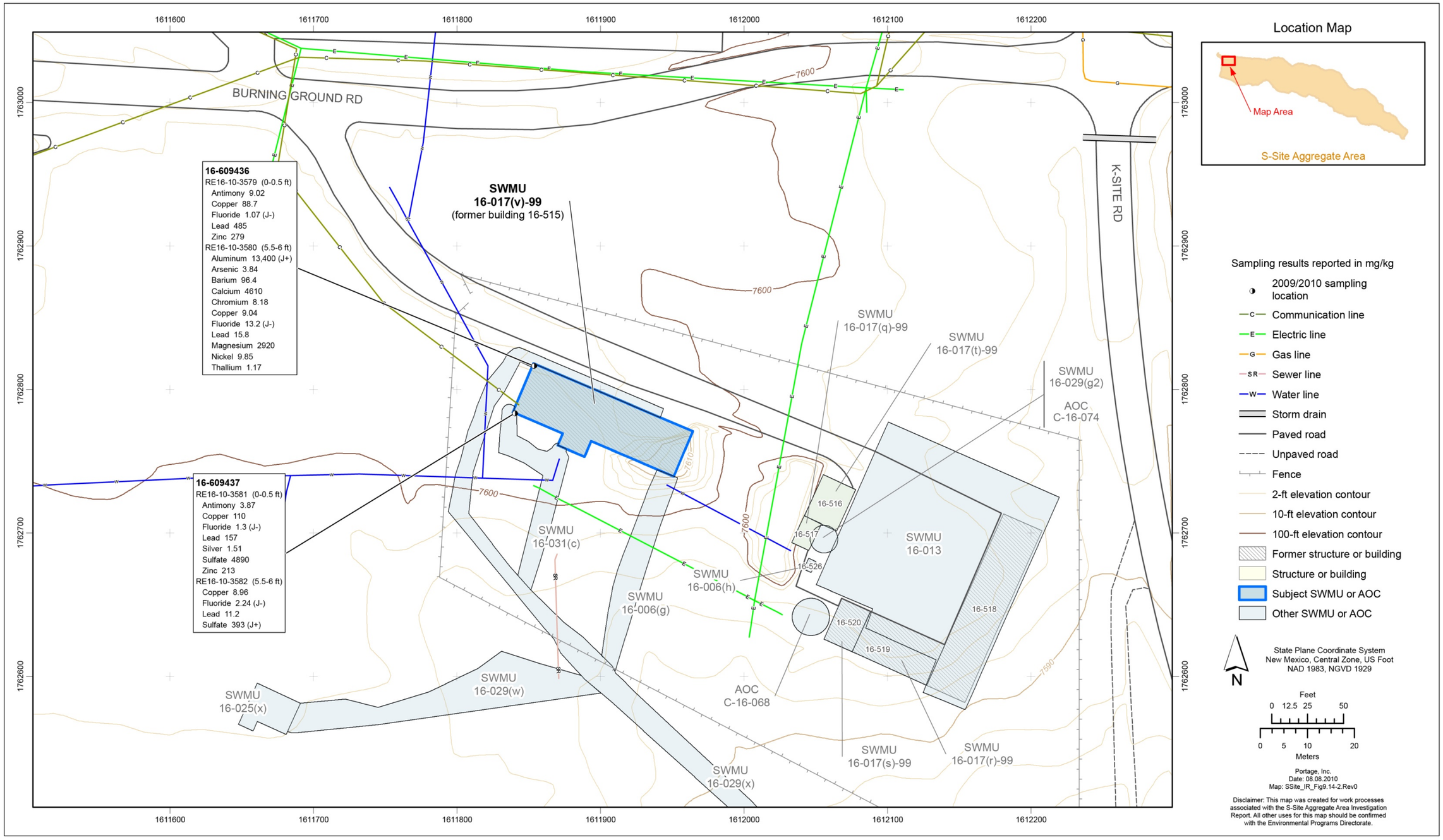


Figure 4.4-38 Inorganic chemicals detected or detected above BVs at SWMU 16-017(v)-99

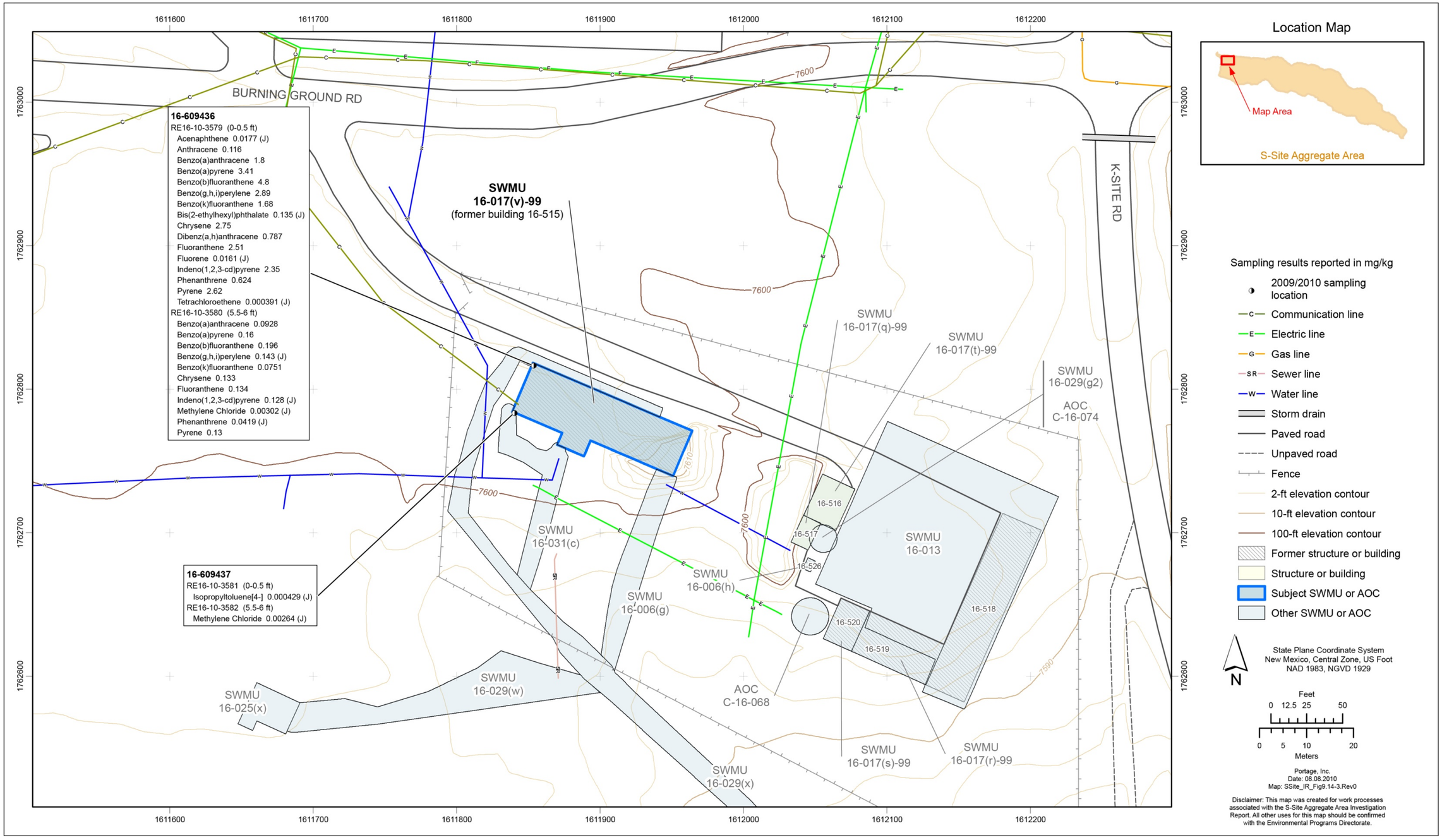


Figure 4.4-39 Organic chemicals detected at SWMU 16-017(v)-99

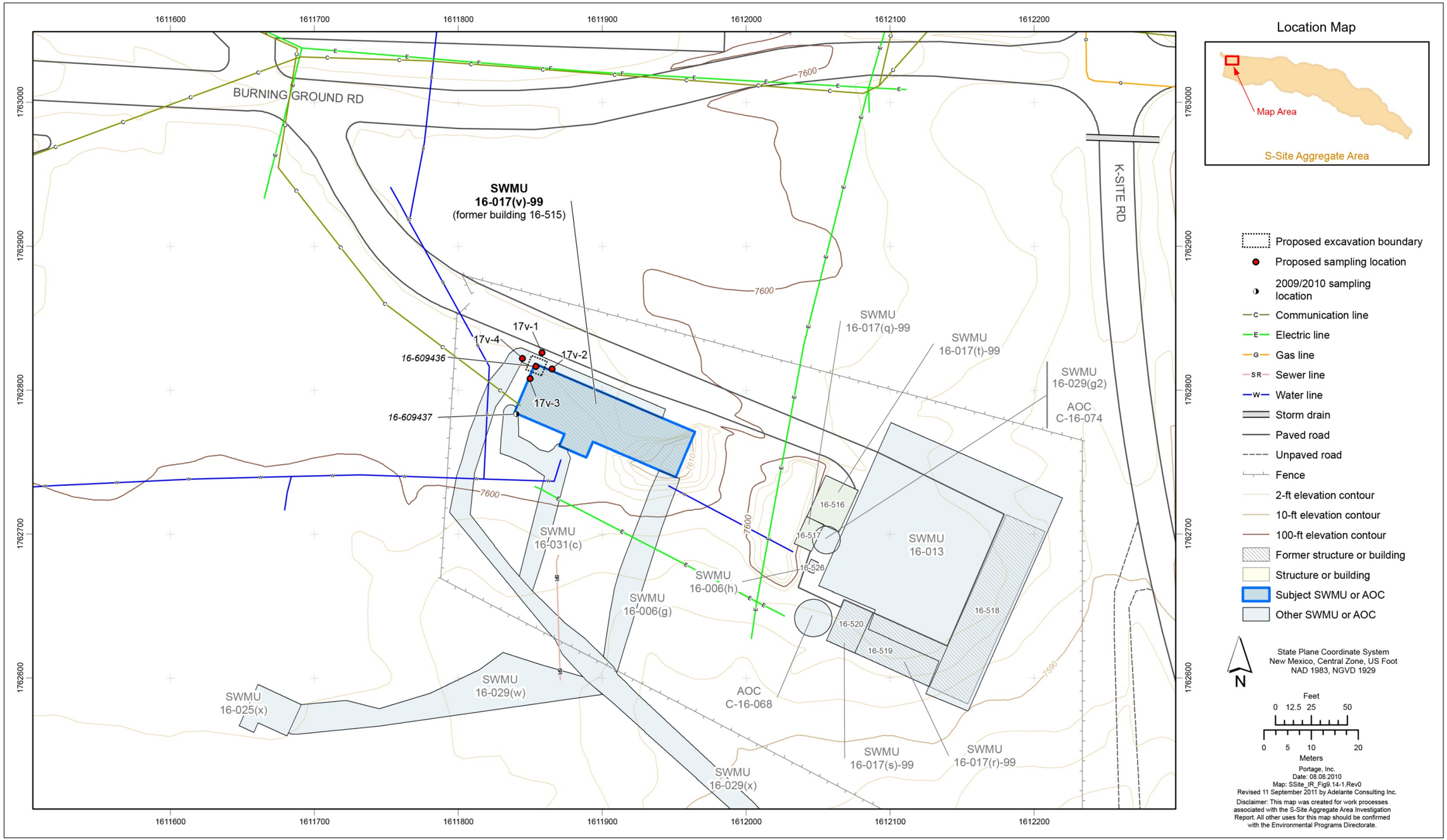


Figure 4.4-40 Proposed sampling locations at SWMU 16-017(v)-99

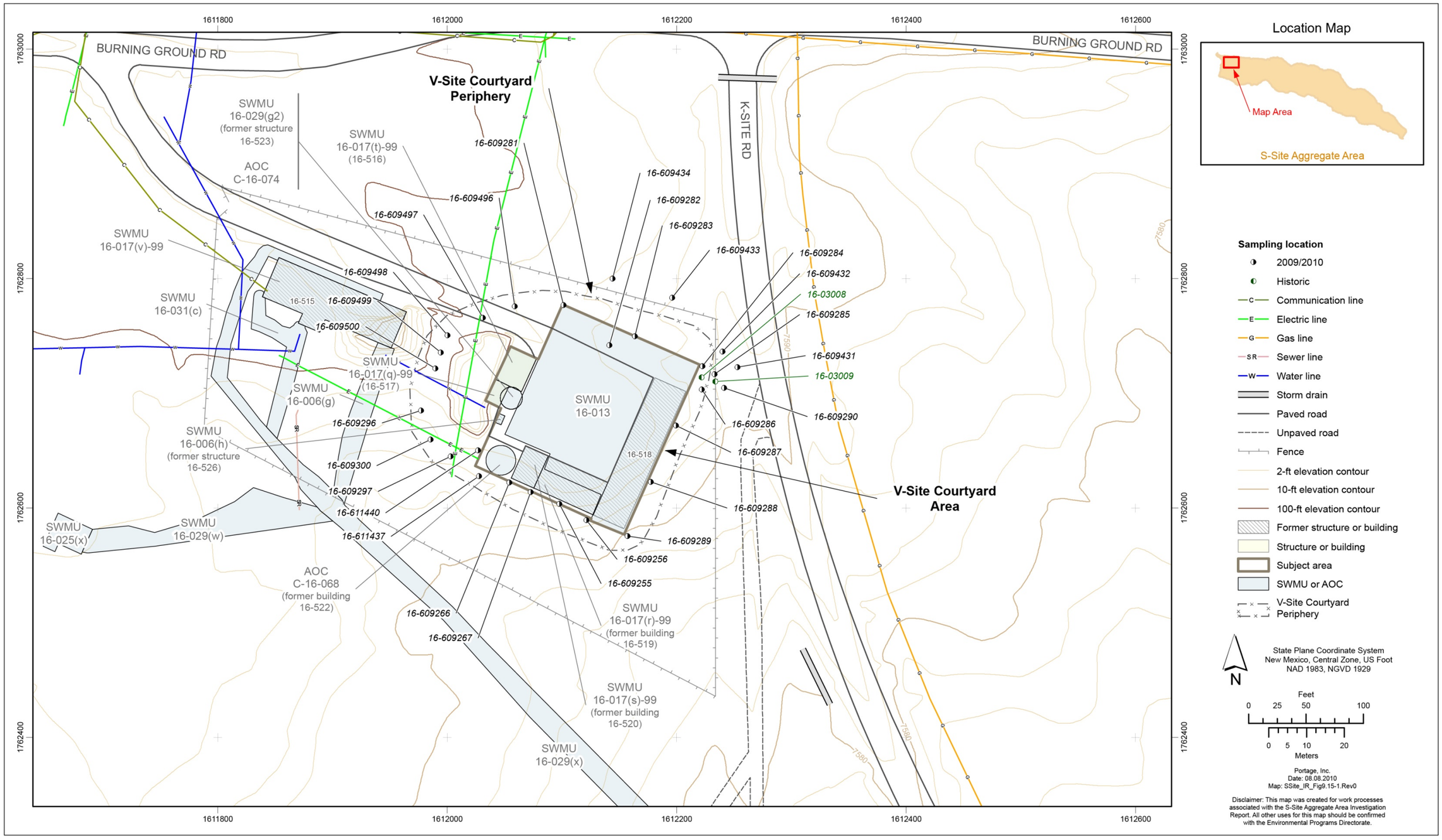


Figure 4.4-41 Site map and sampling locations at the Courtyard Periphery Area and the Drainage North of the Courtyard

Table 1.1-1
Sites under Phase II Investigation in the S-Site Aggregate Area

Consolidated Unit	SWMU/AOC	Site Description	2009–2010 Investigation Results	Proposed Activities
K-Site Subaggregate Area				
	AOC C-11-002	Area of potential soil contamination	Extent not defined: lateral extent of methylene chloride	No additional sampling; results below EQLs
	SWMU 11-005(a)	Septic system	Extent not defined: lateral extent of americium-241 and plutonium-239/240; vertical extent of RDX;	Additional sampling to define extent
	SWMU 11-005(b)	Septic system	Extent not defined: lateral extent of HMX; vertical extent of aluminum, barium, chromium, cobalt, copper, and HMX;	Additional sampling to define extent
11-006(a)-99	SWMU 11-006(a)	HE sump	Extent not defined: lateral and vertical extent of calcium and HMX; lateral extent of copper, lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, and TATB	Additional sampling to define extent
	SWMU 11-006(b)	Catch basin	Extent not defined: lateral and vertical extent of antimony, iron, lead, and vanadium; lateral extent of uranium-238; vertical extent of aluminum, barium, beryllium, bromide, calcium, chromium, cobalt, copper, nickel, perchlorate, HMX, RDX, and TATB	Additional sampling to define extent
	SWMU 11-006(c)	Catch basin	Extent not defined: lateral and vertical extent of plutonium-239/240; lateral extent of RDX; vertical extent of chromium, copper, acenaphthene, and HMX	Additional sampling to define extent
	SWMU 11-006(d)	Catch basin	Extent not defined: lateral extent of total cyanide, uranium-234, and uranium-238; vertical extent of barium, acetone, benzoic acid, HMX, and TATB	Additional sampling to define extent
	SWMU 11-005(c)	Outfall and drainline	Extent not defined: vertical extent of aluminum, barium, chromium, copper, HMX, and uranium-235/236	Additional sampling to define extent
11-011(a)-00	SWMU 11-011(a)	Outfall and drainline	Extent not defined: vertical extent of aluminum, barium, calcium, chromium , copper, nickel, uranium-234, and uranium-238	Additional sampling to define extent
	SWMU 11-011(b)	Outfall and drainline	Extent not defined: lateral and vertical extent of toluene; vertical extent of barium, chromium, copper, acetone, and 4-isopropyltoluene	Additional sampling to define extent

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	2009–2010 Investigation Results	Proposed Activities
	SWMU 11-011(d)	Outfall	Extent not defined: lateral and vertical extent of chromium, nickel and selenium; lateral extent of copper, uranium-234, uranium-235/236, and uranium-238	Additional sampling to define extent
P-Site Subaggregate Area				
	SWMU 16-025(d2)	Potential soil contamination associated with former building 16-480	Extent not defined: vertical extent of acenaphthene, anthracene, benzo(a)anthracene, fluoranthene, fluorene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, and cesium-137	Additional sampling to define extent
	SWMU 16-031(h)	Outfall	Extent not defined: lateral and vertical extent of aluminum, antimony, barium, and selenium; lateral extent of mercury and TATB	Additional sampling to define extent
	AOC 16-024(a)	Potential soil contamination associated with former magazine16-488	Extent not defined: lateral and vertical extent of aluminum, barium, calcium, cobalt, copper, nickel; lateral extent of vanadium, cesium-137, and plutonium-239/240; vertical extent of bromide, sulfate, and perchlorate	Additional sampling to define extent
	AOC 16-024(u)	Potential soil contamination associated with former magazine16-481	Extent not defined: lateral and vertical extent of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene; lateral extent of acenaphthene, anthracene, dibenz(a,h)anthracene, dibenzofuran, fluorene, 2-methylnaphthalene, and naphthalene	Additional sampling to define extent. Removal of benzo(a)pyrene above industrial SSLs.
	AOC C-16-050	Former building 16-482	Extent not defined: lateral and vertical extent of selenium; lateral extent of calcium and perchlorate	Additional sampling to define extent Removal of benzo(a)pyrene above industrial SSLs.
	AOC C-16-060	Former building 16-479	Extent not defined: lateral extent of acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzoic acid, chrysene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene	Additional sampling to define extent

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	2009–2010 Investigation Results	Proposed Activities
13-001-99	SWMUs 13-001, 13-004, 16-035, 16-036	Firing site, burning pits, and potential soil contamination	Extent not defined: lateral and vertical extent of chromium; lateral extent of barium; vertical extent of aluminum, antimony, arsenic, calcium, copper, lead, mercury, perchlorate, zinc, acenaphthene, acetone, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, and TATB	Additional sampling to define extent
	SWMU 13-002	Surface disposal area	Extent not defined: lateral and vertical extent of chromium; lateral extent of mercury and trichloroethene; vertical extent of barium	Additional sampling to define extent
16-029(h)-99	SWMU 16-029(h)	Outfall and drainlines	Extent not defined: lateral and vertical extent of chromium; lateral extent of lead and americium-241; vertical extent of aluminum, antimony, arsenic, barium, copper, iron, nickel, acetone, 2-butanone, and cesium-137	Additional sampling to define extent
	AOC 16-003(p)	Sump	Extent not defined: lateral and vertical extent of acetone and 2-butanone; lateral extent of nickel; vertical extent of barium, cobalt, HMX, and RDX	Additional sampling to define extent
16-004(a)-99	SWMU 16-004(a)	Imhoff tank	Nature and extent defined for inorganic and organic chemicals and radionuclides detected at accessible sampling locations. Proposed sampling location beneath center of Imhoff tank not accessible during site investigation; therefore extent of contamination is not defined.	None; delayed until after D&D of structure 16-530
	SWMU 16-004(b)	Trickling filter	Nature and extent defined for inorganic and organic chemicals and radionuclides except vertical extent of uranium-235/236 detected at accessible sampling locations. Proposed sampling location beneath center of trickling filter not accessible during site investigation; therefore extent of contamination is not defined.	None; delayed until after D&D of structure 16-531
	SWMU 16-004(c)	Clarifier tank	Nature and extent defined for inorganic and organic chemicals and radionuclides detected at accessible sampling locations except vertical extent of uranium-235/236. Proposed sampling location beneath center of clarifier tank not accessible during site investigation; therefore extent of contamination is not defined.	None; delayed until after D&D of structure 16-532
	SWMU 16-004(d)	Sludge drying bed	Extent not defined: vertical extent of barium and calcium	Additional sampling to define extent
	SWMU 16-004(f)	Sludge drying bed	Extent not defined: vertical extent of chromium	Additional sampling to define extent

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	2009–2010 Investigation Results	Proposed Activities
300s Line Subaggregate Area				
	SWMU 16-026(z)	Outfall	Extent not defined: lateral and vertical extent of anthracene and phenanthrene; lateral extent of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, and pyrene; vertical extent of barium, cobalt, and naphthalene	Additional sampling to define extent
16-003(d)-99	SWMU 16-001(e)	Dry well	Extent not defined: lateral extent of TNT; vertical extent of barium and acetone;	Additional sampling to define extent
	SWMU 16-003(d)	Sumps	Extent not defined: lateral and vertical extent of selenium; lateral extent of acetone	Additional sampling to define extent
	SWMU 16-003(e)	Sumps	Extent not defined: vertical extent of cobalt, copper, nickel, zinc, HMX, and RDX	Additional sampling to define extent
	SWMU 16-003(f)	Sumps	Extent not defined: vertical extent of arsenic, chromium, cobalt, lead, thallium, acenaphthene, anthracene, fluoranthene, fluorene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, naphthalene, and RDX	Additional sampling to define extent
	SWMU 16-003(g)	Sumps	Extent not defined: vertical extent of barium, calcium, cobalt, lead, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene	Additional sampling to define extent

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	2009–2010 Investigation Results	Proposed Activities
16-026(b)-99	SWMU 16-026(b)	Outfall	Extent not defined: vertical extent of cyanide (total); lateral extent of fluoranthene and phenanthrene	Additional sampling to define extent Removal of benzo(a)pyrene above industrial SSLs
	SWMU 16-026(c)	Outfall	Extent not defined: lateral and vertical extent of barium; lateral extent of selenium and benzoic acid; vertical extent of chromium, copper, and zinc	Additional sampling to define extent
	SWMU 16-026(d)	Outfall	Extent not defined: lateral extent of copper, mercury, and cesium-137; vertical extent of barium, chromium, selenium, vanadium, zinc, benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, diethylphthalate, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, and RDX	Additional sampling to define extent
	SWMU 16-026(e)	Outfall	Extent not defined: lateral extent of RDX; vertical extent of barium, silver, HMX, and plutonium-239/240	Additional sampling to define extent Removal of RDX above industrial SSLs
	SWMU 16-029(a)	Sumps	Extent not defined: lateral and vertical extent of anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, diethylphthalate, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene; lateral extent of acenaphthene; vertical extent of chromium	Additional sampling to define extent Removal of benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene above industrial SSLs
	SWMU 16-029(b)	Sumps	Extent not defined: lateral and vertical extent of calcium, selenium, acetone, benzo(a)anthracene, phenanthrene, pyrene, benzo(b)fluoranthene, chrysene, and fluoranthene	Additional sampling to define extent
	SWMU 16-029(c)	Sumps	Extent not defined: lateral and vertical extent of selenium	Additional sampling to define extent

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	2009–2010 Investigation Results	Proposed Activities
		Shared Drainages	Extent not defined: vertical extent of aluminum, arsenic, barium, calcium, cobalt, chromium, copper, iron, lead, mercury, nickel, vanadium, zinc, acenaphthene, 2-amino-4,6-dinitrotoluene, anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, dibenzofuran, fluoranthene, fluorene, HMX, indeno(1,2,3-cd)pyrene, 2-methylphenol, 4-methylphenol, phenanthrene, pyrene, RDX, tetryl, and TNT	Additional sampling to define extent Removal of benzo(a)pyrene above industrial SSLs
		Liquid Waste Trunk Line	Extent not defined: lateral and vertical extent of aluminum; lateral extent of cobalt; vertical extent of barium, calcium, chloride, chromium, selenium, acetone, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, benzo(g,h,i)perylene, fluoranthene, phenanthrene, pyrene, acenaphthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, bis-2-ethylhexylphthalate, plutonium-238, and uranium-235/236	Additional sampling to define extent
V-Site Subaggregate Area				
16-013-99	AOC C-16-068	Former building 16-522	Extent not defined: lateral and vertical extent of acetone; vertical extent of bis(2-ethylhexyl)phthalate; lateral extent of copper, lead, mercury, and zinc	Additional sampling to define extent
	AOC C-16-074	Storage area	Extent not defined: lateral extent of barium, chromium, cobalt, copper, lead, nickel, and acetone	Nationally significant historical site; further investigation not possible.

