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Investigation Work Plan for Twomile Canyon Aggregate Area

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EXECUTIVE SUMMARY

The Twomile Canyon Aggregate Area includes a total of 146 solid waste management units (SWMUs) and areas of concern (AOCs) located in Technical Area (TA-03), TA-06, TA-22, TA-40, TA-50, TA-59, TA-64, TA-69, and former TA-07 at Los Alamos National Laboratory. Of these 146 sites, 76 have been previously investigated and/or remediated and approved for no further action. For the remaining 70 sites requiring investigation, 33 are located in TA-03, 21 are in TA-06, 4 are in former TA-07, 5 are in TA-22, 3 are in TA-40, 1 is in TA-50, 2 are in TA-59, and 1 is in TA-69. This investigation work plan identifies and describes the activities needed to complete the investigation of the remaining 70 SWMUs and AOCs. Details of previous investigations and analytical results for the 70 sites included in this work plan are provided in the historical investigation report for the Twomile Canyon Aggregate Area.

The objective of this work plan is to evaluate the historical data and, based on that evaluation, to propose additional sampling as necessary to define the nature and extent of contamination associated with the SWMUs and AOCs in the Twomile Canyon Aggregate Area.

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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 the 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 sea level. The location of the Twomile Canyon Aggregate Area with respect to the Laboratory technical areas (TAs) is shown in Figure 1.0-1.

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

The SWMUs and AOCs addressed in this 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," and DOE Order 435.1, "Radioactive Waste Management." Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

Corrective actions at the Laboratory are subject to the March 1, 2005, Compliance Order on Consent (the Consent Order). This work plan describes work activities that will be executed and completed in accordance with the Consent Order.

1.1 Work Plan Overview

The Twomile Canyon Aggregate Area encompasses the area drained by Twomile Canyon and includes parts of TA-03, TA-06, TA-22, TA-40, TA-50, TA-55, TA-58, TA-59, TA-62, TA-63, TA-64, TA-66, and TA-69 and former TA-07 in the west-central portion of the Laboratory, as well as U.S. Forest Service land to the west of the Laboratory (LANL 2005, 090215, pp. 3–7). Twomile Canyon Aggregate Area includes a total of 146 SWMUs and AOCs located in TA-03, TA-06, TA-22, TA-40, TA-50, TA-59, TA-64, and TA-69 and former TA-07 at the Laboratory (Plate 1). Historical details of previous investigations and data for these sites are provided in the historical investigation report (HIR) for the Twomile Canyon Aggregate Area (LANL 2010, 108330). Of these 146 sites, 76 have been previously investigated and/or remediated and approved for no further action (NFA). The status of each site and the NFA-approval documents are referenced in Table 1.1-1. This investigation work plan identifies and describes the activities needed to complete the investigation of the remaining 70 SWMUs and AOCs and uses the information from previous field investigations or removal actions to evaluate current conditions at each site.

Section 2 of the work plan presents the general site information, operational history, and the preliminary conceptual site model of the Twomile Canyon Aggregate Area sites. General site conditions are discussed in section 3. Section 4 provides summaries of previous investigations and data collected and presents the scope of proposed activities for each site. The 70 sites addressed in this work plan are located in seven TAs and one former TA; therefore, discussion of these sites is organized by TA in this

work plan. Each TA subsection includes background information on operational history; a summary of releases; current site use; and status of the sites in the TAs. Section 5 provides investigation methods for proposed field activities. Ongoing monitoring and sampling programs in the Twomile Canyon Aggregate Area are presented in section 6. Section 7 is an overview of the anticipated schedule of the investigation and reporting activities. The references cited in this 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 glossary, metric conversion table, and a data qualifier definitions table. Appendix B describes the management of investigation-derived waste (IDW).

1.2 Work Plan Objectives

The objective of this work plan is to determine the nature and extent of releases from the 70 sites.

To accomplish this objective, this work plan

- presents historical and background information on the sites;
- describes the rationale for proposed data collection activities;
- identifies and proposes appropriate methods and protocols for collecting, analyzing, and evaluating data to finalize characterization of these sites; and
- identifies and proposes appropriate methods and protocols for remediating select sites.

2.0 BACKGROUND

2.1 General Site Information

Sites within the Twomile Canyon Aggregate Area being investigated are located in TA-03, TA-06, TA-22, TA-40, TA-50, TA-59, TA-69, and former TA-07. General information about these TAs is provided below.

TA-03, located on South Mesa between Los Alamos Canyon to the north and Twomile Canyon to the south, is the Laboratory's main technical area. It contains most of the Laboratory's administrative buildings and public and corporate access facilities. In addition, TA-03 houses several Laboratory activities such as experimental sciences, special nuclear materials, theoretical/computations, and physical support operations.

TA-06 is primarily a reserve area for the Laboratory. Most of the TA is completely undeveloped. The Laboratory uses only a very small portion of land, located in the TA's southwest corner, for high-explosive research and development.

Former TA-07 was a small technical area that now lies within the current boundaries of TA-06. The area operated from the late 1940s to 1959 and was used for weapons stockpile storage, detonator destruction, and a few field experiments. All buildings associated with TA-07 have been removed.

TA-22 is used for the research, development, fabrication, and testing of high-energy detonators and related devices. Detonators, cables, and firing systems are built here. Capabilities include detonator design, printed circuit manufacture, metal deposition, metal joining, plastic materials technology, explosives loading, initiation, diagnostics, and lasers.

TA-40 is used for developing special detonators for initiating high-explosives (HE) systems. Activities include investigating phenomena associated with the physics of HE and research in rapid-shock-induced reactions. The site is also used for investigating the physics and chemistry of detonators and shock-wave propagation.

TA-50 is the location of various Laboratory waste management activities. The TA-50 complex supports a number of waste-management activities for several types of waste, including storing, or treating solid and liquid, low-level radioactive waste, low-level mixed waste, transuranic waste, and hazardous waste. Major facilities at TA-50 are the Radioactive Liquid Waste Treatment Facility (RLWTF) and the Waste Characterization, Reduction, and Repackaging Facility.

TA-59, the Laboratory's Occupational Health complex, provides support services for the Laboratory in the areas of health physics, risk management, industrial hygiene and safety, policy and program analysis, air quality, water quality and hydrology, hazardous and solid waste analysis, and radiation protection. In addition, the Analytical Chemistry Group provides institutional support for environmental and bioassay samples.

TA-69, also known as Anchor North Site, is primarily an undeveloped TA that serves as an environmental buffer for the high-explosives test areas. The only facilities located at this site are used for physical support functions, such as a water tank for fire protection. Past operations included a building in which documents were once shredded and incinerated.

2.2 Operational History

TA-03 was originally built as a firing site in 1945 and contained several wooden structures including an administration building, shop, storage and assembly hutments, and magazines. The site was decommissioned and cleared in 1949. In 1950, construction of major facilities in TA-03 to replace those in the Los Alamos townsite began. These facilities, which began to become operational in 1951, included the Van de Graaf accelerator facility, a communications building, the Chemical and Metallurgical Research (CMR) building, warehouses, and the Physics Building. Infrastructure and support facilities that were also constructed at TA-03 in the early 1950s included a wastewater treatment plant (WWTP), service station and maintenance garage, electrical generating plant, and asphalt batch plant. Construction of the Laboratory's main administration building was completed at TA-03 in 1956, and the Sigma Building, which houses metallurgical and ceramic research and fabrication facilities, was completed in 1959. Construction of new research and support facilities at TA-03 has continued to the present and TA-03 now houses most of the Laboratory's administrative facilities and many of its major research facilities.

TA-06 was first used during the Manhattan Project. Activities at TA-06 focused on the recovery of materials from implosion tests and the development of detonators. Recovery tests were conducted to determine how to recover scarce nuclear materials. Early efforts related to recovery involved dispersion tests, which studied the dispersion of materials from implosion shots fired above the ground. Tracers were used in the test materials to track the dispersion of materials. Subsequent recovery methods investigated at TA-06 involved (1) water recovery, where shots were detonated in water to slow metal fragments; (2) sand recovery, where shots were detonated under piles of sand to retain fragments; and (3) Jumbino vessels, large steel vessels designed to contain the shot fragments.

Detonator development work began at TA-06 in August 1944. This work was directed toward design and fabrication of electric detonators and firing systems. Pentaerythritol tetranitrate (PETN) was selected as the explosive to be used in these detonators. As commercially available PETN was not of sufficient purity to achieve the required performance, work at TA-06 included development of a method for purification and recrystallization of PETN. In 1945, three firing chambers, a laboratory, and an explosives pressing

facility were constructed at TA-06. From 1945 to 1947, TA-06 was also used to detonate defective explosive lenses and to bury classified wastes. In 1948, detonator fabrication was moved from TA-06 to TA-22. Detonator test firing ceased at TA-06 in 1952, when these operations were moved to TA-40. Explosives development, laser, chemical laboratory, and photographic operations were conducted at TA-06 until February 1976. A small carpentry shop, cable fabrication shop, and silk-screening facility were used at TA-06 until the 1980s. TA-06 is presently unused, and most of the structures have been removed.

Former TA-07, also known as Gomez Ranch Site, was established during the Manhattan Project and is located within the current boundaries of TA-06 (Plate 1). The earliest work at former TA-07 consisted of firing 20-mm shells into various targets as part of gun assembly method investigations. The work lasted for a short time before activities were moved to other locations. Laboratory engineering records show that all buildings were removed from former TA-07 in 1945. The site was subsequently used until 1959 for the disposal of detonators and scrap HE by open detonation.

TA-22 was also established during the Manhattan Project. The first buildings at TA-22 were constructed in late 1944 for assembling the conventional explosives for the Fat Man implosion weapon. After this weapon was assembled, the buildings were vacated until 1948, when they were remodeled into office, laboratory, and fabrication facilities to replace detonator fabrication facilities at TA-06. New magazines and utility buildings were also constructed. A new Detonation Systems Laboratory was constructed in 1985 to replace many of the older buildings, which were vacated or demolished.

TA-40 was built in 1950 to replace the detonator firing chambers at TA-06. TA-40 includes an office building, inert assembly building, firing chambers, shot preparation buildings, magazines, and utility buildings. One of the firing chambers was upgraded in the 1980s to house a two-stage gas gun. Construction of the Laboratory's first contained test-firing facility was completed at TA-40 in 1992.

Waste management operations at TA-50 began in 1948 with the establishment of Material Disposal Area (MDA) C for disposal of solid waste, including radioactive and chemical wastes. MDA C was operated until 1974 and occupies an area of approximately 12 acres. The TA-50 RLWTF was constructed in 1963 and is still active. The RLWTF is used to treat almost all radioactively contaminated liquid wastes generated at the Laboratory. Other waste management facilities at TA-50 include an incinerator complex built in 1975, which is now inactive, and an active volume reduction facility built in 1983.

TA-59 was established in 1966 with the opening of the Occupational Health Building, which contains offices and laboratories. TA-59 has expanded since then with construction of other facilities housing environmental, safety, and health support services organizations.

The first structure at TA-69 was constructed in 1955 and consisted of a guard station that is still in use. An incinerator facility was constructed at TA-69 in 1959 for use in destroying classified documents. The incinerator was in use until the late 1970s and has been removed. TA-69 is the location of the Laboratory's Emergency Operations Center, which was constructed after the 2000 Cerro Grande fire.

2.3 Conceptual Site Model

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

2.3.1 Potential Contaminant Sources

Releases at sites within the Twomile Canyon Aggregate Area may have occurred as a result of surface and subsurface placement of solid wastes, air emissions, effluent discharges, or detonation of explosives. Previous sampling results indicate contamination from inorganic chemicals, organic chemicals, and radionuclides (LANL 2010, 108330). Additional sampling is needed to determine the nature and extent of contamination.

2.3.2 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.

2.3.3 Potential Receptors

Potential receptors may include

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

2.3.4 Cleanup Standards

As specified in Section VIII.B.1 of the Consent Order, soil screening levels (SSLs) will be used as soil cleanup levels unless they are determined to be impracticable or unless values do not exist for the current and reasonably foreseeable future land use. The SSLs for the industrial scenario are presented in Table 2.3-1 for previously detected inorganic and organic chemicals. The screening action levels (SALs) for the industrial scenario are also provided in Table 2.3-1 for previously detected radionuclides.

2.4 Data Overview

Data evaluated in this work plan include historical data collected from 1994 to 2003, as part of Resource Conservation and Recovery Act (RCRA) facility investigations (RFIs) and other corrective actions. In the Sample Management Database, all data records include a vintage code field denoting how and where samples were submitted for analyses.

Samples described in this work plan have undergone analyses at both on-site and off-site laboratories. As analytical practices and documentation of analyses vary in quality and completeness, analytical data presented are either screening-level or decision-level data. Screening-level data are appropriate for applications that only require a determination of gross contamination areas and/or for general site characterization. Screening-level data are also often used to specify areas where additional data should be collected. Decision-level data are used to quantify the nature and extent of releases and to perform

risk assessments. The decision-level data provide supporting information for the investigation activities proposed in the work plan.

Inorganic chemical and radionuclide data from previous investigations were compared with background values (BVs) or fallout values (FVs) (LANL 1998, 059730, p. 6-2). Organic chemicals and fallout radionuclides in soil greater than a depth of 1 ft or in rock are evaluated based on detection status.

This work plan summarizes the available decision-level data (and where appropriate, screening-level data) to determine whether the nature and extent of contamination are defined for each site. In addition, this work plan proposes sampling activities and analytical suites for those sites at which the nature and extent of contamination have not been defined.

3.0 SITE CONDITIONS

3.1 Surface Conditions

3.1.1 Soil

The Twomile Canyon Aggregate Area is located on the Pajarito Plateau and within the Pajarito Canyon watershed. Stratigraphic information has not yet been compiled for Twomile Canyon. Because Twomile Canyon is located in the Pajarito Canyon watershed and is next to upper Pajarito Canyon, the conditions described for upper Pajarito Canyon should also be representative of Twomile Canyon. Soil on the Pajarito Plateau was initially mapped and described by Nyhan et al. (1978, 005702). The soil on the slopes between the mesa tops and canyon floors was mapped as mostly steep rock outcrops consisting of approximately 90% bedrock with patches of shallow, weakly developed colluvial soil. South-facing canyon walls generally are steep and usually have shallow soil in limited, isolated patches between rock outcrops. In contrast, the north-facing canyon walls generally have more extensive areas of shallow dark-colored soil under thicker forest vegetation. The canyon floors generally contain poorly developed, deep, well-drained soil on floodplain terraces or small alluvial fans (Nyhan et al. 1978, 005702).

Mesa-top soils in the Twomile Canyon Aggregate Area are primarily those described by Nyhan et al. (1978, 005702) as the Carjo, Tocal, and Pogna series. The Carjo series consists of moderately deep, well-drained soils that formed in material weathered from tuff. This soil series is found on nearly level to moderately sloping mesa tops near the Jemez Mountains. This soil is slowly permeable with medium runoff and moderate erosion hazard. The Tocal series consists of very shallow to shallow, well-drained soils that formed in material weathered from tuff on gently to moderately sloping mesa tops. This soil has moderately slow permeability with medium runoff and moderate erosion hazard. The Pogna series consists of shallow, well-drained soils that formed in material weathered from tuff on gently to strongly sloping mesa tops. This soil has moderately rapid permeability with medium runoff and moderate erosion hazard (Nyhan et al. 1978, 005702).

3.1.2 Surface Water

Most surface water in the Los Alamos area occurs as ephemeral, intermittent, or interrupted streams in canyons cut into the Pajarito Plateau. Springs on the flanks of the Jemez Mountains, west of the Laboratory's western boundary, supply flow to the upper reaches of Cañon de Valle and to Guaje, Los Alamos, Pajarito, and Water Canyons (Purtymun 1975, 011787; Stoker 1993, 056021). These springs discharge water perched in the Bandelier Tuff and Tschicoma Formation at rates from 2 to 135 gal./min (Abeele et al. 1981, 006273). The volume of flow from the springs maintains natural perennial reaches of varying lengths in each of the canyons.

Stream flow in Twomile Canyon is ephemeral. There is relatively little snowmelt runoff because only a small portion of the watershed lies above 8000 ft elevation and most runoff is from summer thunderstorms. There are intermittent springs that feed into this canyon, including a spring originating in alluvium and colluvium deposits northeast of SWMU 06-003(a). This spring is thought to discharge perched groundwater originating from infiltrating snowmelt and rainfall deposited directly on the alluvium (LANL 1993, 026068, p. 3-16).

3.1.3 Land Use

Currently, land use of the Twomile Canyon Aggregate Area is industrial. TA-03 and TA-59, located north of Twomile Canyon on South Mesa, are highly developed with major experimental facilities and numerous office and laboratory buildings, utilities, parking lots, roads, and other paved areas. The remainder of the aggregate area within the Laboratory boundary is less developed or undeveloped. Most of the active TAs in this area are associated with explosives development and testing operations, which require undeveloped buffer areas. A portion of TA-62 to the west of West Jemez Road is accessible to the public. However, TA-62 does not contain any SWMUs or AOCs.

3.2 Subsurface Conditions

3.2.1 Anticipated Stratigraphic Units

The stratigraphy of the Twomile Canyon Aggregate Area is summarized in this section based on information presented in the Investigation Work Plan for Pajarito Canyon (LANL 1998, 059577). Unless otherwise noted, locations of wells and boreholes discussed below are shown in Plate 1. Additional information on the geologic setting of the area and information on the Pajarito Plateau can be found in the Laboratory's 2005 hydrogeologic synthesis report (Collins et al. 2005, 092028).

The surface distribution of bedrock geologic units in the Pajarito Canyon area is shown on geologic maps that have been prepared by Griggs and Hem (1964, 092516); Smith et al. (1970, 009752); Purtymun and Kennedy (1971, 004798); Vaniman and Wohletz (1990, 009995.2); Rogers (1995, 054419); Dethier (1997, 049843); and others. The subsurface geology has been investigated by a number of deep boreholes including those for well PM-2 located in Pajarito Canyon; test holes PCTH-5 and PCTH-6 and SHB-4 (Gardner et al. 1993, 012582, p. 16), also located in Pajarito Canyon; well PM-4 located on Mesita del Buey north of Pajarito Canyon; well PM-5 located north of Pajarito Canyon; and boreholes H-19, SHB-1, SHB-2, and SHB-3, and EGH-LA-1 (Purtymun 1995, 045344, p. 225). Numerous shallow boreholes on the floor of Pajarito Canyon have penetrated alluvium and upper bedrock units.

The principal bedrock units in Pajarito Canyon area consist of the following, in ascending order.

- Santa Fe Group: 4 to 21 Ma (ages from Manley 1979, 011714)
- Puye Formation: 1.7 to 4 Ma (Turbeville et al. 1989, 021587; Spell et al. 1990, 021586) and interstratified volcanic rocks including the Tschicoma Formation on the west (2.53 to 6.7 Ma) (Gardner and Goff 1984, 044021; WoldeGabriel et al. 1996, 054427) and basalts of the Cerros del Rio volcanic field on the east (2 to 3 Ma) (Gardner and Goff 1984, 044021)
- Otowi Member of the Bandelier Tuff: (ca 1.61 Ma) (Izett and Obradovich 1994, 048817)
- Tephras and volcaniclastic sediments of the Cerro Toledo interval (Broxton and Reneau 1995, 049726, p. 11)

- Tshirege Member of the Bandelier Tuff: ca 1.22 Ma (age from Izett and Obradovich 1994, 048817; Spell et al. 1990, 021586)

The bedrock stratigraphy is illustrated in Figure 3.2-1, and a brief description of the principal bedrock units is given below.

3.2.1.1 Santa Fe Group

In the general area of Pajarito Canyon, the Santa Fe Group was penetrated by water supply wells PM-2, PM-3, PM-4, and PM-5 and by borehole EGH-LA-1. Based on borehole lithoiogical and geophysical logs, Purtymun (1995, 045344, p. 4) informally divided the Santa Fe Group into three formations, which include (in ascending order) the Tesuque Formation, the Chamita Formation, and a coarse-grained upper fades (the "Twomile Formation").

The Santa Fe Group was deposited in a late Miocene trough 3 to 4 mi wide and 7 to 8 mi long that extended northeastward beneath the Pajarito Plateau (see Figure 2-4 in the Hydrogeologic Workplan [LANL 1996, 055430]). This trough is filled with up to 1500 ft of gravels, cobbles, and boulders derived from the Jemez volcanic field and with volcanic, metamorphic, and sedimentary rocks derived from highlands to the north and east. The trough is partly coincident with low-gravity anomalies that Ferguson et al. (1995, 056018) interpreted as a sediment-filled graben on the western side of the Española Basin of the Rio Grande rift. The eastern side of this trough crosses Pajarito Canyon near NM 4. The western margin of the trough is not well constrained but may be located in the western portion of the Laboratory.

Tesuque Formation

In wells PM-2 (located in Pajarito Canyon) and PM-4 (located to the north on Mesita del Buey), the Tesuque Formation primarily consists of poorly consolidated, light pinkish brown, silty sandstone, siltstone, and claystone (Cooper et al. 1965, 008582, p. 59). The sandstones are predominately fine- to medium-grained, and the sand grains are subrounded to well rounded. The Tesuque Formation also contains interbedded gravel and conglomerate beds and basalt flows in boreholes for wells that are located in the Pajarito Canyon area.

Chamita Formation

The Chamita Formation is similar in appearance to the Tesuque Formation but reportedly contains a larger proportion of volcanic and granitic clasts in its gravel layers (Galusha and Blick 1971, 021526, p. 71) and Paleozoic limestone cobbles in its conglomerate layers (Dethier and Manley 1985, 021506). The Chamita Formation contains lithologically distinct quartzitic gravels (Galusha and Blick 1971, 021526, p. 71). Upper layers of the Chamita Formation may contain cobbles of Jemez volcanic rocks, primarily andesites and dacites. However, because of similarities of appearance, obvious time overlaps, and interiingering relations, differentiation of the Chamita Formation from the coarse-grained upper facies of the Santa Fe Group is often difficult, particularly in borehole investigations. The Chamita Formation was reported to be 100 ft thick in well PM-2, 80 ft thick in well PM-5, and absent in PM-3 (Purtymun 1995, 045344, pp. 275–277).

Coarse-Grained Upper Facies of the Santa Fe Group

Purtymun (1995, 045344, p. 6) called a distinctive group of coarse-grained sediments at the top of the Santa Fe Group the "Twomile Formation." The name "Twomile Formation" as related to Santa Fe Group sediments is a potentially confusing designation because the type section of the Twomile Formation in

Twomile Canyon is much younger than the coarse-grained upper facies of the Santa Fe Group identified in boreholes on the Pajarito Plateau. In well PM-3, the upper facies consists of medium- to coarse-grained sandstone, conglomerate, and siltstone (Purtymun 1967, 011829, p. 9). Because of the high permeability characteristics of this facies, it is an important aquifer for the development of high-yield, low-drawdown municipal and industrial water supply wells on the Pajarito Plateau.

The deep boreholes in the lower Pajarito Canyon area encountered basaltic lava flows interbedded with the sedimentary deposits of the upper Santa Fe Group. These basalts range in thickness from 30 to 480 ft and are generally described as dark gray and dense, but red vesicular zones are also present (Cooper et al. 1965, 008582; Purtymun 1967, 011829, p. 9; Purtymun 1995, 045344, p. 263).

3.2.1.2 Puye Formation, Tschicoma Formation, and Cerros Del Rio Basalts

The Puye Formation is mostly a fanglomerate deposit generally consisting of poorly sorted boulders, cobbles, and coarse sands. At well PM-3, the clasts are composed of dacite, rhyolite, and fragments of basalt and pumice (Purtymun 1967, 011829, p. 8). At well TW-8, the fanglomerate consists predominately of fine- to coarse-grained sands and interbedded clay, silt, and gravel (Baltz et al. 1963, 008402, Figure 4). The lower part of the fanglomerate includes more than 95 ft of light tan to light gray tuff and tuffaceous sand.

The lower part of the Puye Formation includes coarse sand and boulder deposits interpreted to represent an axial facies deposit of the ancestral Rio Grande as described by Manley (1976, 057673) and Dethier (1997, 049843). The axial facies deposit was previously (informally) called the “Totavi Lentil” of Griggs and Hem (1964, 092516). At well PM-3, this deposit is composed of gravel and boulders of dacite, rhyolite, and quartzite (Purtymun 1967, 011829, p. 9). The thickness of the axial facies deposit varies from 40 ft at well PM-4 to 70 ft at wells PM-2 and PM-5 (Purtymun 1995, 045344, pp. 275–277). The axial facies deposit interfingers with the fanglomerates of the Puye Formation and basaltic rocks of the Cerros del Rio volcanic field in White Rock Canyon.