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	2009–2010 Investigation Results	Proposed Activities
16-029(x)-99	SWMU 16-029(x)	Former sump and outfall	Extent not defined: lateral and vertical extent of acetone, boron and silver; vertical extent of barium, bromide, chromium, manganese, nickel, selenium, bis(2-chloroethyl)ether, 2,4-dinitrotoluene, HMX, fluoranthene, pyrene, 4-amino-2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, RDX, 1,3,5-trimethylbenzene, TNT, and plutonium-238; lateral extent of copper	Additional sampling to define extent
	SWMU 16-029(w)	Former sump and outfall	Extent not defined: lateral and vertical extent of selenium; vertical extent of aluminum, arsenic, barium, calcium, cobalt, copper, lead, magnesium, nickel, vanadium, zinc, and acetone	Additional sampling to define extent
	SWMU 16-025(x)	Potential soil contamination associated with former building 16-100	Extent not defined: vertical extent of antimony, barium, bromide, lead, and uranium	Additional sampling to define extent
	SWMU 16-017(w)-99	Former storage magazine 16-073	Extent not defined: lateral extent of bromide; vertical extent of cobalt, perchlorate, and 2-butanone	Additional sampling to define extent
	SWMU 16-034(m)	Potential soil contamination associated with former building 16-86	Extent not defined: lateral and vertical extent of aluminum and selenium; lateral extent of 1,2,4-trimeythylbenzene; vertical extent of barium	Additional sampling to define extent
	AOC 16-024(n)	Potential soil contamination associated with former HE storage magazine 16-84	Extent not defined: lateral extent of antimony, cadmium, copper, zinc, benzoic acid, and 4-isopropyltoluene	Additional sampling to define extent
	SWMU 16-034(n)	Potential soil contamination associated with former building 16-83	Extent not defined: lateral and vertical extent of antimony, lead, mercury, zinc, perchlorate, acetone, and 4-isopropyltoluene; lateral extent of benzo(b)fluoranthene, fluoranthene, phenanthrene, pyrene, and toluene	Additional sampling to define extent
	AOC 16-024(m)	Potential soil contamination associated with former HE storage magazine 16-66	Extent not defined: lateral and vertical extent of aluminum, barium, calcium, copper, lead, nickel, selenium, and vanadium; vertical extent of cobalt, thallium, acetone, methylene chloride, benzoic acid, and bis(2-ethylhexyl)phthalate; lateral extent of chromium	Additional sampling to define extent
16-029(x)-99	SWMU 16-017(v)-99	Former HE processing building 16-515	Extent not defined: vertical extent of aluminum, barium, calcium, magnesium, and nickel	Additional sampling to define extent. Removal of benzo(a)pyrene above industrial SSLs

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	2009–2010 Investigation Results	Proposed Activities
16-013-99	SWMUs 16-006(h), 16-013, 16-017(q)-99, 16-017(r)-99, 16-017(s)-99, and 16-017(t)-99	Courtyard Periphery Area	Extent not defined: lateral and vertical extent of aluminum, arsenic, copper, lead, thallium, zinc, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, fluorene, 2-methylnaphthalene, naphthalene, dibenzofuran, benzo(g,h,i)perylene, chrysene, diphenylamine, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, acetone, 4-isopropyltoluene, and toluene; lateral extent of barium, calcium, cobalt, silver, HMX, and RDX; vertical extent of selenium	Nationally significant historical site; further investigation not possible.
16-029(x)-99	SWMU 16-006(g)	Former septic system	Extent not defined: not sampled because of historic preservation constraints	Nationally significant historical site; further investigation not possible.
	SWMU 16-031(c)	Former drainline	Extent not defined: not sampled because of historic preservation constraints	Nationally significant historical site; further investigation not possible.

Table 4.1-1
Proposed Sampling and Analysis at SWMU 11-005(a)

Sampling Objective	Location Number	Depth (ft bgs)	Explosive Compounds (EPA SW-846:8321A_MOD)	Americium-241 (HASL-300)	Isotopic Plutonium (HASL 300) Isotopic
Define vertical extent of RDX	11-608728	11–12, 16–17	X[a,b]	—[c]	—
Define lateral extent of americium-241 and plutonium-239/240 downgradient of location 11-608734	5a-1, 5a-2, 5a-3	0–1, 5–6	X[d]	X	X

[a] X = Analysis will be performed.

[b] RDX only.

[c] — = Analysis will not be performed.

[d] HMX only.

Table 4.1-2
Proposed Sampling and Analysis at SWMU 11-005(b)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of aluminum, barium, chromium, cobalt, copper, and HMX	11-608785	13–14, 18–19	X[a,b]	—[c]
	11-608789	14–15, 19–20	—	X[d]
	11-608790	13–14, 18–19	—	X[d]
	11-608791	13–14, 18–19	X[b]	—
	11-608793	10–11, 15–16	X[e]	—
	11-608795	12–13, 17–18	X[f]	—

[a] X = Analysis will be performed.

[b] Barium and chromium only.

[c] — = Analysis will not be performed.

[d] HMX only.

[e] Barium only.

[f] Aluminum, cobalt, and copper only.

Table 4.1-3
Proposed Sampling and Analysis at SWMU 11-006(a)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of calcium and HMX	11-608776	11–12, 16–17	X[a,b]	—[c]
	11-608780	15–16, 20–21	—	X[d]
	11-608781	9–10, 14–15	—	X[d]
	11-608782	9–10, 14–15	—	X[d]

[a] X = Analysis will be performed.

[b] Calcium only.

[c] — = Analysis will not be performed.

[d] HMX only.

Table 4.1-4
Proposed Sampling and Analysis at SWMU 11-006(b)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Anions (EPA 300)	Perchlorate (EPA SW-846:6850)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of aluminum, antimony, barium, beryllium, bromide, calcium, chromium, cobalt, copper, iron, lead, nickel, perchlorate, vanadium, HMX, RDX, and TATB	11-608816	6–7, 11–12	X[a,b]	—[c]	—	—
	11-608818	6–7, 11–12	X[d]	—	—	—
	11-608820	6–7, 11–12	X[e]	X[f]	X	—
	11-608822	9–10, 14–15	X[g]	—	—	—
	11-608823	9–10, 14–15	X[h]	—	X	—
	11-608827	10–11, 15–16	X[i]	X[f]	X	—
	11-608829	10–11, 15–16	X[j]	X[f]	X	—
	11-608831	6–7, 11–12	—	—	—	X[k]
	11-608832	13–14, 18–19	X[l]	—	—	X[m]

[a] X = Analysis will be performed.

[b] Copper, iron, lead, and vanadium only.

[c] — = Analysis will not be performed.

[d] Chromium and copper only.

[e] Aluminum, antimony, barium, and calcium only.

[f] Bromide only.

[g] Chromium, cobalt, copper, iron, nickel, and vanadium only.

[h] Aluminum and copper only.

[i] Calcium, copper, and nickel only.

[j] Aluminum, beryllium, and copper only.

[k] HMX and TATB only.

[l] Beryllium, calcium, copper, and nickel only.

[m] RDX only.

Table 4.1-5
Proposed Sampling and Analysis at SWMU 11-006(c)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Isotopic Plutonium (HASL 300) Isotopic
Determine vertical extent of chromium, copper, acenaphthene, HMX, and plutonium-239/240	11-05902 11-608746 11-608748 11-608749	5–6, 10–11 8–9, 13–14 6–7, 11–12 7–8, 12–13	—[a] — X[d] X[d]	— — — X[e]	X[b,c] — — —	— X — —

[a] — = Analysis will not be performed.

[b] X = Analysis will be performed.

[c] HMX only.

[d] Chromium and copper only.

[e] Acenaphthene only.

Table 4.1-6
Proposed Sampling and Analysis at SWMU 11-006(d)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of barium, acetone, benzoic acid, HMX, and TATB	11-608767 11-608773	13–14, 18–19 9–10, 14–15	X[a,b] —	—[c] X[e]	— X[f]	X[d] —

[a] X = Analysis will be performed.

[b] Barium only.

[c] — = Analysis will not be performed.

[d] HMX and TATB only.

[e] Acetone only.

[f] Benzoic acid only.

Table 4.1-7
Proposed Sampling and Analysis at SWMU 11-005(c)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Explosive Compounds (EPA SW-846:8321A_MOD)	Isotopic Uranium (HASL-300)
Define vertical extent of aluminum, barium, chromium, copper, HMX, and uranium-235/236	11-608751 11-608754 11-608756 11-608757	10–11, 15–16 10–11, 15–16 10–11, 15–16 10–11, 15–16	X[a,b] X[d] — X[f]	—[c] — X[e] —	X — — —

[a] X = Analysis will be performed.

[b] Aluminum and barium only.

[c] — = Analysis will not be performed.

[d] Chromium only.

[e] HMX only.

[f] Copper and chromium only.

Table 4.1-8
Proposed Sampling and Analysis at SWMU 11-011(a)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Isotopic Uranium (HASL-300)
Define vertical extent of aluminum, barium, calcium, chromium, copper, nickel, uranium-234, and uranium-238	11-608797 11-608798 11-608803 11-608804	8–9, 13–14 10–11, 15–16 8–9, 13–14 8–9, 13–14	X[a,b] — X[d] X[e]	—[c] X — —

[a] X = Analysis will be performed.

[b] Chromium and copper only.

[c] — = Analysis will not be performed.

[d] Aluminum, barium, calcium, chromium, and nickel only.

[e] Chromium only.

Table 4.1-9
Proposed Sampling and Analysis at SWMU 11-011(b)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)
Vertical extent of barium, chromium, copper, acetone, 4-isopropyltoluene, and toluene	11-608808 11-608812	10–11, 15–16 6–7, 11–12	X[a,b] —	—[c] X[d]

[a] X = Analysis will be performed.

[b] Barium, chromium, and copper only.

[c] — = Analysis will not be performed.

[d] Acetone, 4-isopropyltoluene, and toluene only.

Table 4.1-10
Proposed Sampling and Analysis at SWMU 11-011(d)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Isotopic Uranium (HASL-300)
Define vertical extent of chromium, nickel, and selenium	11-608764	8–9, 13–14	X[a,b]	—[c]
Define lateral extent of copper, uranium-234, and uranium-238 west of location 11-608761	11d-1 11d-2	0–1, 6–7 0–1, 6–7	X[d] X[d]	X X
Define lateral extent of copper and uranium-235/236 east of location 11-608762	11d-3 11d-4	0–1, 5–6 0–1, 5–6	X[d] X[d]	X X

[a] X = Analysis will be performed.

[b] Chromium, nickel, and selenium only.

[c] — = Analysis will not be performed.

[d] Copper only.

Table 4.2-1
Proposed Sampling and Analysis at SWMU 16-025(d2)

Sampling Objective	Location Number	Depth (ft bgs)	SVOCs (EPA SW-846:8270C)	Cesium-137 (EPA 901.1M)
Define vertical extent of acenaphthene, anthracene, benzo(a)anthracene, fluoranthene, fluorene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, and cesium-137	16-608952 16-608954	10–11, 15–16 10–11, 15–16	—[a] X[c]	X[b] —

[a] — = Analysis will not be performed.

[b] X = Analysis will be performed.

[c] PAHs only.

Table 4.2-2
Proposed Sampling and Analysis at SWMU 16-031(h)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of aluminum, antimony, barium, and selenium	16-608696 16-608697 16-611905 16-611906	10–11, 15–16 10–11, 15–16 10–11, 15–16 10–11, 15–16	X[a,b] X[d] X[e] X[f]	—[c] — — —
Define lateral extent of aluminum, barium, mercury, and TATB downgradient of location 16-608696	31h-1 31h-2 31h-3 31h-4	0–1, 5–6 0–1, 5–6 0–1, 5–6 0–1, 5–6	X[g] X[g] X[g] X[g]	X[h] X[h] X[h] X[h]
Define lateral extent of antimony and selenium east of location 16-611905	31h-5 31h-6	0–1, 5–6 0–1, 5–6	X[f] X[f]	— —
Define lateral extent of antimony, barium, and selenium west of location 16-611906	31h-7 31h-8	0–1, 5–6 0–1, 5–6	X[i] X[i]	— —

[a] X = Analysis will be performed.

[b] Aluminum only.

[c] — = Analysis will not be performed.

[d] Barium only.

[e] Selenium only.

[f] Antimony and selenium only.

[g] Aluminum, barium, and mercury only.

[h] TATB only.

[i] Antimony, barium, and selenium only.

Table 4.2-3
Proposed Sampling and Analysis at AOC 16-024(a)

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Anions (EPA 300)	Perchlorate (EPA SW-846:6850)	Gamma Spectroscopy - Cesium-137 (EPA 901.1M)	Isotopic Plutonium (HASL 300) Isotopic
Define vertical extent of aluminum, barium, bromide, calcium, cobalt, copper, nickel, perchlorate, and sulfate	16-608906	10–11, 15–16	—[a]	X[b,c]	X	—	—
	16-608907	10–11, 15–16	—	—	X	—	—
	16-608908	10–11, 15–16	—	—	X	—	—
	16-608909	10–11, 15–16	X[d]	—	X	—	—
	16-608910	10–11, 15–16	X[e]	—	X	—	—
Define lateral extent of cesium-137 and plutonium-239/240 northeast of location 16-608908	24a-1	0–1, 5–6, 10–11, 15–16	—	—	—	X	X
	24a-2	0–1, 5–6, 10–11, 15–16	—	—	—	X	X
Define lateral extent of aluminum, barium, calcium, cobalt, copper, and vanadium northwest of location 16-608909	24a-3	0–1, 5–6, 10–11, 15–16	X[f]	—	—	—	—
	24a-4	0–1, 5–6, 10–11, 15–16	X[f]	—	—	—	—
Define lateral extent of barium, cobalt, copper, and nickel southwest of location 16-608910	24a-5	0–1, 5–6, 10–11, 15–16	X[g]	—	—	—	—
	24a-6	0–1, 5–6, 10–11, 15–16	X[g]	—	—	—	—

[a] — = Analysis will not be performed.

[b] X = Analysis will be performed.

[c] Bromide and sulfate only.

[d] Aluminum, barium, calcium, cobalt, and copper only.

[e] Barium and nickel only.

[f] Aluminum, barium, calcium, cobalt, copper, and vanadium only.

[g] Barium, cobalt, copper, and nickel only.

Table 4.2-4
Proposed Sampling and Analysis at AOC 16-024(u)

Sampling Objective	Location Number	Depth (ft bgs)	SVOCs (EPA SW-846:8270C)
Define vertical extent of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene	16-608917	10–11, 15–16	X[a,b]
Define lateral extent of acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene. benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene north and east of location 16-608920	24u-1 24u-2 24u-3	0–1, 5–6 0–1, 5–6 0–1, 5–6	X[b] X[b] X[b]
Confirm removal of benzo(a)pyrene to industrial SSL to the east of sampling location 16-609920	24u-4	0–1, 5–6	X[c]

[a] X = Analysis will be performed.

[b] PAHs only.

[c] Benzo(a)pyrene only.

Table 4.2-5
Proposed Sampling and Analysis at AOC C-16-050

Sampling Objective	Location Number	Depth (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)
Define vertical extent of selenium at location 16-609518	16-609518	13–14, 18–19	X[a,b]	—[c]
Define lateral extent of calcium northwest of location 16-609514 and confirm removal of benzo(a)pyrene to industrial SSL to the north of location 16-609514	C50-1 C50-2	0–1, 5–6 0–1, 5–6	X[d] X[d]	X[e] —
Define lateral extent of calcium northeast and east of location 16-609515 and confirm removal of benzo(a)pyrene to industrial SSL to the northeast and east of location 16-609515	C50-3 C50-4	0–1, 5–6, 8–9 0–1, 5–6, 8–9	X[d] X[d]	X[e] X[e]
Lateral extent of selenium southeast of location 16-609519	C50-5 C50-6	0–1, 5–6, 8–9 0–1, 5–6, 8–9	X[b] X[b]	— —
Confirm removal of benzo(a)pyrene to industrial SSL between locations 16-609514 and 16-609515 and west of location 16-609514	C50-7 C50-8	0–1, 5–6 0–1, 5–6	— —	X[e] X[e]

[a] X = Analysis will be performed.

[b] Selenium only.

[c] — = Analysis will not be performed.

[d] Calcium only.

[e] Benzo(a)pyrene only.

Table 4.2-6
Proposed Sampling and Analysis at AOC C-16-060

Sampling Objective	Location Number	Depth (ft bgs)	SVOCs (EPA SW-846:8270C)
Define lateral extent of acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene. benzo(k)fluoranthene, benzoic acid, chrysene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene northeast of location 16-609503	C60-1 C60-2	0–1, 6–7 0–1, 6–7	X[a,b] X[b] X[b]

[a] X = Analysis will be performed.

[b] PAHs only.

Table 4.2-7
Proposed Sampling and Analysis at SWMUs 13-001, 13-004, 16-035, and16-036

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846: 8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of aluminum, antimony, arsenic, calcium, chromium, copper, lead, mercury, perchlorate, zinc, acenaphthene, acetone, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, and TATB	16-608607	11–12, 17–18	X[b,c]	—[d]	—	—	—
	16-608608	7–8, 13–14	X[e]	—	X[f]	—	—
	16-608609	11–12, 17–18	X[g]	—	—	—	—
	16-608615	11–12, 17–18	—	—	—	X[h]	—
	16-608620	9–10, 15–16	X[i]	—	—	—	—
	16-608621	5–6, 11–12	—	—	—	X[j]	X[k]
	16-608622	11–12, 17–18	—	X	—	—	—
	16-608624	11–12, 17–18	X[l]	—	X[f]	—	—
	16-608628	8–9, 14–15	X[m]	—	—	—	—
	16-608633	11–12, 17–18	—	—	—	X[n]	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Aluminum and arsenic only.

[d] — = Analysis will not be performed.

[e] Antimony, calcium, copper, lead, mercury, and zinc only.

[f] Acetone only.

[g] Arsenic only.

[h] Acenaphthene, fluoranthene, phenanthrene, and pyrene only.

[i] Chromium only.

[j] Pyrene only.

[k] TATB only.

[l] Copper and zinc only.

[m] Copper only.

[n] Indeno(1,2,3-cd)pyrene only.

Table 4.2-8
Proposed Sampling and Analysis at SWMU 13-002

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)
Define vertical extent of barium and chromium	16-608658 16-608659 16-608661	10–11, 16–17 10–11, 16–17 10–11, 16–17	X[b,c] X[d] X[c]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Chromium only.

[d] Barium only.

Table 4.2-9
Proposed Sampling and Analysis at SWMU 16-029(h)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)	Gamma Spectroscopy - Cesium-137 (EPA 901.1M)
Define vertical extent of aluminum, chromium, antimony, arsenic, barium, copper, iron, nickel, acetone, 2-butanone, and cesium-137	16-608701 16-608703 16-608706 16-608707 16-608708 16-608710 16-608712	11–12, 17–18 11–12, 17–18 11–12, 17–18 11–12, 17–18 11–12, 17–18 4–5, 5–6 4–5, 5–6	X[b,c] X[e] X[c] X[c] X[g] — X[h]	—[d] X[f] — — — — —	— — — — — X —

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Barium only.

[d] — = Analysis will not be performed.

[e] Aluminum, arsenic, barium, and iron only.

[f] Acetone and 2-butanone only.

[g] Aluminum, arsenic, barium, and nickel only.

[h] Antimony, chromium, and copper only.

Table 4.2-10
Proposed Sampling and Analysis at AOC 16-003(p)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of barium, cobalt, nickel acetone, 2-butanone, HMX, and RDX	16-608667 16-611909	11–12, 17–18 11–12, 17–18	X[b,c] X[f]	—[d] X[g]	X[e] —
Lateral extent of nickel, acetone, and 2-butanone at location 16-611909.	3p-1	0–1, 5–6	X[f]	X[g]	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Barium, and cobalt only.

[d] — = Analysis will not be performed.

[e] HMX and RDX only.

[f] Nickel only.

[g] Acetone and 2-butanone only.

Table 4.2-11
Proposed Sampling and Analysis at SWMU 16-004(d)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)
Define vertical extent of barium and calcium	16-608941 16-608942 16-608943	15–16, 21–22 15–16, 21–22 15–16, 21–22	X[b,c] X[d] X[c]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Barium only.

[d] Calcium only.

Table 4.2-12
Proposed Sampling and Analysis at SWMU 16-004(f)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)
Define vertical extent of chromium	16-608898	14–15, 20–21	X[b,c]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Chromium only.

Table 4.3-1
Proposed Sampling and Analysis at SWMU 16-026(z)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)
Define vertical extent of barium, cobalt, anthracene, naphthalene, and phenanthrene	16-609204 16-609205 16-609207	11–12, 17–18 11–12, 17–18 10–11, 16–17	X[b,c] — X[f]	—[d] X[e] —
Define lateral extent of anthracene, benzo(b)fluoranthene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene downgradient of location 16-609207	26z-1	0–1, 4–5	—	X[g]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Barium and cobalt only.

[d] — = Analysis will not be performed.

[e] Anthracene, naphthalene, and phenanthrene only.

[f] Barium only.

[g] PAHs only.

Table 4.3-2
Proposed Sampling and Analysis at SWMU 16-001(e)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of barium and acetone	16-609170 16-609172 16-609173	31–32, 37–38 33–34, 39–40 22–23, 28–29	—[b] X[e] X[e]	X[c,d] X[d] X[d]	— — —
Define lateral extent of TNT downgradient of locations 16-609173 and 16-609174.	1e-1	0–1, 5–6, 10–11, 16–17, 20–21	—	—	X[f]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] — = Analysis will not be performed.

[c] X = Analysis will be performed.

[d] Acetone only.

[e] Barium only.

[f] TNT only.

Table 4.3-3
Proposed Sampling and Analysis at SWMU 16-003(d)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)
Define vertical extent of selenium	16-611884	20–21, 26–27	X[b,c]	—[d]
Define lateral extent of selenium and acetone downgradient of location 16-611884	3d-1	14–15, 20–21, 26–27	X[c]	X[e]
Define lateral extent of acetone downgradient of location 16-609177	3d-2	6–7, 9–10	—	X[e]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Selenium only.

[d] — = Analysis will not be performed.

[e] Acetone only.

Table 4.3-4
Proposed Sampling and Analysis at SWMU 16-003(e)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of cobalt, copper, nickel, zinc, HMX, and RDX	16-01443	20–21, 26–27	X[b,c]	X[d]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Cobalt, copper, nickel and zinc only.

[d] HMX and RDX only.

Table 4.3-5
Proposed Sampling and Analysis at SWMU 16-003(f)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of arsenic, chromium, cobalt, lead, thallium, acenaphthene, fluorene, anthracene, benzo(a)anthracene, chrysene, fluoranthene, phenanthrene, pyrene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, indeno(1,2,3-cd)pyrene, naphthalene, and RDX	16-609166 16-609167 16-609239	15–16, 21–22 15–16, 21–22 12–13, 18–19	X[b,c] X[f] X[h]	X[d] X[d] —	—[e] X[g] —

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Chromium and cobalt only.

[d] PAHs only.

[e] — = Analysis will not be performed.

[f] Arsenic, lead, and thallium only.

[g] RDX only.

[h] Chromium only.

Table 4.3-6
Proposed Sampling and Analysis at SWMU 16-003(g)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)
Define vertical extent of barium, calcium, cobalt, lead, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, benzo(b)fluoranthene, fluoranthene, phenanthrene, pyrene, fluorene, and indeno(1,2,3-cd)pyrene	16-609186 16-609187	20–21, 26–27 20–21, 26–27	X[b,c] X[e]	X[d] —[f]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Cobalt and lead only.

[d] PAHs only.

[e] Barium and calcium only.

[f] — = Analysis will not be performed.

Table 4.3-7
Proposed Sampling and Analysis at SWMU 16-026(b)

Sampling Objective	Location Number	Depth[a] (ft bgs)	Total Cyanide (EPA SW-846:9012A)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of total cyanide	16-609189	11–12, 17–18	X[b]	—[c]
Confirm removal of benzo(a)pyrene to industrial SSL to the north, south and west of sampling location 16-609189	26b-1, 26b-2, 26b-3	0–1, 5–6	—	X[d]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] — = Analysis will not be performed.

[d] Benzo(a)pyrene only.

Table 4.3-8
Proposed Sampling and Analysis at SWMU 16-026(c)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)
Define vertical extent of barium, chromium, copper, and zinc	16-01459	10–11, 16–17	X[b,c]
	16-01460	5–6, 11–12	X[d]
	16-01461	5–6, 11–12	X[d]
	16-01462	5–6, 11–12	X[d]
	16-01464	5–6, 11–12	X[e]
	16-01655	10–11, 16–17	X[c]
	16-609194	11–12, 17–18	X[f]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Chromium only.

[d] Barium only.

[e] Barium, copper, and zinc only.

[f] Barium and chromium only.

Table 4.3-9
Proposed Sampling and Analysis at SWMU 16-026(d)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of barium, chromium, selenium, vanadium, zinc, benzo(a)anthracene, chrysene, diethylphthalate, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(g,h,i)perylene, and RDX	16-01466	5–6, 11–12	X[b,c]	—[d]	—
	16-01467	5–6, 11–12	X[e]	—	X[f]
	16-01468	5–6, 11–12	X[c]	—	—
	16-01469	5–6, 11–12	X[g]	—	—
	16-01470	5–6, 11–12	X[g]	X[h]	—
	16-01656	12–13, 18–19	X[i]	X[j]	—
	16-609182	11–12, 17–18	—	X[k]	—
	16-609183	10–11, 16–17	X[g]	—	X[f]
	16-609185	11–12, 17–18	X[l]	—	—
	16-611017	12–13, 18–19	X[g]	—	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Barium and zinc only.

[d] — = Analysis will not be performed.

[e] Barium and vanadium only.

[f] RDX only.

[g] Barium only.

[h] Phenanthrene and pyrene only.

[i] Barium and chromium only.

[j] Diethylphthalate only.

[k] PAHs only.

[l] Barium and selenium only.

Table 4.3-10
Proposed Sampling and Analysis at SWMU 16-026(e)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Isotopic Plutonium (HASL 300)Isotopic
Define vertical extent of barium, silver, HMX, and plutonium-239/240	16-01474 16-609201 16-611813 16-611815 16-611816 16-611817	5–6, 11–12 11–12, 17–18 11–12, 17–18 14–15, 20–21 14–15, 20–21 5–6, 11–12	X[b,c] X[c] — — X[c] X[f]	—[d] — — — — —	— X[e] — X[e] — —	— — X — — X
Define lateral extent of RDX east of location 16-611878	26e-1	0–1, 5–6, 11–12, 19–20, 20–21, 26–27	—	—	X[g]	—
Confirm removal of RDX below industrial SSL to the north and south of sampling location 16-611878	26e-2, 26e-3	0–1, 5–6	—	—	X[g]	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Barium only.

[d] — = Analysis will not be performed.

[e] HMX only.

[f] Silver only.

[g] RDX only.

Table 4.3-11
Proposed Sampling and Analysis at SWMU 16-029(a)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)
Define vertical extent of chromium, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, diethylphthalate, fluorene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene	16-01453 16-609209	9–10, 15–16 15–16, 21–22	X[b,c] —[e]	X[d] X[f]
Confirm removal of benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene to industrial SSLs to the north, south, east and west of sampling location 16-01453	29a-1, 29a-2, 29a-3, 29a-4	0–1, 3–4	—	X[g]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Chromium only.

[d] Diethylphthalate and fluorene only.

[e] — = Analysis will not be performed.

[f] PAHs only.

[g] Benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene only

Table 4.3-12
Proposed Sampling and Analysis at SWMU 16-029(b)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)	SVOCs (EPA SW-846:8270C)
Define vertical extent of calcium, selenium, acetone, benzo(a)anthracene, phenanthrene, pyrene, benzo(b)fluoranthene, chrysene, and fluoranthene	16-609199	15–16, 21–22	X[b,c]	X[d]	X[e]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Calcium and selenium only.

[d] Acetone only.

[e] PAHs only.

Table 4.3-13
Proposed Sampling and Analysis at SWMU 16-029(c)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)
Define vertical extent of selenium	16-609214	10–11, 16–17	X[b,c]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Selenium only.

Table 4.3-14
Proposed Sampling and Analysis at Shared Drainages

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)
Define vertical extent of aluminum, arsenic, barium, calcium, cobalt, chromium, copper, iron, lead, mercury, nickel, vanadium, zinc, acenaphthene, 2-amino-4,6-dinitrotoluene, anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, dibenzofuran, fluoranthene, fluorene, HMX, indeno(1,2,3-cd)pyrene, 2-methylphenol, 4-methylphenol, phenanthrene, pyrene, RDX, tetryl, and 2,4,6-trinitrotoluene	16-01411 16-01439 16-01653 16-609215 16-609217 16-609218 16-609219 16-609221	5–6, 11–12 2–3, 3–4 11–12, 17–18 11–12, 17–18 10–11, 16–17 7–8, 13–14 11–12, 17–18 2–3, 3–4	X[b,c] X X[g] X[h] X[i] X[j] X X[k]	—[d] X[e] — — — — — X[l]	— X[f] — — — — X[m]
Confirm removal of benzo(a)pyrene to industrial SSLs to the south, east and west of sampling location 16-609215	SD-1, SD-2, SD-3	0–1, 5–6	—	X[n]	—
Confirm removal of benzo(a)pyrene to industrial SSLs to the south and west of sampling locations 16-01653 and 16-01434, and removal of benzo(a)anthracene and benzo(b)fluoranthene south and west of location 16-01434	SD-4 , SD-5	0–1, 5–6	—	X[o]	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Zinc only.

[d] — = Analysis will not be performed.

[e] Dibenzofuran, 2-methylphenol, 4-methylphenol, and PAHs only.

[f] 2-Amino-4,6-dinitrotoluene, HMX, RDX, tetryl, and TNT only.

[g] Aluminum and cobalt only.

[h] Barium and cobalt only

[i] Arsenic only.

[j] Chromium and copper only.

[k] Copper only.

[l] Benzo(b)fluoranthene, dibenzofuran, fluoranthene, 2-methylphenol, 4-methylphenol, phenanthrene, and pyrene only.

[m] HMX, RDX, tetryl, and TNT only.

[n] Benzo(a)pyrene only.

[o] Benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene only.

Table 4.3-15
Proposed Sampling and Analysis at Liquid Waste Trunk Line

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Anions (EPA 300)	VOCs (EPA SW-846: 8260B)	SVOCs (EPA SW-846:8270C)	Isotopic Plutonium (HASL 300)	Isotopic Uranium (HASL-300)
Define vertical extent of aluminum, barium, calcium, chloride, chromium, selenium, acetone, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, benzo(g,h,i)perylene, fluoranthene, phenanthrene, pyrene, acenaphthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, bis-2-ethylhexylphthalate, plutonium-238, and uranium-235/236	16-609232 16-609237 16-609238 16-609239 16-609240 16-609241 16-609244 16-611849 16-611851 16-611853 16-611856	11–12, 17–18 14–15, 20–21 12–13, 18–19 12–13, 18–19 12–13, 18–19 12–13, 18–19 14–15, 20–21 11–12, 17–18 11–12, 17–18 11–12, 17–18 14–15, 20–21	—[b] X[e] X[f] X[i] — — X[j] — X[k] X[m] X[i]	— — X[g] — — — — — — — —	— — X[h] — — X[h] — — — — —	X[c,d] — — — X[d] — — — X[l] — —	— X — — — — — X — — —	— — X — — — — — — — —
Define lateral extent of cobalt at location 16-611853	LWTL-1	0–1, 5–6	X[n]	—	—	—	—	—
Define lateral extent of aluminum and cobalt at location 16-609238	LWTL-2	0–1, 5–6	X[o]	—	—	—	—	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] — = Analysis will not be performed.

[c] X = Analysis will be performed.

[d] PAHs only.

[e] Barium and selenium only.

[f] Aluminum, barium, and calcium only.

[g] Chloride only.

[h] Acetone only.

[i] Chromium only.

[j] Selenium only.

[k] Aluminum, barium, and selenium only.

[l] Bis(2-ethylhexyl)phthalate and PAHs only.

[m] Aluminum, barium, calcium, and selenium only.

[n] Cobalt only.

[o] Aluminum and cobalt only.

Table 4.4-1
Proposed Sampling and Analysis at AOC C-16-068

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)	SVOCs (EPA SW-846:8270C)
Define vertical extent of acetone and bis(2-ethylhexyl)phthalate	16-611439	11–12, 17–18	—[b]	X[c,d]	X[e]
Define lateral extent of copper, lead, mercury, zinc, and acetone downgradient of location 16-611439 and south of AOC	C68-1, C68-2	0–1, 5–6	X[f]	X[d]	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] — = Analysis will not be performed.

[c] X = Analysis will be performed.

[d] Acetone only.

[e] Bis(2-ethylhexyl)phthalate only.

[f] Copper, lead, mercury, and zinc only.

Table 4.4-2
Proposed Sampling and Analysis at SWMU 16-029(x)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Anions (EPA 300)	Boron (EPA SW-846:6010B)	VOCs (EPA SW-846: 8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Isotopic Plutonium (HASL 300)
Define vertical extent of barium, boron, bromide, chromium, manganese, nickel, selenium, silver, acetone, bis(2-chloroethyl)ether, 2,4-dinitrotoluene, HMX, fluoranthene, pyrene, 4-amino-2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, RDX, 1,3,5-trimethylbenzene, 2,4,6-trinitrotoluene, and plutonium-238	16-03054	11–12, 17–18	X[b,c]	—	—	—[d]	—	—	—
	16-03058	10–11, 16–17	—	—	—	—	X[e]	X[f]	—
	16-03064	10–11, 16–17	X[c]	—	—	—	—	X[g]	—
	16-03066	11–12, 17–18	—	—	—	—	—	X[h]	—
	16-03072	11–12, 17–18	X[c]	—	—	—	—	—	—
	16-03077	9–10, 15–16	X[i]	—	—	—	—	X[h]	—
	16-03082	4–5, 10–11	X[j]	—	X	—	—	X[k]	—
	16-03088	10–11, 16–17	X[i]	—	—	—	—	—	—
	16-03092	10–11, 16–17	X[i]	—	X	—	—	X[k]	—
	16-03094	10–11, 16–17	X[i]	—	—	—	—	—	—
	16-03100	9–10, 15–16	X[i]	—	—	—	—	—	—
	16-03104	9–10, 15–16	—	—	—	—	—	X[h]	—
	16-03148	5–6, 11–12	X[l]	—	—	—	—	—	—
	16-03153	16–17, 22–23	—	—	—	—	—	X[h]	—
	16-03156	16–17, 22–23	—	—	—	—	—	X[h]	—
	16-03174	5–6, 11–12	—	—	X	—	—	—	—
	16-609465	23–24, 29–30	—	—	—	—	—	—	X
	16-609471	5–6, 11–12	—	—	—	—	X[m]	—	—
	16-609473	19–20, 25–26	—	—	—	X[n]	—	—	—
	16-609476	23–24, 29–30	—	—	—	X[n]	—	—	—
	16-609479	21–22, 27–28	—	—	—	—	—	X[h]	—
	16-609480	23–24, 29–30	—	—	—	—	X[o]	—	—
	16-609481	24–25, 30–31	X[p]	—	—	—	X[q]	X[r]	X
	16-609482	9–10, 15–16	—	—	—	—	X[q]	X[h]	—
	16-609485	22–23, 28–29	—	X[s]	—	—	—	X[h]	—
	16-611771	9–10, 15–16	X[t]	—	—	—	—	—	—
Define lateral extent of acetone at locations 16-609461, 16-609462, 16-609467, 16-609473, and 16-609484	29x-1, 29x-3, 29x-4, 29x-5, 29x-6	5–6, 10–11, 16–17, 22–23	—	—	—	X[n]	—	—	—

Table 4.4-2 (continued)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Anions (EPA 300)	Boron (EPA SW-846:6010B)	VOCs (EPA SW-846: 8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Isotopic Plutonium (HASL 300)
Define lateral extent of boron, copper, and silver east of location 16-03174	29x-2	0–1, 5–6, 10-11, 16–17, 22–23	X[u]	—	X	—	—	—	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Barium only.

[d] — = Analysis will not be performed.

[e] Pyrene only.

[f] HMX, TNT, 2-amino-4,6-dinitrotoluene, and 4-amino-2,6-dinitrotoluene only.

[g] TNT, 2-amino-4,6-dinitrotoluene, and RDX only.

[h] RDX only.

[i] Silver only.

[j] Manganese and silver only.

[k] 2-amino-4,6-dinitrotoluene, and 4-amino-2,6-dinitrotoluene only.

[l] Manganese only.

[m] Fluoranthene only.

[n] Acetone only.

[o] Bis(2-chloroethyl)ether only.

[p] Selenium only.

[q] 1,3,5-Trimethylbenzene only.

[r] 2,4-Dinitrotoluene and RDX only.

[s] Bromide only.

[t] Chromium, nickel, and selenium only.

[u] Copper and silver only.

Table 4.4-3
Proposed Sampling and Analysis at SWMU 16-029(w)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)
Define vertical extent of aluminum, arsenic, barium, calcium, cobalt, copper, lead, magnesium, nickel, selenium, vanadium, zinc, and acetone	16-03409 16-05829 16-609486 16-609488 16-609489	11–12, 17–18 9–10, 15–16 23–24, 29–30 19–20, 25–26 22–23, 28–29	X[b,c] X[e] X[f] X[f] X[f]	—[d] — — — X[g]
Define lateral extent of selenium downgradient of locations 16-609486 and 16-609488	29w-1, 29w-2	0–1, 5–6, 11–12, 20–21	X[f]	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Aluminum, arsenic, calcium, cobalt, copper, lead, magnesium, nickel, and zinc only.

[d] — = Analysis will not be performed.

[e] Aluminum, barium, cobalt, selenium, and vanadium only.

[f] Selenium only.

[g] Acetone only.

Table 4.4-4
Proposed Sampling and Analysis at SWMU 16-025(x)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Anions (EPA 300)
Define vertical extent of antimony, barium, bromide, lead, and uranium	16-03015 16-03017 16-609492 16-609494	11–12, 17–18 9–10, 15–16 23–24, 29–30 19–20, 25–26	X[bc] X[c] X[e] X[f]	[d]— — — X[g]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Uranium only

[d] .—= Analysis will not be performed..

[e] Antimony only

[f] Barium and lead only

[g] Bromide only.

Table 4.4-5
Proposed Sampling and Analysis at SWMU 16-017(w)-99

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Anions (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846: 8260B)
Define vertical extent of cobalt, perchlorate, and 2-butanone	16-609442 16-609444 16-609445	11–12, 17–18 11–12, 17–18 11–12, 17–18	X[b,c] — —	—[d] — —	— X X	— — X[e]
Define lateral extent of bromide downgradient of existing sampling location 16-609466	17w-1	0–1, 5–6, 11–12	—	X[f]	—	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Cobalt only.

[d] — = Analysis will not be performed.

[e] 2-Butanone only.

[f] Bromide only.

Table 4.4-6
Proposed Sampling and Analysis at SWMU 16-034(m)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)
Define vertical extent aluminum, barium, and selenium	16-609245 16-609247 16-611840 16-611841	14–15, 20–21 14–15, 20–21 14–15, 20–21 14–15, 20–21	X[b,c] X[e] X[c] X[e]	—[d] — — —
Lateral extent of selenium and 1,2,4-trimethylbenzene downgradient of locations16-609245 and 16-611840	34m-1	0–1, 5–6, 11–12	X[c]	X[f]
Lateral extent of aluminum and selenium downgradient of locations 16-609247 and 16-611841	34m-2	0–1, 5–6, 11–12	X[g]	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Selenium only.

[d] — = Analysis will not be performed.

[e] Aluminum, barium, and selenium only.

[f] 1,2,4-Trimethylbenzene only.

[g] Aluminum and selenium only.

Table 4.4-7
Proposed Sampling and Analysis at AOC 16-024(n)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)
Define lateral extent of cadmium and benzoic acid downgradient of location 16-609301	24n-1	0–1, 5–6	X[b,c]	X[d]
Define lateral extent of antimony, benzoic acid, and 4-isopropyltoluene downgradient of location 16-609303	24n-2	0–1, 5–6	X[e]	X[f]
Define lateral extent of copper downgradient of location 16-609304	24n-3	0–1, 5–6	X[g]	—
Define lateral extent of copper and zinc downgradient of location 16-609305	24n-4	0–1, 5–6	X[h]	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Cadmium only.

[d] Benzoic acid only.

[e] Antimony only.

[f] Benzoic acid and 4-isopropyltoluene only.

[g] Copper only.

[h] Copper and zinc only.

Table 4.4-8
Proposed Sampling and Analysis at SWMU 16-034(n)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846: 8260B)	SVOCs (EPA SW-846:8270C)
Define vertical extent of antimony, lead, mercury, perchlorate, zinc, acetone, and 4-isopropyltoluene	16-04029 16-04032 16-609772 16-609773 16-609774 16-609775	6–7, 12–13 6–7, 12–13 11–12, 17–18 11–12, 17–18 11–12, 17–18 11–12, 17–18	X[b,c] X[e] X[f] X[f] — —	—[d] — X — — X	— — X[g] — X[g] X[h]	— — — —
Define lateral extent of antimony, perchlorate, and acetone northwest of location 16-609775	34n-1	0–1, 5–6	X[f]	X	X[g]	—
Define lateral extent of for lead, mercury, zinc, benzo(b)fluoranthene, fluoranthene, 4-isopropyltoluene, phenanthrene, pyrene, and toluene northeast of location 16-609773	34n-2	0–1, 5–6	X[c]	—	X[i]	X[j]
Define the lateral extent of acetone downgradient of location 16-609774	34n-3	0–1, 5–6	—	—	X[g]	—
Define lateral extent of perchlorate downgradient of location 16-609772	34n-4	0–1, 5–6	—	X	—	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Lead, mercury, and zinc only.

[d] — = Analysis will not be performed.

[e] Lead and mercury only.

[f] Antimony only.

[g] Acetone only.

[h] Acetone and 4-isopropyltoluene only.

[i] 4-Isoprpyltoluene and toluene only.

[j] Benzo(b)fluoranthene, fluoranthene, phenanthrene, and pyrene only.

Table 4.4-9
Proposed Sampling and Analysis at AOC 16-024(m)

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846: 8260B)	SVOCs (EPA SW-846:8270C)
Define vertical extent aluminum, barium, calcium, cobalt, copper, lead, nickel, selenium, thallium, vanadium, acetone, benzoic acid, bis(2-ethylhexyl)phthalate, and methylene chloride	16-04041 16-609250 16-609251 16-609253 16-611836 16-611837 16-611839	6–7, 12–13 14–15, 20–21 14–15, 20–21 14–15, 20–21 14–15, 20–21 14–15, 20–21 14–15, 20–21	—[b] X[e] X[f] X[g] X[i] X[j] X[k]	— — — X[h] — — X[l]	X[c,d] — — — — — —
Lateral extent of aluminum and copper southeast of location 16-611836	24m-1	0–1, 5–6, 11–12	X[m]	—	—
Lateral extent of calcium, chromium and copper northeast of location 16-611837	24m-2	0–1, 5–6, 11–12	X[n]	—	—
Lateral extent of aluminum, barium, calcium, chromium, copper, lead, nickel, and vanadium northwest of location 16-611838	24m-3	0–1, 5–6, 11–12	X[o]	—	—
Lateral extent of aluminum, barium, calcium, copper, nickel, and selenium southwest of location 16-611839	24m-4	0–1, 5–6, 11–12	X[p]	—	—

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] — = Analysis will not be performed.

[c] X = Analysis will be performed.

[d] Benzoic acid and bis(2-ethylhexyl)phthalate only.

[e] Lead, nickel, and thallium only.

[f] Barium, cobalt, copper, and vanadium only.

[g] Barium and selenium only.

[h] Methylene chloride only.

[i] Aluminum, barium, calcium, cobalt, copper, and lead only.

[j] Barium only.

[k] Selenium only.

[l] Acetone and methylene chloride only.

[m] Aluminum and copper only.

[n] Calcium, chromium, and copper only.

[o] Aluminum, barium, calcium, chromium, copper, lead, nickel, and vanadium only.

[p] Aluminum, barium, calcium, copper, nickel, and selenium only.

Table 4.4-10
Proposed Sampling and Analysis at SWMU 16-017(v)-99

Sampling Objective	Location Number	Depth[a] (ft bgs)	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)
Define vertical extent aluminum, barium, calcium, magnesium, and nickel	16-609436	11–12, 17–18	X[b,c]	—[d]
Confirm removal of benzo(a)pyrene to industrial SSL to the north, south, east, and west h of sampling location 16-609436	17v-1, 17v-2, 17v-3, 17v-4	0–1, 5–6	—	X[e]

[a] Estimated depths – may be adjusted in the field to ensure deepest sample is collected in native material.

[b] X = Analysis will be performed.

[c] Aluminum, barium, calcium, magnesium, and nickel only.

[d] — = Analysis will not be performed.

[e] Benzo(a)pyrene only.

Table 5.0-1
Summary of Investigation Methods

Method	Summary
Spade-and-Scoop Collection of Soil Samples	This method is typically used to collect shallow (e.g., approximately 0–12 in.) soil or sediment samples. The spade-and-scoop method involves digging a hole to the desired depth, as prescribed in the sampling and analysis plan, and collecting a discrete grab sample. The sample is typically placed in a clean stainless-steel bowl for transfer into various sample containers.
Hand-Auger Sampling	This method is typically used for sampling soil or sediment at depths of less than 10-15 ft but may in some cases be used for collecting samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4 in. inside diameter), creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth is reached, the auger is decontaminated before the hole is advanced to the sampling depth. The sample material is transferred from the auger bucket to a stainless-steel sampling bowl before the various required sample containers are filled. Carbon-steel auger buckets may be used, particularly in cases where chromium and nickel are the primary constituents of interest and cross-contamination from stainless-steel equipment is a concern.
Handling, Packaging, and Shipping of Samples	Field team members seal and label samples before packing and ensure that the sample containers and the containers used for transport are free of external contamination. Field team members package all samples so as to minimize the possibility of breakage during transportation. After all environmental samples are collected, packaged, and preserved, a field team member transports the samples either to the SMO or to an SMO-approved radiation screening laboratory under COC. The SMO arranges to ship samples to the analytical laboratories. The field team member must inform the SMO and/or the radiation screening laboratory coordinator when levels of radioactivity are in the action-level or limited-quantity ranges.
Sample Control and Field Documentation	The collection, screening, and transport of samples are documented on standard forms generated by the SMO. These include sample container labels and combined SCL/COC forms. Sample collection portions of the combined forms will be completed at the time of sample collection and signed by the sampler and a reviewer who will verify the logs for completeness and accuracy. The COC portions of the combined forms will be completed and signed to verify the samples are not left unattended. Corresponding labels will be initialed and applied to each sample container, and custody seals will be placed around container lids or openings. COC forms are completed and assigned to verify that the samples are not left unattended. Site attributes (e.g., former and proposed soil sampling locations, sediment sampling locations) are located by using a GPS. Horizontal locations will be measured to the nearest 0.5 ft. The survey results for this field event will be presented as part of the investigation report. Sample coordinates will be uploaded into the Sample Management Database.
Field Quality-Control Samples	Field quality-control samples are collected as follows. *Field duplicate*: At a frequency of 10%; collected at the same time as a regular sample and submitted for the same analyses. *Equipment rinsate blank*: At a frequency of 10%; collected by rinsing sampling equipment with deionized water, which is collected in a sample container and submitted for laboratory analysis. *Trip blanks*: Required for all field events that include the collection of samples for VOC analysis. Trip blanks are containers of certified clean sand that are opened and kept with the other sample containers during the sampling process.

Table 5.0-1 (continued)

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

Table 5.9-1
Summary of Analytical Methods

Analyte	Analytical Method
TAL metals	SW-846:6010B; SW-846:6020; SW-846:7471A (Mercury)
Boron	EPA SW-846:6010B
Total cyanide	EPA SW-846:9012A
Perchlorate	SW-846:6850
SVOCs	SW-846:8270C
VOCs	SW-846:8260B
Americium-241	HASL-300:AM-241
Gamma-emitting radionuclides (Cesium-137)	EPA:901.1
Isotopic plutonium	HASL-300:ISOPU
Isotopic uranium	HASL-300:ISOU
Anions (chloride, bromide, nitrate, sulfate)	EPA 300
Explosive compounds	SW-846:8321A Modified

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
COC	chain of custody
CRMT	Cultural Resources Management Team
D&D	decontamination and decommissioning
DOE	Department of Energy (U.S.)
EPA	Environmental Protection Agency (U.S.)
EQL	estimated quantitation limit
FV	fallout value
GPS	global positioning system
HE	high explosive(s)
HMX	1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IDW	investigation-derived waste
IP	individual permit
LANL	Los Alamos National Laboratory
MDA	material disposal area
NHPA	National Historic Preservation Act
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
PAH	polycyclic aromatic hydrocarbon
PID	photoionization detector
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RFI	RCRA facility investigation
SCL	sample collection log
SMA	site-monitoring area
SMO	Sample Management Office
SOP	standard operating procedure

SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list
TATB	triaminotrinitrobenzene
TNT	2,4,6-trinitrotoluene
VOC	volatile organic compound
WCSF	waste characterization strategy form
WWTP	wastewater treatment plant

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

Management Plan for Investigation-Derived Waste

B-1.0 INTRODUCTION

This appendix describes how investigation-derived waste (IDW) generated during the S-Site Aggregate Area Phase II investigation will be managed by Los Alamos National Laboratory (the Laboratory). IDW may include, but is not limited to, drill cuttings, excavated media, contact waste, decontamination fluids, and all other waste that has potentially come into contact with contaminants.

B-2.0 IDW

If required based on the estimated amount of material and size of excavation, area of contamination requests will be submitted for approval to New Mexico Environment Department (NMED) for sites where excavation is proposed.

All IDW generated during investigation activities will be managed in accordance with applicable standard operating procedures (SOPs). These SOPs incorporate the requirements of all applicable U.S. Environmental Protection Agency and NMED regulations, U.S. Department of Energy orders, and Laboratory requirements. The SOP applicable to the characterization and management of IDW is SOP-5238, Characterization and Management of Environmental Program Waste (http://www.lanl.gov/environment/all/qa.shtml).

The most recent version of the Laboratory's Hazardous Waste Minimization Report will be implemented during the investigation to minimize waste generation. The report is updated annually as a requirement of the Laboratory's Hazardous Waste Facility Permit.

A waste characterization strategy form (WCSF) will be prepared and approved per requirements of SOP-5238, Characterization and Management of Environmental Program Waste. The WCSF will provide detailed information on IDW characterization methods, management, containerization, and potential volumes. IDW characterization is completed through review of sampling data and/or documentation or by direct sampling of the IDW or the media being investigated (e.g., surface soil, subsurface soil). Waste characterization may include a review of historical information and process knowledge to identify whether listed hazardous waste may be present (i.e., due diligence reviews). If low levels of listed hazardous waste are identified, a "contained in" determination may be submitted to NMED for approval.

Wastes will be containerized and placed in clearly marked, appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on the type of IDW and its classification. Container and storage requirements as well as transportation and disposal requirements will be detailed in the WCSF and approved before waste is generated. Table B-2.0-1 summarizes the estimated IDW waste streams, waste types, waste volumes, and other data.

The waste streams that are anticipated to be generated during work plan implementation are described below.

B-2.1 Drill Cuttings

This waste stream consists of soil and tuff chips generated by the drilling of boreholes to collect samples. Drill cuttings include excess core sample not submitted for analysis and any returned samples sent for analysis. Drill cuttings will be stored in accordance with the approved WCSF.

This waste stream will be characterized based either on direct sampling of the waste in each container or on the results from core samples collected during drilling. The WCSF will specify the sampling suites for direct sampling of the waste stream. Constituents may be analyzed as necessary to meet the waste acceptance criteria for a receiving facility or if visual observations indicate that additional contaminants may be present.

Cuttings will be land applied if they meet the criteria in the NMED-approved Notice of Intent Decision Tree for Land Application of Investigation Derived Waste Solids from Construction of Wells and Boreholes. The Laboratory expects that cuttings will be land applied or disposed of in accordance with the approved WCSF. Table B-2.0-1 presents the estimated volumes, characterization and management methods, and expected disposition of this waste stream.

B-2.2 Excavated Environmental Media

Excavated environmental media will consist of soil and tuff removed to meet the proposed cleanup levels where cleanup is recommended. The excavated material will be field screened and examined for visible evidence of contamination during the excavation process. The excavated material will remain within the boundary of the site from which it was excavated or within the area of contamination, if one is established, and will be placed in appropriate containers in accordance with the approved WCSF.

A minimum of one direct sample will be collected from each 50 yd^3 or each container of material excavated and will be submitted for laboratory analyses for the analytical suites specified in the WCSF. The Laboratory expects most of the excavated environmental media to be designated as nonhazardous, hazardous, or low-level radioactive waste that will be disposed of in accordance with the approved WCSF. Table B-2.0-1 presents the estimated volumes, characterization and management methods, and expected disposition of this waste stream.

B-2.3 Contact Waste

The contact waste stream consists of potentially contaminated materials that came in contact with waste during sampling and excavation. This waste stream consists primarily of, but is not limited, to personal protective equipment such as gloves; decontamination wastes such as paper wipes; and disposable sampling supplies. Contact waste will be stored in containers and characterized in accordance with the approved WCSF.

Characterization of this waste stream will use acceptable knowledge based on data from the media with which it came into contact (e.g., drill cuttings, soil, sumps, etc.). The Laboratory expects most of the contact waste to be designated as nonhazardous, nonradioactive waste that will be disposed of in accordance with the approved WCSF. Table B-2.0-1 presents the estimated volumes, characterization and management methods, and expected disposition of this waste stream.