At wells PM-2 and PM-4, a sequence of brown and gray basaltic lava flows split the Puye Formation into the main lower part and a thin upper part (Purtymun 1995, 045344, pp. 275–277). Similar basalts were penetrated in the Puye Formation by other deep boreholes in the area. These basalts are present beneath the Guaje Pumice Bed at wells PM-2 and PM-4, although variable thickness of fanglomerate facies may be present above the basalts. The basalts are stratigraphically equivalent to the basaltic rocks of the Cerros del Rio volcanic field and probably represent an extension of that volcanic field beneath the Pajarito Plateau.

Dacitic volcanic rocks, presumably representing the distal edge of a Tschicoma Formation lava flow, were encountered beneath the Bandelier Formation in borehole SHB-1 (located west of TA-55). The dacite flow appears to occupy a similar stratigraphic position within the Puye Formation as do the basalts. Similar dacite flows may underlie the upper and middle sections of Pajarito Canyon. Several deep boreholes drilled to 750 ft at TA-46 did not encounter either the dacite or the basalt flows in the upper Puye Formation (Purtymun 1995, 045344, p. 209). This finding may indicate the volcanic flows in the Puye Formation do not extend laterally beneath the entire Pajarito Plateau.

The top of the regional aquifer beneath the Pajarito Plateau is usually encountered within the fanglomerate of the Puye Formation and the associated interbedded basalts. The regional aquifer was initially encountered at 823 ft in well PM-2 and at 1060 ft in well PM-4. No intermediate perched zones were identified in the Puye Formation during the drilling of these wells.

3.2.1.3 Otowi Member of the Bandelier Tuff

The Otowi Member is a nonwelded, poorly consolidated ignimbrite sheet composed of stacked ash-flow units composed of pumice lapilli supported by a matrix of ash and crystal fragments. The Otowi Member varies in reported thickness from 184 ft in borehole SHB-1 to 465 ft in borehole EGH-LA-1. The deposits of the Otowi Member beneath middle Mortandad Canyon (near well TW-8 and borehole EGH-LA-1) are among the thickest on the Pajarito Plateau from deposition in a pre-Bandelier Formation paleovalley (see Figure 5 in Broxton and Reneau [1996, 055429, p. 330]). The paleovalley containing the thick Otowi Member sediments continues southward across lower Pajarito Canyon.

The Otowi Member does not outcrop in the Pajarito Canyon watershed area but is known to exist in the subsurface from drill hole data. The Otowi Member is 305 ft thick at well PM-2, approximately 155 ft thick at borehole PCTH-6, and approximately 55 ft thick at borehole PCTH-5. The Otowi Member thins eastward against a north-trending basaltic highland that crosses Pajarito Canyon near NM 4. The Otowi Member is absent in lower Pajarito Canyon off the Laboratory where it either was not deposited or was removed by erosion before the Tshirege Member was deposited.

The basal part of the Otowi Member includes the Guaje Pumice Bed, which is a sequence of well-stratified pumice-fall and ash-fall deposits. The Guaje Pumice Bed is typically 30 to 35 ft thick beneath the Pajarito Plateau; however, beneath lower Pajarito Canyon the Guaje Pumice Bed thins from west to east and is 27 ft thick at well PM-2, 20 ft thick at borehole PCTH-6, and 11 ft thick at borehole PCTH-5 (Purtymun 1995, 045344, pp. 223, 275).

3.2.1.4 Tephras and Volcaniclastic Sediments of the Cerro Toledo Interval

Tephras and volcaniclastic sediments of the Cerro Toledo interval is an informal name given to a complex sequence of epiclastic sediments and tephras of mixed provenance (Broxton and Reneau 1995, 049726, p. 11). This unit includes well-stratified tuffaceous sandstones and siltstones, primary ash-fall and pumice-fall deposits, and dacite-rich gravel and boulder deposits. The Cerro Toledo deposits, which vary in thickness from 0 to more than 100 ft, were likely deposited episodically with unevenly distributed local deposits. Some sediment was deposited in drainage channels developed on top of the Otowi Member before deposition of the Tshirege Member, and other blanket-type sediments may have been deposited across the plateau including on paleotopographic drainage divides. Erosion and possible redeposition of the Cerro Toledo interval sediments may have occurred in places before deposition of the Tshirege Qbt 1 unit, which may have contributed to locally variable thickness. The Cerro Toledo interval is approximately 140 ft thick in borehole SHB-1 (Gardner et al. 1993, 012582, p. 9) and approximately 80 ft thick in borehole 35-2028 located in Ten Site Canyon to the north of Pajarito Canyon (LANL 1996, 054422, p. 2-3). The Cerro Toledo interval does not outcrop in the Pajarito Canyon watershed area.

3.2.1.5 Tshirege Member of the Bandelier Tuff

The Tshirege Member is a multiple-flow ignimbrite sheet that underlies the alluvium on the floor of upper and middle Pajarito Canyon and forms the prominent cliffs and mesas adjacent to the canyon. The Tshirege Member includes a number of subunits that can be recognized based on differences in physical and weathering properties. This work plan follows the nomenclature of Broxton and Reneau (1995, 049726, p. 8).

Within the Pajarito Canyon system, the following subunits of the Tshirege Member are present.

The Tsankawi Pumice Bed (Qbtt) is the basal pumice fallout deposit of the Tshirege Member. This pumice bed is typically 1 to 3 ft thick in this part of the Laboratory. It is composed of equant angular to

subangular clast-supported pumice lapilli up to 2.5 in. in diameter. It is not exposed (or not well exposed) at the surface in the Pajarito Canyon watershed area.

Qbt 1g is the lowermost unit in the thick ignimbrite sheet that makes up most of the Tshirege Member. Qbt 1g is a porous, nonwelded, poorly sorted, vitric ignimbrite. It is poorly indurated but nonetheless forms steep cliffs because a resistant bench near the top of the unit forms a protective cap over the softer underlying tuffs. Qbt 1g underlies the broad canyon floor in lower Pajarito Canyon and outcrops as lower parts of cliff walls in portions of the middle sections of Pajarito Canyon.

Qbt 1v is a series of cliff- and slope-forming outcrops composed of porous, nonwelded, devitrified ignimbrite. (All units above Qbt 1g are vapor-phase-altered and devitrified.) The base of the unit is a thin, horizontal zone of preferential weathering that marks the abrupt transition from vitric tuffs below to devitrified tuffs above; this feature forms a mappable marker horizon on canyon walls in portions of middle Pajarito Canyon. The lower part of Qbt 1v is a resistant orange-brown colonnade tuff that forms a distinctive low cliff characterized by columnar jointing. The colonnade tuff is overlain by a distinctive white band of slope-forming tuffs. Qbt 1v is exposed in canyon walls in middle and lower Pajarito Canyon and is present beneath the canyon floor west of the confluence with Twomile Canyon.

Qbt 2 forms a distinctive, medium brown, vertical cliff-forming unit that stands out in marked contrast to the slope-forming, lighter-colored tuffs above and below. This unit is devitrified, relatively highly welded, and underlies the canyon floor in the steep, narrow parts of upper Pajarito Canyon. Qbt 2 forms a resistant caprock on mesa tops surrounding lower Pajarito Canyon and is the caprock at Mesita del Buey.

Qbt 3 is a nonwelded to partially welded, devitrified ignimbrite. The basal part of Qbt 3 consists of a soft, nonwelded tuff that forms a broad gently sloping bench on top of Qbt 2 in canyon wall exposures and on the broad canyon floor in upper Pajarito Canyon. The upper part of Qbt 3 is a partially welded tuff that forms the caprock of mesas adjacent to middle Pajarito Canyon. This unit is more densely welded to the west and locally contains apparent horizontal bedding and/or fracturing where springs discharge.

Qbt 4 is a partially to densely welded ignimbrite characterized by small, sparse pumices and numerous intercalated surge deposits. This unit is exposed on mesa tops west of TA-55 and TA-67 in the Pajarito Canyon area. Some of the most densely welded areas occur on the western margin of the Laboratory.

3.2.1.6 Alluvium

Alluvium of Pleistocene and Holocene age rests unconformably on the Bandelier Tuff in Pajarito Canyon between NM 501 and NM 4 (Devaurs and Purtymun 1985, 007415, p. 11). The alluvium may overlie the Cerro Toledo interval in lower Pajarito Canyon near well PCO-3. East of NM 4 through White Rock the stream channel is often located directly on basalts of the Cerros del Rio volcanic field, with relatively minor alluvium being present. The alluvium includes sediment derived from the Tschicoma Formation and the Tshirege Member of the Bandelier Tuff, which forms the steep walls of the canyon. The alluvium also contains sediment derived from eolian sources and fallout pumice deposits. In the upper canyon, the alluvium is thin and consists of boulders, cobbles, and pebbles of tuff and dacitic rocks intermixed with sand, silt, and clay. The sand consists mainly of fine- to coarse-grained crystals of quartz and sanidine.

In middle and lower Pajarito Canyon, the alluvium is generally composed of finer-grained materials, including sand, silt, and clay (for example, Devaurs 1985, 007416; LANL 1995, 055527, p. 4-179). The alluvium is relatively thin in the upper and middle part of the canyon but widens and thickens downstream from the confluence of Twomile Canyon.

3.2.2 Hydrogeology

The hydrogeology of the Pajarito Plateau is generally separable in terms of mesas and canyons forming the plateau. Mesas are generally devoid of water, both on the surface and within the rock forming the mesa. Canyons range from wet to relatively dry; the wettest canyons contain continuous streams and perennial groundwater in the canyon-bottom alluvium. Dry canyons have only occasional stream flow and may lack alluvial groundwater. Intermediate-perched groundwater has been found at certain locations on the plateau at depths ranging between 100 and 400 ft bgs. The regional aquifer is found at depths of about 600 to 1200 ft bgs.

The hydrogeologic conceptual site model for the Laboratory (Collins et al. 2005, 092028) shows that under natural conditions, relatively small volumes of water move beneath mesa tops because of low rainfall, high evaporation, and efficient water use by vegetation. Atmospheric evaporation may extend into mesas, further inhibiting downward flow.

In the Los Alamos County area, groundwater occurs as (1) water in shallow alluvium in some of the larger canyons, (2) intermediate-perched groundwater (a perched groundwater body lies above a less permeable layer and is separated from the underlying aquifer by an unsaturated zone), and (3) the regional aquifer.

Groundwater investigations in the Twomile Canyon Aggregate Area are limited to those associated with SWMU 03-010(a) and AOC 03-001(e) (see section 4.1.1). These sites are located north fork of Twomile Canyon, and wells have been installed to monitor shallow perched water. Currently, well 03-B-13 at AOC 03-001(e) is sampled quarterly. There are no other monitoring wells in the aggregate area. Several alluvial wells, intermediate well PCI-2, and regional well R-17 are located just east of the eastern end of the aggregate area below the confluence of Twomile and Pajarito Canyons (Plate 1).

4.0 SITE DESCRIPTIONS AND PROPOSED INVESTIGATION ACTIVITIES

The following sections present site descriptions, summaries of previous investigation activities, and proposed sampling and remediation activities. Table 4.0-1 summarizes the investigation strategy for each SWMU or AOC, including the analytical methods for site-characterization activities proposed in this work plan.

The Twomile Canyon Aggregate Area has been disturbed as a result of many years of new construction and demolition of former structures and historical and on-going firing-site activities. Before sampling is conducted, geodetic and geophysical methods in conjunction with radiological and unexploded ordnance (UXO) surveys may be used to verify specific SWMU and AOC boundaries. The sampling locations proposed in this work plan may be relocated as a result of these surveys; however, the overall sampling strategy will remain the same.

Data from samples collected to determine the sources of contamination and the nature and extent of contamination in sediment, surface water of active stream channels, and groundwater beneath canyon floors in Twomile Canyon were reported in the “Pajarito Canyon Investigation Report, Revision 1” (LANL 2009, 106939). The Pajarito Canyon investigation included sampling and analysis of media from the watershed that includes Twomile Canyon and representative sections of the canyon reaches. Fifteen of the reaches identified in Twomile Canyon are down gradient of sites to be investigated in this work plan (TW-1E, TWN-1W, TWN-1C, TWN-1E, TW-2, TW-2E, TW-3W, TW-3E, TW-4W, TW-4E, TWSW-1C, TWSW-1E, TWSW-1W, TWSE-1W, and TWSE-1E) (Plate 1). Analytical suites for samples collected at these reaches included perchlorate, target analyte list (TAL) metals, cyanide, pesticides, polychlorinated

biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), radionuclides, and explosive compounds (LANL 2006, 093713, p. 14). Data from the Twomile Canyon investigation will be combined with data from the sampling proposed in this work plan to assess potential contaminant migration from sites within the Twomile Canyon Aggregate Area. Additional data collected in Twomile Canyon under the Federal Facility Compliance Act (FFCA), Multi-Sector General Permit (MSGP), and the Laboratory's interim facility-wide groundwater monitoring report also will be used to assess potential contaminant migration from the Twomile Canyon Aggregate Area sites.

4.1 Sites under Investigation at TA-03

4.1.1 AOC 03-001(e), Former Storage Area, and SWMU 03-010(a), Surface Disposal Area/Drainage

4.1.1.1 Description and History

SWMU 03-001(e) is the former location of a storage area on the west side of building 03-0030 (Figure 4.1-1). The area was used to store containers of waste oil contaminated with radionuclides, rinse solvents, and waste mercury from vacuum pumps repaired in a shop in building 03-0030. From 1957 to the early 1960s, liquid waste was discharged from a sink in the vacuum pump repair shop in building 03-0030 directly to drums located in the storage area outside the shop. In the early 1960s, the drums were replaced by a large holding tank with a concrete secondary containment berm. In 1984, a concrete containment was constructed in the storage area, over which a metal grate was placed. The surrounding area was paved with asphalt. After the concrete containment was installed, the holding tank was no longer used and the liquid waste was pumped into drums staged on top of the metal grate. This practice continued until vacuum repair operations ceased in 1992 (LANL 1995, 057590, p. 5-17-1).

SWMU 03-010(a) is surface disposal area and drainage that received waste generated from vacuum pumps repaired at the shop in building 03-0030 [AOC 03-001(e)] (Figure 4.1-1). The surface disposal area received discharges of waste oil and mercury between 1950 and 1957 (LANL 1995, 057590, p. 5-17-1). Former site workers estimated that more than 100 lb of mercury was discharged to the area (LANL 1993, 020947, p. 6-12). The drainage site encompasses an area approximately 40 ft long by 15 ft wide on a moderately steep slope that drains into Twomile Canyon (Figure 4.1-1).

Investigation and remediation activities and data for AOC 03-001(e) and SWMU 03-010(a) are summarized below; decision-level data are not presented in this work plan but are presented in the reports referenced below.

4.1.1.2 Previous Investigations

Because AOC 03-001(e) and SWMU 03-010(a) are near each other and share the same contaminant source, investigations have been conducted concurrently at these sites.

In 1992 and 1993, soil and sediment samples were collected to identify potential contaminants, with results indicating the presence of elevated levels of lead, mercury, total petroleum hydrocarbons (TPH), and radionuclides (LANL 1992, 041928; LANL 1995, 046195, pp. 28, 34–37, 43).

In 1994, a voluntary corrective action (VCA) was conducted as a part of the RFI to remove soil containing mercury above 20 parts per million (ppm) and TPH above 100 ppm (LANL 1994, 042624, pp. 3–13). Approximately 120 yd^3 of soil containing mercury, TPH, and radionuclides was removed. During the VCA,

VOCs were detected in the soil (LANL 1994, 042624, pp. 12–13). Because the nature and extent of VOCs have not been characterized, further investigation of the site was required.

Following the VCA, two screening assessments were conducted at SWMU 03-010(a) to identify contaminant concentrations remaining at the site. Screening assessment results identified benzene, chloroform, 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethene (1,1-DCE), and cis-1,3-dichloropropene as the chemicals of potential concern (COPCs) to human health (LANL 1995, 046195, p. 42).

In 1994, as part of the ongoing RFI to identify the nature and extent of VOC contamination, a soil-vapor survey was performed around SWMU 03-010(a) by driving a probe to the soil/tuff or fill/tuff interface, or to refusal, at a total of 32 locations (LANL 1995, 046195, pp. 46–49). Based on the results of the soil-vapor survey, locations for seven boreholes were chosen. These boreholes were augered and sampled to depths of approximately 30 to 100 ft below ground surface (bgs). Free water was encountered in two of the seven boreholes, B1 (borehole [BH] 03-2664) and B4 (BH 03-2667), at approximately 23 ft bgs; water was present in the sample collected near the same depth in B6 (BH 03-2679), but free water was not encountered and the hole was advanced to approximately 100 ft bgs (LANL 1995, 046195, pp. 9, 51).

Data from Phase II investigation soil, soil vapor, surface water seep, and groundwater samples showed low concentrations of VOCs (primarily chlorinated solvents) (LANL 1995, 046195, p. 53–69). Based on the results of a risk assessment, the 1995 VCA report concluded that the concentrations of VOCs in subsurface soil were below levels of concern, the groundwater found in three boreholes did not represent a usable water source, the surface water did not represent a viable exposure pathway for humans, and contaminant concentrations were below a level of concern for ecological receptors (LANL 1995, 046195, p. 89-91).

In response to requests for additional characterization (NMED 1999, 064614), the Laboratory collected additional groundwater, surface water, and sediment samples (LANL 2003, 081607, pp. 3–7) between December 1999 and April 2000. The investigation concluded the only potentially complete exposure pathway was the inhalation of vapors from subsurface soil using two scenarios: long-term workers and trail users. Water was not considered a complete pathway because the volume was not sufficient to constitute a usable resource and because the COPCs were not detected in surface water (LANL 2000, 068736, pp. 12–13).

In 2001, NMED issued a request for supplemental information to the DOE and the Laboratory requiring further investigation of SWMU 03-010(a) (NMED 2001, 071422). The Laboratory proposed using geophysical techniques to help evaluate the extent of groundwater contamination, the direction of groundwater flow in the tuff, and to identify any potential connectivity of the groundwater in the tuff to deeper zones of groundwater (LANL 2001, 071487, pp. 1–2). In 2002, NMED approved the proposal (NMED 2002, 073405).

The geophysical investigations, including high-resolution resistivity, residual potential mapping, and electromagnetics (EM), were conducted in August 2002. Although data from the geophysical investigations were compromised by the presence of subsurface features associated with building 03-0030, they indicated a shallow saturated zone within the fill beneath the foundation of building 03-0030 (LANL 2003, 081599, Appendix B).

In 2005, a drilling investigation was conducted at SWMU 03-010(a) and AOC 03-001(e). DOE subsequently issued an investigation report that concluded the perched groundwater in the area of building 03-0030 is of limited extent and not directly connected with intermediate or regional aquifers (DOE 2006, 092669). The report further concluded that the limited perched zone contained multiple

COPCs, including VOCs and tritium. The VOCs were attributed to historical activities at SWMU 03-010(a) and AOC 03-001(e). The source of the tritium is not known.

In 2005, well MW-1 was pulled and the borehole abandoned. A compromised well vault cover seal had allowed surface runoff to enter the well vault, resulting in accumulation and possible infiltration of surface runoff into the well casing. As a result, the well was no longer useful for groundwater monitoring and was a potential contaminant transport pathway to shallow groundwater. Wells 03-B-9, 03-B-10, and 03-B-13 were installed in 2005 to replace well MW-1. Quarterly sampling of these wells began on June 23, 2006, as part of the SWMU 03-010(a) and AOC 03-001(e) perched-groundwater investigation (LANL 2006, 094043).

A tracer test was also performed in 2006 to identify the source of groundwater recharge at the site. Historical observations of water levels and precipitation generally show a rapid change in water levels in wells 03-B-9, 03-B-10, and 03-B-13 in response to precipitation events (NMED 2007, 098282). Results of the tracer study indicated that the building 03-0030 roof drains were the major source of recharge at the site. Camera logging of the culvert near the foundation of the building (beneath the former vacuum pump repair shop) indicated a break in the culvert, which may have been the pathway allowing precipitation from roof drains to recharge the perched groundwater. The culvert was repaired in 2007 resulting in an immediate drop in water levels at the site (LANL 2007, 099171). However, water levels subsequently rebounded.

An aquifer test was conducted at monitoring well 03-B-10 on September 14, 2009, to evaluate the hydraulic characteristics of the perched immediate groundwater near building 03-0030 before monitoring wells 03-B-9 and 03-B-10 were plugged and abandoned because they had been damaged by snow plows. Test results indicated the perched aquifer beneath building 03-0030 is of limited areal extent. The perched aquifer is estimated to be 160 ft × 160 ft and represents approximately 75 gal., which is consistent with the 71 gal. produced during the pump test (LANL 2009, 107631). Monitoring wells 03-B-9 and 03-B-10 were plugged and abandoned following the aquifer test (LANL 2009, 107459).

4.1.1.3 Proposed Activities

Residual contamination associated with AOC 03-001(e) may be located beneath building 03-0030. Therefore, it is proposed that further site characterization and investigation of AOC 03-001(e) be delayed until the demolition of building 03-0030. Monitoring well 03-B-13, located next to and downgradient of AOC 03-001(e), will be rehabilitated as an aboveground monitoring well. Quarterly sampling will continue at well 03-B-13 as part of the Pajarito Canyon periodic monitoring program, in accordance with the interim facility-wide groundwater monitoring plan (LANL 2009, 106115). Quarterly groundwater samples are analyzed for explosive compounds, perchlorate, TAL metals, tritium, SVOCs, VOCs, and water-quality parameters.

4.1.2 SWMU 03-001(k), Former Storage Area

4.1.2.1 Description and History

SWMU 03-001(k) is the former location of a less-than-90-day hazardous waste accumulation area located on the south side of building 03-0016, the inactive Van de Graaff Accelerator and Ion Beam Facility (Figure 4.1-2). SWMU 03-001(k) consists of two level asphalt areas each measuring approximately 20 ft × 30 ft. The areas are located next to doors on the south side of the building. Concrete pads located in front of each doorway are bounded by asphalt paving on three sides. SWMU 03-001(k) was used primarily as a storage yard for electrical equipment destined for salvage (LANL 1993, 020947). A 1986 field inspection

of SWMU 03-001(k) noted oily unmarked drums where fresh vacuum oil for experiments was stored (DOE 1987, 008663). Asphalt chip samples collected in 1989 indicated the presence of Aroclors (LANL 1993, 020947). A 1993 inspection found the asphalt and concrete pad devoid of stains (LANL 1993, 020947).

4.1.2.2 Previous Investigations

In 2001, four asphalt samples and five soil samples beneath the asphalt were collected at SWMU 03-001(k) (LANL 2001, 070937) and submitted for analysis of inorganic chemicals, PCBs and tritium. In addition, soil samples were submitted for analysis of VOCs. Data from the 2001 sampling event are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs, trace concentrations (<1 ppm) of Aroclor-1260, and tritium detected above the FV. Samples collected in 2001 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 03-001(k).

4.1.2.3 Proposed Activities

Because there are no decision-level data for SWMU 03-001(k), sampling will be performed to characterize the nature and extent of any contamination present at the former storage area location, around the former storage area, and in the drainages downgradient of the former storage area. Concrete and asphalt samples will be collected from 12 locations where electrical equipment and drums of vacuum oil were stored adjacent to the south side of building 03-0016. Soil samples will also be collected at the same 12 locations at depths of 0 to 1 ft and 2 to 3 ft beneath concrete and asphalt. Samples will also be collected at depths of 0 to 1 ft and 2 to 3 ft bgs from eight locations around the former storage area. Samples will be collected at depths of 0 to 1 ft and from the top 1 ft of unweathered tuff from eight locations in the two drainages downgradient of the site. Samples from the western drainage will also be used to characterize the lateral extent for SWMU 03-055(a).

All asphalt, concrete, and soil samples from SWMU 03-001(k) will be analyzed for PCBs and tritium. All soil samples collected beneath the concrete and asphalt for SWMU 03-001(k), and all samples collected downgradient of the site will also be analyzed for TAL metals, cyanide, nitrate, VOCs, and SVOCs. Proposed sampling locations are shown in Figure 4.1-3. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.3 SWMU 03-003(a), Former Storage Area, and AOC 03-042, Former Containment Area

4.1.3.1 Description and History

SWMU 03-003(a) is a former outdoor storage area used for temporary storage of electrical equipment destined for salvage, some of which contained oil. The storage area was located on the north and west sides of building 03-0218 (Figure 4.1-4). The northern portion of the storage area consisted of the asphalt paving next to the north side of building 03-0218. The western portion of the storage area consisted of a 44 ft long × 27 ft wide concrete pad surrounded by an 18 in. to 20 in. high concrete curb. The concrete pad and curb are bounded by on three sides soil covered with gravel. A 30 ft wide × 60 ft long area of asphalt paving abuts the south end of the concrete curb. During the 1986 CEARP survey, six 55-gal. drums were observed stored next to capacitors on asphalt in the storage area on the north side of building 03-0218; staining was visible on the asphalt beneath the drums (DOE 1987, 008663). Capacitors and transformers labeled as containing less than 50 ppm PCBs were stored in the west portion of the former storage area (LANL 1993, 020947). During a 1989 inspection, leaking capacitors, drums of epoxy, one or two batteries, and vacuum pumps were observed in the western portion of the storage area (LANL 1993, 020947). In the early 1990s, a small area of oil stained asphalt was excavated to a depth of 3 in.

around the storm drain located in the western portion of SWMU 03-003(a) (LANL 1993, 020947). Use of the SWMU 03-003(a) storage area ceased in the early 1990s.

AOC 03-042 is a former containment area located around the concrete pad in the western portion of SWMU 03-003(a) (Figure 4.1-4). In 1965, wooden surge tanks (former structures 03-0063 and 03-0064) were erected on the concrete pad and a chainlink fence was installed along the top of the concrete curb surrounding the pad. The tanks contained non-PCB dielectric mineral oil used as insulation in experiments conducted in building 03-0218 (LANL 1995, 057590). The concrete curb around the pad was used as secondary containment in the event the tanks overflowed during pressure surges caused by experiments. During heavy rain events, water with an oily film would overflow the containment area (LANL 1995, 057590). The surge tanks and chainlink fence were removed in 1985 along with the electrical equipment destined for salvage. Stains were observed on the concrete pad during a 1992 inspection (LANL 1993, 020947). The concrete curb and pad are still present at the site beneath transportable containers (structures 03-2279 and 03-2403).

4.1.3.2 Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 03-003(a) and AOC 03-042, two asphalt and nine surface soil samples (0 to 0.5 ft bgs) were collected from eight locations and field screened for PCBs and VOCs (LANL 1995, 057590). PCBs were detected above 0.5 mg/kg in both asphalt samples and in four soil samples. Two of the soil samples were submitted for analysis of metals, VOCs, SVOCs, pesticides, PCBs, and gross radiological screening. Data from the 1994 Phase I RFI are screening-level data and are not presented in this work plan; however, the data showed mercury and zinc detected slightly above BVs in one sample and PCBs detected at concentrations below 1 ppm in both samples. Samples collected during the 1994 RFI and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 03-003(a) and AOC 03-042.

4.1.3.3 Proposed Activities

Because there are no decision-level data for SWMU 03-003(a) and AOC 03-042, sampling will be performed to characterize the nature and extent of any contamination present in and around the former storage and containment areas. Concrete and asphalt samples will be collected from 10 locations within the former storage area and containment area. Soil samples will also be collected at the same 10 locations at depths of 0 to 1 ft and 2 to 3 ft beneath the concrete and asphalt. Samples will be collected at depths of 0 to 1 ft and 2 to 3 ft bgs beneath asphalt from seven locations around the former storage area. Because the asphalt around the former storage area is regularly resurfaced for parking, asphalt samples will not be collected from sampling locations around the former storage area.

All asphalt, concrete, and soil samples from SWMU 03-003(a) and AOC 03-042 will be analyzed for PCBs. All soil samples collected beneath the concrete and asphalt will also be analyzed for TAL metals, cyanide, nitrate, VOCs, and SVOCs. Proposed sampling locations are shown in Figure 4.1-5. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.4 SWMU 03-003(b), Former Storage Area

4.1.4.1 Description and History

SWMU 03-003(b) is a former outdoor storage area located west of building 03-0253 (Figure 4.1-4). The storage area had a compacted base-course surface and was used temporarily to stage oil-containing electrical equipment destined for salvage. The dimensions of the area are not known (LANL 1993,

020947). While in use, up to 100 electrical capacitors were observed to be stored in the area, some of which were leaking (LANL 1996, 052930). In 1985 and 1986, the capacitors and underlying stained soil were removed and the storage area was decommissioned. In 1989, a transportable container, structure 03-1950, was installed at the site (LANL 1996, 052930).

4.1.4.2 Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 03-003(b), 10 surface soil samples (0 to 0.5 ft bgs) were collected from eight locations and field screened for PCBs and VOCs (LANL 1996, 052930). PCBs were detected above 0.5 mg/kg in two soil samples. Two of the samples were submitted for analysis of metals, VOCs, SVOCs, pesticides, PCBs, and gross radiological screening. Data from the 1994 Phase I RFI are screening-level data and are not presented in this work plan; however, the data showed PCBs detected below 1 mg/kg in one sample. Samples collected during the 1994 RFI and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 03-003(b).

4.1.4.3 Proposed Activities

Because there are no decision-level data for SWMU 03-003(b), sampling will be performed to characterize the nature and extent of any contamination present at and around the former storage area. Base course samples will be collected from seven locations within the former storage area. Soil samples will also be collected at the same seven locations at depths of 0 to 1 ft and 2 to 3 ft beneath the base-course layer. Samples will be collected at depths of 0 to 1 ft and 2 to 3 ft bgs beneath the asphalt from five locations around the former storage area. Because the asphalt around the former storage area is regularly resurfaced for parking, asphalt samples will not be collected from sampling locations around the former storage area.

All base course and soil samples from SWMU 03-003(b) will be analyzed for PCBs. Soil samples collected beneath the base course asphalt will also be analyzed for TAL metals, cyanide, nitrate, VOCs, and SVOCs. Proposed sampling locations are shown in Figure 4.1-5. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.5 AOC 03-003(h), Transformers

4.1.5.1 Description and History

AOC 03-003(h) is the former location of three PCB-containing transformers in the mezzanine inside building 03-0039 (Figure 4.1-6). The 1990 SWMU report incorrectly states that four transformers were located at AOC 03-003(h). A 1986 inventory of PCB transformers confirmed that only three transformers were located in this area (LANL 1990, 007511). In 1984, the three transformers were removed and replaced with non-PCB transformers; no staining was observed when the PCB transformers were removed (LANL 1995, 057590).

4.1.5.2 Previous Investigations

No previous investigations have been conducted at AOC 03-003(h).

4.1.5.3 Proposed Activities

Delayed investigation is proposed for AOC 03-003(h) because the site is located inside a restricted access operating facility and there is little potential for environmental contamination. The PCB transformers previously located on the mezzanine were removed and replaced without incident in 1984, indicating a very low likelihood of past releases. The mezzanine where the transformers were located consists of an elevated concrete slab with a containment curb. Even if a release breached this containment, it would still be contained by the concrete floor below, making migration to the environment very unlikely. It is proposed that site characterization and investigation be delayed until building 03-0039 is demolished.

4.1.6 AOC 03-003(j), Transformers

4.1.6.1 Description and History

AOC 03-003(j) is the former location of four PCB-containing transformers in three equipment rooms (Rooms E-6, N-8, and S-18) in the basement of the Physics Building (03-0040) (Figure 4.1-7). In 1991, the transformers were removed from all three equipment rooms. No staining was observed on the concrete pad in equipment room E-6. Because oil staining was observed on the concrete pads beneath the transformers in equipment rooms N-8 and S-18, the concrete pads were also removed (LANL 1995, 057590). One soil sample was collected beneath the concrete pad in each equipment room (N-8 and S-18) and analyzed for PCBs. Analytical results showed PCB detected at 20 ppm in equipment room N-8 and at 49 ppm in equipment room S-18 (Heskett 1994, 065828). New concrete pads were poured in both equipment rooms without further sampling or soil removal (LANL 1995, 057590). Non-PCB transformers were subsequently placed in the three equipment rooms.

4.1.6.2 Previous Investigations

No previous investigations have been conducted at AOC 03-003(j).

4.1.6.3 Proposed Activities

Delayed investigation is proposed for AOC 03-003(j) because characterizing this site, which is located within an operating facility, is not currently feasible. Site access for equipment needed for subsurface investigations is extremely limited. Available information indicates that the residual PCB contamination (<50 ppm) is of limited extent beneath two active non-PCB transformers and the building foundation is effectively preventing exposure to receptors and preventing contact with infiltrating precipitation that could cause migration of contaminants. It is proposed that site characterization and investigation be delayed until building 03-0040 is demolished.

4.1.7 AOC 03-003(k), Area of Potential Soil Contamination

4.1.7.1 Description and History

AOC 03-003(k) is an area of potential soil contamination associated with the former location of a non-PCB transformer (less than 50 ppm PCB), reportedly staged on the east side of building 03-0316 (Figure 4.1-8) (LANL 1989, 011956; LANL 1993, 020947). No additional information is available for this site.

4.1.7.2 Previous Investigations

No previous investigations have been conducted at AOC 03-003(k).

4.1.7.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present at the former transformer location and downgradient of the site. Soil samples will be collected beneath the asphalt at depths of 0 to 1 ft and 2 to 3 ft at four locations at the former transformer location and at two locations downgradient of the site. In addition, soil samples will be collected at depths of 0 to 1 ft and 2 to 3 ft bgs from two additional locations downgradient of the asphalt parking lot. Because the asphalt at and around the former transformer location is regularly resurfaced for parking, asphalt samples will not be collected.

All samples from AOC 03-003(k) will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-9. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.8 AOC 03-003(l), Transformers

4.1.8.1 Description and History

AOC 03-003(l) is the former location of two PCB-containing transformers in room 70 in the basement of the Van de Graaff facility (building 03-0016) (Figure 4.1-2). The two transformers (PCB ID 5557 and 5558) were removed in 1989 (Heskett 1994, 065828). During a 1994 inspection, staining was noted on the basement floor in room 70 (LANL 1995, 057590). Data from PCB swipe samples showed PCB concentrations between 2870 µg/100 cm^2 and 3065 µg/100 cm^2. The area was double-washed, rinsed, and resampled. Postcleanup swipe sampling results showed PCB concentrations between 352 µg/100 cm^2 and 3760 µg/100 cm^2 (Heskett 1994, 065828).

4.1.8.2 Previous Investigations

No previous investigations have been conducted at AOC 03-003(l).

4.1.8.3 Proposed Activities

Delayed investigation is proposed for AOC 03-003(l) because characterizing this site, which is located inside the basement of a radiological facility, is not currently feasible. Site access for equipment needed for subsurface investigations is extremely limited. Available information, including the good condition of the concrete floor in room 70 in the basement of building 03-0016, indicates a very low likelihood of past PCB releases to the environment. Even if a release had occurred, any residual contamination would be located beneath the floor of building 03-0016, effectively preventing exposure to receptors and preventing contact with infiltrating precipitation that could cause migration of contaminants. It is proposed that site characterization and investigation be delayed until the demolition of building 03-0016.

4.1.9 AOC 03-003(p), Former Storage Area

4.1.9.1 Description and History

AOC 03-003(p) is the former location of an outdoor storage area east of warehouse building 03-0142 (Figure 4.1-10). From the early 1960s to 1994, this area was used to store drums, miscellaneous

equipment, and electrical capacitors and transformers (LANL 1995, 057590). Past site inspections documented stains and leaks from drums and equipment (LANL 1993, 020974). In 1995, the former storage area location and the entire area east of building 03-0142 were graded and paved with asphalt for a new parking lot.

4.1.9.2 Previous Investigations

In 1994, before the site was paved, soil samples were collected and analyzed for metals (LANL 1995, 057590). Lead was detected at concentrations above the BV at several sampling locations. A VCA was conducted in August 1995 that resulted in the removal of 10 yd^3 of soil (excavated to a maximum depth of 16 in.) from an unpaved area in the center of AOC 03-003(p) (LANL 1996, 053780). During the 1995 VCA, three confirmatory samples were collected following soil removal activities (LANL 1996, 053780). All sampling locations were field screened for PCB, VOCs, and radioactivity before samples were collected and submitted for analysis of metals and PCBs. Data collected during the 1995 VCA are screening-level data and are not presented in this work plan; however, the data showed lead and antimony detected above soil BVs and detected PCBs with a maximum concentration of 3.23 mg/kg. The entire area was subsequently graded, leveled, and paved. Samples collected during the 1995 VCA and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for AOC 03-003(p).

4.1.9.3 Proposed Activities

Because there are no decision-level data for AOC 03-003(p), sampling will be performed to characterize the nature and extent of any contamination associated with the former storage area next to building 03-0142. Soil samples will be collected at depths of 0 to 1 ft and 2 to 3 ft beneath the asphalt from 12 locations within the former storage area boundary including the 3 previous VCA confirmation sampling locations (03-09000, 03-09001, and 03-09002) and from nine locations around the former storage area. Because the former storage area and surrounding area were paved after the storage area was no longer used, asphalt samples will not be collected.

All samples from AOC 03-003(p) will be analyzed for TAL metals, cyanide, VOCs, SVOCs, and PCBs. Proposed sampling locations are shown in Figure 4.1-11. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.10 AOC 03-014(a2), Floor Drains Associated with Former WWTP

4.1.10.1 Description and History

AOC 03-014(a2) consists of three active floor drains in building 03-0316, the high-voltage test facility (Figure 4.1-12). The drains were installed in 1969 and previously discharged to the sanitary sewer line for the former TA-03 WWTP. The TA-03 WWTP was decommissioned in 1992 when the TA-46 Sanitary Wastewater Systems Consolidation (SWSC) Plant came online; the floor drains were subsequently tied to the SWSC sanitary sewer line.

4.1.10.2 Previous Investigations

No previous investigations have been conducted at AOC 03-014(a2).

4.1.10.3 Proposed Activities

No sampling is currently proposed at the location of the AOC 03-014(a2) floor drains because there is limited accessibility to the active drains for sampling and because of the difficulty in conducting intrusive activities within an operating facility. The floor drains are active, connected to the TA-46 sanitary sewer system, and located inside an active facility (building 03-0316). Available information, including the good condition of the floors around the drains, indicates a very low likelihood of releases to the environment. Even if a release had occurred, any residual contamination would be located beneath the floor of building 03-0316, effectively preventing exposure to receptors and preventing contact with infiltrating precipitation that could cause migration of contaminants. It is proposed that site characterization and investigation of the drains be delayed until building 03-0316 is demolished.

Sampling will be performed to characterize the nature and extent of any contamination associated with the active drainline connecting the floor drains to the main sanitary sewer line. Samples will be collected at depths of 0 to 1 ft and 2 to 3 ft beneath and next to the active drainline from three locations between building 03-0316 and where it connects to the main sanitary sewer line.

All samples from AOC 03-014(a2) will be analyzed for TAL metals, cyanide, nitrate, VOCs, and SVOCs. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-13. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.11 SWMU 03-014(t), Lift Station Associated with Former WWTP

4.1.11.1 Description and History

SWMU 03-014(t) consists of an active sanitary wastewater lift station (structure 03-1869) on the north side of building 03-1612 (Figure 4.1-14). The lift station, constructed in 1987, pumped sanitary effluent from buildings in the southeast portion of TA-03 north to an elevation that yielded gravity flow to the TA-03 WWTP. The lift station was tied into the TA-46 SWSC plant when it came online in 1992.

4.1.11.2 Previous Investigations

No previous investigations have been conducted at SWMU 03-014(t).

4.1.11.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination associated with the sanitary lift station. Samples will be collected from two locations next to the lift station and from four locations along the drainline between the lift station and where it connects to the main sanitary sewer line. Samples will be collected at depths of 0 to 1 ft and 2 to 3 ft beneath and next to the bottom of the lift station and drainline.

All samples from SWMU 03-014(t) will be analyzed for TAL metals, nitrate, cyanide, VOCs, and SVOCs. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-15. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.12 AOC 03-014(z), Former Floor Drain Associated with Former WWTP

4.1.12.1 Description and History

AOC 03-014(z) consists of a single floor drain located in the former printed circuit board shop in the Physics Building (03-0040) (Figure 4.1-16). This floor drain discharged to the sanitary sewer, which in turn drained to the former TA-03 WWTP (LANL 1995, 057590). Mop water and spills from sinks were directed to the AOC 03-014(z) floor drain. The drainline for the floor drain is visible in the utility access raceway beneath the floor of the former circuit board shop. Visual inspections of AOC 03-014(z) found that the surrounding concrete floor and drain cover were stained and corroded from acid spills (LANL 1990, 007511). The printed circuit shop ceased operations in early 1989, and the floor drain in the former shop was plugged in October 1992. The shop area in building 03-0040 was gutted and remodeled into office space in 2006–2007.

4.1.12.2 Previous Investigations

No previous investigations have been conducted at AOC 03-014(z).

4.1.12.3 Proposed Activities

Delayed investigation is proposed for AOC 03-014(z) because characterizing this site, which is located within an operating facility, is not currently feasible. Site access for equipment needed for subsurface investigations is extremely limited. Available information indicates that floor drain in the former printed circuit shop was plugged in October 1992 and removed when the space was remodeled into office space in 2006–2007. As the remaining section of inactive drainline runs through the utility access raceway beneath the floor of the former circuit board shop, there is a very low likelihood of past releases to the environment. Even if a release had occurred, any residual contamination would be located beneath the floor of building 03-0040, effectively preventing exposure to receptors and preventing contact with infiltrating precipitation that could cause migration of contaminants. It is proposed that site characterization and investigation be delayed until building 03-0040 is demolished.

4.1.13 AOC 03-022, Former Containment Sump

4.1.13.1 Description and History

AOC 03-022 is the former location of a containment sump (former structure 03-0550) southwest of building 03-0316 (LANL 1990, 007511) (Figure 4.1-17). The 84 ft long × 17 ft wide × 2.3 ft deep containment sump was constructed of steel reinforced concrete walls with a sand bottom underlain by a Hypalon liner and a metal screen and steel I-beams over the top (LANL 1996, 053795). Two 500-gal. steel tanks containing Shell Diala AX dielectric fluid used to operate a generator in building 03-0316 were situated on the I-beams (LANL 1996, 053795). The containment sump provided secondary containment for the two tanks. The tanks were connected to building 03-0316 by a buried 90-ft-long 6-in.-diameter steel transfer pipe. During a 1988 field inspection, oily water was observed in the sump along with oil spills next to the sump (LANL 1990, 007511). The tanks, pumps, and aboveground piping connecting the two tanks were removed in early 1995 (LANL 1996, 057590).

4.1.13.2 Previous Investigations

During a 1995 VCA, the steel support structure, oily water, and the Hypalon liner were removed and disposed of along with any visibly stained soil beneath the liner. Soil beneath and surrounding the sump

was sampled for TPH and benzene, toluene, ethylbenzene, and xylene (BTEX) to guide excavation activities and resulted in soil and tuff with TPH concentrations greater than the 2600 mg/kg cleanup level being excavated to a depth of 4.7 ft bgs (LANL 1996, 053795). The oil transfer line and the soil surrounding the transfer line between the containment sump and building 03-0316 were also removed and disposed of during the VCA (LANL 1996, 053795). Confirmation samples were collected and analyzed for TPH to confirm that the 2600 mg/kg TPH cleanup level had been met. Data from the 1995 VCA confirmation samples are screening-level data and are not presented in this work plan; however, the data showed TPH concentrations ranging from 257 mg/kg to 862 mg/kg in the confirmation samples (LANL 1996, 053795). Samples collected during the 1995 VCA and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for AOC 03-022.

4.1.13.3 Proposed Activities

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any residual contamination at and around the former AOC 03-022 containment sump location, beneath the former oil transfer line, and in the two drainages downgradient of the site. Samples will be collected at eight locations within former sump footprint at depths of 0 to 1 ft, 3 to 4 ft, and 5 to 6 ft beneath the clean fill placed at the site following the VCA, or until no soil staining, odor, or elevated photoionization detector (PID) readings are observed. Samples will also be collected from eight locations around the former sump footprint at depths of 0 to 1 ft, 3 to 4 ft, and 5 to 6 ft bgs. Samples will be collected from three locations along the former location of the oil transfer line to building 03-0316 at depths of 0 to 1 ft, 3 to 4 ft, and 5 to 6 ft bgs. Samples will be collected from nine locations in two drainages downgradient of the site at depths of 0 to 1 ft bgs and from the top 1 ft of unweathered tuff.

All samples from AOC 03-022 will be analyzed for TAL metals, cyanide, total extractable TPH, PCBs, VOCs, and SVOCs. Proposed sampling locations are shown in Figure 4.1-18. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.14 SWMU 03-025(b), Oil/Water Separators

4.1.14.1 Description and History

SWMU 03-025(b) consists of two oil/water separators, one active (above-floor) and one inactive (subfloor) in the basement of the Tech Shops Addition (building 03-0102) (LANL 1990, 007511) (Figure 4.1-19). The active oil/water separator is constructed of welded steel with dimensions of 40 in. long × 2 ft wide × 30 in. deep and is positioned on the concrete basement floor within an 8-in.-high concrete berm. The subfloor inactive oil/water separator is a 0.25-in.-thick welded steel box contained in a concrete sump (LANL 1996, 057590). Wastewater from floor, shower, and sink drains in building 03-0102 flows through the active, above-floor separator where any oil is collected in the trap. The wastewater then flows through a drainline that passes through the inactive, below-floor separator and continues on to the radioactive liquid waste (RLW) line that transfers the wastewater to the RLWTF at TA-50. Oil collected in the separator is manually suctioned into containers and disposed of off-site.

4.1.14.2 Previous Investigations

No previous investigations have been conducted at SWMU 03-025(b).

4.1.14.3 Proposed Activities

Delayed investigation is proposed for SWMU 03-025(b) because characterizing this site, which is located inside the basement of an active, restricted access, radiological facility, is not currently feasible. Site access for equipment needed for subsurface investigations is extremely limited. Available information, including the good condition of the oil/water separators, concrete containment berm, and concrete floor the basement of building 03-0102, indicates a very low likelihood of releases to the environment. Even if a release had occurred, any residual contamination would be located beneath the floor of building 03-0102, effectively preventing exposure to receptors and preventing contact with infiltrating precipitation that could cause migration of contaminants. It is proposed that site characterization and investigation be delayed until building 03-0102 is demolished.

4.1.15 AOC 03-025(c), Oil/Water Separator

4.1.15.1 Description and History

AOC 03-025(c) is the former location of an oil/water separator that was located outdoors next to the south side of the steam-cleaning room at the Tech Shop (building 03-0039) (LANL 1990, 007511) (Figure 4.1-20). The oil/water separator was contained within a concrete sump that provided secondary containment (LANL 1990, 007511). The oil/water separator was installed in 1963 and received wastewater containing radioactively contaminated oil and solvents from steam cleaning of newly machined parts. Oil and solvents in the wastewater were collected in the separator and the wastewater was discharged to the RLW line, which transferred the wastewater to the TA-50 RLWTF (LANL 1995, 057590). The RLW line was removed in the mid-1980s as part of the RLW line-removal project (Elder et al. 1986, 006666). Oil collected in the separator was manually suctioned into containers and disposed of at MDA G at TA-54. The separator was equipped with an alarm in the event the separator reached capacity, which never occurred. Discharges from steam cleaning operations in building 03-0039 ceased in 1992 and the oil/water separator was removed; however, the concrete containment remains in place (LANL 1995, 057590).

4.1.15.2 Previous Investigations

No previous investigations have been conducted at AOC 03-025(c).

4.1.15.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination associated with the former separator. Samples will be collected from three locations next to the concrete sump that housed the oil/water separator at depths of 0 to 1 ft and 2 to 3 ft beneath the bottom of the separator sump.

All samples from AOC 03-025(c) will be analyzed for TAL metals, cyanide, VOCs, SVOCs, nitrate, perchlorate, isotopic uranium, isotopic plutonium, americium-241, TPH, and gamma-emitting radionuclides. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-21. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.16 SWMU 03-026(d), Sump/Lift Station

4.1.16.1 Description and History

SWMU 03-026(d) is an inactive wastewater sump/lift station in room 50 in the basement of the Van de Graaff facility (building 03-0016) (LANL 1993, 020947) (Figure 4.1-2). The lift station was installed in 1962 and received wastewater from bathrooms and floor drains throughout the facility including tritium-contaminated flow from fixtures and drains in rooms 2, 3, 62, 64, 66, 67, 69, 70, 170, and 270; the wastewater was pumped to the former TA-03 WWTP (LANL 1990, 007511). Building 03-0316 and the lift station have been inactive since the late 1990s. Decontamination and decommissioning activities to remove radioactively contaminated equipment and fixtures from the interior of building 03-0016 were implemented in 2005–2007.

4.1.16.2 Previous Investigations

No previous investigations have been conducted at SWMU 03-026(d).