B-2.4 Decontamination Fluids

Decontamination fluids consist of liquid wastes generated from decontamination of excavation, sampling, and drilling equipment. For waste minimization, dry decontamination methods will be used to avoid the generation of liquid waste and to minimize the IDW. Dry decontamination uses disposable paper towels and over-the-counter cleaner, such as Fantastik or equivalent. All sampling and measuring equipment, including but not limited to, stainless-steel sampling tools and split-barrel or core samplers, will be decontaminated in accordance with SOP-01.08, Field Decontamination of Drilling and Sampling Equipment.

Dry decontamination may be followed by wet decontamination, if necessary. Wet decontamination may include washing with a nonphosphate detergent and water, followed by a water rinse and a second rinse with deionized water. Alternatively, steam cleaning may be used. The decontamination fluids will be characterized by direct sampling of the containerized waste for the suites specified in approved WCSF. The Laboratory expects most of these wastes to be nonhazardous liquid waste that will be sent to one of the Laboratory's wastewater treatment facilities in accordance with the approved WCSF. Table B-2.0-1 presents the estimated volumes, characterization and management methods, and expected disposition of this waste stream.

Table B-2.0-1
Summary of Estimated IDW Generation and Management

Waste Stream	Expected Waste Type	Estimated Volume	Characterization Method	On-Site Management	Expected Disposition
Drill cuttings	Industrial waste, nonhazardous, nonradioactive	20 yd^3	Analytical results from direct sampling of waste or core samples	Accumulation in 55-gal. drums, covered rolloff containers, or other appropriate containers	Land application, permitted off-site facility for which waste meets acceptance criteria, or Technical Area 54 (TA-54), Area G
Excavated environmental media	Industrial waste, nonhazardous, hazardous, low-level radioactive, nonradioactive	20 yd^3	Analytical results from direct sampling of waste	On ground within site boundary or accumulation in 55-gal. drums, covered rolloff containers, or other appropriate containers	Permitted off-site facility for which waste meets acceptance criteria, or TA-54, Area G
Contact waste	Industrial waste, nonhazardous, nonradioactive	0.5 yd^3	Acceptable knowledge	Accumulation in 55-gal. drums	Permitted off-site facility for which waste meets acceptance criteria, or TA-54, Area G
Decontamination fluids	Industrial waste, nonhazardous, nonradioactive	10 gal.	Acceptable knowledge; analytical results from direct sampling of waste	Accumulation in 30-gal. plastic drums	Treatment at an on-site facility for which waste meets acceptance criteria

Plate 1. S-Site Aggregate Area

- Surface water monitoring station
- Monitoring well, regional
- Monitoring well, alluvial
- Spring
- Paved road
- Unpaved road
- Fence
- TA boundary
- LANL boundary
- Major drainage
- 20-ft elevation contour
- 100-ft elevation contour
- Structure or building
- Liquid Waste Trunk Line
- SWMU or AOC
- Canyon reach (planned)
- Drainages map area
- S-Site Aggregate Area

N

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet: 0 125 250 500
Meters: 0 50 100 200

S-Site Aggregate Area

TA-09 TA-14 TA-15 TA-16 TA-11 TA-28 TA-37 TA-49

V-Site P-Site K-Site 300s Line

CDV-1C CDV-1E CDVS-1 CDV-2W CDV-2E CDV-3 CDV-4

CDV-16-02655 CDV-16-02656 CDV-16-02657 CDV-16-02658

SS-1W SS-2 SS-3 MS-1

WAN-1 WANE-1 WAN-2 WA-2 WA-3

FL-1 FL-2 FLC-16-25279 FLC-16-25278 FLC-16-25280

MSC-16-02665 MSC-16-06294 MSC-16-06295

R-25 R-48 CdV-R-15-3 CdV-R-37-2

Q-SITE

MARTIN SPRING CANYON DRAINAGES (AREA 1)
MARTIN SPRING CANYON DRAINAGES (AREA 2)
MARTIN SPRING CANYON DRAINAGES (AREA 3)
MARTIN SPRING CANYON DRAINAGES (AREA 4)
FISHLADDER CANYON DRAINAGES (GENERAL AREA)

Undisturbed area of TA-13 where SWMU 13-004 may be located

Liquid Waste Trunk Line

Baseflow station between E252 and Water at Beta

Martin Spring Canyon
Fishladder Canyon
Water
Canada del Buey

Martin Spring
Burning Ground Spring
SWSC Spring
Fish Ladder Spring
Hollow Spring
CDV-0.8 Spring

DEPARTMENT OF ENERGY
BANDELIER NATIONAL MONUMENT

Inset: S-Site Aggregate Area; E262.5; E263; Area of Detail
Los Alamos National Laboratory

Portage Inc.
Date: 08.08.2010
Map: SSite_IR_Plate1.Rev0

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

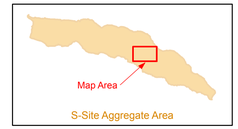
1612000 1614000 1616000 1618000 1620000 1622000 1624000
1764000 1762000 1760000 1758000

PLATE 2.
Summary of inorganic chemicals above BVs at Martin Spring Canyon Drainages Area 4

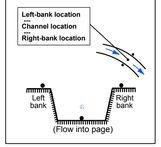
Sampling results reported in mg/kg

- 2009/2010 sampling location
- Planned location, not sampled due to site conditions
- NPDES-permitted outfall, inactive (approx. location)
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Paved road
- Unpaved road
- Fence
- TA boundary
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Structure or building
- SWMU or AOC
- Canyon reach (planned)

Location Map



Detects Key for Cross-sectional Sampling



State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet: 0 12.5 25 50

Meters: 0 5 10 20

Portage, Inc.
Date: 08.09.2010
Map: SSite_IR_Plate28.Rev0

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

16-608566
RE16-10-352 (0-0.5 ft)
Nitrate 1.24

16-608565
RE16-10-350 (0-0.5 ft)
Barium 300
Copper 16.8 (J)
Nitrate 1.65
Zinc 49.4
RE16-10-351 (1-1.5 ft)
Antimony 3.05

16-608567
RE16-10-354 (0-0.5 ft)
Cyanide (Total) 0.514
RE16-10-355 (1-1.5 ft)

16-608570
RE16-10-360 (0-0.5 ft)
Fluoride 0.71 (J-)
Manganese 766
Zinc 50.3

16-608568
RE16-10-356 (0-0.5 ft)
Barium 306
Cobalt 8.75
Fluoride 1.43 (J-)
Manganese 1780

16-608569
RE16-10-358 (0-0.5 ft)
Barium 402
Fluoride 1.23 (J-)
Manganese 949
Mercury 0.122
RE16-10-359 (1-1.5 ft)
Fluoride 1.25 (J-)
Manganese 1370

16-611206
RE16-10-392 (0-0.5 ft)
Copper 14.9
Fluoride 1.47 (J-)
Lead 22.7
Manganese 1140
Zinc 51.5
RE16-10-393 (1-1.5 ft)
Fluoride 3.78 (J-)

16-611204
RE16-10-388 (0-0.5 ft)
Fluoride 1.71 (J-)
Nitrate 2.02
RE16-10-389 (1-1.5 ft)
Fluoride 1.15 (J-)
Nitrate 1.43

16-611205
RE16-10-390 (0-0.5 ft)
Fluoride 0.747 (J-)
RE16-10-391 (1-1.5 ft)
Fluoride 1.07 (J-)

16-611209
RE16-10-398 (0-0.5 ft)
Fluoride 1.15 (J-)

16-611208
RE16-10-396 (0-0.5 ft)
Copper 16.1
Fluoride 3.85 (J-)
Manganese 957
Mercury 0.171
Zinc 50.5

16-611207
RE16-10-394 (0-0.5 ft)
Fluoride 2.28 (J-)
Nitrate 1.75
RE16-10-395 (1-1.5 ft)
Fluoride 3.83 (J-)

16-611213
RE16-10-406 (0-0.5 ft)
Fluoride 4.75 (J-)

16-611215
RE16-10-410 (0-0.5 ft)
Fluoride 1.58 (J-)
Nitrate 3.49

16-611214
RE16-10-408 (0-0.5 ft)
Fluoride 2.18 (J-)
Nitrate 1.82

16-611330
RE16-10-11738 (0-0.5 ft)
Fluoride 3 (J-)
Nitrate 1.71
RE16-10-11739 (1-1.5 ft)
Fluoride 1.67 (J-)
Nitrate 1.37

16-611328
RE16-10-11734 (0-0.5 ft)
Fluoride 2.32 (J-)
RE16-10-11735 (1-1.5 ft)
Fluoride 2.09 (J-)

16-611329
RE16-10-11736 (0-0.5 ft)
Fluoride 2.77 (J-)
Nitrate 2.09
RE16-10-11737 (1-1.5 ft)
Fluoride 2.98 (J-)
Nitrate 1.35

16-611211
RE16-10-402 (0-0.5 ft)
Fluoride 1.98 (J-)
RE16-10-403 (1-1.5 ft)
Chromium 10.1
Fluoride 1.24 (J-)

16-611212
RE16-10-404 (0-0.5 ft)
Fluoride 2.3 (J-)
Nitrate 2.42
RE16-10-405 (1-1.5 ft)
Fluoride 1.63 (J-)

16-611210
RE16-10-400 (0-0.5 ft)
Fluoride 1.67 (J-)
RE16-10-401 (1-1.5 ft)
Fluoride 3.05 (J-)
Perchlorate 0.000896 (J)

16-611217
RE16-10-414 (0-0.5 ft)
RE16-10-415 (0.5-1.5 ft)
Nitrate 4.28
---
unsampled

16-611218
RE16-10-416 (0-0.5 ft)
Perchlorate 0.000798 (J)
RE16-10-417 (1-1.5 ft)

TA-11
TA-16
TA-37
SS-3
Martin Spring Canyon
SWMU 11-005(c)
SWMU 11-006(b)
SWMU 11-005(b)
SWMU 11-006(a)
SWMU 11-006(c)
SWMU 11-006(d)
05A069
05A096
05A097
11-24
11-2
11-3
11-45
Drop Tower (11-25)
7280
7300
7320
7340
1761000
1760800
1760600
1760400
1618200
1618400
1618600
1618800
1619000
1619200
1619400
1619600

PLATE 3.
Locations sampled for Martin Spring Canyon Drainages Area 4

- 2009/2010 sampling location
- Planned location, not sampled due to site conditions
- NPDES-permitted outfall, inactive (approx. location)
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Paved road
- Unpaved road
- Fence
- TA boundary
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Structure or building
- SWMU or AOC
- Canyon reach (planned)

Location Map

Detects Key for Cross-sectional Sampling

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 12.5 25 50
0 5 10 20
Meters

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate24.Rev0

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

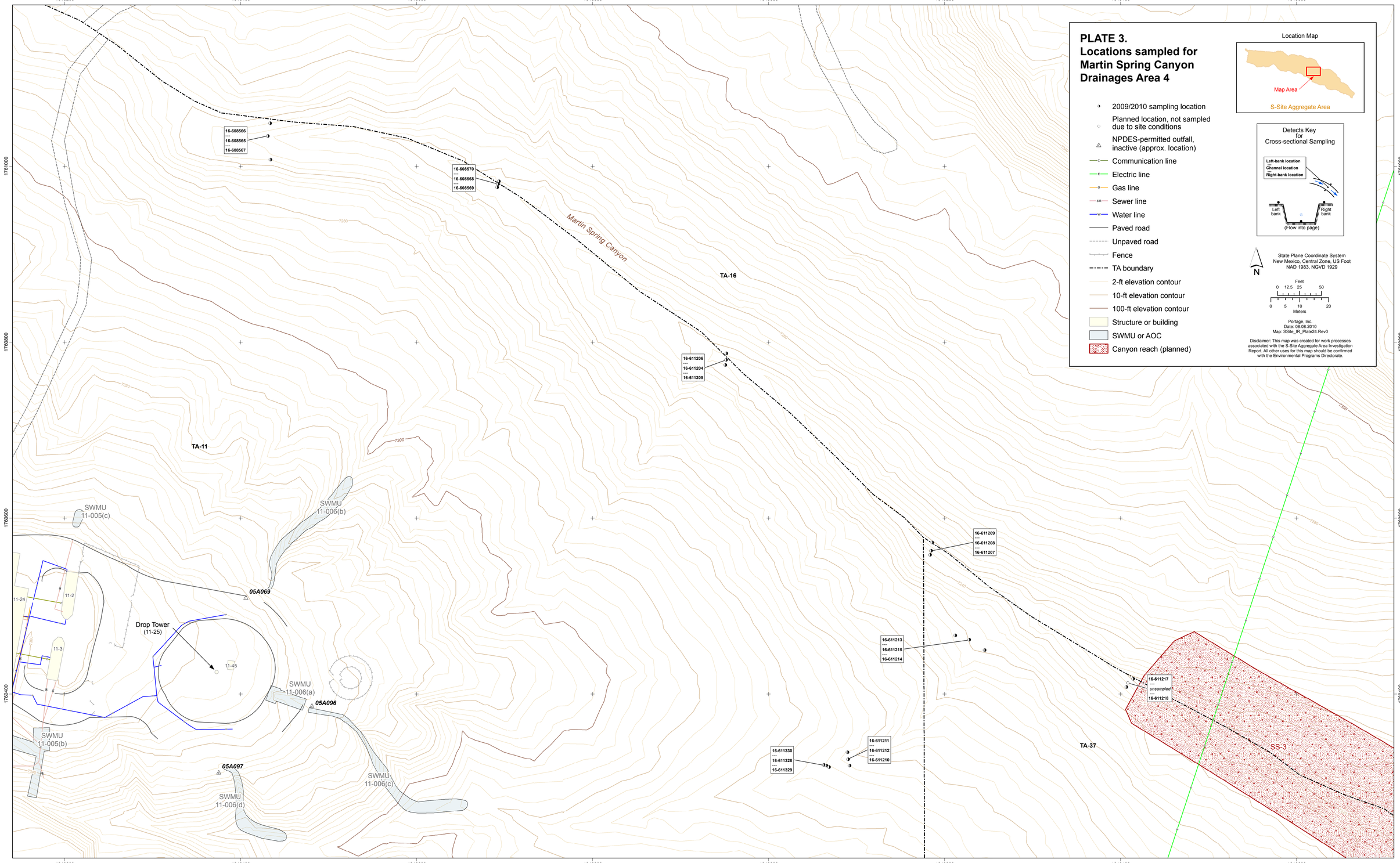
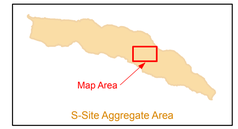


PLATE 4.
Organic chemicals detected in samples at Martin Spring Canyon Drainages Area 4

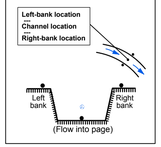
Sampling results reported in mg/kg

- 2009/2010 sampling location
- Planned location, not sampled due to site conditions
- NPDES-permitted outfall, inactive (approx. location)
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Paved road
- Unpaved road
- Fence
- TA boundary
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Structure or building
- SWMU or AOC
- Canyon reach (planned)

Location Map



Detects Key for Cross-sectional Sampling



State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet: 0 12.5 25 50
Meters: 0 5 10 20

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate32.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

16-608566
RE16-10-352 (0-0.5 ft)

16-608565
RE16-10-350 (0-0.5 ft)
RE16-10-351 (1-1.5 ft)
Fluoranthene 0.0304 (J)

16-608567
RE16-10-354 (0-0.5 ft)
Dichloroethene[1,1-] 0.000723 (J)
RE16-10-355 (1-1.5 ft)
Benzo(b)fluoranthene 0.255
Fluoranthene 0.0492 (J)
Isopropylbenzene 0.00777
Isopropyltoluene[4-] 0.0023 (J)
Pyrene 0.0451 (J)
Toluene 0.00146
Trinitrotoluene[2,4,6-] 0.334 (J)

16-608570
RE16-10-360 (0-0.5 ft)

16-608568
RE16-10-356 (0-0.5 ft)
HMX 16.7 (J)

16-608569
RE16-10-358 (0-0.5 ft)
HMX 1.39 (J)
Styrene 0.000663 (J)
RE16-10-359 (1-1.5 ft)
Bis(2-ethylhexyl)phthalate 0.538
HMX 17.1 (J)
Toluene 0.000634 (J)

16-611206
RE16-10-392 (0-0.5 ft)
Benzo(a)anthracene 0.0374 (J)
Benzo(b)fluoranthene 0.3
Chrysene 0.0399 (J)
Fluoranthene 0.0763 (J)
Phenanthrene 0.031 (J)
Pyrene 0.0682 (J)
Toluene 0.000722 (J)
RE16-10-393 (1-1.5 ft)
Benzo(b)fluoranthene 0.129
Fluoranthene 0.0187 (J)
Pyrene 0.0167 (J)

16-611204
RE16-10-388 (0-0.5 ft)
Benzo(b)fluoranthene 0.124
Fluoranthene 0.0183 (J)
HMX 0.235 (J)
Pyrene 0.0142 (J)
RE16-10-389 (1-1.5 ft)
Benzo(b)fluoranthene 0.117
HMX 0.157 (J)

16-611205
RE16-10-390 (0-0.5 ft)
Benzo(b)fluoranthene 0.278
HMX 0.371 (J)
RE16-10-391 (1-1.5 ft)
Toluene 0.000669 (J)

16-611209
RE16-10-398 (0-0.5 ft)

16-611208
RE16-10-396 (0-0.5 ft)
Benzo(b)fluoranthene 0.307

16-611207
RE16-10-394 (0-0.5 ft)
Benzo(b)fluoranthene 0.29
Fluoranthene 0.0436 (J)
Pyrene 0.04 (J)
Toluene 0.000624 (J)
RE16-10-395 (1-1.5 ft)
Benzo(a)anthracene 0.0181 (J)
Benzo(b)fluoranthene 0.141
Chrysene 0.0191 (J)
Fluoranthene 0.0418 (J)
Isopropyltoluene[4-] 0.00857
Phenanthrene 0.0203 (J)
Pyrene 0.0357 (J)
Toluene 0.000619 (J)

16-611213
RE16-10-406 (0-0.5 ft)
Isopropyltoluene[4-] 0.0124
Styrene 0.00047 (J)
Toluene 0.00536

16-611215
RE16-10-410 (0-0.5 ft)
HMX 6.66 (J)
TATB 8.96 (J+)

16-611214
RE16-10-408 (0-0.5 ft)
HMX 0.356 (J)

16-611217
RE16-10-414 (0-0.5 ft)
RE16-10-415 (0.5-1.5 ft)

16-611218
RE16-10-416 (0-0.5 ft)
Acetone 0.0216 (J)
Bis(2-ethylhexyl)phthalate 0.111 (J)
Fluoranthene 0.0314 (J)
HMX 8.01 (J)
Phenanthrene 0.0159 (J)
Propylbenzene[1-] 0.000612 (J)
Pyrene 0.029 (J)
Toluene 0.00438
RE16-10-417 (1-1.5 ft)
Anthracene 0.01 (J)
Benzo(a)anthracene 0.0318 (J)
Benzo(a)pyrene 0.0233 (J)
Benzo(b)fluoranthene 0.0331 (J)
Bis(2-ethylhexyl)phthalate 0.273 (J)
Chrysene 0.0248 (J)
Fluoranthene 0.0577
HMX 0.356 (J)
Phenanthrene 0.0405 (J)
Pyrene 0.051
Toluene 0.00115 (J)

16-611330
RE16-10-11738 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.337 (J)
HMX 0.884 (J-)
RDX 0.12 (J-)
RE16-10-11739 (1-1.5 ft)
Acetone 0.474
Fluoranthene 0.0158 (J)
HMX 0.697 (J-)
Isopropyltoluene[4-] 0.664
Pyrene 0.0146 (J)
Toluene 0.00142

16-611328
RE16-10-11734 (0-0.5 ft)
Benzo(a)anthracene 0.0391 (J)
Benzo(a)pyrene 0.0315 (J)
Benzo(b)fluoranthene 0.0466
Benzo(g,h,i)perylene 0.0143 (J)
Benzo(k)fluoranthene 0.0194 (J)
Bis(2-ethylhexyl)phthalate 0.174 (J)
Chrysene 0.0361 (J)
Fluoranthene 0.0743
HMX 31.2 (J-)
Indeno(1,2,3-cd)pyrene 0.0136 (J)
Phenanthrene 0.0204 (J)
Pyrene 0.0607
RDX 0.175 (J-)
RE16-10-11735 (1-1.5 ft)
Benzo(a)anthracene 0.0161 (J)
Bis(2-ethylhexyl)phthalate 0.129 (J)
Fluoranthene 0.0277 (J)
HMX 23.6 (J-)
Isopropyltoluene[4-] 0.000427 (J)
Pyrene 0.0216 (J)
RDX 0.143 (J-)

16-611329
RE16-10-11736 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 1.95 (J)
Fluoranthene 0.0144 (J)
HMX 1.95 (J-)
Pyrene 0.0153 (J)
RDX 0.107 (J-)
RE16-10-11737 (1-1.5 ft)
HMX 0.925 (J-)
RDX 0.105 (J-)

16-611211
RE16-10-402 (0-0.5 ft)
HMX 12.1 (J)
TATB 2.32 (J+)
RE16-10-403 (1-1.5 ft)

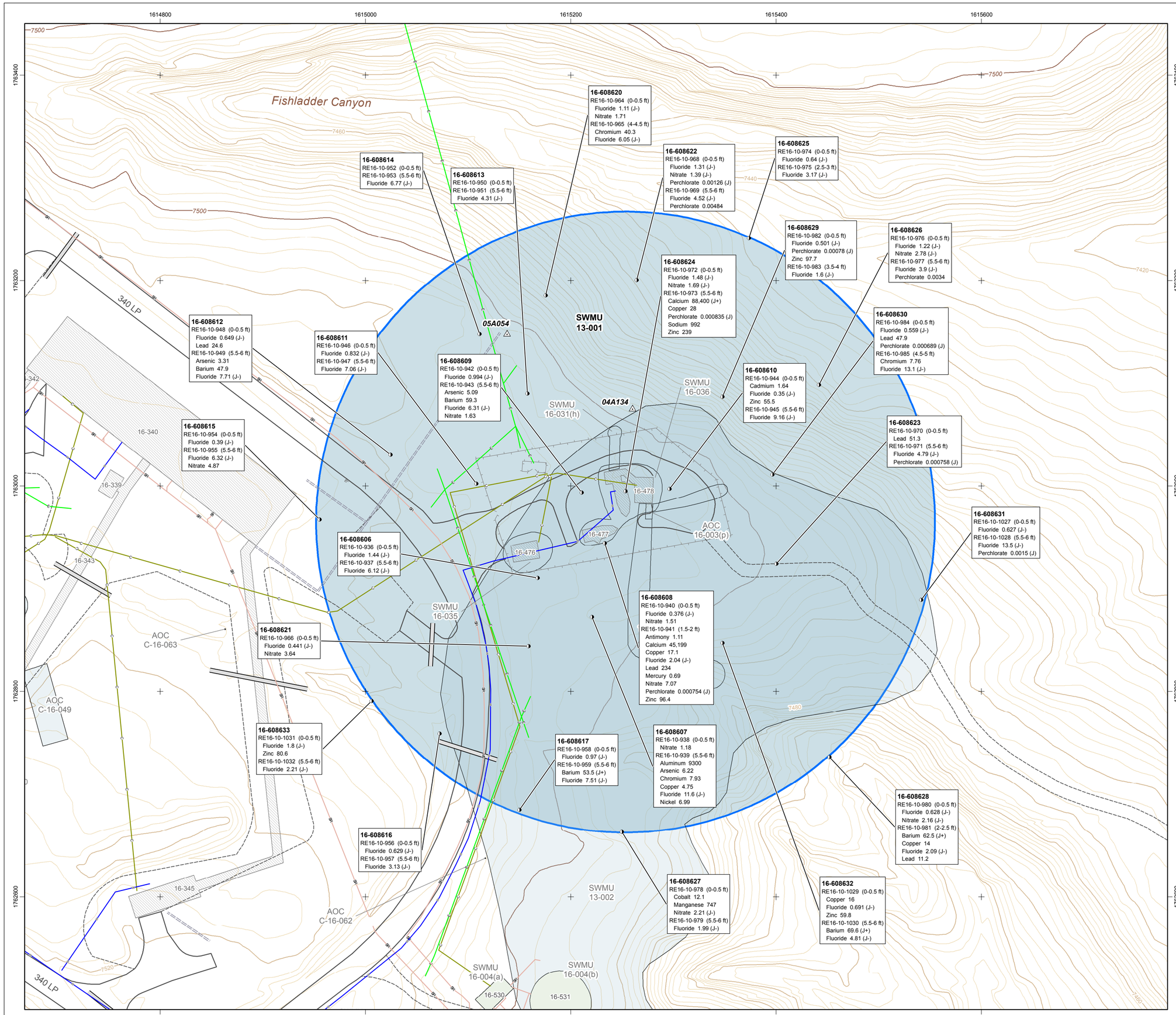
16-611212
RE16-10-404 (0-0.5 ft)
Anthracene 0.0149 (J)
Benzo(a)anthracene 0.049
Benzo(a)pyrene 0.0302 (J)
Benzo(b)fluoranthene 0.172
Chrysene 0.0514
Fluoranthene 0.145
HMX 12.2 (J)
Phenanthrene 0.0819
Pyrene 0.117
TATB 20.4 (J+)
RE16-10-405 (1-1.5 ft)
HMX 22.2 (J)
TATB 2.56 (J+)

16-611210
RE16-10-400 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 9.94
Isopropyltoluene[4-] 0.00219
Toluene 0.000555 (J)
RE16-10-401 (1-1.5 ft)

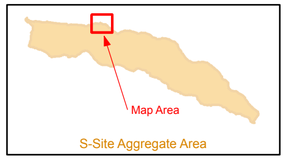
TA-11
TA-16
TA-37
SS-3
Martin Spring Canyon
SWMU 11-005(c)
SWMU 11-006(b)
SWMU 11-005(b)
SWMU 11-006(a)
SWMU 11-006(c)
SWMU 11-006(d)
05A069
05A096
05A097
11-24
11-2
11-3
11-45
Drop Tower (11-25)
7280
7300
7320
7340
7360
7380
7400

1618200 1618400 1618600 1618800 1619000 1619200 1619400 1619600
1761000
1760800
1760600
1760400

PLATE 5.
Summary of inorganic chemicals above BVs at SWMU 13-001



Location Map



Sampling results reported in mg/kg

- 2009/2010 sampling location
- NPDES-permitted outfall, inactive (approx. location)
- Former drainline
- Communication line
- Electric line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Former structure or building
- Structure or building
- Subject SWMU or AOC
- Other SWMU or AOC