4.1.16.3 Proposed Activities

Delayed investigation is proposed for SWMU 03-026(d) because characterizing this site, which is located inside the basement of a radiological facility, is not currently feasible. Site access for equipment needed for subsurface investigations is extremely limited. Available information, including the good condition of the concrete floor in the basement of building 03-0016, indicates a very low likelihood of past releases to the environment. Even if a release had occurred, any residual contamination would be located beneath the floor of building 03-0016, effectively preventing exposure to receptors and preventing contact with infiltrating precipitation that could cause migration of contaminants. It is proposed that site characterization and investigation be delayed until building 03-0016 is demolished.

4.1.17 SWMU 03-033, Former Liquid Waste Collection System

4.1.17.1 Description and History

SWMU 03-033 consists of the former liquid waste collection system associated with the former printed circuit board shop located in the northwest portion of the Physics Building (03-0040) (LANL 1990, 007511) (Figure 4.1-16). The printed circuit board shop operated from the mid-1970s to January 1991 (LANL 1993, 020947). Wastes from plating baths and plating rinses were discharged to the SWMU 03-033 collection system and subsequently containerized and disposed of. The wastes consisted of ammonia-etching rinsates, concentrated nitric acid, and diluting water and residues. The wastes contained trace amounts of nickel, copper, lead, silver, gold, and tin as well as cyanides, ferric chloride, pyrophosphate solutions, and hydrochloric acid (LANL 1993, 020947).

The waste collection system was located outside the Physics Building and consisted of a 200-gal. transfer tank (and pump) housed inside a section of 6-ft-diameter corrugated metal pipe. The corrugated pipe was lined with an epoxy coating and installed upright, 8 ft belowgrade. Originally, the pipe had a gravel base. In 1986, the gravel base was upgraded to a concrete base. Liquid wastes from the printed circuit board shop were discharged to the transfer tank. The liquid wastes were pumped from the tank through an underground line to a portable 800-gal. tank, tuff tanks, or drums for temporary storage pending removal and disposal. The temporary storage tanks and drums were staged above a secondary containment structure constructed of concrete and measuring 6 ft wide × 8 ft long × 2 ft deep (LANL 1993, 020947).

The printed circuit board shop ceased operation in 1991 and the 200-gal. transfer tank and associated pump were removed in October 1992. The secondary containment structure and 6-ft-diameter corrugated metal pipe remain at the site. In 2006-2007, the former location of the printed circuit board shop in building 03-0040 was gutted and remodeled into office space.

4.1.17.2 Previous Investigations

During the 1994 Phase I RFI, 12 samples were collected from two depths (0 to 1 ft and 1 to 1.5 ft bgs) from four locations around the secondary concrete containment and from two locations next to the downgradient side of the corrugated metal pipe area (LANL 1996, 052930). Sampling locations were field screened for VOCs, and the samples were submitted for analysis of metals; some samples were also submitted for analysis of VOCs and SVOCs. Data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs and detected only PAHs. Samples collected during the 1994 RFI and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330).

In 2003, three concrete chip samples were collected from three locations in the bottom of the utility raceway located beneath the floor of the former printed circuit board before the area was remodeled. The three concrete samples were submitted for analysis of metals, VOCs, and SVOCs. Data collected in 2003 are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs in the concrete samples. Samples collected in 2003 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 03-033.

4.1.17.3 Proposed Activities

Most of the components of the former SWMU 03-033 liquid waste collection system associated with the former printed circuit board shop have been removed. Therefore, the remaining containment structures and accessible buried drainline located next to the northwest corner of building 03-0040 will be removed and the remaining drainlines in the confined access the utility raceway in basement of building 03-0040 will be plugged. Delayed investigation is proposed for the portion of SWMU 03-033, located in the confined access utility raceway in basement of building 03-0040, because characterizing this site, which is in an operating facility, is not currently feasible. Site access for equipment needed for subsurface investigations is extremely limited. Available information indicates that floor drains in the former printed circuit shop were plugged in October 1992 and removed when the space was remodeled into office space in 2006–2007. As the remaining section of inactive drainline runs through the utility access raceway beneath the floor of the former circuit board shop, there is a very low likelihood of releases to the environment. Even if a release had occurred, any residual contamination would be located beneath the floor of building 03-0040, effectively preventing exposure to receptors and preventing contact with infiltrating precipitation that could cause migration of contaminants. It is proposed that site characterization and investigation of the portion of SWMU 03-033 in the basement of building 03-0040 be delayed until building 03-0040 is demolished.

After the accessible containment structures and drainlines are removed , samples will be collected from two locations within the steel containment excavation, two locations within the concrete secondary containment excavation, three locations within the drainline excavation, three locations around the concrete secondary containment, and four locations downgradient of these structures. At each location, samples will be collected at depths of 0 to 1 ft and 3 to 4 ft beneath the former structures.

All samples from SWMU 03-033 will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, and SVOCs. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-22. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.18 AOC 03-038(f), Drainline

4.1.18.1 Description and History

AOC 03-038(f) consists of an abandoned section of the former industrial/acid waste line that served a transportable (structure 03-1502) (LANL 1990, 007511) (Figure 4.1-23). The drainline discharged liquid wastes from a shower, sink, and toilet in structure 03-1502 to the old industrial waste line via a manhole (structure 03-0728) (LANL 1990, 007511). In 1986, manhole 03-0728 and the majority of the RLW line within TA-03 were removed; however, a section of drainline from the manhole to structure 03-1502 (under a retaining wall) was left in place (LANL 1995, 057590). Structure 03-1502 was moved to TA-54 in 1987 after the drainline removal project was completed. Building 03-1898 is now located within the footprint of former structure 03-1502.

4.1.18.2 Previous Investigations

No previous investigations have been conducted at AOC 03-038(f).

4.1.18.3 Proposed Activities

The abandoned section of the former industrial/acid waste line that served former structure 03-1502 will be located, uncovered, removed, and disposed of. Any portion of the waste line that cannot be removed will be filled with grout. Because there are no decision-level data for SWMU 03-038(f), sampling will be performed to characterize the nature and extent of any contamination present from the abandoned section of the former industrial/acid waste line. Samples will be collected from three locations along the removed and/or grouted section of the former industrial/acid waste line at depths of 0 to 1 ft and 2 to 3 ft beneath the waste line. Radiological field screening will be used to guide sampling.

All samples from SWMU 03-038(f) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, isotopic uranium, isotopic plutonium, tritium, and gamma-emitting radionuclides. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-24. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.19 SWMU 03-043(c), Area of Potential Soil Contamination from Former Manhole

4.1.19.1 Description and History

SWMU 03-043(c) consists of an area of potential soil contamination associated with former manhole 03-0718, located in an alcove on the north side of building 03-0040 (LANL 1995, 057590) (Figure 4.1-25). The 1990 SWMU report incorrectly identified SWMU 03-043(c) as a tank of unknown capacity; however, structure 03-0718 is correctly identified as a manhole in subsequent reports (West 1994, 076164; LANL 1995, 057590). The manhole was constructed of steel-reinforced concrete 8 in. thick × 3 ft long × 4 ft wide × 4 ft deep and located belowgrade (LANL 1995, 057590). The manhole was part of the RLW collection system that transported RLW from building 03-0040 to the former RLWTF at TA-45. A 6-in.-diameter industrial waste line passed horizontally through the bottom of the manhole (LANL 1995, 057590). In 1984, the manhole was removed and the area remediated as part of the RLW line removal

project (LANL 1995, 057590). The manhole was noted as being in good condition with no visible cracks before or during the removal action (LANL 1994, 076164).

4.1.19.2 Previous Investigations

No previous investigations have been conducted at SWMU 03-043(c).

4.1.19.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present from the former RLW manhole and drainline. Samples will be collected from one location in the center of the former manhole location and four step-out locations around the former manhole location at depths of 1 to 2 ft, 4 to 5 ft, and 6 to 7 ft bgs. Samples will be collected from three locations along the former drainline between the former manhole location and where it connected to the main RLW collection line at depths of 0 to 1 ft and 2 to 3 ft beneath the bottom of the former RLW drainline. Radiological field screening will be used to guide sampling.

All samples from SWMU 03-043(c) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, isotopic uranium, isotopic plutonium, tritium, and gamma-emitting radionuclides. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-26. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.20 Consolidated Unit 03-050(a)-00, Area of Potential Soil Contamination from Stack Emissions

4.1.20.1 SWMU 03-050(a), Potential Soil Contamination from Stack Emissions

Description and History

SWMU 03-050(a) is an area of potential soil contamination associated with the exhaust emissions from 24 active stacks on the roof of building 03-0029 (LANL 1990, 007511) (Figure 4.1-27). Building 03-0029, the CMR Building, was built in 1961 and houses an irradiated-fuel examination facility and analytical chemistry operations that involve handling radioactive materials containing uranium, plutonium, iodine, mixed fission products, and tritium (LANL 1995, 057590). High-efficiency particulate air (HEPA), Aerosolve 95, and charcoal filters are used to remove radioactive particulates from stack effluent gas (Balo and Warren 1982, 007205, p. 17-435).

Previous Investigations

No previous investigations have been conducted at SWMU 03-050(a).

Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present from the exhaust emissions from 24 active stacks on the roof of the CMR building (03-0029). Samples will be collected from 22 locations around building 03-0029 at depths of 0 to 1 ft and 2 to 3 ft bgs beneath any asphalt and concrete.

All samples from SWMU 03-050(a) will be analyzed for isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides. In addition, 20% of all samples

will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-28. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.20.2 SWMU 03-050(d), Potential Soil Contamination from Stack Emissions

Description and History

SWMU 03-050(d) is an area of potential soil contamination associated with the exhaust emissions from the air-pollution-control device located on the south side of building 03-0102 (Figure 4.1-29). The device was a shaker-type baghouse situated on a concrete pad (LANL 1990, 007511). Building 03-0102 was constructed in 1957 for machining uranium-235 and uranium-238, lithium hydride, and small quantities of other metals. The baghouse was the primary air-pollution-control device to remove lithium hydride particles from the gas stream to the stack, and it was also used as a secondary air-pollution-control device to remove uranium graphite particulates from the gas stream to the stack. The baghouse ceased operating in 1992 because of a failure detected in a test, which measured the efficiency of the collection system. The baghouse was replaced by HEPA-filter banks. Radionuclide air emissions from the baghouse were monitored from the time it became operational in 1957 until it was decommissioned in 1992. Releases of radioactive uranium particulates through the baghouse fabric were deposited on the concrete pad. The concrete pad underlying the baghouse was subsequently painted to immobilize any existing uranium particulates. Radiological field survey results showed no detectable activity on the concrete pad or surrounding soil.

Previous Investigations

No previous investigations have been conducted at SWMU 03-050(d).

Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present around the former baghouse that was located on the south side of building 03-0102. Samples will be collected from 11 locations around building 03-0102 at depths of 0 to 1 ft and 2 to 3 ft bgs beneath any asphalt and concrete.

All samples from SWMU 03-050(d) will be analyzed for isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-30. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.20.3 SWMU 03-050(f), Potential Soil Contamination from Stack Emissions

Description and History

SWMU 03-050(f) is an area of potential soil contamination associated with emissions from the exhaust stack on the Physics Building (03-0040) (Figure 4.1-31). Beryllium foil was manufactured in room S-118 in the Physics Building during the 1950s. During the 1960s, beryllium windows were cleaned with acetone and other solvents in room E-116. The cleaning solvents were allowed to evaporate in the fume hood connected to the exhaust stack. Work involving tritium was conducted in the calibration laboratory (room W-10) beginning in the mid-1980s.

Previous Investigations

No previous investigations have been conducted at SWMU 03-050(f).

Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present from historical emissions from the exhaust stack on the Physics Building (03-0040). Samples will be collected from 13 locations around building 03-0040 at depths of 0 to 1 ft and 2 to 3 ft bgs beneath asphalt and concrete.

All samples from SWMU 03-050(f) will be analyzed for beryllium, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-32. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.20.4 SWMU 03-050(g), Potential Soil Contamination from Stack Emissions

Description and History

SWMU 03-050(g) is an area of potential soil contamination associated with tritium emissions from exhaust stacks on the Van de Graaff facility (building 03-0016) (Figure 4.1-33). Tritium work was carried out at the Van de Graaff facility from 1951 to the early 1990s when the facility became inactive. Radiological decontamination and decommissioning activities began at the Van de Graaff facility in 2005.

Previous Investigations

No previous investigations have been conducted at SWMU 03-050(g).

Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present from historical tritium emissions from exhaust stacks on the Van de Graaff facility (building 03-0016). Samples will be collected from 16 locations around building 03-0016 at depths of 0 to 1 ft and 2 to 3 ft bgs beneath any asphalt or concrete.

All samples from SWMU 03-050(g) will be analyzed for tritium. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-34. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.21 AOC 03-051(a), Area of Potential Soil Contamination

4.1.21.1 Description and History

AOC 03-051(a) is an area of potential soil contamination associated with an inactive air compressor located in a metal shed adjacent to the southeast corner of building 03-0039 (LANL 1995, 057590) (Figure 4.1-35). The compressor was noted as leaking during the 1987 RCRA facility assessment investigation (LANL 1995, 057590). The oil used in the compressor leaked through gaskets and oil stains were observed inside the shed and on the asphalt 2 ft from the shed (LANL 1995, 057590). One swipe sample was collected from the compressor in 1994 and analyzed for PCBs; results showed a PCB concentration of 2.5 µg/100 cm^2 (LANL 1995, 057590).

4.1.21.2 Previous Investigations

No previous investigations have been conducted at AOC 03-051(a).

4.1.21.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present from the inactive compressor. Asphalt samples will be collected from six locations around the compressor shed; sampling locations will be biased toward any observed staining. Soil samples will also be collected at the same six locations at depths of 0 to 1 ft and 2 to 3 ft beneath the asphalt.

All asphalt and soil samples from AOC 03-051(a) will be analyzed for PCBs. Soil samples collected beneath the asphalt will also be analyzed for TAL metals, cyanide, nitrate, VOCs, and SVOCs. Proposed sampling locations are shown in Figure 4.1-36. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.22 AOC 03-051(b), Area of Potential Soil Contamination

4.1.22.1 Description and History

AOC 03-051(b) is an area of potential soil contamination associated with the former location of two air compressors adjacent to the southwest corner of building 03-0102 (LANL 1995, 057590) (Figure 4.1-37). Lightweight mineral oil used in the compressors leaked through gaskets and stains were reported up to 15 ft south of the compressors (LANL 1995, 057590). In 1992, the stained area where the spill was located was double washed and double rinsed (LANL 1995, 057590). Swipe samples collected from each compressor in 1994 showed PCB concentrations ranging from 9.4 µg/100 cm^2 to 17 µg/100 cm^2 (LANL 1995, 057590). A concrete slab extends from the former compressor locations to the fence line south of building 03-0102; there is no evidence of staining on the concrete.

4.1.22.2 Previous Investigations

No previous investigations have been conducted at AOC 03-051(b).

4.1.22.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present from the former compressors. Samples will be collected from six locations at and around the former compressor at depths of 0 to 1 ft and 2 to 3 ft beneath the concrete. Samples will also be collected from two locations downgradient of the former compressor location and directly south of the concrete pad and the facility fence at depths of 0 to 1 ft and 2 to 3 ft bgs.

All samples from AOC 03-051(b) will be analyzed for TAL metals, cyanide, nitrate, VOCs, SVOCs, and PCBs. Proposed sampling locations are shown in Figure 4.1-38. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.23 Consolidated Unit 03-052(a)-00, Storm Drains and Outfall

Consolidated Unit 03-052(a)-00 includes two active storm drains [SWMUs 03-052(a) and 03-052(e)] and a shared outfall [SWMU 03-054(b)]. Each storm drain consists of a drop inlet that receives runoff from paved areas and roadways in the northwest portion of TA-03; stormwater is discharged to the

SWMU 03-054(b) outfall. The active storm drain system that discharges to the SWMU 03-054(b) outfall also receives stormwater from other storm drains in the northwest portion of TA-03. Therefore, the three sites will be investigated as a consolidated unit.

4.1.23.1 Description and History

SWMU 03-052(a), Storm Drain

SWMU 03-052(a) is a storm drain located on the east side of the TA-03 Tech Shop (building 03-0039) (Figure 4.1-39). From 1954 to 1991, this storm drain served a storage dock that is approximately 10 ft wide × 100 ft long (LANL 1995, 057590). Dumpsters located on the storage dock were used for the disposal of machining-operation wastes. The machining-operation wastes included aluminum, stainless steel, copper and brass filings, with traces of 1,1,1-trichloroethane (TCA), trichloroethene (TCE), and ethylene glycol (LANL 1995, 057590). In 1993, a metal barrier was constructed around the dumpster area and the storm drain was sealed.

SWMU 03-052(e), Storm Drain

SWMU 03-052(e) is a storm drain located near the southeast corner of building 03-0039 (Figure 4.1-39) that may have received residual paint and solvents from an indoor paint booth located in building 03-0039 (LANL 1995, 057590).

SWMU 03-054(b), Outfall

SWMU 03-054(b) is an outfall located southeast of building 03-1411 and southwest of building 03-1316 (Figure 4.1-39). The outfall receives stormwater from surface areas surrounding 26 buildings and from 94 roof drains, and noncontact cooling water from a furnace in building 03-0102 (LANL 1995, 057590). The outfall discharges to a drainage channel west of building 03-1612. The outfall was formerly permitted as National Pollutant Discharge Elimination System (NPDES) 03A009 to receive discharge water from the cooling tower effluent blowdown from building 03-0102; however, this discharge was rerouted to the TA-46 SWSC in 1993 (LANL 1995, 057590).

Consolidated Unit 03-052(a)-00

Before the outfall area was disturbed by the 2002–2003 construction of building 03-1411 and a new parking lot and by the installation of a new storm drain culvert in the outfall area, 18 samples were collected from two depths (0 to 0.5 ft and 1 to 1.5 ft bgs) within the outfall area. The samples were submitted for analysis of TAL metals, SVOCs, and TPH-DRO, and three of the deeper samples were also submitted for analysis of VOCs. Samples collected in 2002 and the analyses requested are presented in Table 4.1-1.

Decision-level data from the 2002 outfall area sampling are presented in Table 4.1-2 for inorganic chemicals above BVs. Inorganic chemicals detected above BVs were antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, silver, and zinc. Antimony was detected above the soil BV in seven samples. Arsenic, beryllium, and cobalt were each detected above the soil BVs in one sample. Cadmium was detected above the soil BV in 13 samples. Chromium was detected above the soil BV in 11 samples. Copper was detected above the soil BV in 17 samples with the maximum a detected concentration of 9 times the BV. Lead was detected above the soil BV in all 18 samples. Mercury was detected slightly above the soil BV in two samples. Nickel and silver were each detected above the soil BV in six samples. Zinc was detected above the soil BV in all 18 samples with the

maximum a detected concentration of 17 times the BV, probably from the galvanized metal storm drain pipes that have carried stormwater from SWMUs 03-052(a) and 03-052(e) to the SWMU 03-054(b) outfall area since the 1950s. Sampling locations and results for inorganic chemicals detected above BVs are shown in Figure 4.1-40.

Decision-level data from the 2002 outfall area sampling are presented in Table 4.1-3 for detected organic chemicals. Thirty organic chemicals [acenaphthene; acenaphthylene; anthracene; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; benzoic acid; bis(2-ethylhexyl)phthalate; butylbenzenephthalate; chrysene; di-n-octylphthalate; dibenz(a,h)anthracene; dibenzofuran; 2,4-dimethylphenol; ethylbenzene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; 4-methylphenol; naphthalene; phenanthrene; pyrene; TPH-DRO; TCA; TCE; and xylene] were detected in 2 to 18 soil samples. Sampling locations and results for detected organic chemicals are shown in Plate 2.

4.1.23.3 Proposed Activities

Decision-level data from the 2002 outfall area sampling showed detections of numerous metals above BVs and detections of numerous organic chemicals at several sampling locations (Tables 4.1-2 and 4.1-3). Lateral and vertical extent of metals and organic chemicals are not defined within the outfall area. As the outfall was disturbed in 2002–2003 by the construction of building 03-1411 and a new parking lot and by the installation of a new storm drain culvert, additional sampling is needed to define the nature and the lateral and vertical extent of contamination within and downgradient of the outfall area. Also, the 2002 decision-level analytical suite was limited, so additional sampling with an expanded analytical suite is needed.

Samples will be collected from seven locations within outfall area at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs. Samples will be collected from eight locations in the drainage downgradient of the outfall area at depths of 0 to 1 ft bgs and from the top 1 ft of unweathered tuff.

All samples from Consolidated Unit 03-052(a)-00 will be analyzed for TAL metals, cyanide, nitrate, VOCs, SVOCs, and PCBs. Proposed sampling locations are shown in Figure 4.1-41. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.24 Consolidated Unit 03-054(a)-00, Outfalls

Consolidated Unit 03-054(a)-00 includes two outfalls: SWMUs 03-054(a) and 03-054(d). Both outfalls discharged through the same culvert to the same location (next to the northwest corner of building 03-0016) and will be investigated together.

4.1.24.1 Description and History

The 1990 SWMU report describes SWMU 03-054(a) as an outfall from a cooling tower (former structure 03-0019) (LANL 1990, 007511) (Figure 4.1-42). The 1990 SWMU report also describes SWMU 03-054(d) as an outfall that discharged blowdown from the cooling tower on the roof of the Van de Graaff facility (building 03-0016) and wastewater from floor drains in former building 03-0208 (LANL 1990, 007511). Although the sources of each of these SWMUs is distinct, the discharge point for both SWMUs is the same (i.e., the outfall located next to the northwest corner of the Van de Graaff facility [building 03-0016]). The cooling tower (former structure 03-0019) associated with SWMU 03-054(a) was removed in 1966. When the cooling tower was removed, the chilled water system in the Van de Graaff facility (building 03-0016) was connected to the drainline that previously drained the cooling tower. From 1966 to the time

the Van de Graaff facility was decommissioned in the early 1990s, discharges from the flushing of the chilled water system in the Van de Graaff building were directed to the outfall location at the northwest corner of building 03-0016. Effluent from the outfall flowed directly to the west into Twomile Canyon.

Although the outfall operated as an NPDES-permitted outfall until 1998 (EPA 03A-025), the outfall currently receives only stormwater from the Van de Graaff building roof drains (Santa Fe Engineering Ltd. 1992, 074043).

4.1.24.2 Previous Investigations

No previous investigations have been conducted at Consolidated Unit 03-054(a)-00.

4.1.24.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination beneath the drainlines, at the outfall, and in the drainage downgradient of the outfall. Samples will be collected at depths of 0 to 1 ft and 2 to 3 ft below the bottom of the drainlines from five locations along the drainlines between building 03-0016 and former buildings 03-0208 and 03-0019. Samples will be collected at 0 to 1 ft and 2 to 3 ft bgs from five mesa-top locations at and downgradient of the outfall. Samples will also be collected from five locations in the drainage downgradient of the outfall area at depths of 0 to 1 ft bgs and from the top 1 ft of unweathered tuff.

All samples will be analyzed for TAL metals, hexavalent chromium, cyanide, nitrate, VOCs, SVOCs, PCBs, and tritium. Proposed sampling locations are shown in Figure 4.1-43. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.25 SWMU 03-055(a), Outfall

4.1.25.1 Description and History

SWMU 03-055(a) is an outfall located approximately 50 ft south of the Van de Graaff facility (building 03-0016) (Figure 4.1-2). Roof drains and one floor drain in generator room 68 discharged to the outfall at the edge of the mesa into Twomile Canyon (LANL 1995, 057590). The outfall currently receives only stormwater from Van de Graaff building roof drains (Santa Fe Engineering 1993, 074043). The Van de Graaff facility was constructed in 1952. The facility has been inactive since the late 1990s; radiological decontamination and decommissioning activities began in 2005.

4.1.25.2 Previous Investigations

No previous investigations have been conducted at SWMU 03-055(a).

4.1.25.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present below the drainline, at the outfall, and in the drainage downgradient of the outfall. Samples will be collected from two locations beneath the drainline between building 03-0016 and the outfall at depths of 0 to 1 ft and 2 to 3 ft below the bottom of the drainline. Samples will be collected from four locations at and downgradient of the outfall at depths of 0 to 1 ft bgs and from the top 1 ft of unweathered tuff.

All samples from SWMU 03-055(a) will be analyzed for TAL metals, cyanide, nitrate, VOCs, SVOCs, and tritium. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-3. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2 Sites under Investigation at TA-06

4.2.1 SWMU 06-001(a), Septic System

4.2.1.1 Description and History

SWMU 06-001(a) is an inactive septic tank (structure 06-0040) and associated outfall. The septic tank is located approximately 100 ft north of former building 06-0003 (Figure 4.2-1). The septic system outfall drained to Tributary A of Twomile Canyon. The septic tank, which had a volume of 840 gal., serviced former buildings 06-0001 and 06-0003.

Former building 06-0001 was constructed in May 1944 and was originally used to develop analytical procedures for nonradioactive cobalt tracer shots. An engineering drawing shows the building to have two rooms, one identified as a carpenter shop and the other as a laboratory (McGehee et al. 2004, 108213). The laboratory had an acid-resistant work bench and a lead-lined sink connected to the septic system (LANL 1997, 056664, p. 129). In the late 1950s, silver soldering may have been conducted in the carpenter shop. In the early 1980s, cable and boxed inert supplies were warehoused in former building 06-0001 (Schott 1993, 021496). The building was not used after the carpenter shop closed in the 1980s.

Former building 06-0003 contained a restroom, a darkroom, and a laboratory with a lead-lined sink. The building was first used as a control bunker for explosives shots and was surrounded on three sides by an earthen berm. It was remodeled in 1944 with explosion-proof fixtures because diethyl ether was used in the analyses performed in the building (McGehee et al. 2004, 108213, p. 36). From 1945 to 1948, the building housed offices, and from 1948 to the early 1950s, the building had a firing control panel and a bridgewire-testing laboratory to prepare cobalt tracers. In 1972, the building was remodeled into a printed circuit shop, and was later used as a silk-screen facility until the mid-1980s. After the mid-1980s, the building was used for storage.

The septic system was decommissioned in 1986, and the drainline was plugged in 1988 (LANL 1989, 011546). During a reconnaissance visit in 1992, the tank was located, its cover removed, and the tank was found to be empty (Rofer and Guthrie 1992, 015040). Buildings 06-0001 and 06-0003 were demolished and removed in 2004. The septic system was left in place.

4.2.1.2 Previous Investigations

A Phase I RFI was conducted at SWMU 06-001(a) in 1994 (LANL 1997, 056664). Samples were collected from the tank sludge, next to the tank, and at the outfall area and submitted for analysis of metals, cyanide, SVOCs, and HE (not including PETN). Samples from the boreholes in the tank area were also analyzed for VOCs. Data collected during the Phase I RFI are screening-level data and are not presented in this work plan; however, the data showed metals and cyanide above BVs and detected organic chemicals. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 06-001(a).

4.2.1.3 Proposed Activities

The buildings served by this septic system have been removed and the system is no longer used. Therefore, the septic tank will be removed and the drainlines plugged. Because there are no decision-

level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the tank, below inlet and outlet drainlines, at the outfall, and downgradient of the outfall. After the tank is removed, samples will be collected within the excavation at a location beneath the former tank, beneath the inlet to the tank, and beneath the outlet from the tank. Samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 5 to 6 ft below the bottom of the excavation and below the bottom of the inlet and outlet lines to define vertical extent. Samples will also be collected below the inlet drainlines between former buildings 06-0001 and 06-0003 and the septic tank. Samples will be collected at the locations where the drainlines exited the buildings, at the midpoints of the drainlines, and where the drainlines join near the inlet to the septic tank. A sample will also be collected at the midpoint of the outlet drainline between the septic tank and the outfall at depths of 0 to 1 ft and 3 to 4 ft below the drainlines. The locations of three former RFI samples at and downgradient of the outfall (locations 06-06001, 06-06002, and 06-06003) do not align with the location of the outfall and will not be resampled. Six locations at and downgradient of the outfall will be sampled to define lateral extent in the drainage from the site. Sampling locations will be biased to areas where sediment has accumulated. Samples will be collected at and downgradient of the outfall at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower.

All samples from SWMU 06-001(a) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, isotopic uranium, and gamma-emitting radionuclides. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.2 SWMU 06-001(b), Septic System

4.2.2.1 Description and History

SWMU 06-001(b) consists of a 960-gal.-capacity septic tank (structure 06-0043) and associated drainlines, distribution box, filter trench, and outfall located approximately 200 ft north of former building 06-0006 (Figure 4.2-3). The septic system served former building 06-0006 and operated from 1945 to the 1980s. The tank's dimensions are 5 ft × 9 ft × 5 ft 9 in. deep. Effluent from the septic tank discharged north to a distribution box and then to a filter trench consisting of two parallel trenches with perforated pipe surrounded by sand and covered with gravel (LASL 1973, 108216). Overflow from the filter trench went north to an outfall that drained into Tributary A of Twomile Canyon. In 1989, the drainline was cut and capped (LANL 2006, 095626). Building 06-0006 was demolished and removed in 2004; however, the septic tank, drainlines, distribution box, and filter trenches were left in place.

Former building 06-0006 originally housed laboratory operations related to detonator assembly, an electronics work room, a chemistry laboratory, two darkrooms, restrooms, and a sink (Creamer 1993, 015063). The sink drain received rinsate containing copper, brass, and steel parts dipped in nitric acid to remove silver solder flux and oxidized metals. Solvents were also used to degrease metal. Tin and lead soldering using paste and aqueous zinc/aluminum chloride fluxes was performed on electrical circuits. Manometric apparatuses containing liquid mercury were serviced. Ionizing radiation, in the form of electrically generated x-rays, was used through the 1950s to about 1965 (Schott 1993, 021496). By 1961, the darkrooms, assembly room, and a storage area had been converted to offices (McGehee et al. 2004, 108213). In the 1970s, former building 06-0006 was used as a cable shop, where acetone, alcohol, and dilute acids may have been used. In the early 1980s, former building 06-0006 was used for printed circuit production.

The RFI work plan for Operable Unit (OU) 1111 (LANL 1993, 026068) and the 1997 RFI report (LANL 1997, 056664) state that plumbing in buildings 06-0005 and 06-0008 also drained to SWMU 06-001(b).

However, engineering drawings for these two buildings show no drains or points of discharge (McGehee et al. 2004, 108213). In addition, an engineering drawing of the sanitary sewer system at TA-06 shows no waste lines coming from either building (LANL 2001, 108215). Thus, engineering records indicate the information in the RFI work plan and report concerning discharges from these buildings to SWMU 06-001(b) is incorrect.

4.2.2.2 Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 06-001(b), samples were collected from the tank sludge, in the tank area, within the filter trench, and in the outfall area (LANL 1997, 056664). Samples were field screened for radioactivity, metals, SVOCs, VOCs, and HE and submitted for analysis of metals, cyanide, SVOCs, and HE (not including PETN). Samples from the boreholes in the tank area were also submitted for VOC analysis. Data collected during the Phase I RFI are screening-level data and are not presented in this work plan; however, the data showed metals above BV, and one organic chemical was detected. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 06-001(b).

4.2.2.3 Proposed Activities

The building served by this septic system has been removed and the system is no longer used. Therefore, the septic tank will be removed and the drainlines plugged. Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the tank, below inlet and outlet drainlines, in the filter trench, at the outfall, and downgradient of the outfall. After the tank is removed, samples will be collected within the excavation at a location beneath the former tank, beneath the inlet to the tank, and beneath the outlet from the tank. Samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 5 to 6 ft below the bottom of the excavation and the bottom of the inlet and outlet lines to define vertical extent. Samples will also be collected below the inlet drainline between former building 06-0006 and the septic tank. Samples will be collected at the location where the drainline exited the building and at two points along the drainline. Samples from beneath the inlet drainline will be collected at depths of 0 to 1 ft and 3 to 4 ft below the drainline. Four samples will be collected in the filter trench area: one beneath the distribution box, one beneath the perforated drainlines in each of the two filter trenches, and one beneath the outlet drainline at the discharge from the filter trench. Samples in the filter trench area will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft below the distribution box and drainlines. The locations of three former RFI sampling locations at and downgradient of the outfall (locations 06-06011, 06-06012, and 06-06013) do not align with the location of the outfall and will not be resampled. Six locations at and downgradient of the outfall will be sampled to define lateral extent in the drainage from the site. Sampling locations will be biased to areas where sediment has accumulated, and samples from these locations may also be used to define lateral extent for all upslope SWMUs and AOCs. Samples at and downgradient of the outfall will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower.

All samples from SWMU 06-001(b) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, isotopic uranium, and gamma-emitting radionuclides. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-4. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.3 Consolidated Unit 06-002-00, Septic System and Area of Potential Soil Contamination

Consolidated Unit 06-002-00 consists of SWMUs 06-002 and 06-003(c) and AOCs C-06-005, C-06-006, C-06-016, and C-06-020. SWMU 06-003(c) and AOCs C-06-006, C-06-016, and C-06-020 have been approved for NFA (NMED 2000, 066381) and are not discussed in this work plan. The remaining SWMU and AOC in this consolidated unit consist of a septic system (SWMU 06-002) and an area of potential soil contamination from a former building (AOC C-06-005) (Figure 4.2-5).

4.2.3.1 SWMU 06-002, Septic System

Description and History

SWMU 06-002 is the former location of a 1000-gal. steel septic tank (structure 06-0041) and associated drainlines (Figure 4.2-5). The septic system was located approximately 420 ft southwest of the intersection of Twomile Mesa Road and Gomez Ranch Road. The tank received wastewater from two sources: process wastewater from the PETN recrystallization operation in building 06-0010 [SWMU 06-003(g)], and sanitary wastewater from the employee rest house (building 06-0020, AOC C-06-020). A 1992 memo estimates that up to 0.2 lb of PETN, with an unspecified quantity of solvents, may have been released to SWMU 06-002 during recrystallization operations (Meyers 1993, 015072). Engineering drawings show the discharge point to be 100 ft southeast of the septic tank. The septic system discharged into Tributary B of Twomile Canyon. The tank was removed in 1965, but the drainlines remain in place.

Previous Investigations

Previous investigations at SWMU 06-002 include a Phase I RFI conducted in 1995, with resampling in 1998 to address issues identified from the 1995 sampling (Kopp 1998, 059185; LANL 1998, 062227). The 1995 and 1998 sampling results are included in the 1998 RFI report (LANL 1998, 062227).

Samples were collected in 1995 at three locations at the site of the former septic tank (LANL 1998, 062227, p. 19). One surface (0 to 0.5 ft bgs) and one subsurface sample (approximately 3 to 4 ft bgs) were collected at each location. Samples collected in 1995 were field screened for HE, radioactivity, and VOCs and submitted for analysis of metals and HE (not including PETN). Subsurface samples were also submitted for analysis of VOCs, and one surface sample was submitted for analysis of tritium. All field screening showed concentrations or counts at or below background (LANL 1998, 062227, p. 22).

In 1998, two samples were collected at the septic system outfall and 10 ft beyond the outfall at depths of 0 to 0.5 ft and 4.25 to 4.5 ft bgs in both locations (LANL 1998, 062227, p. 21). Samples were field screened for HE, VOCs, and radiation, and submitted for analysis of metals and HE (including PETN). Subsurface samples were also submitted for analysis of VOCs. One 1995 RFI sampling location at the septic tank was also resampled at depths of 5.2 to 5.7 ft and 7.5 to 8.0 ft bgs. One sample was submitted for laboratory analysis of TAL metals and PETN and the other sample for laboratory analysis of antimony and PETN.

Samples collected during the Phase I RFI and the analyses requested are presented in Table 4.2-1. Decision-level data from the 1995 and 1998 Phase I RFI sampling are presented in Tables 4.2-2 and 4.2-3 for inorganic chemicals above BV and detected organic chemicals, respectively.

Inorganic chemicals detected above BVs during the 1995 Phase I RFI sampling at SWMU 06-002 were barium, cadmium, cobalt, and manganese. Barium, cobalt, and manganese were detected above the soil BVs in one sample, and cadmium was detected above the soil BV in six samples.

Inorganic chemicals detected above BVs during the 1998 Phase I RFI sampling at SWMU 06-002 were barium, manganese, and thallium. Barium and manganese were detected above the soil BVs in one sample. Thallium was detected above the soil BV in three samples.

Two organic chemicals (acetone and toluene) were detected in two of the 1995 samples collected in the area of the septic tank inlet lines. No organic chemicals were detected in the 1998 samples.

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.

Proposed Activities

Decision-level data from the 1995 and 1998 RFI sampling showed several metals detected above BVs (Table 4.2-2) and two VOCs detected (Table 4.2-3). Vertical extent of metals was defined at the former location of the septic tank, but the RFI analytical suite was limited, so additional sampling with an expanded analytical suite is needed. Vertical extent was not defined at the other two sampling locations near the tanks and additional sampling is needed at a greater depth. Metals were detected above BVs in the deepest samples collected at and below the outfall, so additional sampling is needed to define lateral and vertical extent. No previous sampling has been performed beneath inlet and outlet drainlines, so sampling is needed to define nature and extent.

The three RFI sampling locations at and next to the septic tank (locations 06-08001, 06-08002, and 06-08003) will be resampled at depths of 0 to 1 ft, 4 to 5 ft, and 8 to 9 ft bgs. The drainlines from former buildings 06-0010 and 06-0020 to the septic tank and from the septic tank to the outfall are expected to be in place, but their locations could not be confirmed by engineering drawings. Trenches will be excavated from the expected locations of the drainlines to confirm their locations. Samples will be collected from beneath the inlet drainlines from former buildings 06-0010 and 06-0020 at the locations where the drainlines exited the buildings, at the location where the drainlines joined at the inlet to the septic tank, and approximately every 100 ft along the drainlines. Samples will be collected beneath the outlet drainline, midway between the locations of the septic tank and outfall at depths of 0 to 1 and 3 to 4 ft below the drainlines. Samples will be collected at two RFI sampling locations at and downgradient of the outfall (locations 06-08060 and 06-08061) and at two locations farther downgradient to the toe of the slope. Samples will be collected at depths of 0 to 1 ft, 4 to 5 ft, and 8 to 9 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower.

All samples from SWMU 06-002 will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Radionuclides were not used in the facilities that discharged to the septic tank; therefore, samples will not be analyzed for radionuclides. Proposed sampling locations are shown in Figure 4.2-8. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.3.2 AOC C-06-005, Area of Potential Soil Contamination

Description and History

AOC C-06-005 is the location of former building 06-0013, a 16 ft × 16 ft × 9 ft high wood-frame building located along the west side of Gomez Ranch Road, approximately 125 ft south of the intersection with Twomile Mesa Road. Former building 06-0013 was used as a chemistry laboratory, as a detonator assembly building, and for storing explosives (Figure 4.2-5). The laboratory sink in this building discharged to a French drain next to the east side of the building. The building was destroyed by burning

in 1960. Explosives used in detonators assembled in the building were PETN, tetryl, hexahydroxy-1,3,5-trinitro-1,3,5-triazine (RDX), Composition A, Composition B, Baratol, and 2,4,6-trinitrotoluene (TNT).

Previous Investigations

Previous investigations at AOC C-06-005 include a Phase I RFI conducted in 1995, with resampling in 1998 to address data issues identified from the 1995 sampling (LANL 1998, 062227). The 1995 and 1998 sampling results are included in the 1998 RFI report (LANL 1998, 062227). In 1995, samples were collected at one location within the footprint of former building 06-0013 and at two locations extending 5 ft from the building's outer boundary upgradient and downgradient of the building. At each location, samples were collected at the surface (0 to 0.5 ft bgs) and at the soil/tuff interface (2.6 to 3.1 ft bgs or 3 to 3.3 ft bgs) (LANL 1998, 062227). All samples were field screened for HE, radioactivity, and VOCs and submitted for analysis of TAL metals and HE (not including PETN). Subsurface samples were also analyzed for VOCs, and one surface sample was analyzed for tritium. Field screening showed concentrations or counts at or below background. In 1998, two of the 1995 RFI sampling locations were resampled. At one location, a surface (0 to 0.5 ft bgs) sample was collected, and at the other location a subsurface sample (10.1 to 12.6 ft bgs) was collected. The samples were field screened for HE, VOCs, and radiation and submitted for laboratory analysis of antimony, cadmium, and silver (LANL 1998, 062227, p. 24).

Samples collected during the Phase I RFI and the analyses requested are presented in Table 4.2-1. Table 4.2-2 presents decision-level data from the 1995 sampling for inorganic chemicals above BV. Aluminum, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, and zinc were detected above BVs in the 1995 samples. Aluminum, chromium, cobalt, copper, and zinc were each detected above the soil BVs in two samples. Barium and nickel were detected above the soil BVs in three samples. Cadmium was detected above the soil BV in five samples. Iron and manganese were detected above the soil BVs in one sample. Lead was detected above the soil BV in four samples. No metals were detected above BVs in the 1998 samples. Locations of samples and inorganic chemicals detected above BVs are shown in Figure 4.2-9.

Table 4.2-3 presents decision-level data from the 1995 sampling for detected organic chemicals. Toluene was detected in one 1995 sample. Sampling locations and results for detected organic chemicals are shown in Figure 4.2-7.

Proposed Activities

Decision-level data from the 1995 and 1998 RFI sampling at AOC C-06-005 showed several metals detected above BVs (Table 4.2-2). Lateral and vertical extent of metals contamination were not defined in all cases, and sampling at greater depths and distances from the former building is needed. Also, the RFI analytical suite was limited, so additional sampling with an expanded analytical suite is needed.

The RFI data showed lead above the residential SSL and approximately equal to the industrial SSL in the surface sample collected inside the building footprint (location 06-08011). Before sampling is conducted, an x-ray fluorescence (XRF) survey will be performed to identify areas of soil contamination above the residential SSL. Soil contaminated above the residential SSL will be excavated until XRF screening shows lead concentrations below residential SSLs. Confirmation samples will then be collected where soil is excavated. Confirmation samples will be collected at depths of 0 to 1 ft and 2 to 3 ft below the bottom of the excavation and analyzed for TAL metals.

The three RFI sampling locations in and around the building footprint (locations 06-08010, 06-08011, and 06-08012) will be resampled, and samples will also be collected from four step-out locations approximately 20 ft to 30 ft from the building footprint. Samples will be collected at depths of 0 to 1, 4 to 5, and 8 to 9 ft bgs (or below the bottom of the excavation if the sampling location is excavated). All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, and dioxins/furans. In addition, 20% of all samples will be analyzed for PCBs. Radionuclides were not used in former building 06-0013; therefore, samples will not be analyzed for radionuclides. Proposed sampling locations are shown in Figure 4.2-8. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.4 Consolidated Unit 06-003(a)-99, Firing Sites

4.2.4.1 SWMU 06-003(a), Firing Site

Description and History

SWMU 06-003(a) is a 100-ft-radius concrete bowl (structure 06-0037) located near the center of TA-06, south of Twomile Mesa Road (Figure 4.2-10). The concrete bowl was constructed in late 1944 for water recovery shots and consisted of 16 sections with expansion joints running radially from the center of the bowl to its perimeter. Small-scale explosives tests (up to 10 lb of HE) contained in water vessels were detonated on a tower located on the central raised area of the bowl (Creamer 1993, 015063). A 5-ft × 5-ft × 10-ft-deep filter pit is still present at the low point of the bowl next to the center raised area. A 2 ft layer of graded gravel overlain by 2 ft of filter sand was placed in the bottom of the pit. Water was removed from the bowl either by draining it through a drainline running under the bowl to an outfall north of the bowl or by pumping it through the sand and gravel filter.

The firing site was used to investigate dispersal of material. Debris from a test explosion dropped into the bowl, which was then washed and wash water filtered to recover shot fragments. The water recovery shots used depleted uranium. No fissionable materials were used in the tests. The site was used until mid-1945.

The concrete bowl firing site is a historically significant structure because of its role in the Manhattan Project and is eligible for listing in the National Registry of Historic Places (McGehee et al. 2004, 108213). Therefore, any disturbance of the structure must be approved in advance by the New Mexico State Historic Preservation Office.

Previous Investigations

In 1978, SWMU 06-003(a) was monitored with a Phoswich counter; no radiation above background was detected (Elliott 1978, 004647).

During the 1994 RFI, samples were collected from three locations inside and three locations outside the bowl. Samples were field screened for radioactivity, HE, and VOCs and submitted for analysis of metals, cyanide, HE (not including PETN), isotopic uranium, cesium-137, and strontium-90. Data collected during the 1994 are screening-level data and are not presented in this work plan; however, the data showed metals above BVs and radionuclides above BVs and FVs. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330).

In 1997, a sediment sample was collected from the filter pit, which was not sampled in 1994 to avoid potentially impacting salamander habitat. The sampling location was screened for radioactivity, VOCs, and HE before the sample was collected. One surface sample was collected and submitted for analysis of

metals, HE (including PETN), isotopic uranium, gamma-emitting radionuclides, and strontium-90 (LANL 1997, 056664, pp. 116–117). The analyses requested for the 1997 sample are presented in Table 4.2-1.

Table 4.2-2 presents decision-level data for inorganic chemicals above BVs in the 1997 sample. Calcium, copper, lead, sodium, vanadium, and zinc were detected above soil BVs. Table 4.2-3 shows decision-level data from the 1997 sampling for detected organic chemicals. RDX and TNT were detected in the one sample collected. Table 4.2-4 shows decision-level data from the 1997 sampling for radionuclides detected or detected above the soil BVs/FVs. Americium-241 and cesium-137 were detected above soil FVs, sodium-22 was detected, and uranium-234 and uranium-238 were detected above soil BVs.

Sampling locations and results for inorganic chemicals detected above BV, detected organic chemicals, and radionuclides detected or detected above BVs/FVs are shown in Figures 4.2-11, 4.2-12, and 4.2-13, respectively.

Proposed Activities

SWMU 06-003(a) is listed in Table IV-2 of the Consent Order (Deferred Sites in Testing Hazard Zones), and investigation of this site may be deferred per section IV.A.5.b of the Consent Order. Based on current operations within the testing hazard zone encompassing this site, the potential for this site to be affected by explosives testing is low. Therefore, investigation of this site is not being deferred.

The concrete bowl firing site is eligible for the National Register of Historic Places and will be preserved by the Laboratory. Decision-level data from the 1997 filter pit sediment sample showed several metals, including copper, lead, vanadium, and zinc, above BVs; detected RDX and TNT; americium-241 and cesium-137 above FVs, and uranium isotopes above BVs. Because this structure will be preserved, it will be decontaminated by removing any remaining water and sediment from the bowl and filter pit. Sediment and water will be sampled before removal for waste characterization purposes. A minimum of six sediment samples and three water samples will be collected from representative locations in the bowl and pit and analyzed for TAL metals, VOCs, SVOCs, explosive compounds, PCBs, isotopic uranium, gamma-emitting radionuclides, and americium-241. Water will be pumped from the bowl and pit into transportable tanks. After the water is removed, the sediment will be allowed to dry and then removed by vacuuming. Following removal, confirmation swipe samples will be collected from 10 locations on the bowl and in the pit. The analytical suite for the swipe samples will be determined based on the results of the sediment sampling analysis.

Because structure 06-0037 is historically significant, intrusive sampling through the bowl or filter pit requires approval by the New Mexico State Historical Preservation Office and may not be possible. Therefore, sampling to characterize potential releases from the bowl and filter pit will be performed by angle drilling beneath the bowl. One angled borehole will be advanced beneath the bowl to a target depth of approximately 10 ft below the bottom of the filter pit shaft. Four core samples will be collected at intervals of 40 ft along the borehole at the bowl's rim, beneath the bowl, and beneath the bottom of the filter pit.

The three RFI sampling locations around the perimeter of the bowl (locations 06-04004, 06-04005, and 06-04006) will be resampled. Samples will also be collected at three new step-out locations, approximately 60 ft from the RFI locations, to define lateral extent. Samples at these six locations will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs. Samples will be collected at the outfall from the filter pit drainline and at two locations downgradient of the outfall at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower.

All soil and tuff samples collected at SWMU 06-003(a) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, isotopic uranium, isotopic plutonium, gamma-emitting radionuclides, americium-241, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-14. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.4.2 AOC 06-008, Area of Potential Soil Contamination

Description and History

AOC 06-008 is the former location of an underground storage tank (structure 06-0047) that was directly adjacent to the concrete bowl [SWMU 06-003(a)] (Figure 4.2-10). The tank was partially buried, with approximately one-quarter of the tank exposed. It was approximately 12 ft long and 4.5 ft wide. Reports vary as to the use of the tank (LANL 1990, 007511; LANL 1993, 026068, p. 5-43). The tank was removed in 1987. When it was removed, the tank contained approximately 600 gal. of liquid that appeared to be water. The tank's contents were sampled and analyzed for gross-alpha, -beta, and -gamma radioactivity and tritium before it was removed. No detectable activity was associated with the tank contents. The tank contents were removed for recycling and the tank was removed for salvage (McInroy 1993, 015266).

Previous Investigations

In 1978, this area was monitored with a Phoswich counter; no radiation above background was detected (Elliott 1978, 004647).

During the 1994 Phase I RFI, three samples were collected from three intervals ranging from the surface to the soil/tuff interface from three boreholes at the former tank location (LANL 1997, 056664, pp. 116–117). The samples were field screened for radioactivity, HE, and VOCs and were submitted for analysis of metals, cyanide, HE (not including PETN), isotopic uranium, cesium-137, and strontium-90. Data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs and cesium-137 above FV. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for AOC 06-008.