N

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

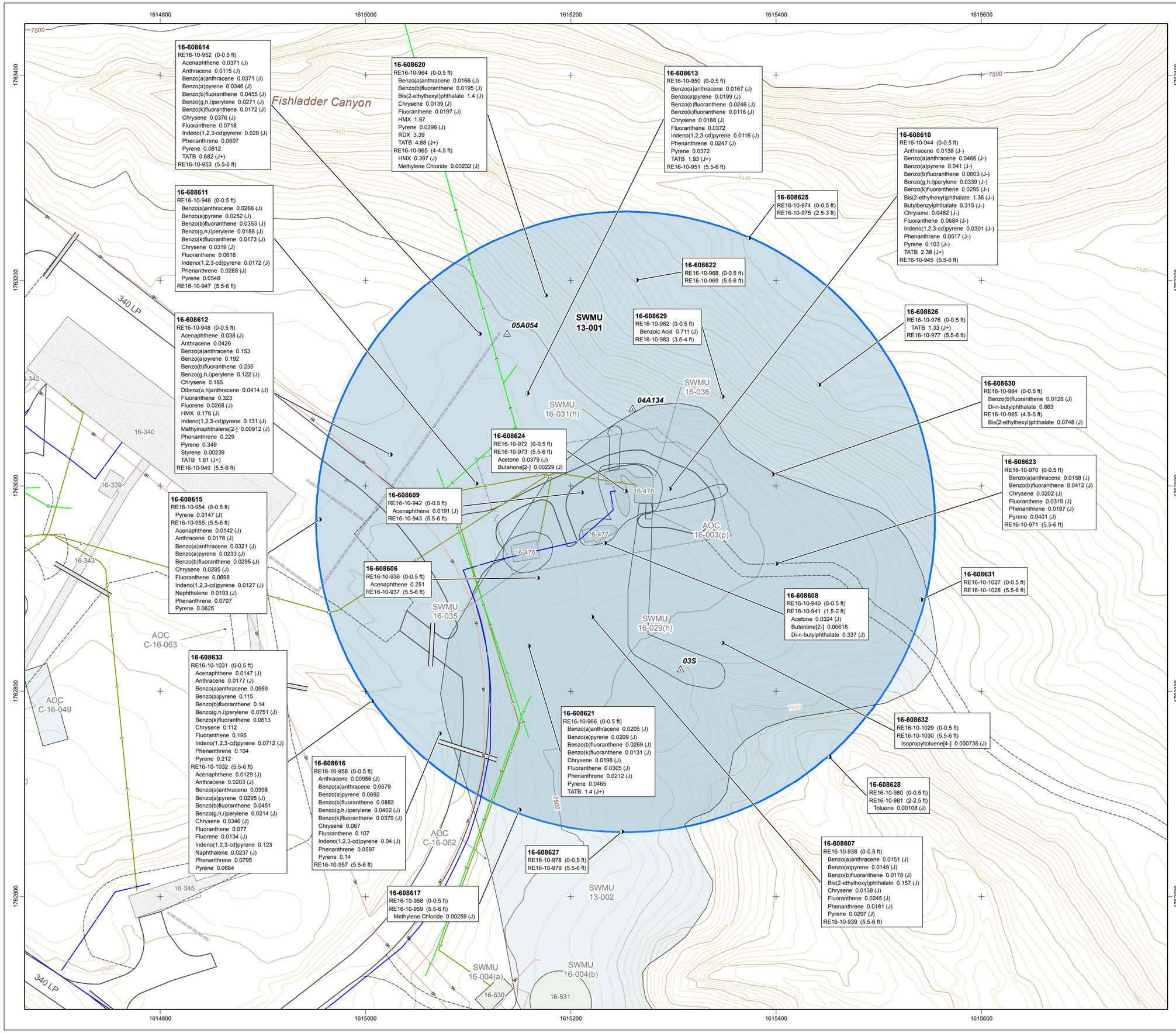
Feet
0 12.5 25 50

0 5 10 20
Meters

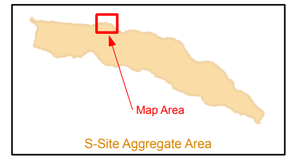
Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate6.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

PLATE 6.
Organic chemicals detected in samples at SWMU 13-001



Location Map



Sampling results reported in mg/kg

- 2009/2010 sampling location
- NPDES-permitted outfall, inactive (approx. location)
- Former drainline
- Communication line
- Electric line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Former structure or building
- Structure or building
- Subject SWMU or AOC
- Other SWMU or AOC

N

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

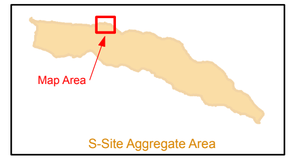
Feet
0 12.5 25 50
0 5 10 20
Meters

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate7 Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

PLATE 7.
Summary of inorganic chemicals above BVs at SWMU 16-029(h)

Location Map



16-608700
RE16-10-1515 (0-0.5 ft)
Fluoride 2.25 (J-)
Nitrate 1.49
RE16-10-1516 (5.5-6 ft)
Fluoride 1.33

16-608701
RE16-10-1517 (0-0.5 ft)
Fluoride 2.09 (J-)
Lead 39.9
Nitrate 2.58
RE16-10-1518 (5.5-6 ft)
Barium 85.3
Fluoride 2.4
Nickel 6.82

16-608702
RE16-10-1519 (0-0.5 ft)
Cobalt 14.8
Fluoride 2.1 (J-)
Lead 23.2
Manganese 1420
Nitrate 1.37
RE16-10-1520 (5.5-6 ft)
Fluoride 1.91

16-608703
RE16-10-1521 (0-0.5 ft)
Fluoride 1.35 (J-)
RE16-10-1522 (5.5-6 ft)
Aluminum 9500 (J+)
Arsenic 9.92
Barium 204
Fluoride 23.9
Iron 20,400
Lead 11.9
Perchlorate 0.00115 (J)
Silver 1.16

16-608704
RE16-10-1523 (0-0.5 ft)
Antimony 3.26 (J-)
Calcium 22,900
Copper 15.3
Fluoride 1.05 (J-)
Lead 47.8
Mercury 0.256
Zinc 73.8
RE16-10-1524 (5.5-6 ft)
Fluoride 5.52

16-608705
RE16-10-1525 (0-0.5 ft)
Copper 34.7
Fluoride 2.43 (J-)
Lead 125
Mercury 0.955
Nitrate 1.5
Thallium 0.753
RE16-10-1526 (5.5-6 ft)
Arsenic 3.46
Fluoride 6.16

16-608706
RE16-10-1527 (0-0.5 ft)
Copper 15.5
Fluoride 1.78 (J-)
RE16-10-1528 (5.5-6 ft)
Arsenic 3.94
Barium 60.3
Fluoride 6.49

16-608707
RE16-10-1529 (0-0.5 ft)
Fluoride 1.46 (J-)
Nitrate 2.31
RE16-10-1530 (5.5-6 ft)
Arsenic 3.19
Barium 86.5
Fluoride 5.96
Lead 11.6

16-608708
RE16-10-1531 (0-0.5 ft)
Fluoride 1.44 (J-)
Nitrate 1.65
Perchlorate 0.000729 (J)
RE16-10-1532 (5.5-6 ft)
Aluminum 7350 (J+)
Arsenic 5.76
Barium 60.7
Fluoride 6.13
Nickel 15.6 (J-)
Perchlorate 0.000935 (J)

16-608709
RE16-10-1533 (0-0.5 ft)
Copper 20.6
Fluoride 1.58 (J-)
Lead 30.2
Nitrate 2.48
RE16-10-1534 (4-4.5 ft)
Fluoride 3.03

16-608710
RE16-10-1535 (0-0.5 ft)
Fluoride 1.59 (J-)
Nitrate 5.31
RE16-10-1536 (5.5-6 ft)
Fluoride 3.76

16-608711
RE16-10-1537 (0-0.5 ft)
Copper 45.7
Fluoride 1.48 (J-)
Lead 51.6
Nitrate 1.78
Zinc 53.5
RE16-10-1538 (3-3.5 ft)
Fluoride 2.42

16-608712
RE16-10-1539 (0-0.5 ft)
Fluoride 1.25 (J-)
Nitrate 2.03
RE16-10-1540 (3-3.5 ft)
Antimony 0.927 (J)
Chromium 59
Copper 15.5
Fluoride 3.89
Perchlorate 0.000761 (J)

16-608713
RE16-10-1541 (0-0.5 ft)
Copper 34
Fluoride 1.85 (J-)
Lead 28.1
Nitrate 8.85
RE16-10-1542 (3-3.5 ft)
Fluoride 2.97

16-608714
RE16-10-1543 (0-0.5 ft)
Fluoride 2.24
RE16-10-1544 (5.5-6 ft)
Fluoride 3.76
RE16-10-1514 (9-9.5 ft)
Fluoride 11.9 (J-)

16-608715
RE16-10-1545 (0-0.5 ft)
Calcium 79,100
Fluoride 1.77
Lead 48.7
Mercury 0.149
Zinc 68.4
RE16-10-1546 (5.5-6 ft)
Fluoride 3.5
Lead 28.3

16-611541
RE16-10-13141 (0-0.5 ft)
Fluoride 2.79 (J-)
RE16-10-13142 (5.5-6 ft)
Barium 114
Fluoride 3.22 (J-)
RE16-10-13143 (9-9.5 ft)
Fluoride 12.5 (J-)

SWMU 13-001
SWMU 16-031(h)
SWMU 16-036
SWMU 16-035
SWMU 16-029(h)
SWMU 13-002
SWMU 16-004(a)
SWMU 16-004(b)
AOC 16-003(p)
AOC C-16-063
AOC C-16-049
AOC C-16-062
05A054
04A134
03S
Fishladder Canyon
340 LP
16-339
16-340
16-342
16-343
16-345
16-476
16-477
16-478
16-530
16-531

Sampling results reported in mg/kg

- 2009/2010 sampling location
- NPDES-permitted outfall, inactive (approx. location)
- Former drainline
- Communication line
- Electric line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Former structure or building
- Structure or building
- Subject SWMU or AOC
- Other SWMU or AOC

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

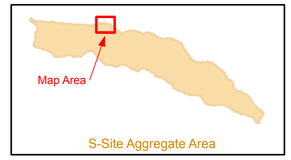
Feet
0 12.5 25 50
Meters
0 5 10 20

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate8.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

PLATE 8.
Organic chemicals detected in samples at SWMU 16-029(h)

Location Map



Fishladder Canyon

SWMU 16-029(h)

SWMU 13-001

SWMU 16-031(h)

SWMU 16-036

SWMU 16-035

SWMU 13-002

SWMU 16-004(a)

SWMU 16-004(b)

AOC 16-003(p)

AOC C-16-063

AOC C-16-049

AOC C-16-062

340 LP

16-608700
RE16-10-1515 (0-0.5 ft)
Benzo(a)pyrene 0.0146 (J)
Benzo(b)fluoranthene 0.0254 (J)
Chrysene 0.0139 (J)
Fluoranthene 0.0293 (J)
Methylene Chloride 0.00261 (J)
Phenanthrene 0.0149 (J)
Pyrene 0.0314 (J)
RE16-10-1516 (5.5-6 ft)

05A054

16-608702
RE16-10-1519 (0-0.5 ft)
RE16-10-1520 (5.5-6 ft)
Benzoic Acid 0.587 (J)

16-608703
RE16-10-1521 (0-0.5 ft)
TATB 0.324 (J)
RE16-10-1522 (5.5-6 ft)
Acetone 0.0278 (J)
Butanone[2-] 0.00824 (J)
HMX 0.387 (J)
RDX 0.142 (J)

04A134

16-608701
RE16-10-1517 (0-0.5 ft)
Benzo(a)pyrene 0.0171 (J)
Benzo(b)fluoranthene 0.0404 (J)
Benzo(g,h,i)perylene 0.0135 (J)
Benzo(k)fluoranthene 0.0156 (J)
Chrysene 0.0229 (J)
Fluoranthene 0.0491
Phenanthrene 0.0202 (J)
Pyrene 0.0491
RE16-10-1518 (5.5-6 ft)

16-608704
RE16-10-1523 (0-0.5 ft)
Benzo(a)anthracene 0.0338 (J)
Benzo(a)pyrene 0.0142 (J)
Benzo(b)fluoranthene 0.0224 (J)
Benzo(g,h,i)perylene 0.0137 (J)
Benzo(k)fluoranthene 0.0139 (J)
Chrysene 0.027 (J)
Di-n-butylphthalate 0.242 (J)
Fluoranthene 0.0685
Indeno(1,2,3-cd)pyrene 0.133
Methylene Chloride 0.00317 (J)
Phenanthrene 0.0228 (J)
Pyrene 0.0614
RE16-10-1524 (5.5-6 ft)

16-611541
RE16-10-13141 (0-0.5 ft)
Acetone 0.00198 (J)
Isopropyltoluene[4-] 0.000704 (J)
RE16-10-13142 (5.5-6 ft)
Acetone 0.0022 (J)
RE16-10-13143 (9-9.5 ft)
Acetone 0.00279 (J)

16-608714
RE16-10-1543 (0-0.5 ft)
Methylene Chloride 0.00243 (J)
RE16-10-1544 (5.5-6 ft)
Bis(2-ethylhexyl)phthalate 0.102 (J)
HMX 47.2
RDX 23.9 (J)
TATB 0.357 (J)
RE16-10-1514 (9-9.5 ft)
Acetone 0.00187 (J)

16-608705
RE16-10-1525 (0-0.5 ft)
Benzo(a)pyrene 0.0166 (J)
Benzo(g,h,i)perylene 0.0133 (J)
Chrysene 0.0235 (J)
Di-n-butylphthalate 0.582
Fluoranthene 0.0463
Indeno(1,2,3-cd)pyrene 0.135
Phenanthrene 0.0208 (J)
Pyrene 0.0447
RE16-10-1526 (5.5-6 ft)
Methylene Chloride 0.00364 (J)

16-608706
RE16-10-1527 (0-0.5 ft)
Fluoranthene 0.02 (J)
Pyrene 0.0194 (J)
RE16-10-1528 (5.5-6 ft)

16-608715
RE16-10-1545 (0-0.5 ft)
Benzo(b)fluoranthene 0.0169 (J)
Bis(2-ethylhexyl)phthalate 0.128 (J)
Fluoranthene 0.0144 (J)
Pyrene 0.0188 (J)
TATB 7.06 (J)
Trimethylbenzene[1,2,4-] 0.000892 (J)
RE16-10-1546 (5.5-6 ft)
Benzo(a)anthracene 0.0187 (J)
TATB 0.397 (J)

16-608707
RE16-10-1529 (0-0.5 ft)
Acenaphthene 0.0661
RE16-10-1530 (5.5-6 ft)
Methylene Chloride 0.00321 (J)

03S

16-608712
RE16-10-1539 (0-0.5 ft)
Benzo(b)fluoranthene 0.0176 (J)
Benzoic Acid 0.681 (J)
Fluoranthene 0.0232 (J)
Phenanthrene 0.0145 (J)
Pyrene 0.0266 (J)
RE16-10-1540 (3-3.5 ft)

16-608708
RE16-10-1531 (0-0.5 ft)
RE16-10-1532 (5.5-6 ft)
Methylene Chloride 0.00407 (J)

16-608713
RE16-10-1541 (0-0.5 ft)
Benzo(a)anthracene 0.0201 (J)
Benzo(a)pyrene 0.0178 (J)
Benzo(b)fluoranthene 0.0228 (J)
Benzo(k)fluoranthene 0.0159 (J)
Chrysene 0.0161 (J)
Fluoranthene 0.0313 (J)
Phenanthrene 0.0216 (J)
Pyrene 0.0327 (J)
Tris (o-cresyl) phosphate 0.329 (J)
RE16-10-1542 (3-3.5 ft)
Methylene Chloride 0.00275 (J)

16-608709
RE16-10-1533 (0-0.5 ft)
Benzo(a)anthracene 0.0174 (J)
Benzo(a)pyrene 0.0131 (J)
Benzo(b)fluoranthene 0.0178 (J)
Chrysene 0.0142 (J)
Fluoranthene 0.029 (J)
Indeno(1,2,3-cd)pyrene 0.124
Phenanthrene 0.0219 (J)
Pyrene 0.028 (J)
RE16-10-1534 (4-4.5 ft)

16-608711
RE16-10-1537 (0-0.5 ft)
Benzo(a)anthracene 0.0197 (J)
Benzo(a)pyrene 0.0155 (J)
Benzo(b)fluoranthene 0.0222 (J)
Chrysene 0.0162 (J)
Fluoranthene 0.0269 (J)
Phenanthrene 0.0186 (J)
Pyrene 0.0289 (J)
RE16-10-1538 (3-3.5 ft)

16-608710
RE16-10-1535 (0-0.5 ft)
Benzo(a)anthracene 0.0304 (J)
Benzo(a)pyrene 0.026 (J)
Benzo(b)fluoranthene 0.0373 (J)
Benzo(k)fluoranthene 0.0195 (J)
Benzoic Acid 0.734 (J)
Chrysene 0.0287 (J)
Fluoranthene 0.0588
Phenanthrene 0.044 (J)
Pyrene 0.0584
TATB 0.615 (J)
RE16-10-1536 (5.5-6 ft)

16-340 16-339 16-343 16-342 16-345 16-478 16-477 16-476 16-530 16-531

1614800 1615000 1615200 1615400 1615600
1763200 1763000 1762800

Sampling results reported in mg/kg

- 2009/2010 sampling location
- NPDES-permitted outfall, inactive (approx. location)
- Former drainline
- Communication line
- Electric line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Former structure or building
- Structure or building
- Subject SWMU or AOC
- Other SWMU or AOC

N

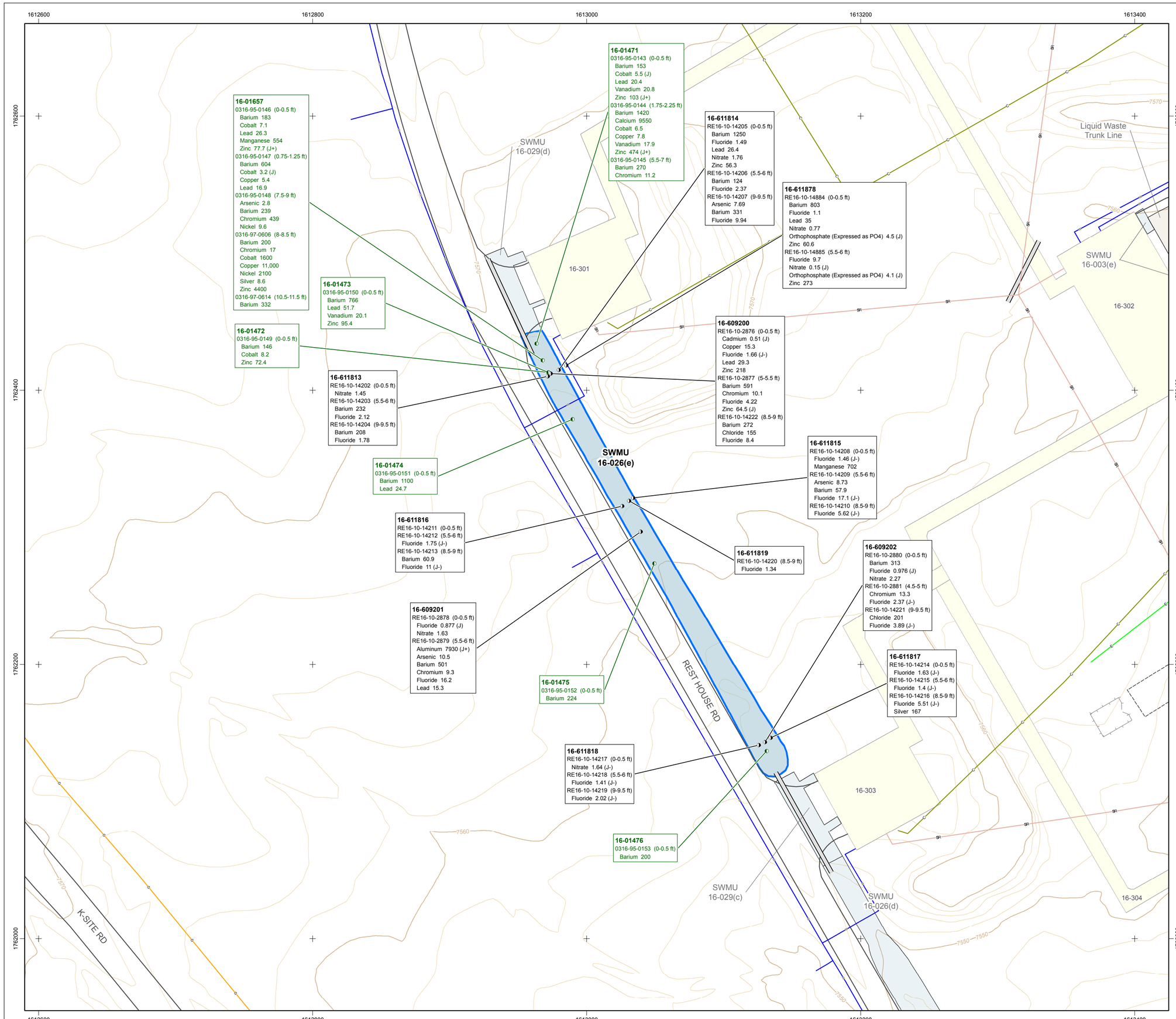
State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 12.5 25 50
0 5 10 20
Meters

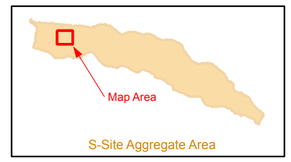
Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate9.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

PLATE 9.
Summary of inorganic chemicals above BVs at SWMU 16-026(e)



Location Map



Sampling results reported in mg/kg

Sampling location

- 2009/2010
- Historic
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- Structure or building
- Liquid Waste Trunk Line
- Subject SWMU or AOC
- Other SWMU or AOC

N

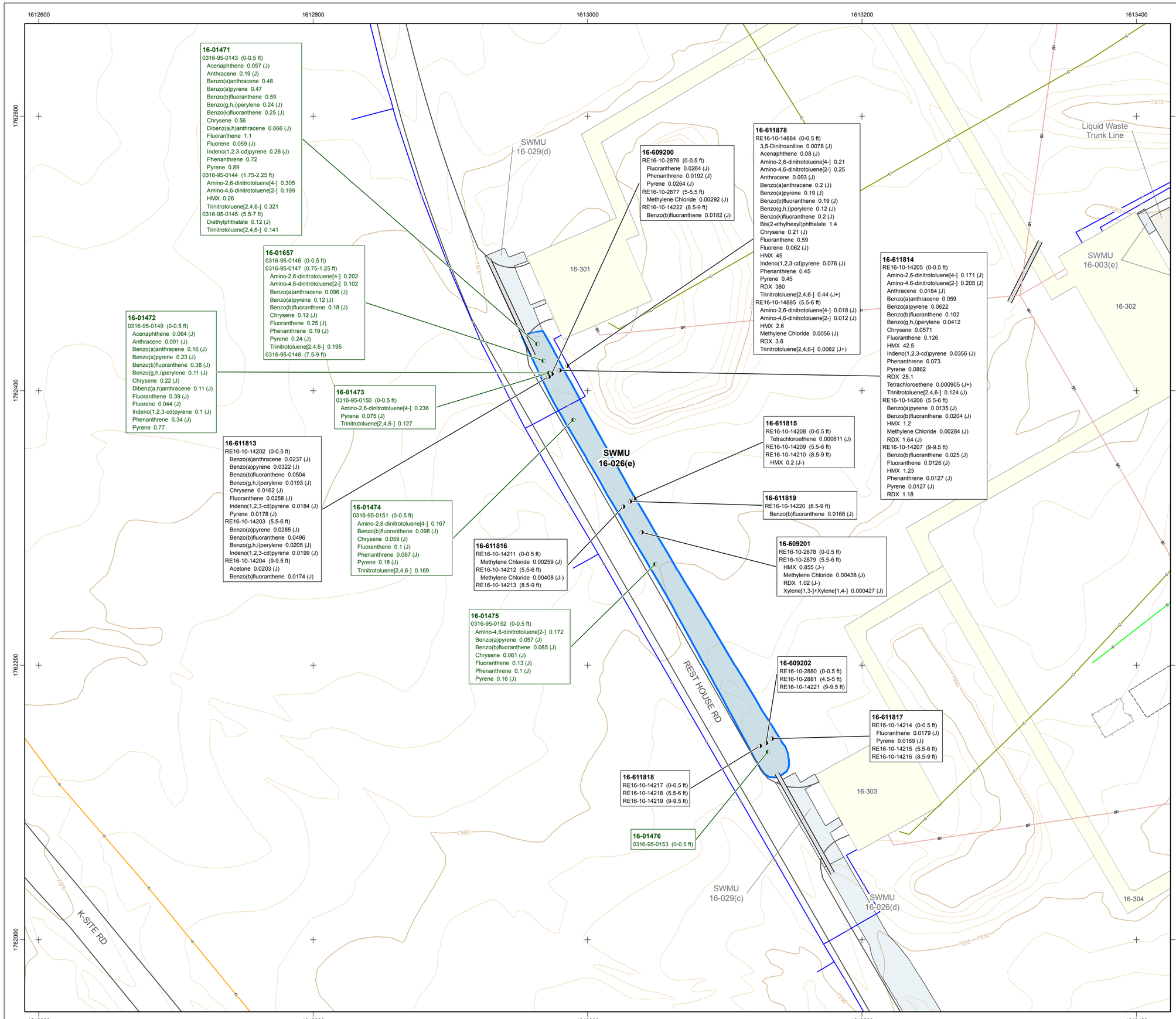
State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 12.5 25 50
0 5 10 20
Meters

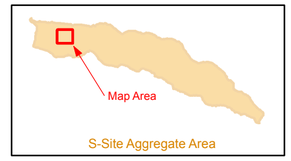
Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate10.RevD
Revised 25 August 2011 by Adelante Consulting Inc.