Proposed Activities

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the former tank. The locations of the Phase I RFI samples do not align with the location of structure 06-0047, as shown on structure location maps. Therefore, the RFI locations will not be resampled, and samples will be collected from new locations at and around the former location of the tank shown on structure location maps. Samples will be collected at the former location of the tank and at three step-out locations approximately 15 ft from the north, south, and east sides of the tank. Samples at the tank location will be collected below backfill at depths of 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft below the top of undisturbed soil/tuff. If the undisturbed material below the excavation backfill cannot be identified in the field, samples will be collected at depths of 4 to 5 ft, 7 to 8 ft, and 10 to 11 ft bgs (based on the description of the tank when it was removed, the bottom of the tank should have been approximately 3.5 ft bgs). Samples at the step-out locations will be collected at depths of 4 to 5 ft, 7 to 8 ft, and 10 to 11 ft bgs.

Because of conflicting information concerning the contents of the tank, samples will be analyzed using a broad analytical suite consisting of TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, TPH, isotopic uranium, isotopic plutonium, gamma-emitting radionuclides, americium-241, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-14. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.4.3 AOC C-06-019, Area of Potential Soil Contamination

Description and History

AOC C-06-019 is the former location of a generator building (06-0038) located north of the concrete bowl firing site (Figure 4.2-10). Engineering records show that this building was a wood-frame structure open on one end. The building was 10 ft × 20 ft × 10 ft high with an earthen floor. Use of building 06-0038 ceased in December 1959, and it was destroyed by burning in January 1960.

Previous Investigations

During the 1994 Phase I RFI, samples were collected from two depths at three locations in the footprint of the former generator building (LANL 1997, 056664, pp. 116–117). Samples were field screened for radioactivity, HE, and VOCs and submitted for analysis of metals, cyanide, HE (not including PETN), SVOCs, VOCs, PCBs, isotopic uranium, cesium-137, and strontium-90. Data collected during the 1994 are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs and detected organic chemicals. Samples collected in 1994, the analyses requested, and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for AOC C-06-019.

Proposed Activities

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the former generator building. The locations of the Phase I RFI samples do not align with the location of structure 06-0038, as shown on structure location maps. Therefore, the RFI locations will not be resampled, and samples will be collected from new locations at and around the former location of the structure shown on structure location maps. Samples will be collected at one location within the footprint of the former structure and two locations next to the footprint. One step-out location to the west, approximately 10 ft from the former building, will also be sampled to determine lateral extent. Lateral extent to the north will be defined by sampling at SWMU 06-003(a) and lateral extent to the east and south will be defined by the sampling at AOC 06-008. Samples will be collected 0 to 1 ft, 4 to 5 ft, and 8 to 9 ft bgs.

Because this site may have been impacted by operations at SWMU 06-003(a), samples will be analyzed for the same suite as SWMU 06-003(a): TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, isotopic uranium, isotopic plutonium, gamma-emitting radionuclides, americium-241, and strontium-90. In addition, because of known use of petroleum fuel in the building, all samples will be analyzed for TPH. Because the building was destroyed by burning, all samples will be analyzed for dioxins and furans. Twenty percent of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-14. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.5 SWMU 06-003(d), Firing Site

4.2.5.1 Description and History

SWMU 06-003(d) is the former location of a firing chamber, former building 06-0007, located 125 ft northwest of former building 06-0006 (Figure 4.2-15). The firing chamber was constructed of concrete and consisted of two rooms. One room was 8 ft × 10 ft with 8-in.-thick walls and was completely enclosed. The other room was 8 ft × 8 ft with 2-ft-thick concrete walls lined with steel plate and was open on one end. From 1945 to 1952, the firing chamber was used to test-fire complete or partially loaded (with PETN) detonators (LANL 1993, 026068; Schott 1993, 021496). From 1952 to 1976, the firing chamber was used for experiments on detonation and shock waves in gases. The firing chamber was demolished and removed in 2004.

4.2.5.2 Previous Investigations

No previous investigations have been conducted at SWMU 06-003(d).

4.2.5.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present at the location of former building 06-0007. One location within the footprint of the former building will be sampled, along with four step-out locations approximately 15 ft from the former building footprint. Samples will be collected at depths of 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft bgs at each location and analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Radionuclides were not used in former building 06-0007; therefore, samples will not be analyzed for radionuclides. Proposed sampling locations are shown in Figure 4.2-16. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.6 SWMU 06-003(e), Firing Site

4.2.6.1 Description and History

SWMU 06-003(e) is the former location of a firing chamber, former building 06-0009 (LASL 1945, 015039), located 85 ft northeast of former building 06-0006 (Figure 4.2-17). The firing chamber was constructed in 1945 to use in detonator experiments and consisted of two adjacent concrete structures. One of these structures consisted of an enclosed room next to a steel-plate-lined chamber that was open on one end. The enclosed room was 8 ft × 8 ft with 8-in.-thick walls. The chamber had dimensions of 6 ft × 8 ft with 2-ft-thick walls. The second structure consisted of a single enclosed room that was 12 ft × 8 ft with 1- and 2-ft-thick walls. The area between the two structures consisted of a concrete pad covered with a steel plate. From 1945 to 1952, the firing chamber was used to test-fire complete or partially loaded (with PETN) detonators (LANL 1993, 026068; Schott 1993, 021496). From 1952 to 1976, it was used for experiments on detonation and shock waves in gases. The firing chamber was demolished and removed in 2004.

4.2.6.2 Previous Investigations

No previous investigations have been conducted at SWMU 06-003(e).

4.2.6.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present at the location of the former building 06-0009. Two locations within the footprint of the former building will be sampled, along with four step-out locations approximately 15 ft from the former building footprint. Samples will be collected at depths of 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft bgs at each location. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Radionuclides were not used in building former 06-0009; therefore, samples will not be analyzed for radionuclides. Proposed sampling locations are shown in Figure 4.2-18. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.7 SWMU 06-003(f), Firing Site

4.2.7.1 Description and History

SWMU 06-003(f) is a formerly used firing site located on the north side of Twomile Mesa Road (Figure 4.2-19). Engineering drawings show that the cleared circular pad was 60 ft in diameter and constructed of a 1-ft-thick layer of sand (McGehee et al. 2004, 108213). The circular area and some of the sand are still visible at the site. Experiments conducted at the firing site used metal parts made from irradiated copper to determine material dispersal from explosions. Nonradioactive cobalt was also used as a tracer. Experiments conducted at this site were controlled from building 06-0003.

4.2.7.2 Previous Investigations

During the 1994 Phase I RFI, two samples were collected from three locations within the area of the gravel pad and from three locations that extended 10 ft beyond the firing site (LANL 1997, 056664). The site was surveyed radiologically and with a metal detector before sampling. Sampling locations were field screened for radioactivity, VOCs, and HE before samples were collected. All field-screening results were at background levels. Samples were submitted for analysis of metals, cyanide, HE (not including PETN), isotopic uranium, cesium-137, and strontium-90. Data collected during the 1994 are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 06-003(f).

4.2.7.3 Proposed Activities

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the former firing pad. The results from the RFI sampling, although screening-level data, indicated that the RFI sampling locations were adequate to establish lateral extent (i.e., concentrations decreased with distance from the site). Therefore, the six RFI locations within and outside the pad (locations 06-04022, 06-04023, 06-04024, 06-04025, 06-04026, and 06-04027) will be resampled, with samples collected at deeper depths and with an expanded analytical suite to determine nature and extent. Samples will be collected at depths of 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft bgs at each location. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, isotopic uranium, gamma-emitting radionuclides, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-20. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.8 SWMU 06-003(h), Firing Site

4.2.8.1 Description and History

SWMU 06-003(h) is a formerly used firing site located north of Twomile Mesa Road (Figure 4.2-21). This site was not identified in the 1990 SWMU report (LANL 1990, 007511). It was first discussed in the OU 1111 RFI work plan as part of MDA F. In describing MDA F, the RFI work plan states that defective explosive lenses manufactured for use in the Fat Man implosion weapon were destroyed in this area by detonation in 1945 (LANL 1993, 026068, p. 5-2). Some of the lenses were described as consisting of the explosive Baratol, which contains barium and TNT. A former employee involved with the detonations described this firing site as being located in the general area between the larger MDA F disposal pit [SWMU 06-007(a)] and Twomile Mesa Road (Van Vessem 1992, 015073).

In 1993, the Laboratory requested EPA add SWMU 06-003(h) to the hazardous waste permit as a separate site; EPA approved the request in 1994 (LANL 1994, 039440).

4.2.8.2 Previous Investigations

Phase I RFI sampling for SWMU 06-003(h) was conducted in 1994, although the results of this sampling were never documented in a report. Eleven surface soil samples (0 to 0.5 ft bgs) were collected from 11 locations. The sample collection logs (SCLs) provide a reference to “Aggregate 1 6-005” of the RFI work plan for OU 1111, which could be interpreted as SWMU 06-005. The sampling locations noted in the logs, however, refer to “MDA F Lens Disposal Area,” which has since been designated as SWMU 06-003(h). In addition, the sampling locations are in the eastern portion of MDA F, whereas SWMU 06-005 is located to the west of MDA F. Therefore, these samples were for SWMU 06-003(h) rather than SWMU 06-005. Sampling locations were spot-tested for HE and surveyed for radioactivity. The samples were submitted for analysis of metals, cyanide, HE (not including PETN), isotopic uranium, cesium-137, and strontium-90. Data collected in the RFI are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs and strontium-90 detected above FV. Samples collected during the 1994 RFI and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 06-003(h).

4.2.8.3 Proposed Activities

SWMU 06-003(h) is listed in Table IV-2 of the Consent Order (Deferred Sites in Testing Hazard Zones), and investigation of this site may be deferred per section IV.A.5.b of the Consent Order. Based on current operations within the testing hazard zone encompassing this site, the potential for this site to be affected by explosives testing is low. Therefore, investigation of this site is not being deferred.

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of contamination at the former firing site. The location of SWMU 06-003(h) is reportedly in the general vicinity of MDA F, but the exact location is not known. Based on past operations at this site, surface contamination with metals (e.g., barium) and TNT may be present. Two locations with elevated barium were identified in the screening-level data from the 1994 sampling. To identify areas for additional sampling, field screening for metals using XRF and for TNT using EnSys immunoassay test kits will be performed. The general location of SWMU 06-003(h), including the area sampled in 1994, will be gridded using a 20- × 20-ft grid and samples will be collected for field screening. Based on the field-screening results, the three locations with the highest levels of metal and/or explosives contamination will be selected for sampling. Samples will also be collected at four step-out locations approximately 25 ft outside the area bounded by the other three sampling locations at depths of 0 to 1 ft, 4 to 5 ft, and 8 to 9 ft bgs at

each location. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, SVOCs, explosive compounds, isotopic uranium, gamma-emitting radionuclides, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-22. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.9 SWMU 06-006, Storage Area

4.2.9.1 Description and History

SWMU 06-006 is a former container and equipment storage area located near the south and east sides of the former location of building 06-0006 (Figure 4.2-23). The storage area consisted of a concrete pad and asphalt parking lot, approximately 300 ft × 20 ft, and was partially surrounded by a 4-ft berm (LANL 1990, 007511). Waste containers and electrical equipment, including capacitors, were stored in this area from the late 1970s to the late 1980s (ICF Kaiser Engineers 1995, 056879, p. 10).

4.2.9.2 Previous Investigations

In 1994, three surface samples of engineered material and soil were collected at three locations at the northeast corner of the site and analyzed for PCBs. Surface and subsurface sediment samples were collected at three locations in drainages along the north side of the SWMU and analyzed for VOCs, SVOCs, and PCBs. The screening-level data collected in 1994 were not previously reported and are not presented in this work plan; however, the data showed PCBs detected in two engineered material samples. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 06-006.

4.2.9.3 Proposed Activities

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the former storage area. Soil/tuff samples will be collected beneath the pad to determine whether contaminants have migrated beneath the pad and samples will be collected around the pad to determine whether contaminants have migrated from the pad by surface runoff. Eight locations within the storage area will be sampled at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft below the pad. Because the previous screening-level data showed detections of PCBs in the pad material, samples of the asphalt or concrete will also be collected. Six step-out locations approximately 10 ft from the edge of the pad will be sampled at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs. All soil and tuff samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, isotopic uranium, and gamma-emitting radionuclides. Samples of the pad material will be analyzed for PCBs only. Proposed sampling locations are shown in Figure 4.2-24. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.10 Consolidated Unit 06-007(a)-99, MDA F and Disposal Pits

4.2.10.1 SWMU 06-005, Pit

Description and History

SWMU 06-005 is the location of a timber-lined pit (former structure 06-0042) measuring 16 ft × 16 ft × 8 ft deep (Figure 4.2-25). The purpose of the pit is not known; however, according to the 1990 SWMU report, it may have been used as a firing pit (LANL 1990, 007511). The pit was constructed in 1945 and abandoned in 1952 when it was filled with soil.

Previous Investigations

No previous investigations have been conducted at SWMU 06-005.

Proposed Activities

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the former structure 06-0042. Two locations within the footprint of the former pit will be sampled along with four step-out locations approximately 10 ft from the footprint of the former pit. Samples will be collected within the footprint of the pit at depths of 0 to 1 ft and 3 to 4 ft below the bottom of the backfill material placed in the pit. Step-out samples will be collected at depths of 0 to 1 ft, 4 to 5 ft, and 9 to 10 ft bgs. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, SVOCs, explosive compounds, isotopic uranium, gamma-emitting radionuclides, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-26. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.10.2 SWMUs 06-007(a–e), MDA F and Disposal Pits

Description and History

SWMU 06-007(a), MDA F, consists of two pits and three disposal shafts located north of Twomile Mesa Road (Figure 4.2-25). One of the pits became operational in 1946 and the other in 1947. The pits were used to dispose of large classified objects that could not easily be destroyed by cutting. At the time the RFI work plan for OU 1111 was prepared, each of these pits was enclosed by a fence. The fences have since been removed (LANL 1993, 026068). The larger pit was described as a bulldozed trench 50 ft wide × 20 ft deep at the deepest point and sloping up to the ground level at each end, with an overall length of 100 to 150 ft. It was reportedly used to dispose of several tons of metal parts, concrete mockups, handling fixtures, and other nonexplosive, nonradioactive classified materials (North 1974, 015083). The smaller pit was used to dispose of firing unit gaps that contained small amounts of radioactivity and small detonators with squibs (Courtright 1964, 005677). The exact location of the pits is not known.

In addition to the two pits, MDA F contains three disposal shafts located in the area of the smaller disposal pit (Van Vessem 1992, 015073). Three shafts were drilled between 1950 and 1952 to dispose of spark gaps that contained cesium-137 (LANL 1993, 026068, p. 5-2). The exact locations of the pits and the shafts are unknown, but they are believed to be next to SWMU 06-007(b).

The 1990 SWMU report identifies SWMU 06-007(b) as a single pit, estimated to be 40 ft × 70 ft based on photographs taken during an aerial survey conducted in the 1940s (LANL 1990, 007511). The exact location of this site is not known, but it is likely in the vicinity of MDA F and SWMUs 06-007(a), 06-007(c), 06-007(d), and 06-007(e) (Figure 4.2-25).

SWMU 06-007(c) is a disposal pit identified in the 1990 SWMU report based on a February 1950 Laboratory work order that called for digging a 6 ft × 6 ft × 6 ft hole on Twomile Mesa to be used to bury classified material (LASL 1950, 015074).

SWMU 06-007(d) is a disposal pit identified in the 1990 SWMU report based on a August 1950 Laboratory work order that called for digging a 2 ft × 2 ft × 4 ft hole on Twomile Mesa for disposal purposes (LASL 1950, 015074).

SWMU 06-007(e) is a disposal pit identified in the 1990 SWMU report based on an environmental survey conducted by DOE in 1987. As part of this survey, DOE conducted sampling at three pits in TA-06 (DOE 1989, 015365).

The 1990 SWMU report identifies SWMUs 06-007(c), 06-007(d), and 06-007(e) as sites sampled by DOE in 1987 and shows the location of these pits to be south of Twomile Mesa Road (LANL 1990, 007511). The RFI work plan for OU 1111 does not provide an exact location for this site, but it identifies these three SWMUs as being within the general area of SWMU 06-007(a), north of Twomile Mesa Road (Figure 4.2-25). It is not known which of these documents provides the correct location of this disposal pit.

Previous Investigations

As part of the 1986 Comprehensive Environmental Assessment and Response Program (CEARP) survey, most of MDA F (then fenced) was surveyed with ground-penetrating radar (GPR) and magnetometry in an attempt to find the locations of pits and shafts (Weston 1986, 015243). Data from the survey are difficult to interpret because of the wide grid spacing and because the fences interfered with the survey equipment (Sandness 1987, 015244). No definitive locations were identified.

No other previous investigations have been conducted at SWMUs 06-007(a, b, c, d, and e).

Proposed Activities

Because the locations of SWMUs 06-007(a–e) are not known, geophysical surveys will be conducted to locate these former disposal pits. Two areas will be surveyed. One area is north of Twomile Mesa Road and includes the two former fenced areas that may have been the location of SWMU 06-007(a) and also includes the expected location of SWMU 06-007(b) (Figure 4.2-25). The other area is to the south of Twomile Mesa Road, west of structure 06-0037, which the 1990 SWMU report showed as the location of SWMUs 06-007(c–e) (LANL 1990, 007511) (Figure 4.2-25). Both of these areas will be gridded and geophysical surveys conducted to determine the locations of the former disposal pits. A backhoe will be used to excavate trenches or test pits at anomalies identified in the geophysical survey to verify the locations of the disposal units. Boreholes will be advanced around the boundaries of the disposal units, and samples will be collected at depths of 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft below the bottoms of the pits. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, isotopic uranium, gamma-emitting radionuclides, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.11 SWMU 06-007(f), Surface Disposal Area

4.2.11.1 Description and History

SWMU 06-007(f) is the location of a former surface disposal site located about 400 ft north of the former location of building 06-0003 (Figure 4.2-27). The site is approximately 20 ft × 30 ft. Disposal dates are not known. The site drains north into Tributary A of Twomile Canyon.

4.2.11.2 Previous Investigations

A Phase I RFI was conducted at SWMU 06-007(f) in 1994. Activities and sampling results from the RFI are documented in a 1996 VCA report (LANL 1996, 054330). Debris at the site was surveyed for radioactivity; no elevated levels were detected. Soil samples were collected from two depths at three

locations (LANL 1993, 026068, pp. 60–61). The samples were field screened for radioactivity and HE and submitted for analysis of metals, cyanide, SVOCs, HE (not including PETN), cesium-137, and strontium-90. Subsurface samples were also analyzed for VOCs. Data collected in the 1994 RFI are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs, detected organic chemicals, and cesium-137 above FV. Samples collected during the 1994 RFI and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330).

A VCA was conducted at the site in 1995. Debris at the site was field screened for gross-alpha, -beta, and -gamma radioactivity and VOCs. No levels above background were detected. The VCA consisted of removing soil and debris from an area measuring approximately 20 ft × 30 ft. Debris removed from the site consisted of Manhattan Project–era artifacts, including laboratory equipment and glassware, inactive detonators, and chunks of metal. Soil at the site contained ash, metal, and glass debris. The site also contained metal fragments from Jumbino vessels (LANL 1996, 054330, p. 2). Confirmatory samples were collected following soil and debris removal. Soil samples were collected from three surface locations within the footprint of the removed materials and analyzed for metals, SVOCs, and gamma-emitting radionuclides. Data collected in the 1995 RFI are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs and cesium-137 was detected. No organic chemicals were detected. Samples collected during the 1995 VCA and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 06-007(f).

4.2.11.3 Proposed Activities

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the former disposal area. The three VCA locations (06-09911, 06-09912, and 06-09913) will be resampled, with samples collected at deeper depths and with an expanded analytical suite to determine vertical extent. Samples will be collected from 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft into undisturbed soil/tuff below fill placed during the previous excavation. Four step-out locations, approximately 20 ft from the former disposal site, will also be sampled to determine lateral extent. Samples will be collected 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft bgs and analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, dioxins and furans, isotopic uranium, gamma-emitting radionuclides, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-28. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.12 SWMU 06-007(g), Area of Potential Soil Contamination

4.2.12.1 Description and History

SWMU 06-007(g) is an area of potential soil contamination associated with former building 06-0012, an HE press building located north of Twomile Mesa Road (Figure 4.2-29). This SWMU also includes soil contamination from a small former surface disposal area located next to former building 06-0012. Exploded detonator housings were found discarded over an approximate 5 ft^2 area next to the former location of building 06-0012 and removed (LANL 1997, 056664, p. 200).

4.2.12.2 Previous Investigations

A Phase I RFI was conducted at SWMU 06-007(g) in 1994 (LANL 1997, 056664, pp. 200–202). Samples were collected from two depths at three locations in the footprint of the former location of building 6-0012. Sampling locations were field screened for radioactivity, VOCs, and HE before samples were collected. All field-screening results were negative or at background levels. Samples were submitted for analysis of

metals, cyanide, SVOCs, HE (not including PETN), cesium-137, and strontium-90. Subsurface samples were also analyzed for VOCs. Data collected in the 1994 RFI are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs, detected organic chemicals, and cesium-137 above FV. Samples collected during the 1994 RFI and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 06-007(g).

4.2.12.3 Proposed Activities

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the former building and disposal area. The three RFI locations (06-05004, 06-05005, and 06-05006) will be resampled, with samples collected at deeper depths to determine vertical extent. Four step-out locations, approximately 20 ft from the RFI sampling locations, will also be sampled to determine lateral extent. Samples will be collected 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft bgs and analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, isotopic uranium, gamma-emitting radionuclides, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-30. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.13 AOC C-06-001, Area of Potential Soil Contamination

4.2.13.1 Description and History

AOC C-06-001 consists of an area of potential soil contamination from the footprint of former building 06-0004, an explosives magazine located west of former buildings 06-0005 and 06-0006 (Figure 4.2-31). The magazine was a wooden frame building 7 ft × 7 ft × 7 ft high with an earthen berm covering three sides. The magazine was used for explosives storage beginning in 1945 and was demolished in place in 1972 (Parker 1971, 004635).

4.2.13.2 Previous Investigations

A Phase I RFI was conducted at AOC C-06-001, and samples were collected in 1995 and 1998. The investigation and the sampling were not documented in a report. A surface (0 to 0.5 ft bgs) and subsurface (0.8 to 1.25 ft bgs to 3.8 to 4.3 ft bgs) sample were collected at each of three locations and submitted for laboratory analysis of metals and HE. Two of these locations were resampled in 1998 with a surface (0 to 0.5 ft bgs) and subsurface (2.2 to 2.8 ft bgs and 4.2 to 4.8 ft bgs) sample collected at each site. These samples were submitted for laboratory analysis of antimony, cadmium, and HE (including PETN). Samples collected in 1995 and 1998 and the analyses requested are presented in Table 4.2-1.

Table 4.2-2 shows decision-level data for inorganic chemicals above BVs in the 1995 and 1998 samples. Cadmium was detected above the soil BV in five 1995 samples and one 1998 sample. Sampling locations and results for inorganic chemicals detected above BV are shown in Figure 4.2-32.

4.2.13.3 Proposed Activities

Decision-level data from the 1995 and 1998 sampling showed cadmium above BV (Table 4.2-2). The decision-level data for this site are not sufficient to define nature and extent, and additional sampling will be performed. The three RFI sampling locations (06-08004, 06-08005, and 06-08006) will be resampled, with samples collected at deeper depths and with an expanded analytical suite to determine vertical extent. Two step-out locations, approximately 10 ft from the former magazine footprint, will also be

sampled to determine lateral extent. Samples will be collected 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft bgs and analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, and isotopic uranium. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-33. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3 Sites under Investigation at Former TA-07

4.3.1 Consolidated Unit 07-001(a)-99, Firing Sites

4.3.1.1 SWMU 07-001(a), Inactive Firing Pit

Description and History

SWMU 07-001(a) is an inactive firing pit located near the east end of TA-06 (Figure 4.3-1). The site consists of a circular depression, surrounded by an annular berm about 4 ft high and approximately 30 ft in diameter. The firing pit was used in the 1950s to destroy scrap detonators and explosives. The materials to be destroyed were mixed with Composition B scraps or flaked TNT and the mixture was detonated. A 1959 memorandum states this method was very effective in destroying detonators, with no intact detonators thrown out of a pit and no undestroyed detonators found during a site survey, although pellets of unexploded plastic-bonded explosive (PBX) were found (Spaulding 1959, 004574). In 1959, this method of destroying detonators was discontinued at this site.

Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 07-001(a), samples were collected from two depths at three central locations inside the annular berm and three locations away from the center of the site (two locations outside the berm and one location inside the berm) (LANL 1997, 056664). Samples were submitted for analysis of metals, cyanide, HE, isotopic uranium, cesium-137, and strontium-90. Data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however the data showed metals detected above BVs. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330).

All samples from the 1994 RFI at SWMU 07-001(a) were to have been submitted for analysis of SVOCs, but SVOCs were omitted from the list of requested analyses. For this reason, and because holding times were exceeded for the samples submitted for HE analysis, the locations and depths sampled in 1994 were resampled in 1996 with all samples submitted for analysis of SVOCs and HE. Data from the 1996 resampling effort are decision-level data and showed detected organic chemicals. Samples collected and analyses requested are shown in Table 4.3-1.

Decision-level data from the 1996 resampling effort are presented in Table 4.3-2. One organic chemical, benzoic acid, was detected in one sample from SWMU 07-001(a). Sampling locations and results for detected organic chemicals are shown in Figure 4.3-2.

Proposed Activities

SWMU 07-001(a) was formerly used for disposal of waste detonators. Although the presence of unexploded detonators at or around this firing site has not been previously reported, a UXO survey will be conducted around this site to ensure no unexploded detonators are present. The UXO survey will be conducted before sampling at this site for safety purposes. Any unexploded detonators or related debris will be detonated in place by certified munitions technicians and/or removed and disposed of.

Decision-level data from the 1996 sampling showed one organic chemical detected (Table 4.3-2). The decision-level data for this site are not sufficient to define nature and extent and additional sampling will be performed. The six RFI sampling locations (07-04041, 07-04042, 07-04043, 07-04044, 07-04045, 07-04046) will be resampled, with samples collected at deeper depths and with an expanded analytical suite to determine nature and extent. Samples will be collected at depths of 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft bgs. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, SVOCs, explosive compounds, isotopic uranium, gamma-emitting radionuclides, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-3. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.1.2 SWMU 07-001(b), Inactive Firing Pit

Description and History

The description and history of SWMU 07-001(b) are the same as that of SWMU 07-001(a) (section 4.3.1.1) (Figure 4.3-1).

Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 07-001(b), samples were collected from two depths at three central locations inside the annular berm and three locations away from the center of the site (two locations outside the berm and one location inside the berm) (LANL 1997, 056664). Samples were submitted for analysis of metals, cyanide, HE, isotopic uranium, cesium-137, and strontium-90. Data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however the data showed metals detected above BVs and detected organic chemicals. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330).

All samples from the 1994 RFI at SWMU 07-001(b) were to have been submitted for analysis of SVOCs, but SVOCs were omitted from the list of requested analyses. For this reason, and because holding times were exceeded for the samples submitted for HE analysis, the locations and depths sampled in 1994 were resampled in 1996, and all samples were submitted for analysis of SVOCs and HE. Data from the 1996 resampling effort are decision-level data and showed detected organic chemicals. Samples collected and analyses requested are shown in Table 4.3-1.

Decision-level data from the 1996 resampling effort are presented in Table 4.3-2. Thirteen organic chemicals [benzo(a)anthracene; benzo(k)fluoranthene; 2-chloronaphthalene; di-n-octylphthalate; 1,2-dichlorobenzene; 1,3-dichlorobenzene; diethylphthalate; hexachlorobenzene; phenanthrene; pyrene; RDX; tetryl; and 1,2,4-trichlorobenzene] were detected in samples from SWMU 07-001(b). All organic chemicals, except RDX, were detected in one sample; RDX was detected in five samples. Sampling locations and results for detected organic chemicals are shown in Figure 4.3-2.

Proposed Activities

SWMU 07-001(b) was previously used for disposal of waste detonators. Although the presence of unexploded detonators at or around this site has not been previously reported, a UXO survey will be conducted around this site to ensure unexploded detonators are not present. The UXO survey will be conducted before sampling is performed at this site for safety purposes. Any unexploded detonators or related debris will be detonated in place by certified munitions technicians and/or removed and disposed of.

Decision-level data from the 1996 sampling showed 13 organic chemicals detected (Table 4.3-2). The decision-level data for this site are not sufficient to define nature and extent, and additional sampling will be performed. The six RFI sampling locations (07-04047, 07-04048, 07-04049, 07-04050, 07-04051, 07-04052) will be resampled, with samples collected at deeper depths and with an expanded analytical suite to determine nature and extent. Samples will be collected at depths of 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft bgs and analyzed for TAL metals, cyanide, nitrate, perchlorate, SVOCs, explosive compounds, isotopic uranium, gamma-emitting radionuclides, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-3. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.1.3 SWMU 07-001(c), Inactive Firing Site

Description and History

SWMU 07-001(c) is in an inactive amphitheater-shaped firing site, approximately 50 ft × 50 ft, located near the eastern boundary of TA-06 (Figure 4.3-1). Soft metal disks imbedded with bullets have been found at this site. Little is known about this site's history, but the site may have been used briefly to study ballistic initiation of critical mass through the study of projectiles fired at lead plates (LANL 1997, 056664, p. 72).

Previous Investigations

Phase I RFI activities were conducted at SWMU 07-001(c) in 1994 (LANL 1997, 056664). Surface soil samples (0 to 0.5 ft bgs) were collected at three locations where contaminants (metal debris) were determined most likely to be found. All samples were submitted for laboratory analysis of metals, cyanide, HE, isotopic uranium, cesium-137, and strontium-90. All data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however the data showed detections of metals detected above BVs and radionuclides detected above FVs. No HE was detected, but holding times were exceeded for HE analysis. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 07-001(c).

Proposed Activities

SWMU 07-001(c) is listed in Table IV-2 of the Consent Order (Deferred Sites in Testing Hazard Zones), and investigation of this site may be deferred per section IV.A.5.b of the Consent Order. Based on current operations within the testing hazard zone encompassing this site, the potential for this site to be affected by explosives testing is low. Therefore, investigation of this site is not being deferred.

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the former firing site. The three RFI locations (07-04053, 07-04054, 07-04055) will be resampled, with samples collected at deeper depths and with an expanded analytical suite to determine vertical extent. These samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs. Samples will also be collected at three locations in the drainage downgradient of the site to define lateral extent. Drainage sampling locations will be biased to areas where sediment has accumulated. Samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, SVOCs, explosive compounds, isotopic uranium, gamma-emitting radionuclides, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs.

Proposed sampling locations are shown in Figure 4.3-3. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.1.4 SWMU 07-001(d), Inactive Firing Site

Description and History

SWMU 07-001(d) is an inactive firing site located near the eastern boundary of TA-06 (Figure 4.3-1). The site is an approximately 20-ft-diameter by 3-ft-deep crater. Detonator parts have been found near the crater. Little is known about this site's operating history, but the site is believed to be the location of a one-time "celebratory shot" fired in 1945 after the Japanese surrender at the end of World War II (LANL 1997, 056664).

Previous Investigations

During the 1994 Phase I RFI, samples were collected from two depths at three central locations inside the center of the crater and at three locations within 10 ft of the outside the crater (LANL 1997, 056664). Samples were submitted for analysis of metals, cyanide, HE, isotopic uranium, cesium-137, and strontium-90. Data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however the data showed metals detected above BVs. No organic chemicals were detected, but the holding times for HE analysis were exceeded. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 07-001(d).

Proposed Activities

SWMU 07-001(d) is listed in Table IV-2 of the Consent Order (Deferred Sites in Testing Hazard Zones), and investigation of this site may be deferred per section IV.A.5.b of the Consent Order. Based on current operations within the testing hazard zone encompassing this site, the potential for this site to be affected by explosives testing is low. Therefore, investigation of this site is not being deferred.

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the former firing site. The six RFI locations (locations 07-04062, 07-04063, 07-04064, 07-04065, 07-04066, 07-04067) will be resampled, with samples collected at deeper depths and with an expanded analytical suite to determine vertical and lateral extent. Samples will also be collected at one additional step-out location farther downgradient of the site to define lateral extent at depths of 0 to 1 ft, 3 to 4 ft, and 6 to 7 ft bgs. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, SVOCs, explosive compounds, isotopic uranium, gamma-emitting radionuclides, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-3. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.4 Sites under Investigation at TA-22

4.4.1 SWMU 22-010(a), Septic System

4.4.1.1 Description and History

SWMU 22-010(a) consists of an inactive septic tank (structure 22-0050), drainlines, and drain field located directly north of building 22-0034 (Figure 4.4-1). The septic system was constructed in 1952 and

received sanitary waste from building 22-0034, the detonator explosives building (LANL 1990, 007512). The septic tank is constructed of concrete with a 1365-gal. capacity and discharged north to an 800 ft^2 tile drain field (LANL 1993, 026068, p. 5-64). The drain field discharged into a marshy area at the head of Tributary B of Twomile Canyon (LANL 1997, 056664, p. 149).The septic system became inactive in 1993 when building 22-0034 was tied into the TA-46 SWSC plant and the inlet drainline to the septic tank was plugged.

4.4.1.2 Previous Investigations

During the 1994 Phase I RFI, samples of the septic tank contents were collected and soil samples were collected beneath the septic tank inlet and outlet, beneath the tank, and surrounding the tank (LANL 1997, 056664). Sampling locations were field screened for VOCs, HE, and radioactivity; the results were nondetect or at background levels and submitted for analysis of metals, VOCs, SVOCs, and HE. Data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs and detected organic chemicals. Samples collected in 1994, the analyses requested, and the data are presented in Appendix B of the HIR (LANL 2010, 108330).

Because the drain field location was incorrectly identified during the 1994 RFI, a second sampling event was conducted in 1997 (LANL 1997, 056664). To determine the location of the drain field, GPR was used. Six samples were collected from two depths from three boreholes (4.5 to 5 ft and 7.5 to 8 ft; 3 to 3.5 ft and 6.7 ft; 4.8 to 5.5 ft and 7 to 7.7 ft bgs, respectively) (Figure 4.4-1). Sampling locations were field screened for radioactivity, VOCs and HE before samples were collected. All samples were submitted for analysis of metals, VOCs, SVOCs, and HE. Samples collected during the 1997 Phase I RFI and the analyses requested are presented in Table 4.4-1.

Metals detected above BVs were barium, cobalt, and manganese. Barium and manganese were detected above the soil BV in one sample. Cobalt was detected above soil BV in two samples. Sampling locations and inorganic chemicals detected above BVs are presented in Table 4.4-2 and shown in Figure 4.4-2.

Three organic chemicals (di-n-butylphthalate, methylene chloride, trichlorofluoromethane) were each detected in two to six samples. Sampling locations and results for detected organic chemicals are presented in Table 4.4-3 and shown in Figure 4.4-3.

4.4.1.3 Proposed Activities

Decision-level data from the 1997 RFI sampling showed detections of several inorganic chemicals above BVs and several organic chemicals adjacent to the manhole riser and in the area northwest of the drain field. Vertical and horizontal extent of inorganic and organic chemicals were not defined. There are no decision-level data for other areas of the site, including around the septic tank, below drainlines, and at the outfall. Additional sampling is needed to characterize nature and extent in all areas.

The drainline from building 22-0034 that served the septic tank is plugged, and the system is no longer used. Therefore, the septic tank and manhole riser will be removed and the associated drainlines plugged. After the tank and manhole riser are removed, samples will be collected within the excavation at a location beneath the former tank, beneath the inlet to the tank, beneath the outlet from the tank, and beneath the manhole riser. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the bottom of the tank excavation and the bottom of the inlet and outlet lines and manhole riser to define vertical extent. Samples will be collected below the drainline, where the drainline exits building 22-0034, and at the midpoint between the septic tank and the building. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the drainlines. Samples will be collected at four locations in the drain field area: one

location beneath each perforated drainline (three locations total) and one location beneath the point of discharge from the drain field. The location of drain field area is approximate and will be field-verified using GPR to determine actual sampling locations. In the drain field area, samples will be collected at depths of 0 to 1 ft, and 2 to 3 ft below the drainlines. Samples will be collected at one location at the outfall, at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower. Samples will be collected in the area downgradient of the outfall as part of the investigation of SWMU 22-014(a).

All samples from SWMU 22-010(a) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.4-4. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.2 SWMU 22-014(a), Sump System

4.4.2.1 Description and History

SWMU 22-014(a) consists of an active HE sump system and associated inactive drainline and seepage pit. The sump system is located immediately south of building 22-0093 (Figure 4.4-5). The sump is constructed of concrete containing an inset aluminum tank and is approximately 4 ft deep × 9 ft long × 3 ft wide. The sump system has been operating since 1985 and receives rinse water from a washing facility for parts and clothing from explosives compacting operations in rooms C112 and C114 in building 22-0093 (LANL 1993, 007512). Before 1995, the sump discharged approximately 100 gal. of wastewater each week through a drainline to a seepage pit located 150 ft south of the sump in the upper part of Tributary B of Twomile Canyon. The seepage pit is 4 ft in diameter and 40 ft deep (LANL 1993, 026028, p. 5-25). In 1995, the outflow from the sump was capped leaving the sump drainlines and seepage pit inactive (LANL 1997, 056664, p. 185). Operations in building 22-0093 continue to discharge wastewater to the sump, where the effluent is retained and suspended solids settle out as sludge. The sump contents are periodically removed for disposal at approved facilities at TA-16 (LANL 1997, 056664, p. 185). The sump is equipped with a level monitor and an alarm that are monitored remotely in a manager's office.

4.4.2.2 Previous Investigations

During the 1994 Phase I RFI, one sample of sludge water was collected from the sump tank and 15 samples were collected from three depths from five borehole locations around the sump and next to the drainline outlet (LANL 1997, 056664). In addition, nine samples were collected from three depths from three boreholes in the seepage pit area. Sampling locations were field screened for VOCs, HE, and radioactivity; the results were nondetect or at background levels. The samples were submitted for analysis of HE. Data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however, the data showed detected HE in samples collected around the active sump. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 22-014(a).

4.4.2.3 Proposed Activities

The sump that serves building 22-0091 is active; however, the sump drainline that formerly discharged from the sump to the seepage pits is plugged and the seepage pit is no longer used. Therefore, the sump will be left in place, the sump outlet drainline verified as plugged, and the seepage pit surface infrastructure removed and backfilled.

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the sump, below inlet and outlet drainlines, and downgradient of the seepage pit. Samples will be collected at two locations next to and below the sump, next to and below the inlet to the sump, and beneath the outlet from the sump. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the sump and below the inlet and outlet drainlines. Samples will be collected below the drainline where it exits building 22-0093 at two locations and below the outlet drainline at two locations between the sump and the seepage pit and at the inlet to the seepage pit. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the drainlines. Samples will be collected from three locations downgradient of the seepage pit at depths of 0 to 1 ft and 3 to 4 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower. Six RFI sampling locations (40-03056, 40-03057, 40-03058, 40-03059, 40-03060, and 40-03061) will be resampled downgradient of the seepage pit in the marsh area (locations were originally sampled as part of an RFI investigation for SWMU 40-005), at depths of 0 to 1 ft, 2 to 3 ft and 5 to 6 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower. One borehole will be advanced next to the seepage pit on the downgradient side to determine the vertical extent of contamination in the seepage pit area. Borehole samples will be collected at 10-ft intervals to a depth of 30 ft below the bottom of the seepage pit.

All samples from SWMU 22-014(a) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.4-6. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.3 SWMU 22-014(b), Sump System

4.4.3.1 Description and History

SWMU 22-014(b) consists of an inactive explosives sump and a former outfall area that serves rooms 101 through 113 in building 22-0034 (LANL 1990, 007512) (Figure 4.4-7). The sump is located on the northeast corner of building 22-0034, is constructed of concrete, and is 4 ft × 2 ft × 3 ft deep with an inset aluminum tank (LANL 1990, 007512). The sump probably began to be used shortly after building 22-0034 was completed in 1953. Building 22-0034, currently used as a laser laboratory, previously housed a chemistry laboratory, an explosives laboratory, and a photographic laboratory (LANL 1997, 056664). The sump effluent drained to the north via a drainline to an outfall located in a marshy area in the upper part of Tributary B of Twomile Canyon until 1994, when the sump outlet was plugged (LANL 1997, 056664). The sump has not been used since 1994 when building 22-0034 became a laser laboratory.

4.4.3.2 Previous Investigations

During the 1994 Phase I RFI, 15 samples were collected from three depths from five borehole locations around the sump and next to the drainline outlet (LANL 1997, 056664). In addition, three surface samples were collected from three locations in the outfall area. The sampling locations were field screened for VOCs, HE, and radioactivity; the results were nondetect or at background levels and submitted for analysis of metals, sulfates/copper salts, nitrates/nitrites, fluoride, cyanide, VOCs, SVOCs, and HE. Data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs, detected organic chemicals around the sump, and a single HE detect in the outfall area. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 22-014(b).

4.4.3.3 Proposed Activities

The drainline from building 22-0034 is plugged and the sump system is no longer used. Therefore, the sump will be removed and the drainline from the sump plugged.

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination present at the location of the sump, below the inlet and the outlet drainlines, at the outfall, and downgradient of the outfall. After the sump is removed, samples will be collected within the excavation at a location beneath the former sump, beneath the inlet to the sump, and beneath the outlet from the sump. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the bottom of the sump excavation and below the bottom of the inlet and outlet drainlines. Samples will be collected below the inlet drainline where it exits building 22-0034 and below the outlet drainline at two locations between the sump and the outfall. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the drainline. Samples will be collected at one location at the outfall, five locations downgradient of the outfall to the toe of the slope, and three locations farther downgradient in the drainage. The drainage samples will also be used to define lateral extent for upgradient SWMUs 22-010(a), 22-014(a), and 22-015(a). Samples at and downgradient of the outfall will be collected at depths of 0 to 1 ft, 2 to 3, and 4 to 5 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower.

All samples from SWMU 22-014(b) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.4-8. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.4 SWMU 22-015(a), Seepage Pits

4.4.4.1 Description and History

SWMU 22-015(a) consists of two inactive seepage pits (Pits A and B), located in an open grass-covered area east of building 22-0091 (LANL 1990, 007512) (Figure 4.4-9). Each pit has an outside diameter of 4 ft and is filled with crushed gravel with a central 4-in. polypropylene perforated pipe vented to the surface (Creamer 1993, 015248). Pit A is 26 ft deep, and Pit B is 20 ft deep (LANL 1997, 056749). The seepage pits were operated in series and served rooms B102, B107, B121, B123, B145, and B160 in building 22-0091, which housed printed circuit board etching operations (DOE 1987, 008663). The seepage pits began operation shortly after building 22-0091 was occupied in 1985. From 1985 to 1987, treated waste from the etching operations was discharged through a 6-in.-diameter polyvinyl chloride drainpipe to the seepage pits (LANL 1997, 056749). As the effluent production rate exceeded the infiltration rate of liquid into the tuff causing the seepage pits to overflow, the drainline was disconnected from the seepage pits in 1987 and the pits became inactive (Creamer 1993, 015248; LANL 1997, 056749). After the pits were disconnected, effluent was allowed to daylight for only a few months before the drainlines were tied into the TA-16 WWTF (Creamer 1993, 015228).

4.4.4.2 Previous Investigations

In 1987, DOE sampled the marshy area in the upper part of Tributary B of Twomile Canyon east of buildings 22-0091 and 22-0093 that was impacted by releases from SWMU 22-015(a) (LANL 1990, 007512). Three surface samples and five subsurface samples were collected from six locations. Sampling locations were field screened for VOCs, HE, and radioactivity; the results were nondetect or at background levels. Samples were submitted for analysis of metals, VOCs, HE, asbestos, and alpha-,

beta-, and gamma-emitting radionuclides. The 1987 DOE data are screening-level data and not are presented in this work plan; however, the data showed concentrations of inorganic chemicals above BVs.

During the 1994 Phase I RFI, nine samples were collected from three depths from three borehole locations: one next to and downgradient of Pit A, one next to and downgradient of Pit B, and one between the two pits (LANL 1997, 056749). Sampling locations were field screened for VOCs, HE, and radioactivity; the results were nondetect or at background levels. The samples were submitted for analysis of TAL metals, VOCs, SVOCs, and HE. The holding times for the HE analyses were exceeded, and PETN analysis was not requested. Data collected during the 1994 RFI sampling investigation are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs in the seepage pit area. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330).

In 1997 RFI, four samples were collected from two boreholes, each drilled through a seepage pit into the underlying tuff 3 ft below the bottom of each pit. Samples from the Pit A borehole were collected at 27.7 to 28.7 ft and 29 to 30 ft bgs, and at the Pit B borehole samples were collected at 20.5 to 21.5 and 23 to 24 ft bgs. The samples were submitted for analysis of metals, VOCs, cyanide, and HE, including PETN. Samples collected during the 1997 Phase I RFI and the analyses requested for the decision-level data are presented in Table 4.4-1.

Inorganic chemicals detected above BVs were copper and silver. Copper was detected above the sediment BV in two samples and above the soil BV in one sample. Silver was detected above the sediment BV in one sample. Sampling locations and inorganic chemicals detected above BVs are presented in Table 4.4-2 and shown in Figure 4.4-10. Acetone was detected in two samples. Sampling locations and detected results for organic chemicals are presented in Table 4.4-3 and shown in Figure 4.4-11.

4.4.4.3 Proposed Activities

Decision-level data from the 1997 RFI sampling showed metals detected above BVs in the deepest borehole samples at the seepage pits and one organic chemical, acetone, in borehole samples. Vertical extent of contamination was not defined at these locations. There are no decision-level data for other areas of the site, including below drainlines and at the outfall. Additional sampling is needed to characterize nature and extent.

The drainline from building 22-0091 is plugged and the seepage pits are no longer used. Therefore, the drainlines will be verified as plugged, the seepage pit surface infrastructure removed, and the excavation backfilled. Sampling will be performed to characterize the nature and extent of any contamination present along the drainline, in the seepage pit area, and downgradient of the seepage pits. Samples will be collected beneath the drainline where it exits building 22-0091 at two locations, at the junction where the drainlines from building 22-0091 join, along the drainline between the drainline junction and seepage pit A, beneath the inlet of seepage pit A, beneath the outlet of seepage pit A and beneath the inlet of seepage pit B. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the drainline. Samples will be collected at six locations downgradient of the seepage pits at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower. Additional downgradient samples will be collected as part of SWMU 22-014(a). Two boreholes will be advanced, one next to the downgradient side of each seepage pit to determine the vertical extent of contamination in the seepage pit area. Borehole samples will be collected at 10-ft intervals to a depth of 30 ft below the bottom of each seepage pit.

All samples from SWMU 22-015(a) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.4-12. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.5 SWMU 22-015(b), Sump and Outfall

4.4.5.1 Description and History

SWMU 22-015(b) consists of an inactive HE sump, drainline, and outfall located at the northeast corner of building 22-0025, a small structure previously used for the recrystallization of PETN (LANL 1997, 056749) (Figure 4.4-13). The sump is constructed of concrete, is 4.5 ft × 3 ft × 3.5 ft deep, and contains an inset aluminum tank (LANL 1993, 026028). A drainline from the sump extends to the outfall in an open area approximately 50 ft to the north. The outfall discharged to a hillside, which drains to a drainage channel that flows eastward into Twomile Canyon. The sump and outfall operated from 1949 to the 1960s, when the operations in building 22-0025 ceased (Creamer 1992, 015247).

4.4.5.2 Previous Investigations

During the 1994 Phase I RFI, 15 samples were collected from three depths from five borehole locations around the sump and adjacent to the drainline outlet (LANL 1997, 056664). In addition, three surface samples were collected from three locations in the outfall area (LANL 1997, 056749). No samples were collected from the sump because no liquid or sludge was present. Sampling locations were field screened for radioactivity, VOCs, and HE; the results were nondetect or at background levels. The samples were submitted for analysis of VOCs and HE. Samples collected during the 1994 RFI for VOC analysis were lost by the analytical laboratory, and PETN was not requested as part of the HE suite (LANL 1997, 056749). Data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however, the data showed no detected HE. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330).

Supplemental samples collected in 1997 included three samples collected from three depths (0 to 0.5 ft, 3.5 to 4.5 ft, 6.6 to 7.7 ft bgs) beneath the sump outlet, and three samples collected from three depths (0 to 0.5 ft, 3 to 3.5 ft, 3.5 to 4 ft bgs) beneath the northeast corner of the sump. Six samples were collected from two depths (0 to 0.5 ft and from a second interval ranging in depth from 1.3 to 2.7 ft bgs) in the outfall area. Sampling locations were field screened for VOCs and HE before samples were collected; the results were nondetect or at background levels. The samples were submitted for analysis of VOCs and HE. Samples collected during the 1997 Phase I RFI and the analyses requested for the decision-level data are presented in Table 4.4-1.