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

PLATE 10.
Organic chemicals detected in samples at SWMU 16-026(e)



Location Map



Sampling results reported in mg/kg

Sampling location

- 2009/2010
- Historic
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- Structure or building
- Liquid Waste Trunk Line
- Subject SWMU or AOC
- Other SWMU or AOC

N

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 12.5 25 50
0 5 10 20
Meters

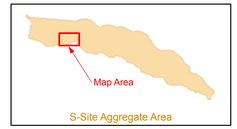
Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate11.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

PLATE 11.
Organic chemicals detected in samples at the Shared Drainages

Sampling results reported in mg/kg

Location Map



Sampling location
- 2009/2010
- Historic
- NPDES-permitted outfall, inactive (approx. location)
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Structure or building
- Liquid Waste Trunk Line
- SWMU or AOC

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 12.5 25 50
0 5 10 20
Meters

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate12.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

1613400 1613600 1613800 1614000 1614200 1614400 1614600

1762000 1761800 1761600 1761400

16-01434
0316-95-0095 (0-0.5 ft)
Acenaphthene 2.4 (J)
Amino-4,6-dinitrotoluene[2-] 0.877
Anthracene 3.9 (J)
Benzo(a)anthracene 7.3 (J)
Benzo(a)pyrene 7.9 (J)
Benzo(b)fluoranthene 5.8 (J)
Benzo(g,h,i)perylene 6 (J)
Bis(2-ethylhexyl)phthalate 3 (J)
Chrysene 9.9 (J)
Dibenzofuran 1.6 (J)
Dinitrotoluene[2,4-] 0.406
Fluoranthene 11
Fluorene 2.7 (J)
HMX 0.818
Indeno(1,2,3-cd)pyrene 4.9 (J)
Methylnaphthalene[2-] 1.2 (J)
Naphthalene 3.8 (J)
Phenanthrene 15
Pyrene 26
RDX 1.1
Tetryl 1.13
Trinitrobenzene[1,3,5-] 0.262
Trinitrotoluene[2,4,6-] 90.1
0316-95-0096 (0.33-0.83 ft)
Acenaphthene 7.2
Acenaphthylene 0.091 (J)
Amino-4,6-dinitrotoluene[2-] 1.53
Anthracene 27
Benzo(a)anthracene 31
Benzo(a)pyrene 31
Benzo(b)fluoranthene 22
Benzo(g,h,i)perylene 23
Benzo(k)fluoranthene 29
Bis(2-ethylhexyl)phthalate 7.5
Butanone[2-] 0.01 (J)
Chrysene 43
Di-n-butylphthalate 0.24 (J)
Dibenzofuran 4.7
Dimethylphenol[2,4-] 0.29 (J)
Dinitrotoluene[2,4-] 0.417
Fluoranthene 57
Fluorene 7
HMX 20.7
Indeno(1,2,3-cd)pyrene 19
Methylnaphthalene[2-] 3.3
Methylphenol[2-] 0.12 (J)
Methylphenol[4-] 0.38 (J)
Naphthalene 12
Phenanthrene 69
Pyrene 110
RDX 24.5
Tetryl 0.514
Trichloroethane[1,1,1-] 0.043
Trinitrobenzene[1,3,5-] 0.097
Trinitrotoluene[2,4,6-] 50.9
0316-95-0097 (2.5-3.5 ft)
Acenaphthene 0.17 (J)
Anthracene 0.82
Benzo(a)anthracene 0.64
Benzo(a)pyrene 0.6
Benzo(b)fluoranthene 0.52
Benzo(g,h,i)perylene 0.46
Bis(2-ethylhexyl)phthalate 0.12 (J)
Butanone[2-] 0.006 (J)
Chrysene 0.93
Dibenzofuran 0.11 (J)
Fluoranthene 1.6
Fluorene 0.21 (J)
Indeno(1,2,3-cd)pyrene 0.37 (J)
Methylnaphthalene[2-] 0.062 (J)
Naphthalene 0.14 (J)
Phenanthrene 1.5
Pyrene 1.6
Trinitrotoluene[2,4,6-] 1.71

16-01653
0316-95-0098 (0-0.5 ft)
Acenaphthene 0.1 (J)
Anthracene 0.2 (J)
Benzo(a)anthracene 0.51
Benzo(a)pyrene 0.54
Benzo(b)fluoranthene 0.57
Benzo(g,h,i)perylene 0.42 (J)
Benzo(k)fluoranthene 0.48 (J)
Bis(2-ethylhexyl)phthalate 0.37 (J)
Chrysene 0.77
Dibenzofuran 0.057 (J)
Dinitrotoluene[2,4-] 0.48 (J)
Fluoranthene 0.83
Fluorene 0.11 (J)
Indeno(1,2,3-cd)pyrene 0.36 (J)
Naphthalene 0.061 (J)
Phenanthrene 0.83
Pyrene 2
Trinitrotoluene[2,4,6-] 1.1
0316-95-0099 (0.5-1.25 ft)
Acenaphthene 0.61
Acetone 0.031
Anthracene 1.2
Benzo(a)anthracene 2.6
Benzo(a)pyrene 2.3
Benzo(b)fluoranthene 2.1
Benzo(g,h,i)perylene 2
Benzo(k)fluoranthene 1.7
Bis(2-ethylhexyl)phthalate 0.39 (J)
Chrysene 3.5
Dibenzofuran 0.36 (J)
Fluoranthene 4.6
Fluorene 0.7
HMX 0.18
Indeno(1,2,3-cd)pyrene 1.8
Methylene Chloride 0.007
Methylnaphthalene[2-] 0.24 (J)
Naphthalene 0.74
Phenanthrene 4.7
Pyrene 8.5
Trichloro-1,2,2-trifluoroethane[1,1,2-] 0.003 (J)
Trichlorofluoromethane 0.014
Trinitrotoluene[2,4,6-] 1.85
0316-95-0100 (4.5-5.5 ft)
Acetone 0.009 (J)
Amino-4,6-dinitrotoluene[2-] 0.126
Bis(2-ethylhexyl)phthalate 0.21 (J)
Chrysene 0.045 (J)
Fluoranthene 0.066 (J)
Methylene Chloride 0.005 (J)
Phenanthrene 0.058 (J)
Pyrene 0.062 (J)
Trichlorofluoromethane 0.008
Trinitrotoluene[2,4,6-] 2.04

16-609217
RE16-10-2925 (0-0.5 ft)
Fluoranthene 0.0182 (J)
Pyrene 0.0268 (J)
RE16-10-2926 (4.5-5 ft)
Acetone 0.00548 (J)

16-609219
RE16-10-2929 (0-0.5 ft)
Anthracene 0.0123 (J)
Benzo(a)anthracene 0.0709
Benzo(a)pyrene 0.0823
Benzo(b)fluoranthene 0.116
Benzo(k)fluoranthene 0.0529
Chrysene 0.084
Fluoranthene 0.135
Indeno(1,2,3-cd)pyrene 0.0394 (J)
Phenanthrene 0.0731
Pyrene 0.194
TATB 1.13
RE16-10-2930 (5.5-6 ft)
Fluoranthene 0.0175 (J)
Pyrene 0.0175 (J)

16-609218
RE16-10-2927 (0-0.5 ft)
Pyrene 0.0122 (J)
RE16-10-2928 (1.5-2 ft)

16-609169
RE16-10-2778 (0-0.5 ft)
Anthracene 0.00835 (J)
Benzo(b)fluoranthene 0.0196 (J)
Fluoranthene 0.0188 (J)
Pyrene 0.0199 (J)

16-611945
RE16-10-2780 (0-0.5 ft)
Acetone 0.00227 (J-)
Anthracene 0.0181 (J)
Benzo(a)anthracene 0.0596
Benzo(a)pyrene 0.0516
Benzo(b)fluoranthene 0.0922
Benzo(g,h,i)perylene 0.0306 (J)
Chrysene 0.0625
Fluoranthene 0.122
Indeno(1,2,3-cd)pyrene 0.0294 (J)
Phenanthrene 0.0758
Pyrene 0.126

16-01411
0316-95-0092 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.058 (J)
Fluoranthene 0.057 (J)
Phenanthrene 0.098 (J)
Pyrene 0.059 (J)
Trinitrotoluene[2,4,6-] 0.132
0316-95-0093 (0.5-1 ft)
Acetone 0.008 (J)
Anthracene 0.17 (J)
Benzo(a)anthracene 0.24 (J)
Bis(2-ethylhexyl)phthalate 4.3
Chrysene 0.32 (J)
Fluoranthene 0.27 (J)
Methylene Chloride 0.004 (J)
Phenanthrene 0.36 (J)
Pyrene 0.81
0316-95-0094 (3.5-5 ft)
Bis(2-ethylhexyl)phthalate 0.11 (J)
Trinitrotoluene[2,4,6-] 0.139

16-609221
RE16-10-2933 (0-0.5 ft)
Acetone 0.00291 (J)
Benzo(a)anthracene 0.0199 (J)
Chrysene 0.016 (J)
Fluoranthene 0.0294 (J)
Isopropyltoluene[4-] 0.000399 (J)
Phenanthrene 0.0192 (J)
Pyrene 0.0471
Toluene 0.000919 (J)
Trinitrotoluene[2,4,6-] 0.174 (J)

16-609229
RE16-10-2947 (0-0.5 ft)
RE16-10-2948 (4-5.5 ft)
Acetone 0.00242 (J)
RE16-10-2949 (10-12 ft)
RE16-10-2950 (17.5-20 ft)
RE16-10-2945 (23-25 ft)

16-01439
0316-95-0105 (0-0.5 ft)
Acenaphthene 0.3 (J)
Amino-4,6-dinitrotoluene[2-] 0.098
Anthracene 0.64 (J)
Benzo(a)anthracene 1.1 (J)
Benzo(a)pyrene 1.2 (J)
Benzo(b)fluoranthene 2.2
Benzo(g,h,i)perylene 0.64 (J)
Chrysene 1.2 (J)
Fluoranthene 2.5
Fluorene 0.29 (J)
HMX 1.06
Indeno(1,2,3-cd)pyrene 0.72 (J)
Methylphenol[2-] 1.7
Phenanthrene 2
Pyrene 4.5
Trinitrotoluene[2,4,6-] 2.89

16-01438
0316-95-0104 (0-0.5 ft)
Benzo(a)pyrene 0.067 (J)
Benzo(b)fluoranthene 0.065 (J)
Chrysene 0.076 (J)
Fluoranthene 0.13 (J)
Phenanthrene 0.082 (J)
Pyrene 0.12 (J)
Trinitrotoluene[2,4,6-] 0.488

16-01437
0316-95-0103 (0-0.5 ft)
Amino-2,6-dinitrotoluene[4-] 0.094
Anthracene 0.13 (J)
Benzo(a)anthracene 0.47 (J)
Benzo(a)pyrene 0.58 (J)
Benzo(b)fluoranthene 0.89
Benzo(g,h,i)perylene 0.24 (J)
Benzo(k)fluoranthene 0.31 (J)
Benzoic Acid 0.51 (J)
Chrysene 0.61 (J)
Fluoranthene 1.1
Indeno(1,2,3-cd)pyrene 0.29 (J)
Methylphenol[4-] 0.089 (J)
Phenanthrene 0.54 (J)
Pyrene 0.98
Trinitrotoluene[2,4,6-] 0.533

16-01436
0316-95-0102 (0-0.5 ft)
Acenaphthene 0.31 (J)
Amino-2,6-dinitrotoluene[4-] 0.092
Amino-4,6-dinitrotoluene[2-] 0.093
Anthracene 1
Benzo(a)anthracene 1.5
Benzo(a)pyrene 1.7
Benzo(b)fluoranthene 2.3
Benzo(g,h,i)perylene 0.62
Benzo(k)fluoranthene 0.91
Benzoic Acid 0.18 (J)
Chrysene 1.6
Dibenz(a,h)anthracene 0.17 (J)
Dibenzofuran 0.14 (J)
Fluoranthene 3
Fluorene 0.31 (J)
HMX 1.14
Indeno(1,2,3-cd)pyrene 0.79
Methylnaphthalene[2-] 0.086 (J)
Methylphenol[4-] 0.16 (J)
Naphthalene 0.26 (J)
Phenanthrene 2.2
Pyrene 2.9
Tetryl 0.094
Trinitrotoluene[2,4,6-] 4.49

16-01435
0316-95-0101 (0-0.5 ft)
Acenaphthene 0.045 (J)
Anthracene 0.066 (J)
Benzo(a)anthracene 0.14 (J)
Benzo(a)pyrene 0.16 (J)
Benzo(b)fluoranthene 0.19 (J)
Benzo(g,h,i)perylene 0.09 (J)
Benzo(k)fluoranthene 0.077 (J)
Chrysene 0.18 (J)
Dibenz(a,h)anthracene 0.074 (J)
Fluoranthene 0.38 (J)
Fluorene 0.043 (J)
Naphthalene 0.06 (J)
Phenanthrene 0.34 (J)
Pyrene 0.34 (J)

16-609215
RE16-10-2921 (0-0.5 ft)
Acenaphthene 0.596
Acetone 0.00277 (J)
Anthracene 1.29
Benzo(a)anthracene 3.78
Benzo(a)pyrene 3.82
Benzo(b)fluoranthene 7.4
Benzo(g,h,i)perylene 1.65 (J)
Benzo(k)fluoranthene 2.45
Chrysene 4.19
Dibenzofuran 0.281 (J)
Fluoranthene 12.3
Fluorene 0.621
Indeno(1,2,3-cd)pyrene 1.72 (J)
Isopropyltoluene[4-] 0.00043 (J)
Methylnaphthalene[2-] 0.0246 (J)
Naphthalene 0.0354 (J)
Phenanthrene 10.2
Pyrene 15.2
Toluene 0.00043 (J)
RE16-10-2922 (5.5-6 ft)
Acenaphthene 0.0143 (J)
Acetone 0.0216 (J)
Anthracene 0.0353 (J)
Benzo(a)anthracene 0.0996
Benzo(a)pyrene 0.0663
Benzo(b)fluoranthene 0.139
Benzo(g,h,i)perylene 0.0473 (J)
Benzo(k)fluoranthene 0.0521
Bis(2-ethylhexyl)phthalate 0.157 (J)
Chrysene 0.109
Fluoranthene 0.209
Fluorene 0.016 (J)
HMX 0.248 (J)
Indeno(1,2,3-cd)pyrene 0.045 (J)
Phenanthrene 0.173
Pyrene 0.234

16-609216
RE16-10-2923 (0-0.5 ft)
Benzo(a)anthracene 0.0331 (J)
Benzo(a)pyrene 0.0462
Benzo(b)fluoranthene 0.0919
Benzo(g,h,i)perylene 0.0448 (J)
Benzo(k)fluoranthene 0.0351 (J)
Chrysene 0.0525
Fluoranthene 0.0694
Indeno(1,2,3-cd)pyrene 0.0383 (J)
Phenanthrene 0.032 (J)
Pyrene 0.0975
RE16-10-2924 (5.5-6 ft)
Xylene[1,3-]+Xylene[1,4-] 0.000807 (J)

16-01458
0316-95-0120 (0-0.5 ft)
Acenaphthene 0.045 (J)
Anthracene 0.076 (J)
Benzo(a)anthracene 0.1 (J)
Benzo(a)pyrene 0.13 (J)
Benzo(b)fluoranthene 0.17 (J)
Bis(2-ethylhexyl)phthalate 0.042 (J)
Chrysene 0.15 (J)
Fluoranthene 0.25 (J)
Fluorene 0.04 (J)
Indeno(1,2,3-cd)pyrene 0.068 (J)
Phenanthrene 0.24 (J)
Pyrene 0.4

16-609220
RE16-10-2931 (0-0.5 ft)
Benzo(a)anthracene 0.0305 (J)
Benzo(a)pyrene 0.038 (J)
Benzo(b)fluoranthene 0.0521
Benzo(g,h,i)perylene 0.0239 (J)
Benzo(k)fluoranthene 0.0279 (J)
Chrysene 0.0432
Fluoranthene 0.055
Indeno(1,2,3-cd)pyrene 0.0225 (J)
Phenanthrene 0.0291 (J)
Pyrene 0.0743
RE16-10-2932 (5.5-6 ft)
Fluoranthene 0.0143 (J)
Isopropyltoluene[4-] 0.000375 (J)
Pyrene 0.0125 (J)
Xylene[1,3-]+Xylene[1,4-] 0.000375 (J)

16-609215
RE16-10-2921 (0-0.5 ft)
Acenaphthene 0.596
Acetone 0.00277 (J)
Anthracene 1.29
Benzo(a)anthracene 3.78
Benzo(a)pyrene 3.82
Benzo(b)fluoranthene 7.4
Benzo(g,h,i)perylene 1.65 (J)
Benzo(k)fluoranthene 2.45
Chrysene 4.19
Dibenzofuran 0.281 (J)
Fluoranthene 12.3
Fluorene 0.621
Indeno(1,2,3-cd)pyrene 1.72 (J)
Isopropyltoluene[4-] 0.00043 (J)
Methylnaphthalene[2-] 0.0246 (J)
Naphthalene 0.0354 (J)
Phenanthrene 10.2
Pyrene 15.2
Toluene 0.00043 (J)
RE16-10-2922 (5.5-6 ft)
Acenaphthene 0.0143 (J)
Acetone 0.0216 (J)
Anthracene 0.0353 (J)
Benzo(a)anthracene 0.0996
Benzo(a)pyrene 0.0663
Benzo(b)fluoranthene 0.139
Benzo(g,h,i)perylene 0.0473 (J)
Benzo(k)fluoranthene 0.0521
Bis(2-ethylhexyl)phthalate 0.157 (J)
Chrysene 0.109
Fluoranthene 0.209
Fluorene 0.016 (J)
HMX 0.248 (J)
Indeno(1,2,3-cd)pyrene 0.045 (J)
Phenanthrene 0.173
Pyrene 0.234

16-01457
0316-95-0119 (0-0.5 ft)
Amino-2,6-dinitrotoluene[4-] 0.354
Amino-4,6-dinitrotoluene[2-] 0.362
Benzo(a)anthracene 0.094 (J)
Benzo(a)pyrene 0.11 (J)
Benzo(b)fluoranthene 0.17 (J)
Bis(2-ethylhexyl)phthalate 0.045 (J)
Chrysene 0.12 (J)
Fluoranthene 0.26 (J)
HMX 143
Phenanthrene 0.12 (J)
Pyrene 0.23 (J)
RDX 0.649

16-304 16-1484 16-305 16-306 16-307

Liquid Waste Trunk Line

SWMU 16-003(g)
SWMU 16-001(e)
SWMU 16-026(z)
SWMU 16-026(c)
SWMU 16-026(b)
SWMU 16-029(a)

05A058

Martin Spring Canyon

REST HOUSE RD
HE RD

PLATE 12.
Summary of inorganic chemicals above BVs at the Liquid Waste Trunk Line

16-611849
RE16-10-14808 (0-0.5 ft)
Fluoride 1.4
Nitrate 0.28
RE16-10-14809 (5.5-6 ft)
Fluoride 6.3
Nitrate 0.15 (J)

16-611848
RE16-10-14806 (0-0.5 ft)
Calcium 6330
Fluoride 0.93 (J)
Nitrate 0.094 (J)
Zinc 107
RE16-10-14807 (5.5-6 ft)
Chloride 254
Fluoride 5
Nitrate 0.074 (J)

16-609241
RE16-10-2984 (1-1.5 ft)
Antimony 0.945 (J)
Calcium 16,400 (J+)
Chloride 380
Copper 23.8
Fluoride 1.33
Nitrate 1.76
RE16-10-2985 (6.5-7 ft)
Fluoride 3.01
Nitrate 2.85

16-609232
RE16-10-2966 (1.5-2 ft)
Fluoride 2.43
Zinc 161
RE16-10-2967 (5.5-6 ft)
Fluoride 2.78
Zinc 51.7

16-609233
RE16-10-2968 (0-0.5 ft)
Fluoride 0.937 (J)
RE16-10-2969 (5.5-6 ft)
Fluoride 8.26

16-611851
RE16-10-14812 (0-0.5 ft)
Fluoride 0.65 (J)
Nitrate 0.2 (J)
RE16-10-14813 (5.5-6 ft)
Aluminum 9050
Barium 77.5 (J+)
Fluoride 6.5
Nickel 6.6
Nitrate 0.3
Selenium 1.3

16-611850
RE16-10-14810 (0-0.5 ft)
Fluoride 0.46 (J)
Nitrate 0.087 (J)
RE16-10-14811 (5.5-6 ft)
Fluoride 5.9
Nitrate 0.26

16-609240
RE16-10-2982 (1-1.5 ft)
Calcium 9920 (J+)
Fluoride 2.92
Nitrate 1.43
RE16-10-2983 (6.5-7 ft)
Fluoride 1.83

16-609234
RE16-10-2970 (0-0.5 ft)
Fluoride 0.44 (J)
RE16-10-2971 (5.5-6 ft)
Fluoride 3.73

16-609242
RE16-10-2986 (0-0.5 ft)
Cadmium 0.9
Fluoride 2.3
Lead 84.4 (J)
Zinc 62.3
RE16-10-2987 (5.5-6 ft)
Fluoride 1.8
RE16-10-2988 (8.5-9 ft)
Fluoride 0.8 (J)

16-609244
RE16-10-2989 (0-0.5 ft)
Cadmium 2
Copper 14.8
Fluoride 2.7
Lead 61.7 (J)
Zinc 81.8
RE16-10-2990 (5.5-6 ft)
Barium 123
Calcium 2240 (J+)
Fluoride 4.8
Selenium 0.59 (J)
RE16-10-2991 (8.5-9 ft)
Barium 52.2
Fluoride 1.3
Selenium 1

16-609235
RE16-10-2972 (0-0.5 ft)
Cadmium 1.4
Lead 33.6
Zinc 58.4
RE16-10-2973 (1.5-2 ft)
RE16-10-14801 (8.5-9 ft)
Fluoride 1.3

16-611853
RE16-10-14816 (0-0.5 ft)
Cadmium 0.95
Fluoride 2.6
Lead 26.7
Nitrate 0.25 (J)
Zinc 191
RE16-10-14817 (5.5-6 ft)
Aluminum 14,400 (J+)
Arsenic 2.9
Barium 225
Beryllium 1.4
Calcium 2760 (J+)
Cobalt 3.7
Copper 8.2
Fluoride 4.6
Lead 17.1
Magnesium 2140
Nitrate 0.091 (J)
Selenium 1.6

16-611852
RE16-10-14814 (0-0.5 ft)
Fluoride 2.1
Nitrate 0.3
RE16-10-14815 (5.5-6 ft)
Fluoride 6.9
Nitrate 0.15 (J)

16-609236
RE16-10-2974 (0-0.5 ft)
Fluoride 2.43
Lead 26.2
Nitrate 1.71 (J-)
RE16-10-2975 (2.5-3 ft)
Fluoride 7.06

16-609237
RE16-10-2976 (0-0.5 ft)
Fluoride 0.88 (J)
RE16-10-2977 (5.5-6 ft)
Fluoride 2.4
RE16-10-14802 (8.5-9 ft)
Barium 139
Fluoride 0.69 (J)
Nitrate 0.059 (J)
Selenium 1.4

16-611856
RE16-10-14821 (0-0.5 ft)
Fluoride 1.3 (J)
Lead 22.7
Manganese 742
Nitrate 0.22 (J)
RE16-10-14822 (5.5-6 ft)
Fluoride 1.6
Nitrate 0.83
Selenium 1
RE16-10-14823 (8.5-9 ft)
Fluoride 1.4
Nitrate 0.064 (J)
Selenium 1.2

16-609239
RE16-10-2980 (1-1.5 ft)
Cobalt 32.7
Fluoride 4.1 (J-)
Nitrate 1.77
Sodium 1100
RE16-10-2981 (6.5-7 ft)
Chromium 38.3
Fluoride 2.65 (J-)
Nitrate 1.54

16-611854
RE16-10-14818 (0-0.5 ft)
Fluoride 0.75 (J)
Nitrate 0.36
RE16-10-14819 (5.5-6 ft)
Aluminum 10,300 (J+)
Barium 102
Copper 5.9
Fluoride 3.1
Selenium 0.84
RE16-10-14820 (8.5-9 ft)
Barium 65.1
Fluoride 2.5
Nitrate 0.059 (J)
Selenium 0.58 (J)

16-609238
RE16-10-2978 (1-2 ft)
Cobalt 37.5
Fluoride 3.98 (J-)
Nitrate 2.2
Perchlorate 0.000936 (J)
RE16-10-2979 (6.5-7 ft)
Aluminum 10,900
Barium 85.1
Calcium 5060 (J+)
Chloride 164
Fluoride 17.7
Nitrate 3.43

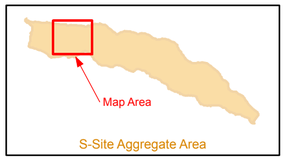
BURNING GROUND RD
K-SITE RD
REST HOUSE RD
340 LP
HE RD
Martin Spring Canyon
Liquid Waste Trunk Line
05A058

SWMU 16-003(d)
SWMU 16-025(d2)
SWMU 16-029(d)
SWMU 16-003(e)
SWMU 16-026(e)
SWMU 16-003(f)
SWMU 16-029(c)
SWMU 16-026(d)
SWMU 16-003(g)
SWMU 16-029(b)
SWMU 16-026(z)
SWMU 16-001(e)
SWMU 16-026(c)
SWMU 16-026(b)

AOC 16-024(u)
AOC C-16-060
AOC C-16-050
AOC 16-024(a)
AOC C-16-049

16-300 16-301 16-302 16-303 16-304 16-305 16-306 16-307
16-340 16-341 16-342 16-343

Location Map



Sampling results reported in mg/kg

- 2009/2010 sampling location
- NPDES-permitted outfall, inactive (approx. location)
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Former structure or building
- Structure or building
- Subject area
- SWMU or AOC

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

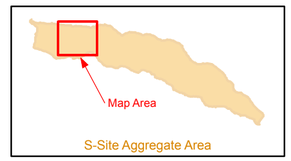
Feet
0 25 50 100
0 12.5 25 50
Meters

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate13 Rev0
Revised 25 August 2011 by Adelante Consulting Inc

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

PLATE 13.
Organic chemicals detected in samples at the Liquid Waste Trunk Line

Location Map



16-609241
RE16-10-2984 (1-1.5 ft)
Acenaphthene 0.122
Acetone 0.0145
Anthracene 0.2
Benzene 0.000724 (J)
Benzo(a)anthracene 0.301
Benzo(a)pyrene 0.241
Benzo(b)fluoranthene 0.358
Benzo(g,h,i)perylene 0.162
Butanone[2-] 0.00211 (J)
Chrysene 0.245
Fluoranthene 0.649
Fluorene 0.116
Indeno(1,2,3-cd)pyrene 0.14
Methylnaphthalene[2-] 0.0693
Naphthalene 0.24
Phenanthrene 0.614
Pyrene 0.56
Toluene 0.00164
Xylene[1,3-]+Xylene[1,4-] 0.000776 (J)
RE16-10-2985 (6.5-7 ft)
Acenaphthene 0.0719
Acetone 0.0223
Anthracene 0.131
Benzo(a)anthracene 0.214
Benzo(a)pyrene 0.168
Benzo(b)fluoranthene 0.246
Benzo(g,h,i)perylene 0.107
Chrysene 0.181
Fluoranthene 0.475
Fluorene 0.0699
Indeno(1,2,3-cd)pyrene 0.0906
Methylnaphthalene[2-] 0.0339 (J)
Naphthalene 0.107
Phenanthrene 0.429
Pyrene 0.383

16-609240
RE16-10-2982 (1-1.5 ft)
Acetone 0.012
Anthracene 0.014 (J)
Benzo(a)pyrene 0.0546
Benzo(b)fluoranthene 0.0849
Benzo(g,h,i)perylene 0.036 (J)
Chrysene 0.0625
Fluoranthene 0.101
Indeno(1,2,3-cd)pyrene 0.0334 (J)
Phenanthrene 0.0474
Pyrene 0.0932
RE16-10-2983 (6.5-7 ft)
Acenaphthene 0.0696
Acetone 0.00457 (J)
Anthracene 0.117
Benzo(a)anthracene 0.179
Benzo(a)pyrene 0.137
Benzo(b)fluoranthene 0.207
Benzo(g,h,i)perylene 0.061
Chrysene 0.127
Fluoranthene 0.429
Fluorene 0.0566
Indeno(1,2,3-cd)pyrene 0.0578
Methylene Chloride 0.0047 (J)
Methylnaphthalene[2-] 0.0356 (J)
Naphthalene 0.136
Phenanthrene 0.339
Pyrene 0.305

16-611849
RE16-10-14808 (0-0.5 ft)
Anthracene 0.061 (J)
Benzo(a)anthracene 0.27 (J)
Benzo(a)pyrene 0.25 (J)
Benzo(b)fluoranthene 0.24 (J)
Benzo(g,h,i)perylene 0.14 (J)
Benzo(k)fluoranthene 0.28 (J)
Chrysene 0.29 (J)
Dibenz(a,h)anthracene 0.042 (J)
Fluoranthene 0.54
Indeno(1,2,3-cd)pyrene 0.11 (J)
Phenanthrene 0.29 (J)
Pyrene 0.47
RE16-10-14809 (5.5-6 ft)

16-611850
RE16-10-14810 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.2 (J)
RE16-10-14811 (5.5-6 ft)
Diethylphthalate 1.8

16-609233
RE16-10-2968 (0-0.5 ft)
Fluoranthene 0.0145 (J)
Pyrene 0.0128 (J)
RE16-10-2969 (5.5-6 ft)

16-609234
RE16-10-2970 (0-0.5 ft)
Benzo(b)fluoranthene 0.453
Fluoranthene 0.0638 (J)
Pyrene 0.0728 (J)
RE16-10-2971 (5.5-6 ft)

16-609244
RE16-10-2989 (0-0.5 ft)
Acenaphthene 0.062 (J)
Anthracene 0.081 (J)
Benzo(a)anthracene 0.28 (J)
Benzo(a)pyrene 0.27 (J)
Benzo(b)fluoranthene 0.25 (J)
Benzo(g,h,i)perylene 0.12 (J)
Benzo(k)fluoranthene 0.28 (J)
Chrysene 0.32 (J)
Dinitrotoluene[2,4-] 0.007 (J)
Fluoranthene 0.73
Indeno(1,2,3-cd)pyrene 0.1 (J)
Phenanthrene 0.45 (J)
Pyrene 0.59
Trinitrotoluene[2,4,6-] 0.021 (J)
Tris (o-cresyl) phosphate 0.25
RE16-10-2990 (5.5-6 ft)
RE16-10-2991 (8.5-9 ft)
Fluoranthene 0.041 (J)

16-609236
RE16-10-2974 (0-0.5 ft)
Fluoranthene 0.0517 (J)
Pyrene 0.0545 (J)
RE16-10-2975 (2.5-3 ft)

16-611852
RE16-10-14814 (0-0.5 ft)
RE16-10-14815 (5.5-6 ft)

16-611851
RE16-10-14812 (0-0.5 ft)
Fluoranthene 0.048 (J)
Pyrene 0.04 (J)
RE16-10-14813 (5.5-6 ft)
Benzo(a)anthracene 0.061 (J)
Benzo(a)pyrene 0.047 (J)
Benzo(b)fluoranthene 0.043 (J)
Benzo(k)fluoranthene 0.056 (J)
Bis(2-ethylhexyl)phthalate 1.4
Chrysene 0.058 (J)
Fluoranthene 0.16 (J)
Phenanthrene 0.086 (J)
Pyrene 0.11 (J)

16-609237
RE16-10-2976 (0-0.5 ft)
RE16-10-2977 (5.5-6 ft)
RE16-10-14802 (8.5-9 ft)

16-611854
RE16-10-14818 (0-0.5 ft)
RE16-10-14819 (5.5-6 ft)
RE16-10-14820 (8.5-9 ft)

16-609238
RE16-10-2978 (1-2 ft)
Acetone 0.0074 (J)
Anthracene 0.0372 (J)
Benzo(a)anthracene 0.107
Benzo(a)pyrene 0.101
Benzo(b)fluoranthene 0.142
Benzo(g,h,i)perylene 0.086
Chrysene 0.0983
Fluoranthene 0.198
Indeno(1,2,3-cd)pyrene 0.0749
Phenanthrene 0.129
Pyrene 0.177
RE16-10-2979 (6.5-7 ft)
Acetone 0.148 (J)
Anthracene 0.0126 (J)
Benzo(a)pyrene 0.0206 (J)
Benzo(b)fluoranthene 0.033 (J)
Benzo(g,h,i)perylene 0.0178 (J)
Fluoranthene 0.0574
Indeno(1,2,3-cd)pyrene 0.0144 (J)
Phenanthrene 0.0413 (J)
Pyrene 0.0432

16-611848
RE16-10-14806 (0-0.5 ft)
Acenaphthene 0.041 (J)
Anthracene 0.064 (J)
Benzo(a)anthracene 0.2 (J)
Benzo(a)pyrene 0.18 (J)
Benzo(b)fluoranthene 0.17 (J)
Benzo(g,h,i)perylene 0.12 (J)
Benzo(k)fluoranthene 0.22 (J)
Bis(2-ethylhexyl)phthalate 0.087 (J)
Chrysene 0.22 (J)
Di-n-butylphthalate 0.086 (J)
Fluoranthene 0.49
Fluorene 0.036 (J)
Indeno(1,2,3-cd)pyrene 0.082 (J)
Phenanthrene 0.29 (J)
Phenol 0.11 (J)
Pyrene 0.41
RE16-10-14807 (5.5-6 ft)

16-609232
RE16-10-2966 (1.5-2 ft)
Fluoranthene 0.0412 (J)
Phenanthrene 0.0298 (J)
Pyrene 0.0417 (J)
RE16-10-2967 (5.5-6 ft)
Anthracene 0.0357 (J)
Benzo(a)anthracene 0.0803
Benzo(a)pyrene 0.0786
Benzo(b)fluoranthene 0.0489
Benzo(g,h,i)perylene 0.044 (J)
Benzo(k)fluoranthene 0.0359 (J)
Chrysene 0.072
Fluoranthene 0.192
Fluorene 0.0164 (J)
Indeno(1,2,3-cd)pyrene 0.176
Phenanthrene 0.133
Pyrene 0.173

16-611853
RE16-10-14816 (0-0.5 ft)
Anthracene 0.053 (J)
Benzo(a)anthracene 0.14 (J)
Benzo(a)pyrene 0.12 (J)
Benzo(b)fluoranthene 0.13 (J)
Benzo(g,h,i)perylene 0.07 (J)
Benzo(k)fluoranthene 0.15 (J)
Chrysene 0.16 (J)
Fluoranthene 0.38 (J)
Indeno(1,2,3-cd)pyrene 0.053 (J)
Phenanthrene 0.27 (J)
Pyrene 0.3 (J)
RE16-10-14817 (5.5-6 ft)

16-611856
RE16-10-14821 (0-0.5 ft)
Butylbenzene[n-] 0.00084 (J)
Toluene 0.0022 (J)
RE16-10-14822 (5.5-6 ft)
RE16-10-14823 (8.5-9 ft)

16-609242
RE16-10-2986 (0-0.5 ft)
3,5-Dinitroaniline 0.017 (J)
Acenaphthene 0.066 (J)
Anthracene 0.089 (J)
Benzo(a)anthracene 0.28 (J)
Benzo(a)pyrene 0.26 (J)
Benzo(b)fluoranthene 0.28 (J)
Benzo(g,h,i)perylene 0.11 (J)
Benzo(k)fluoranthene 0.28 (J)
Chrysene 0.32 (J)
Fluoranthene 0.74
Fluorene 0.059 (J)
Indeno(1,2,3-cd)pyrene 0.081 (J)
Phenanthrene 0.5
Pyrene 0.58
RDX 0.024 (J-)
Trinitrotoluene[2,4,6-] 0.078 (J)
Tris (o-cresyl) phosphate 0.83
RE16-10-2987 (5.5-6 ft)
Dinitrotoluene[2,4-] 0.0047 (J)
Fluoranthene 0.088 (J)
Phenanthrene 0.061 (J)
Pyrene 0.069 (J)
Trinitrotoluene[2,4,6-] 0.067 (J)
Tris (o-cresyl) phosphate 0.22
RE16-10-2988 (8.5-9 ft)
Fluoranthene 0.046 (J)

16-609239
RE16-10-2980 (1-1.5 ft)
Acenaphthene 0.0243 (J)
Anthracene 0.0479
Benzo(a)anthracene 0.119
Benzo(a)pyrene 0.151
Benzo(b)fluoranthene 0.214
Benzo(g,h,i)perylene 0.14
Chrysene 0.123
Dibenz(a,h)anthracene 0.0394 (J)
Fluoranthene 0.22
Fluorene 0.0179 (J)
Indeno(1,2,3-cd)pyrene 0.118
Phenanthrene 0.165
Pyrene 0.205
Xylene[1,2-] 0.000398 (J)
RE16-10-2981 (6.5-7 ft)
Benzo(a)anthracene 0.0235 (J)
Benzo(a)pyrene 0.0167 (J)
Benzo(b)fluoranthene 0.02 (J)
Chrysene 0.0194 (J)
Fluoranthene 0.0363 (J)
Indeno(1,2,3-cd)pyrene 0.0133 (J)
Phenanthrene 0.0227 (J)
Pyrene 0.0357 (J)

16-609235
RE16-10-2972 (0-0.5 ft)
Acenaphthene 0.378 (J)
Anthracene 0.481
Benzo(a)anthracene 1.25
Benzo(a)pyrene 1.08
Benzo(b)fluoranthene 2.94
Benzo(g,h,i)perylene 0.569
Chrysene 1.41
Fluoranthene 3.06
Fluorene 0.318 (J)
Indeno(1,2,3-cd)pyrene 0.293 (J)
Methylnaphthalene[2-] 0.107 (J)
Naphthalene 0.28 (J)
Phenanthrene 2.39
Pyrene 3.14
RE16-10-2973 (1.5-2 ft)
Acenaphthene 0.399
Anthracene 0.567
Benzo(a)anthracene 0.917
Benzo(a)pyrene 0.817
Benzo(b)fluoranthene 1.44
Benzo(g,h,i)perylene 0.32
Chrysene 0.958
Dibenz(a,h)anthracene 0.076 (J)
Dibenzofuran 0.195 (J)
Fluoranthene 2.36
Fluorene 0.371
Indeno(1,2,3-cd)pyrene 0.238
Methylnaphthalene[2-] 0.154
Naphthalene 0.542
Phenanthrene 2.21
Pyrene 2.3
RE16-10-14801 (8.5-9 ft)

Sampling results reported in mg/kg

- 2009/2010 sampling location
- NPDES-permitted outfall, inactive (approx. location)
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Former structure or building
- Structure or building
- Subject area
- SWMU or AOC

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet: 0 25 50 100
Meters: 0 12.5 25 50

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate14.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

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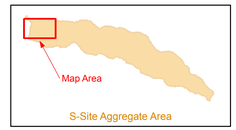
PLATE 14.
Summary of inorganic chemicals above BVs at SWMU 16-029(x)

Sampling results reported in mg/kg

Location Map



Sampling location
- 2009/2010
- Historic
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Former structure or building
- Structure or building
- Subject SWMU or AOC
- Other SWMU or AOC

N

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 25 50 100
0 5 10 20
Meters

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate15.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

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1611200 1611400 1611600 1611800 1612000 1612200 1612400 1612600 1612800 1613000

1763000 1762800 1762600 1762400 1762200 1762000

BURNING GROUND RD

V-SITE RD

PRESSING RD

REST HOUSE RD

K-SITE RD

SWMU 16-029(x)

SWMU 16-017(w)-99

SWMU 16-017(q)-99

SWMU 16-017(t)-99

SWMU 16-017(v)-99

SWMU 16-029(g2)

AOC C-16-074

SWMU 16-031(c)

SWMU 16-006(h)

SWMU 16-006(g)

SWMU 16-013

SWMU 16-029(w)

SWMU 16-025(x)

AOC C-16-068

SWMU 16-017(s)-99

SWMU 16-017(r)-99

SWMU 16-029(d)

SWMU 16-026(e)

SWMU 16-034(n)

SWMU 16-034(m)

AOC 16-024(m)

AOC 16-024(n)

SWMU 16-017(p)-99

16-454 16-468 16-285 16-515 16-516 16-517 16-526 16-518 16-520 16-519 16-301

16-03064
RE16-98-0046 (4.25-4.5 ft)
Barium 57
RE16-98-0047 (5.25-5.5 ft)
Barium 170

16-03066
0316-97-0020 (5-5.5 ft)
Boron 16.8

16-609485
RE16-10-3791 (0-0.5 ft)
Fluoride 0.847 (J-)
Nitrate 1.46
RE16-10-3792 (17.5-20 ft)
Bromide 4.14
Nitrate 2.15

16-03068
RE16-98-0020 (3.5-4.5 ft)
RE16-98-0021 (4.5-5.5 ft)
Thallium 0.88

16-609469
RE16-10-3743 (0-0.5 ft)
Cadmium 0.401 (J)
Fluoride 1.52 (J-)

16-03071
0316-97-0017 (4.4.33 ft)
Barium 355
Boron 9.8
Silver 55.6 (J-)

16-609471
RE16-10-3749 (0-0.5 ft)
Cadmium 0.449 (J)
Fluoride 1.91 (J-)
Nitrate 1.99

16-609472
RE16-10-3752 (0-0.5 ft)
Fluoride 1.63 (J-)
Silver 2.33

16-03072
RE16-98-0018 (3.5-4.5 ft)
Aluminum 12,000
Arsenic 2.9 (J-)
Barium 590 (J-)
Copper 5.6
Nickel 6.7
Silver 27
RE16-98-0019 (5-5.5 ft)
Barium 600 (J-)
Silver 26

16-03077
0316-97-0015 (3.5-4 ft)
Barium 444
Boron 5.8
Copper 26.3
Nickel 471
Silver 15.9 (J-)
Uranium 1.98

16-609476
RE16-10-3764 (0-0.5 ft)
Cadmium 0.45 (J)
Fluoride 3.36 (J-)
Manganese 675
Silver 1.93
RE16-10-3765 (10-12 ft)
Fluoride 2.46
RE16-10-3766 (15-18 ft)
Fluoride 1.02 (J)
Nitrate 1.23

16-609475
RE16-10-3761 (0-0.5 ft)
Cadmium 0.527 (J)
Fluoride 3.6 (J-)
Silver 4.26
RE16-10-3762 (11.5-15 ft)
Fluoride 1.61 (J+)
RE16-10-3763 (18-20 ft)
Fluoride 1.11 (J+)
Nitrate 1.19

16-609478
RE16-10-3770 (0-0.5 ft)
Cobalt 12.5
Fluoride 1.47 (J-)
Manganese 748
Nitrate 1.69
Perchlorate 0.000759 (J)
RE16-10-3771 (10-12 ft)
Fluoride 0.903 (J)
RE16-10-3772 (15.5-17.5 ft)
Fluoride 0.947 (J)

16-03058
0316-97-0021 (4.75-5 ft)
Boron 14.1

16-03054
RE16-98-0051 (3-3.5 ft)
Barium 61
Zinc 120
RE16-98-0017 (5-6 ft)
Barium 110 (J-)
Copper 6.3

16-609470
RE16-10-3746 (0-0.5 ft)
Fluoride 2.03 (J-)
Nitrate 1.78

16-611771
RE16-10-14023 (0-0.5 ft)
Fluoride 1.3
Nitrate 1.3
Silver 1.5
RE16-10-14024 (3-3.5 ft)
Chromium 19
Fluoride 2.2
Nickel 9.4
Nitrate 0.1 (J)
Selenium 2.3

16-609473
RE16-10-3755 (0-0.5 ft)
Barium 302
Cadmium 0.604
Fluoride 1.97 (J-)
Nitrate 2.24
Silver 5.06
RE16-10-3756 (11-13 ft)
Fluoride 0.847 (J)
RE16-10-3757 (16.5-18.5 ft)
Fluoride 1.03 (J)

16-609474
RE16-10-3758 (0-0.5 ft)
Cadmium 0.521 (J)
Fluoride 1.93 (J-)
Nitrate 3.75
Silver 1.17
RE16-10-3759 (11-13 ft)
Fluoride 1.59
RE16-10-3760 (15-17 ft)
Fluoride 1.59

16-609477
RE16-10-3767 (0-0.5 ft)
Fluoride 1.36 (J-)
RE16-10-3768 (11.5-13.5 ft)
Barium 48

16-03104
0316-97-0008 (1.5-2 ft)
Boron 8.6
Copper 15.1
Silver 6 (J-)
Uranium 2.95

16-609482
RE16-10-3782 (0-0.5 ft)
Fluoride 0.889 (J-)
Nitrate 3.08
Silver 1.63
Zinc 51
RE16-10-3783 (10-12 ft)
Fluoride 0.47 (J)
Selenium 1.2
RE16-10-3784 (15-17 ft)
Fluoride 0.32 (J)
Nitrate 0.083 (J)
Selenium 1.1

16-03082
0316-97-0014 (3-3.5 ft)
Boron 4.9
Manganese 863
Silver 3.5 (J-)
Uranium 2.66

16-03088
0316-97-0012 (4.5-5 ft)
Boron 7.5
Copper 25.2
Silver 26.3 (J-)
0316-97-0013 (4.5-5 ft)
Boron 5.8
Copper 19.2
Silver 8.9 (J-)

16-03094
0316-97-0010 (4.5-5 ft)
Boron 6
Copper 37.5
Silver 10.1 (J-)
Uranium 2.04

16-03092
0316-97-0011 (4-4.5 ft)
Boron 5.2
Silver 10.7 (J-)
Uranium 2.72

16-609480
RE16-10-3776 (0-0.5 ft)
Nitrate 1.51
RE16-10-3777 (10-12 ft)
Boron 1.31 (J)
Fluoride 1.49
RE16-10-3778 (16.5-18 ft)
Fluoride 1.05

16-609467
RE16-10-3737 (0-0.5 ft)
Fluoride 0.927 (J-)
Nitrate 3.51
RE16-10-3738 (11.5-13 ft)
Boron 4.17 (J)
Calcium 2410 (J+)
Fluoride 4.79
RE16-10-3739 (15.5-17.5 ft)
Boron 2.29 (J)
Fluoride 1.06

16-609468
RE16-10-3740 (0-0.5 ft)
Cadmium 0.427 (J)
Fluoride 1.43 (J-)
Nitrate 1.6
RE16-10-3741 (11-14 ft)
Fluoride 1.06
RE16-10-3742 (16.5-18 ft)
Fluoride 1.1

16-609464
RE16-10-3730 (0-0.5 ft)
Fluoride 2.12 (J-)
RE16-10-3728 (9.2-13.5 ft)
Fluoride 0.94 (J)
Nitrate 0.064 (J)
Selenium 0.98
RE16-10-3729 (16.5-18 ft)
Fluoride 0.55 (J)
Nitrate 0.11 (J)
Selenium 0.93

16-609483
RE16-10-3785 (0-0.5 ft)
RE16-10-3786 (11.5-13 ft)
Fluoride 1.61

16-03174
0316-97-0028 (0-1.5 ft)
Boron 2.5 (J)
Copper 71.2
Silver 49.8
Uranium 2.09

16-03100
0316-97-0009 (3-3.5 ft)
Boron 6.6
Copper 18.5
Silver 15.6 (J-)
Uranium 2.41

16-609479
RE16-10-3773 (0-0.5 ft)
Fluoride 1.19 (J-)
Nitrate 2.18
RE16-10-3774 (10-12 ft)
Fluoride 1.06
RE16-10-3775 (15-16 ft)

16-609481
RE16-10-3779 (0-0.5 ft)
Fluoride 1.5 (J-)
Manganese 732
Nitrate 3.84
Perchlorate 0.000733 (J)
Silver 1.71
RE16-10-3780 (10-13 ft)
Fluoride 0.4 (J)
Selenium 1.1
RE16-10-3781 (16.5-18.5 ft)
Fluoride 0.37 (J)
Selenium 1.2

16-609484
RE16-10-3788 (0-0.5 ft)
Bromide 5.36
Fluoride 1.09 (J-)
RE16-10-3789 (10-11.5 ft)
Fluoride 1.14
RE16-10-3790 (15-17 ft)
Fluoride 1.02 (J)

16-609466
RE16-10-3734 (0-0.5 ft)
Fluoride 0.92 (J-)
RE16-10-3736 (10-12 ft)
Fluoride 0.58 (J)
Selenium 1.3
RE16-10-3735 (16.5-18 ft)
Fluoride 0.34 (J)
Nitrate 0.18 (J)
Selenium 1.2

16-609465
RE16-10-3731 (0-0.5 ft)
Fluoride 1.85 (J-)
RE16-10-3732 (11-13 ft)
Fluoride 0.49 (J)
Nitrate 0.066 (J)
Selenium 1.1
RE16-10-3733 (16.5-18 ft)
Fluoride 0.91 (J)
Nitrate 0.088 (J)
Selenium 1.1

16-03156
0316-97-0025 (0-2.5 ft)
Silver 3.6
0316-97-0026 (9.7-11.01 ft)

16-03148
0316-97-0027 (0-1.5 ft)
Arsenic 8.7
Boron 4.7 (J)
Cobalt 9.8 (J)
Copper 27.5
Lead 23.5
Manganese 561
Silver 40.2
Uranium 2.5
Vanadium 40.1

16-03153
0316-97-0023 (0-2.5 ft)
0316-97-0024 (10-10.75 ft)

16-609461
RE16-10-3719 (0-0.5 ft)
Fluoride 1.37 (J-)
RE16-10-3720 (9.5-13 ft)
RE16-10-3721 (16.5-19 ft)
Boron 1.46 (J)

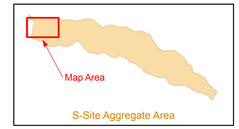
16-609462
RE16-10-3722 (0-0.5 ft)
Fluoride 1.65 (J-)
RE16-10-3723 (11.5-13 ft)
Fluoride 0.795 (J-)
RE16-10-3724 (16.5-18 ft)

16-609463
RE16-10-3725 (0-0.5 ft)
Fluoride 1.78 (J-)
RE16-10-3726 (11-13 ft)
Fluoride 1.7
Selenium 1.4
RE16-10-3727 (16.5-18 ft)
Fluoride 0.85 (J)
Nitrate 0.076 (J)
Selenium 1

PLATE 15.
Organic chemicals detected in samples at SWMU 16-029(x)

Sampling results reported in mg/kg

Location Map



Sampling location
- 2009/2010
- Historic
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Former structure or building
- Structure or building
- Subject SWMU or AOC
- Other SWMU or AOC

N

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 25 50 100
0 5 10 20
Meters

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate16.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.

1611200 1611400 1611600 1611800 1612000 1612200 1612400 1612600 1612800 1613000

1763000 1762800 1762600 1762400 1762200 1762000

SWMU 16-017(w)-99
SWMU 16-017(q)-99
SWMU 16-017(t)-99
SWMU 16-017(v)-99
SWMU 16-029(g2)
AOC C-16-074
SWMU 16-031(c)
SWMU 16-006(h)
SWMU 16-006(g)
SWMU 16-013
AOC C-16-068
SWMU 16-029(w)
SWMU 16-025(x)
SWMU 16-017(s)-99
SWMU 16-017(r)-99
SWMU 16-029(x)
SWMU 16-029(d)
SWMU 16-026(e)
SWMU 16-034(n)
SWMU 16-034(m)
AOC 16-024(m)
AOC 16-024(n)
SWMU 16-017(p)-99
16-515
16-516
16-517
16-526
16-518
16-520
16-519
16-301
BURNING GROUND RD
V-SITE RD
REST HOUSE RD
PRESSING RD
K-SITE RD

16-609470
RE16-10-3746 (0-0.5 ft)

16-03064
RE16-98-0046 (4.25-4.5 ft)
Amino-2,6-dinitrotoluene[4-] 0.3
Amino-4,6-dinitrotoluene[2-] 0.3
RDX 1.5
Trinitrotoluene[2,4,6-] 5
RE16-98-0047 (5.25-5.5 ft)
Amino-4,6-dinitrotoluene[2-] 1.9
RDX 5.2
Trinitrotoluene[2,4,6-] 54

16-03058
0316-97-0021 (4.75-5 ft)
Amino-2,6-dinitrotoluene[4-] 0.553
Amino-4,6-dinitrotoluene[2-] 0.431
Fluoranthene 0.079
HMX 0.253
Pyrene 0.096
Trinitrotoluene[2,4,6-] 0.972

16-03054
RE16-98-0051 (3-3.5 ft)
Methylene Chloride 0.0079
Trichloro-1,2,2-trifluoroethane[1,1,2-] 0.0063
RE16-98-0017 (5-5 ft)

16-609485
RE16-10-3791 (0-0.5 ft)
RE16-10-3792 (17.5-20 ft)
RDX 0.67 (J-)

16-03066
0316-97-0020 (5-5.5 ft)
Amino-2,6-dinitrotoluene[4-] 0.815
Amino-4,6-dinitrotoluene[2-] 1.1
DDT[4,4'-] 0.00147
HMX 0.799
RDX 0.652
Trinitrotoluene[2,4,6-] 2.54

16-03068
RE16-98-0053 (3-3.5 ft)
Methylene Chloride 0.0075
RE16-98-0020 (3.5-4.5 ft)
RE16-98-0021 (4.5-5.5 ft)

16-609469
RE16-10-3743 (0-0.5 ft)

16-03071
0316-97-0017 (4-4.33 ft)
Amino-2,6-dinitrotoluene[4-] 0.217
Amino-4,6-dinitrotoluene[2-] 0.268
HMX 2.11
Tetrachloroethene 0.002 (J)
Toluene 0.002 (J)
Trinitrotoluene[2,4,6-] 0.091

16-609471
RE16-10-3749 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.131 (J)
Fluoranthene 0.0135 (J)
Pentachlorophenol 0.333 (J)

16-609472
RE16-10-3752 (0-0.5 ft)
Pentachlorophenol 0.35 (J)

16-03072
RE16-98-0018 (3.5-4.5 ft)
RE16-98-0052 (3.5-4.5 ft)
Methylene Chloride 0.0085
RE16-98-0019 (5-5.5 ft)

16-03077
0316-97-0015 (3.5-4 ft)
Amino-2,6-dinitrotoluene[4-] 0.576
Amino-4,6-dinitrotoluene[2-] 0.879
Butylbenzene[n-] 0.002 (J)
HMX 1.23
RDX 1.04
Toluene 0.006
Trinitrotoluene[2,4,6-] 9.11

16-611771
RE16-10-14023 (0-0.5 ft)
Benzo(a)anthracene 0.051 (J-)
Benzo(k)fluoranthene 0.04 (J-)
Chrysene 0.051 (J-)
Fluoranthene 0.11 (J-)
Phenanthrene 0.08 (J-)
Pyrene 0.1 (J-)
Trinitrotoluene[2,4,6-] 0.0092 (J+)
RE16-10-14024 (3-3.5 ft)

16-609476
RE16-10-3764 (0-0.5 ft)
Benzo(a)pyrene 0.0222 (J)
Benzo(b)fluoranthene 0.0256 (J)
Chrysene 0.0246 (J)
Fluoranthene 0.0516
Phenanthrene 0.0317 (J)
Pyrene 0.0473
Tetrachloroethene 0.000657 (J)
RE16-10-3765 (10-12 ft)
RDX 1.33 (J-)
Trinitrobenzene[1,3,5-] 0.108 (J-)
RE16-10-3766 (15-18 ft)
Acetone 0.0276
RDX 0.421 (J-)

16-609474
RE16-10-3758 (0-0.5 ft)
Acenaphthene 0.0203 (J)
Anthracene 0.0314 (J)
Benzo(a)anthracene 0.079
Benzo(a)pyrene 0.0665
Benzo(b)fluoranthene 0.0835
Benzo(g,h,i)perylene 0.0448
Benzo(k)fluoranthene 0.0336 (J)
Bis(2-ethylhexyl)phthalate 0.159 (J)
Chrysene 0.0801
Fluoranthene 0.177
Fluorene 0.0165 (J)
Indeno(1,2,3-cd)pyrene 0.0375 (J)
Methylene Chloride 0.00281 (J)
Phenanthrene 0.14
Pyrene 0.189
Toluene 0.000428 (J)
RE16-10-3759 (11-13 ft)
Acetone 0.051
RE16-10-3760 (15-17 ft)
Acetone 0.0206

16-609473
RE16-10-3755 (0-0.5 ft)
Benzo(a)pyrene 0.0208 (J)
Benzo(b)fluoranthene 0.0273 (J)
Chrysene 0.0192 (J)
Fluoranthene 0.0345 (J)
Phenanthrene 0.0209 (J)
Pyrene 0.0337 (J)
RE16-10-3756 (11-13 ft)
Acetone 0.00186 (J)
RDX 0.191 (J-)
RE16-10-3757 (16.5-18.5 ft)
Acetone 0.0502

16-609475
RE16-10-3761 (0-0.5 ft)
Benzo(a)pyrene 0.0316 (J)
Benzo(b)fluoranthene 0.0375 (J)
Benzo(k)fluoranthene 0.0155 (J)
Bis(2-ethylhexyl)phthalate 0.091 (J)
Chrysene 0.03 (J)
Fluoranthene 0.0596
Phenanthrene 0.0239 (J)
Pyrene 0.0553
Tetrachloroethene 0.000543 (J)
RE16-10-3762 (11.5-15 ft)
Acetone 0.00305 (J)
RDX 0.583 (J-)
Trinitrobenzene[1,3,5-] 0.646 (J-)
RE16-10-3763 (18-20 ft)
Acetone 0.00262 (J)
RDX 0.504 (J-)
Trinitrobenzene[1,3,5-] 0.202 (J-)

16-609478
RE16-10-3770 (0-0.5 ft)
Acenaphthene 0.0164 (J)
Anthracene 0.0292 (J)
Benzo(a)anthracene 0.0752
Benzo(a)pyrene 0.0651
Benzo(b)fluoranthene 0.0753
Benzo(g,h,i)perylene 0.04
Benzo(k)fluoranthene 0.0362 (J)
Chrysene 0.0789
Fluoranthene 0.192
Fluorene 0.0148 (J)
Indeno(1,2,3-cd)pyrene 0.0363 (J)
Naphthalene 0.011 (J)
Phenanthrene 0.134
Pyrene 0.166
RE16-10-3771 (10-12 ft)
RE16-10-3772 (15.5-17.5 ft)

16-03092
0316-97-0011 (4-4.5 ft)
Amino-4,6-dinitrotoluene[2-] 0.123
Methylene Chloride 0.006

16-03082
0316-97-0014 (3-3.5 ft)
Amino-2,6-dinitrotoluene[4-] 0.201
Amino-4,6-dinitrotoluene[2-] 0.427
Tetrachloroethene 0.002 (J)

16-03088
0316-97-0012 (4.5-5 ft)
Butanone[2-] 0.002 (J)
Toluene 0.002 (J)
0316-97-0013 (4.5-5 ft)
Amino-4,6-dinitrotoluene[2-] 0.1

16-03094
0316-97-0010 (4.5-5 ft)
Methylene Chloride 0.007

16-609480
RE16-10-3776 (0-0.5 ft)
RE16-10-3777 (10-12 ft)
RE16-10-3778 (16.5-18 ft)
Bis(2-chloroethyl)ether 0.0708 (J)

16-03104
0316-97-0008 (1.5-2 ft)
Amino-2,6-dinitrotoluene[4-] 0.501
Amino-4,6-dinitrotoluene[2-] 1.15
Di-n-butylphthalate 0.44
HMX 0.655
RDX 0.508

16-609482
RE16-10-3782 (0-0.5 ft)
Benzo(b)fluoranthene 0.0203 (J)
Chrysene 0.0354 (J)
Fluoranthene 0.0522
Phenanthrene 0.018 (J)
Pyrene 0.0663
Tetrachloroethene 0.00598
RE16-10-3783 (10-12 ft)
3,5-Dinitroaniline 0.012 (J)
Dinitrotoluene[2,4-] 0.0057 (J)
HMX 0.062 (J-)
RDX 0.031 (J-)
Trinitrobenzene[1,3,5-] 0.09
Trinitrotoluene[2,4,6-] 0.014 (J)
RE16-10-3784 (15-17 ft)
3,5-Dinitroaniline 0.0088 (J)
Amino-4,6-dinitrotoluene[2-] 0.0071 (J)
HMX 0.076 (J-)
RDX 0.086 (J-)
Trinitrobenzene[1,3,5-] 0.17
Trinitrotoluene[2,4,6-] 0.0077 (J)

16-609477
RE16-10-3767 (0-0.5 ft)
Anthracene 0.0131 (J)
Benzo(a)anthracene 0.034 (J)
Benzo(a)pyrene 0.0295 (J)
Benzo(b)fluoranthene 0.0354 (J)
Benzo(g,h,i)perylene 0.0188 (J)
Benzo(k)fluoranthene 0.0187 (J)
Chrysene 0.0313 (J)
Fluoranthene 0.078
Indeno(1,2,3-cd)pyrene 0.0176 (J)
Phenanthrene 0.0544
Pyrene 0.0695
RE16-10-3768 (11.5-13.5 ft)

16-03100
0316-97-0009 (3-3.5 ft)
Amino-2,6-dinitrotoluene[4-] 0.116
Amino-4,6-dinitrotoluene[2-] 0.112
DDE[4,4'-] 0.00122
Methylene Chloride 0.01

16-609479
RE16-10-3773 (0-0.5 ft)
RE16-10-3774 (10-12 ft)
RE16-10-3775 (15-16 ft)
RDX 0.383 (J-)

16-03174
0316-97-0028 (0-1.5 ft)

16-609484
RE16-10-3788 (0-0.5 ft)
Tetrachloroethene 0.00483
RE16-10-3789 (10-11.5 ft)
Acetone 0.0549 (J-)
Benzo(b)fluoranthene 0.012 (J)
RE16-10-3790 (15-17 ft)

16-609481
RE16-10-3779 (0-0.5 ft)
RDX 0.122 (J)
Tetrachloroethene 0.0109
RE16-10-3780 (10-13 ft)
3,5-Dinitroaniline 0.0095 (J)
HMX 0.13 (J-)
Trinitrobenzene[1,3,5-] 0.097
Trinitrotoluene[2,4,6-] 0.022 (J)
RE16-10-3781 (16.5-18.5 ft)
3,5-Dinitroaniline 0.0068 (J)
Amino-2,6-dinitrotoluene[4-] 0.0067 (J)
Amino-4,6-dinitrotoluene[2-] 0.0098 (J)
Dinitrotoluene[2,4-] 0.0065 (J)
HMX 0.078 (J-)
RDX 0.15 (J-)
Trinitrobenzene[1,3,5-] 0.099
Trinitrotoluene[2,4,6-] 0.006 (J)

16-609467
RE16-10-3737 (0-0.5 ft)
RE16-10-3738 (11.5-13 ft)
Acetone 0.0379 (J)
RE16-10-3739 (15.5-17.5 ft)
Acetone 0.026 (J)
RDX 0.101 (J-)

16-609466
RE16-10-3734 (0-0.5 ft)
RE16-10-3736 (10-12 ft)
Amino-2,6-dinitrotoluene[4-] 0.0068 (J)
Trinitrobenzene[1,3,5-] 0.04 (J)
Trinitrotoluene[2,4,6-] 0.026 (J+)
RE16-10-3735 (16.5-18 ft)

16-609465
RE16-10-3731 (0-0.5 ft)
RE16-10-3732 (11-13 ft)
RE16-10-3733 (16.5-18 ft)

16-03156
0316-97-0025 (0-2.5 ft)
0316-97-0026 (9.7-11.01 ft)
RDX 0.24

16-03153
0316-97-0023 (0-2.5 ft)
Acetone 0.043
Isopropyltoluene[4-] 0.012
Tetrachloroethene 0.0072
0316-97-0024 (10-10.75 ft)
RDX 0.296

16-03148
0316-97-0027 (0-1.5 ft)

16-609483
RE16-10-3785 (0-0.5 ft)
Tetrachloroethene 0.00275
RE16-10-3786 (11.5-13 ft)

16-609468
RE16-10-3740 (0-0.5 ft)
Tetrachloroethene 0.00161
RE16-10-3741 (11-14 ft)
Acetone 0.0165 (J)
RE16-10-3742 (16.5-18 ft)
Acetone 0.015 (J)

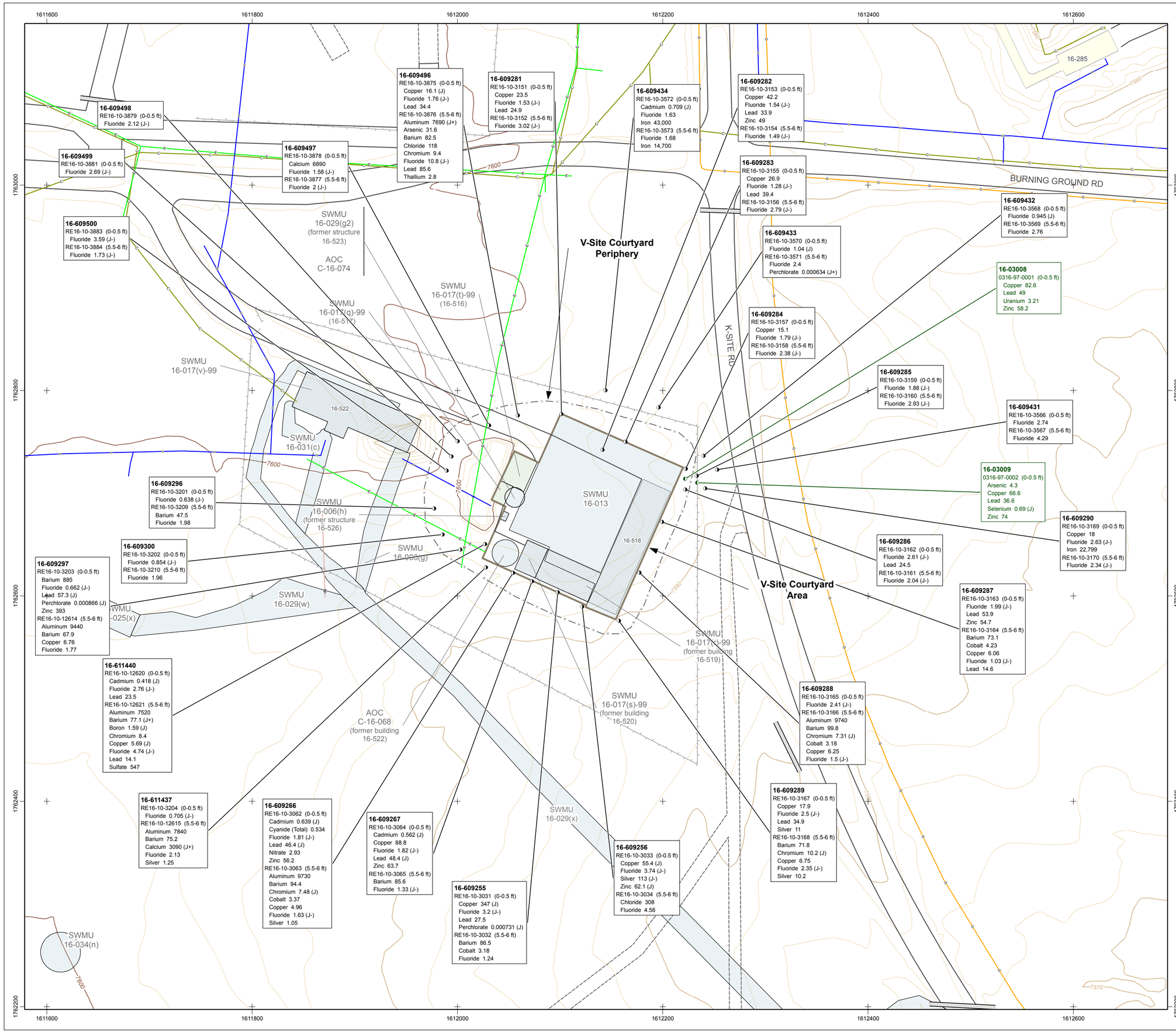
16-609464
RE16-10-3730 (0-0.5 ft)
Tetrachloroethene 0.00052 (J)
RE16-10-3728 (9.2-13.5 ft)
RE16-10-3729 (16.5-18 ft)

16-609463
RE16-10-3725 (0-0.5 ft)
RE16-10-3726 (11-13 ft)
RE16-10-3727 (16.5-18 ft)

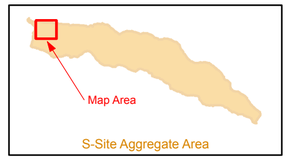
16-609462
RE16-10-3722 (0-0.5 ft)
RE16-10-3723 (11.5-13 ft)
Acetone 0.055
RE16-10-3724 (16.5-18 ft)

16-609461
RE16-10-3719 (0-0.5 ft)
RE16-10-3720 (9.5-13 ft)
Acetone 0.0632
RE16-10-3721 (16.5-19 ft)
Acetone 0.0399
RDX 0.133 (J-)

PLATE 16.
Summary of inorganic chemicals above BVs at the V-Site Courtyard Periphery and the Drainage North of the Courtyard



Location Map



Sampling results reported in mg/kg

Sampling location
- 2009/2010
- Historic

- Communication line
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- Gas line
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- Storm drain
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- 10-ft elevation contour
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- Structure or building
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- V-Site Courtyard Periphery

N

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 12.5 25 50
0 5 10 20
Meters

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate17.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

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PLATE 17.
Organic chemicals detected in samples at the V-Site Courtyard Periphery and the Drainage North of the Courtyard

16-609497
RE16-10-3878 (0-0.5 ft)
Benzo(a)anthracene 0.0416
Benzo(a)pyrene 0.0201 (J)
Benzo(b)fluoranthene 0.034 (J)
Benzo(g,h,i)perylene 0.0139 (J)
Benzo(k)fluoranthene 0.0127 (J)
Fluoranthene 0.0874
Phenanthrene 0.0431
Pyrene 0.0606
RE16-10-3877 (5.5-6 ft)
Methylene Chloride 0.00215 (J)

16-609496
RE16-10-3875 (0-0.5 ft)
Benzo(a)pyrene 0.0243 (J)
Benzo(b)fluoranthene 0.127
Benzo(g,h,i)perylene 0.026 (J)
Chrysene 0.0749
Fluoranthene 0.0588
Indeno(1,2,3-cd)pyrene 0.0215 (J)
Phenanthrene 0.0411
Pyrene 0.0519
RE16-10-3876 (5.5-6 ft)

16-609281
RE16-10-3151 (0-0.5 ft)
Benzo(b)fluoranthene 0.0154 (J)
Bis(2-ethylhexyl)phthalate 0.386
Fluoranthene 0.0201 (J)
Phenanthrene 0.0162 (J)
Pyrene 0.0206 (J)
RE16-10-3152 (5.5-6 ft)
HMX 0.254 (J)
Isopropyltoluene[4-] 0.000604 (J)
RDX 0.168 (J)
Toluene 0.000737 (J)

16-609498
RE16-10-3879 (0-0.5 ft)
Benzo(b)fluoranthene 0.025 (J)
Chrysene 0.0203 (J)
HMX 1.66 (J)
Pyrene 0.012 (J)
RDX 8.67

16-609434
RE16-10-3572 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.096 (J)
RE16-10-3573 (5.5-6 ft)
Bis(2-ethylhexyl)phthalate 0.102 (J)

16-609499
RE16-10-3881 (0-0.5 ft)
Benzo(a)pyrene 0.0479
Benzo(b)fluoranthene 0.223
Benzo(g,h,i)perylene 0.0642
Chrysene 0.113
Fluoranthene 0.0866
Indeno(1,2,3-cd)pyrene 0.0504
Phenanthrene 0.0241 (J)
Pyrene 0.0852

16-609282
RE16-10-3153 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.166 (J)
RE16-10-3154 (5.5-6 ft)
Bis(2-ethylhexyl)phthalate 0.103 (J)

16-609283
RE16-10-3155 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.169 (J)
RE16-10-3156 (5.5-6 ft)
RDX 0.147 (J-)

16-609432
RE16-10-3568 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.103 (J)
RE16-10-3569 (5.5-6 ft)
Bis(2-ethylhexyl)phthalate 0.133 (J)

16-609433
RE16-10-3570 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.0984 (J)
RE16-10-3571 (5.5-6 ft)
Bis(2-ethylhexyl)phthalate 0.0863 (J)

16-609284
RE16-10-3157 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.1 (J)
Dichloroethene[1,1-] 0.000603 (J)
Isopropyltoluene[4-] 0.00109 (J)
RE16-10-3158 (5.5-6 ft)

16-609500
RE16-10-3883 (0-0.5 ft)
Benzo(b)fluoranthene 0.0699
Benzo(g,h,i)perylene 0.0131 (J)
Chrysene 0.0464
Fluoranthene 0.0449
Phenanthrene 0.014 (J)
Pyrene 0.0365 (J)
RE16-10-3884 (5.5-6 ft)
Methylene Chloride 0.00328 (J)

16-609431
RE16-10-3566 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.151 (J)
RE16-10-3567 (5.5-6 ft)
Bis(2-ethylhexyl)phthalate 0.0753 (J)

16-609285
RE16-10-3159 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.161 (J)
RE16-10-3160 (5.5-6 ft)

16-609296
RE16-10-3201 (0-0.5 ft)
Benzo(a)pyrene 0.0121 (J)
Benzo(b)fluoranthene 0.0207 (J)
Bis(2-ethylhexyl)phthalate 0.0989 (J)
Chrysene 0.0207 (J)
Fluoranthene 0.0211 (J)
Pyrene 0.0217 (J)
RE16-10-3209 (5.5-6 ft)
Acenaphthene 0.0176 (J)
Acetone 0.0058
Anthracene 0.0148 (J)
Benzo(a)anthracene 0.0162 (J)
Benzo(a)pyrene 0.0113 (J)
Benzo(b)fluoranthene 0.0216 (J)
Chrysene 0.0175 (J)
Fluoranthene 0.0504
Phenanthrene 0.0247 (J)
Pyrene 0.0396

16-03008
0316-97-0001 (0-0.5 ft)

16-03009
0316-97-0002 (0-0.5 ft)
Di-n-butylphthalate 0.97 (J)

16-609290
RE16-10-3169 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.152 (J)
RE16-10-3170 (5.5-6 ft)
Methylene Chloride 0.00422 (J)

16-609286
RE16-10-3162 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.116 (J)
Fluoranthene 0.0124 (J)
Isopropyltoluene[4-] 0.00211
Pentachlorophenol 0.114 (J)
Pyrene 0.0164 (J)
RE16-10-3161 (5.5-6 ft)

16-609300
RE16-10-3202 (0-0.5 ft)
Benzo(b)fluoranthene 0.0447 (J)
Benzo(k)fluoranthene 0.0146 (J)
Bis(2-ethylhexyl)phthalate 0.128 (J)
Chrysene 0.0516
Dichloroethene[1,1-] 0.000524 (J)
Fluoranthene 0.15
Phenanthrene 0.107
Pyrene 0.0983
RE16-10-3210 (5.5-6 ft)
Acetone 0.00503 (J)

16-609297
RE16-10-3203 (0-0.5 ft)
RE16-10-12614 (5.5-6 ft)

16-609287
RE16-10-3163 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.0968 (J)
Dichloroethene[1,1-] 0.000539 (J)
RE16-10-3164 (5.5-6 ft)

16-611440
RE16-10-12620 (0-0.5 ft)
Benzo(a)anthracene 0.0159 (J)
Bis(2-ethylhexyl)phthalate 0.104 (J)
RE16-10-12621 (5.5-6 ft)
Benzo(b)fluoranthene 0.0116 (J)

16-609288
RE16-10-3165 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.107 (J)
RE16-10-3166 (5.5-6 ft)

16-611437
RE16-10-3204 (0-0.5 ft)
Bis(2-ethylhexyl)phthalate 0.134 (J)
RE16-10-12615 (5.5-6 ft)
Acetone 0.0126

16-609289
RE16-10-3167 (0-0.5 ft)
Benzo(b)fluoranthene 0.0231 (J)
Bis(2-ethylhexyl)phthalate 0.315 (J)
Fluoranthene 0.0171 (J)
Pyrene 0.0135 (J)
RE16-10-3168 (5.5-6 ft)
Acenaphthene 3.09
Acetone 0.00608
Anthracene 6.33
Benzo(a)anthracene 5.46
Benzo(a)pyrene 3.66
Benzo(b)fluoranthene 7.28
Benzo(g,h,i)perylene 2.4 (J)
Bis(2-ethylhexyl)phthalate 0.0878 (J)
Chrysene 6.17
Dibenzofuran 0.647
Diphenylamine 1.06
Fluoranthene 23
Fluorene 1.49
Indeno(1,2,3-cd)pyrene 2.07 (J)
Isopropyltoluene[4-] 0.00139
Methylnaphthalene[2-] 0.0471
Naphthalene 0.0203 (J)
Phenanthrene 6.47
Pyrene 16

16-609256
RE16-10-3033 (0-0.5 ft)
RE16-10-3034 (5.5-6 ft)
Acetone 0.00379 (J)
Methylene Chloride 0.00431 (J)

16-609266
RE16-10-3062 (0-0.5 ft)
Benzo(a)pyrene 0.011 (J)
Benzo(b)fluoranthene 0.041
Benzo(g,h,i)perylene 0.0169 (J)
Benzo(k)fluoranthene 0.0148 (J)
Bis(2-ethylhexyl)phthalate 0.123 (J)
Chrysene 0.0194 (J)
Fluoranthene 0.0201 (J)
Indeno(1,2,3-cd)pyrene 0.114
Pyrene 0.0177 (J)
RE16-10-3063 (5.5-6 ft)
Acetone 0.0544
Isopropyltoluene[4-] 0.0638
Methylene Chloride 0.00403 (J)
Toluene 0.00194

16-609267
RE16-10-3064 (0-0.5 ft)
Benzo(a)pyrene 0.0147 (J)
Benzo(b)fluoranthene 0.0316 (J)
Benzo(g,h,i)perylene 0.0193 (J)
Benzo(k)fluoranthene 0.0173 (J)
Bis(2-ethylhexyl)phthalate 0.228 (J)
Chrysene 0.024 (J)
Fluoranthene 0.0332 (J)
Indeno(1,2,3-cd)pyrene 0.14
Pyrene 0.0299 (J)
RE16-10-3065 (5.5-6 ft)
Acetone 0.00446 (J)
Methylene Chloride 0.00319 (J)

16-609255
RE16-10-3031 (0-0.5 ft)
Acetone 0.0499
Bis(2-ethylhexyl)phthalate 0.124 (J)
Isopropyltoluene[4-] 0.0165
Toluene 0.0124
RE16-10-3032 (5.5-6 ft)
Acetone 0.0323
Isopropyltoluene[4-] 0.0177
Methylene Chloride 0.00435 (J)
Toluene 0.00118

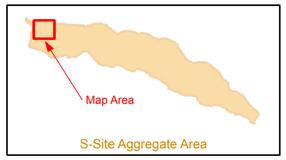
V-Site Courtyard Periphery

V-Site Courtyard Area

BURNING GROUND RD

SWMU 16-029(g2) (former structure 16-523)
AOC C-16-074
SWMU 16-017(t)-99 (16-516)
SWMU 16-017(q)-99 (16-517)
SWMU 16-017(v)-99
SWMU 16-031(c)
SWMU 16-006(h) (former structure 16-526)
SWMU 16-006(g)
AOC C-16-068 (former building 16-522)
SWMU 16-013
SWMU 16-029(w)
SWMU 16-025(x)
SWMU 16-017(r)-99 (former building 16-519)
SWMU 16-017(s)-99 (former building 16-520)
SWMU 16-029(x)
SWMU 16-034(n)
16-522
16-518
16-285

Location Map



Sampling results reported in mg/kg

Sampling location
- 2009/2010
- Historic
- Communication line
- Electric line
- Gas line
- Sewer line
- Water line
- Storm drain
- Paved road
- Unpaved road
- Fence
- 2-ft elevation contour
- 10-ft elevation contour
- 100-ft elevation contour
- Former structure or building
- Structure or building
- Subject area
- SWMU or AOC
- V-Site Courtyard Periphery

N

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 12.5 25 50
0 5 10 20
Meters

Portage, Inc.
Date: 08.08.2010
Map: SSite_IR_Plate18.Rev0
Revised 25 August 2011 by Adelante Consulting Inc.

Disclaimer: This map was created for work processes associated with the S-Site Aggregate Area Investigation Report. All other uses for this map should be confirmed with the Environmental Programs Directorate.