Three organic chemicals (tetryl; 2,4-dinitrotoluene; and toluene) were each detected in one sample. Sampling locations and results for detected organic chemicals are presented in Table 4.4-3 and shown in Figure 4.4-14.

4.4.5.3 Proposed Activities

Decision-level data from the 1997 RFI sampling showed detections of organic chemicals in one sample next to the sump and in two samples in the outfall area. The vertical and horizontal extent was not defined in these areas and the analytical suite was limited, so additional sampling with an expanded analytical suite is needed to define nature and extent.

Building 22-0025, which formerly discharged to the sump, is abandoned and the sump and outfall are no longer used. Therefore, the sump will be removed and the drainlines plugged. After the sump is removed, samples will be collected within the excavation beneath the former sump, beneath the inlet to the sump, and beneath the outlet from the sump. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the bottom of the sump excavation and the bottom of the inlet and outlet drainline. One RFI sampling location next to the sump (location 22-03024) will be resampled at depths of 0 to 1 ft, 4 to 5 ft, and 8 to 9 ft bgs. Samples will be collected below the drainline where it exits building 22-0025 and below the drainline at the midpoint between the sump and the outfall. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the drainline. Two RFI sampling locations will be resampled: one location at the outfall (location 22-6066) and one location downgradient of the outfall (location 22-6068). Six additional locations downgradient of the outfall will be sampled to the toe of the slope. Samples at and downgradient of the outfall will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower.

All samples from SWMU 22-015(b) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.4-15. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.5 Sites under Investigation at TA-40

4.5.1 SWMU 40-001(b), Septic System

4.5.1.1 Description and History

SWMU 40-001(b) is an inactive septic system located southeast of building 40-0001 (Figure 4.5-1). The septic system consists of a 1215-gal. reinforced concrete septic tank (structure 40-0024), an inactive drain field, two inactive seepage pits, associated piping, an inactive distribution box, and an inactive outfall. The septic tank was installed in 1949 and originally served former building 40-0019 but currently serves buildings 40-0001 and 40-0023 (LANL 1993, 026068). The effluent from this tank was originally discharged to a drain field. In 1973, because of the inadequate percolation in the drain field, the septic tank overflow was diverted to two gravel-filled seepage pits (LASL 1973, 004636). Because percolation in the seepage pits was also inadequate, the outlet drainline was plugged in 2004. Since that time, the septic tank has operated as a holding tank and is routinely pumped out. The depth of the seepage pits is not known.

Building 40-0001 originally housed an explosives laboratory, offices, and a darkroom. In the early 1980s, the explosives laboratory was removed and the building was converted entirely to office space (LANL 1993, 026068). Building 40-0023, originally used for cable fabrication, an electronics laboratory, and a warehouse, was converted to offices, a laser laboratory, carpenter shop, and staff shop in the early 1980s (Creamer 1993, 015063). Former building 40-0019, originally a three-room guard shack was converted to a storage building in 1977 and was decommissioned and removed in 2006.

4.5.1.2 Previous Investigations

During the 1994 Phase I RFI, samples of the septic tank contents were collected from three depths in the tank and nine tuff samples were collected from three depths from three locations around the drain field and seepage pits and six tuff samples were collected from two depths in the outfall area. Samples were submitted for analysis of metals, cyanide, VOCs, SVOCs, and HE. Data collected during the 1991 RFI are screening-level data, were not previously reported in an RFI report, and are not presented in this work

plan; however, the data showed metals detected above BVs and detected organic chemicals and HE. Samples collected in 1994 and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 40-001(b).

4.5.1.3 Proposed Activities

This septic tank is currently being used by buildings 40-0023 and 40-0001 as a sanitary waste holding tank; however, the drainline from the tank has been plugged and the seepage pits and drain field are no longer active. Therefore, the distribution box and the seepage pit surface infrastructure will be removed and backfilled.

Because there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any contamination below the drainline from the buildings to the septic tank, below the tank, below the tank inlet and outlet drainlines, below the distribution box, next to seepage pits, in the drain field area, and downgradient of the drain field in the drainage. Samples will be collected below the active inlet drainline from one location where it exits building 40-0023, at one location where it exits building 40-0001, at one location at the drainline junction to former building 40-0019, and at one location immediately east of Twomile Mesa Road between the septic tank and the drainline junction. Samples will be collected 0 to 1ft and 3 to 4 ft below the drainline. Samples will be collected from one location next to and below the level of the cleanout inlet and outlet drainlines. Samples will be collected at one location next to and below the level of the bottom of the septic tank, next to and below the inlet to the tank, and next to and below the outlet of the tank. Samples will also be collected next to and below the inlet to and outlet from the cleanout. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the bottom tank and the bottom of the inlet and outlet lines to the septic tank and cleanout. The distribution box, located downgradient of the tank, will be removed, after which samples will be collected within the excavation beneath the former distribution box at depths of 0 to 1 ft and 3 to 4 ft below the distribution box. Samples will be collected at the inlet and outlet of each seepage pit at a depth of 0 to 1 ft and 3 to 4 ft below the drainline junction. Samples will be collected at three locations in the drain field area: one location beneath each perforated drainline. Samples in the drain field area will be collected at depths of 0 to 1 ft and 3 to 4 ft below the drainlines. The existence of an outfall from the drain field is not known; if a drain field outfall is identified during field investigation, a sampling location will be added at the outfall. Samples will be collected at four locations in the canyon drainage bottom downgradient of the drain field. Samples in the drainage will be collected at depths of 0 to 1 ft, 2 to 3 ft , and 4 to 5 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower. Two boreholes will be advanced, one next to the downgradient side of each seepage pit. Borehole samples will be collected at 10-ft intervals to a depth of 30 ft below the bottom of each seepage pit.

All samples from SWMU 40-001(b) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.5-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.5.2 SWMU 40-005, Sump

4.5.2.1 Description and History

SWMU 40-005 is an inactive sump (structure 22-0075) located at the northwest corner of building 40-0041 (formerly building 22-0041) (Figure 4.5-3). Constructed in 1952, building 40-0041 is a small structure (approximately 1000 ft^2) where explosive grinding operations were previously conducted. Before it was incorporated into TA-40, building 40-0041 and the sump were part of TA-22. Currently, the building

is used to prepare for explosive tests conducted at TA-40. The sump, built in 1961, is constructed of concrete with an inset aluminum baffle tank (LANL 1990, 007512). The sump is 4 ft 6 in. × 6 ft 4 in. × 5 ft deep. Wastewater from a single sink drain discharged to the sump (Santa Fe Engineering Ltd. 1993, 031756). Originally, the sump discharged via a drainline to a former NPDES-permitted outfall (EPA 05A-154) that flowed into Tributary B of Twomile Canyon. In 1994, the sump outlet port was capped, and in December 1995 the outfall was deleted from the NPDES permit (LANL 1997, 056664). The sump has been removed from service and filled with concrete.

4.5.2.2 Previous Investigations

During the 1994 Phase I RFI, 14 samples were collected from two to three depths from four locations at the corners of the sump and from one location beneath the sump outlet. Three surface samples were collected within the outfall area (LANL 1997, 056664). In addition, six surface samples were collected in a small marsh area about 0.25 mi upstream and upcanyon in an area north of building 22-0034. Samples collected during the 1994 RFI were submitted for analysis of TAL metals only. Data collected in 1994 are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs. Samples collected during the 1994 RFI and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330).

In 1996, each of the 1994 RFI sampling locations were resampled immediately next to the original sampling locations. Fifteen samples were collected in the sump area from five borehole locations around the sump. Three samples were collected from each borehole at depth intervals representing the surface (0 to 0.5 ft bgs), level with the bottom of the sump (4.5 to 5.5 ft bgs) and 3 ft below the sump (7.5 to 8.5 ft bgs). Four surface samples (0 to 0.5 ft bgs) were collected in the outfall area from one location at the outfall and three locations downgradient of the outfall. The sampling locations were field screened for radioactivity, VOCs, and HE before samples were collected and submitted for analysis of VOCs and HE; the results were nondetect or at background levels. Samples collected during the 1996 RFI and the analysis requested for the decision-level data are presented in Table 4.5-1.

Two organic chemicals, acetone and methylene chloride, were detected. Acetone was detected in eight samples and methylene chloride in one. Sampling locations and results for detected organic chemicals are presented in Table 4.5-2 and shown in Figure 4.5-4.

4.5.2.3 Proposed Activities

Decision-level data from the 1996 RFI sampling showed detections of organic chemicals in eight samples collected next to the sump. The vertical extent was not defined in this area and the analytical suite was limited, so additional sampling to deeper depths with an expanded analytical suite is needed.

Because the sump has been filled with concrete, it will be left in place and the drainlines verified as plugged. Samples will be collected beneath the inlet to the sump and beneath the outlet from the sump. Samples will be collected at depths of 0 to 1 ft, 4 to 5 ft, and 8 to 9 ft below the of the inlet and outlet lines. Four RFI sampling locations (40-3048, 40-3049, 40-3050 and 40-3051) in the area surrounding the sump will be resampled at depths of 0 to 1 ft, 4 to 5 ft, and 8 to 9 ft. Samples will be collected below the inlet drainline where it exits building 40-0041 and below the outlet drainline at the midpoint between the sump and the outfall. Samples will be collected at depths of 0 to 1 ft and 3 to 4 ft below the drainlines. Samples will be collected at one location at the outfall (RFI sample location 40-3053), and five locations downgradient of the outfall to the toe of the slope. Samples will be collected at and downgradient of the outfall at depths of 0 to 1 ft and 2 to 3 ft bgs or from the top 1 ft of unweathered tuff, whichever is

shallower. The six RFI sampling locations in the marsh area of TA-22 will be resampled as part of SWMU 22-014(a).

All sampling locations for SWMU 40-005 will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.5-5. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.5.3 AOC 40-007(e), Storage Area

4.5.3.1 Description and History

AOC 40-007(e) is a satellite accumulation area (SAA) located in building 40-0041 (Figure 4.5-6), which is used to prepare for explosives tests at the TA-40 firing sites. Wastes accumulated in the SAA are associated with HE detonator assembly and typically consist of rags contaminated with explosives; such wastes are generated at a rate of 1 to 2 gal./mo (LANL 1990, 007512). No historical releases are documented for this site.

4.5.3.2 Previous Investigations

No previous investigations have been conducted at AOC 40-007(e).

4.5.3.3 Proposed Activities

The SAA located in building 40-0041 is in use. As there are no decision-level data for this site, sampling will be performed to characterize the nature and extent of any potential releases from the building. Samples will be collected from depths of 0 to 1 ft and 2 to 3 ft bgs at four step-out locations on each side of the building, 8 ft from the building.

All samples from SWMU 40-007(e) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, and explosive compounds. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.5-7. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.6 Sites under Investigation at TA-50

4.6.1 AOC C-50-001, Transformer

4.6.1.1 Description and History

AOC C-50-001 is the former location of a PCB transformer (PCB ID 855023) that was situated on a 20 ft × 10 ft concrete pad surrounded by asphalt on the east side of building 50-0001 (Figure 4.6-1). There is only one documented release from the transformer, which involved a minor seep from a valve in August 1989 (LANL 2000, 067470.2). The valve was cleaned, and metal epoxy was used to seal the valve. The transformer was removed in 1994 and replaced with a non-PCB transformer.

While the PCB transformer was being replaced, oil staining was noted on the concrete pad directly beneath the transformer. A sample of the material confirmed the presence of PCBs on the concrete pad. The staining did not extend beyond the perimeter boundary of the transformer on the concrete pad. The pad was scraped and double wash-rinsed five times using an alkaline detergent in accordance with EPA's PCB Cleanup Policy (40 Code of Federal Regulations [CFR] Part 761, Subpart G). Also in accordance

with 40 CFR Part 761, Subpart G, the cleaned area was encapsulated with polymeric paint/sealer before the new non-PCB transformer was placed on the pad (NMED 2000, 066400). After the non-PCB transformer was installed, the concrete transformer pad was expanded and a containment drain installed along the inside edge of the pad.

4.6.1.2 Previous Investigations

No previous investigations have been conducted at AOC C-50-001.

4.6.1.3 Proposed Activities

Sampling will be performed to characterize the nature and extent of any contamination present around the former transformer location. Soil samples will be collected from eight locations around the concrete pad at depths of 0 to 1 ft and 2 to 3 ft beneath the asphalt. The area round the concrete pad has been repaved several times since 1994; therefore, asphalt samples will not be collected.

All samples from AOC C-50-001 will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.6-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites. Because the area around the transformer is flat, stormwater does not runoff.

4.7 Sites under Investigation at TA-59

4.7.1 AOC 59-004, Outfall

4.7.1.1 Description and History

AOC 59-004 consists of an inactive, former NPDES-permitted outfall (03A098) that discharged wastewater from the occupational health laboratory (building 59-0001) and cooling tower blowdown from building 59-0010 (Santa Fe Engineering Ltd. 1992, 074043) (Figure 4.7-1). The outfall received stormwater, acidic scrubber water from fume hoods, air-conditioning condensate, and wastewater from floor drains in building 59-0001 (Santa Fe Engineering Ltd. 1992, 074043). The outfall discharged to a rock-lined drainage channel measuring approximately 4 ft wide × 50 ft long (LANL 1996, 052930, p. 139). The outfall was removed from the NPDES permit in December 1995 (LANL 1996, 108214).

4.7.1.2 Previous Investigations

During the 1994 Phase I RFI, three surface samples were collected from three locations in the outfall area (LANL 1996, 052930). Sampling locations were field screened for VOCs before the sample was collected; results were nondetect. Samples were submitted for analysis of TAL metals, SVOCs, tritium, and gamma-emitting radionuclides; one sample was submitted for analysis of VOCs to confirm field-screening nondetects. Data collected during the 1994 RFI are screening-level data and are not presented in this work plan; however, data showed metals detected above BVs and one detected SVOC (PAH) chemical. Samples collected during the 1994 RFI and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for AOC 59-004.

4.7.1.3 Proposed Activities

Nature and extent have not been determined for this site. Sampling will be performed to characterize the nature and extent of contamination present at the outfall and downgradient of the outfall. Samples will be collected at the outfall, five locations downgradient of the outfall, and two locations in the drainage

downgradient of the outfall. Samples will be collected at depths of 0 to 1 ft bgs and from the top 1 ft of unweathered tuff.

All samples from SWMU 59-004 will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, isotopic-uranium, isotopic-plutonium, gamma spectroscopy, tritium, americium-241, and strontium-90. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.7-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.7.2 AOC C-59-001, Transformer

4.7.2.1 Description and History

AOC C-59-001 is the former location of a PCB transformer in room B-1 of building 59-0001 (Figure 4.7-3). The transformer contained 212 gal. of dielectric fluid with a PCB concentration greater than 500 ppm (LANL 1991, 066133). In September 1985, stains were noted on the transformer, primarily around bushings and gaskets; no stains were noted on the pad (LANL 1991, 066133). In June 1991, the transformer was replaced with a non-PCB transformer (LANL 1991, 066133). No staining was visible during a site visit performed in 1994 (LANL 1995, 057590, p. 6-67).

4.7.2.2 Previous Investigations

No previous investigations have been conducted at AOC C-59-001.

4.7.2.3 Proposed Activities

Delayed investigation is proposed for AOC C-59-001 because characterizing this site, which is located in the basement of an active facility, is not currently feasible. The former transformer is located inside building 59-0001, which is a concrete structure. There are no release pathways to the environment and no evidence of any past releases to the environment. Samples cannot be collected beneath the concrete floor of building 59-0001 to confirm the absence of releases because this is an active facility and access for sampling is limited. Because there is no history of releases from this site, it is proposed that investigation be delayed until the building is decommissioned and demolished.

4.8 Sites under Investigation at TA-69

4.8.1 SMWU 69-001, Twomile Incinerator Facility

4.8.1.1 Description and History

SWMU 69-001 is the site of the former Twomile Incinerator Facility, former building 69-0003, used from 1960 to the late 1970s to destroy classified documents (LANL 1993, 020949, p. 5-77) (Figure 4.8-1). The building was 20 ft × 28 ft × 15 ft tall. Two incinerators and a shredder were located within former building 69-0003. Cleanout water from the incinerators drained through a pipe to a pond located on the northeast side of former building 69-0003 in a shallow swale that drained into Twomile Canyon. Ash from the incinerators was manually removed and placed in the pond, which was bisected by a dirt road (LANL 1993, 020949, pp. 5-77–5-79). The portion of the pond on the south side of the road was located directly below the incinerator outflow pipe and measured approximately 15 ft by 15 ft. The portion of the pond on the north side of the road measured approximately 30 ft by 60 ft and was flanked by a 3 ft earthen berm

on the east and north sides (ICF Kaiser Engineers 1995, 056712, p. 8). Demolition of building 69-003 was completed in July and August 2004 (LANL 1996, 108214).

4.8.1.2 Previous Investigations

During the 1994 Phase I RFI, four surface samples (0 to 0.5 ft bgs) were collected from one location next to former building 69-0003 and three locations in the pond area (LANL 1996, 054334, pp. B-1–B-12). One sample was submitted for analysis of VOCs and SVOCs; all four samples were submitted for analysis of metals. Data collected in 1994 are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs. Samples collected during in 1994 are screening-level and are presented on CD in Appendix B of the HIR (LANL 2010, 108330).

During the 1995 VCA conducted at SWMU 69-001, 265 yd^3 of ash and soil was removed from the incinerator pond, pond berm, and surrounding area (LANL 1996, 054334, pp. 7–8). Field screening of the site and potentially contaminated materials showed no detected HEs or VOCs, and radioactivity was at background levels. Following the removal, nine surface (0 to 0.5 ft bgs) confirmation samples were collected from the pond area and submitted for analysis of TAL metals. Data collected during the 1995 VCA are screening-level data and are not presented in this work plan; however, the data showed metals detected above BVs. Samples collected during the 1995 VCA and the data are presented on CD in Appendix B of the HIR (LANL 2010, 108330). No decision-level data are available for SWMU 69-001.

4.8.1.3 Proposed Activities

The incinerator, incinerator building, drainage pond, and associated infrastructure have been removed, with the exception of the concrete foundation of former building 69-0003.

The nature and extent of contamination have not been determined for this site. Sampling will be performed to characterize the nature and extent of any contamination present downgradient of the former facility, in the area of the 1995 VCA removal, the downgradient canyon hillslope, and the canyon drainage bottom. Concrete chip samples will be collected from four locations on the concrete foundation of the former incinerator building 69-0003. Samples will be collected from two locations on the west side of Jumbino Road at the outfall of former incinerator facility at depths of 0 to 1 ft, 3 to 4 ft, and 4 to 5 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower. Samples will be collected from five locations in the drainage where the VCA was implemented, six locations along east and west side of VCA excavation area, and two locations to the north of the VCA excavation area. Samples in the VCA area and downgradient will be collected at depths of 0 to 1 ft and 2 to 3 ft bgs or from the top 1 ft of unweathered tuff, whichever is shallower. Geomorphic-survey sampling location techniques will be used to identify sediment packets on the canyon hillslope downgradient of the VCA area, and four locations will be sampled at a depth of 0 to 1 ft bgs and from the top 1 ft of unweathered tuff.

All samples from SWMU 69-001 will be analyzed for TAL metals, cyanide, dioxins/furans, VOCs, SVOCs, and PCBs. Proposed sampling locations are shown in Figure 4.8-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

5.0 INVESTIGATION METHODS

A summary of the 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://www.lanl.gov/environment/all/qa.shtml. Summaries of the field-investigation methods are provided

below. Additional procedures may be added as necessary to describe and document quality-affecting activities.

Chemical and radionuclide analyses will be performed in accordance with the analytical statement of work (LANL 2000, 071233). Accredited contract analytical laboratories will use the most recent EPA- and industry-accepted extraction and analytical methods for analyses of the samples.

5.1 Field Surveys

The following sections describe the field surveys that will be conducted as appropriate at the Twomile Canyon Aggregate Area sites.

5.1.1 Geodetic Surveys

Geodetic surveys will be conducted by a land surveyor in accordance with the latest version of EP-ERSS-SOP-5028, Coordinating and Evaluating Geodetic Surveys, to locate historical structures and to document field activities, such as sampling and excavation locations. The surveyors will use a Trimble GeoXT hand-held global-positioning system (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 EP-ERSS-SOP-5028.

5.1.2 Geophysical Surveys

Geophysical surveys will be performed at selected sites to identify anomalies that may indicate the location of former waste disposal pits SWMUs 06-007(a–e). Geophysical methods employed will include terrain conductivity (EM-31 or equivalent), high-sensitivity metal detection (EM-61 or equivalent), and GPR.

Terrain conductivity and high-sensitivity metal detection data will be recorded at approximately 2 ft intervals along lines spaced approximately 20 ft apart. Higher resolution coverage will be completed, as needed, in selected target areas using 5 ft line spacing. Line and station separation may vary depending upon surface obstructions. Geodetic coordinates will be recorded at 1-s intervals using an integrated GPS. A base station free from cultural interference will be used at the beginning and end of each survey day to calibrate the instrument and perform system functional tests. During these tests, battery, phasing, and sensitivity checks will be performed.

The GPR survey will be performed using a digital subsurface interface radar system. After initial field tests are conducted to determine maximum penetration and sufficient resolution, an appropriate transducer will be selected to perform the survey. Different transducers may be used in an attempt to provide greater penetration depths. Data will be digitally recorded, displayed, and analyzed during acquisition to allow real-time interpretation. Line locations will be selected based on electromagnetic anomaly and surface obstructions.

5.1.3 UXO Surveys

UXO surveys will be performed at SWMUs 07-001(a) and 07-001(b) where excess detonators were historically disposed of by open detonation. Visual surveys of the sites and surrounding area will be performed by trained UXO technicians to identify unexploded detonators or associated debris. Surveys will be accomplished by walking survey lines with several trained personnel positioned at approximately

arms-length distance. Once a survey line is completed in one direction, the survey line will be pivoted around the individual at one end of the line to survey in the opposite direction. The individual at the "pivot point" will survey the same area going in the opposite direction to ensure overlap of each survey line. Survey flags will be placed along the ends of the survey lines to ensure adequate coverage. Hand-held metal detectors may be used to identify metallic debris in areas overgrown with brush that cannot be visually inspected.

If any unexploded detonators are located, they will be removed or detonated in place by Laboratory emergency response personnel.

5.2 Archaeological and Biological Screenings

The concrete bowl and related structures associated with SWMU 06-003(a) and AOCs 06-008 and C-06-019 are historical structures eligible for inclusion in the National Register of Historic Places and have been identified as part of a potential Manhattan National Historic Landmark District. The former firing pits associated Consolidated Unit 07-001(a)-99 are part of an historical archaeological site from the Manhattan Project era that are eligible for inclusion in the National Register of Historic Places. Therefore, a compliance consultation on with the State Historic Preservation Office will be required before sampling activities begin at these sites to ensure the proposed investigation activities will not have adverse effects on the historical structures at these sites.

SWMU 22-010(a) is located within a jurisdictional wetland, and SWMUs 22-015(a) 22-015(b) are located in close proximity to a jurisdictional wetland; therefore, excavation activities will require a wetland assessment and implementation of wetland protection measures before sampling and/or remediation activities begin. SWMUs 22-010(a), 22-015(a), 22-015(b), 40-001(b), and 40-005, and AOC 40-007(e) are located in close proximity to a Mexican spotted owl core habitat. Heavy equipment operations (including the operation of drill rigs and back hoes) will be restricted at these sites between March 1 and May 15 of any given year unless a biological assessment is completed before field work begins. A biological assessment to determine the presence of Mexican spotted owls will take 6 mo to complete.

5.3 Field Screening

Because sampling is primarily being conducted to finalize nature and extent based on previous investigations, field screening will be conducted mainly for health and safety purposes. However, if elevated field-screening levels are observed for the deepest sample collected from a specific sampling location, sample collection will continue until field-screening results show no elevated readings. The Laboratory's proposed field-screening approach will be to (1) visually examine all samples for evidence of contamination, (2) screen for VOCs, and (3) screen for radioactivity. As appropriate at certain sites, screening may also be performed for metals and HE. The field-screening methods are discussed below.

5.3.1 VOCs

Based on the previous RFI results, significant VOC contamination is not expected to be encountered, and VOC screening will be conducted primarily for health and safety purposes.

Screening will be conducted using a PID capable of measuring quantities as low as 1 ppm. Vapor screening of soil, sediment, and subsurface core for VOCs will be conducted using a PID equipped with an 11.7 electron volt lamp. All samples will be screened for VOCs 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 EP-ERSS-SOP-5181, Notebook Documentation for Waste and Environmental Services Technical Field Activities.

5.3.2 Radioactivity

Field screening for radioactivity will be conducted primarily for health and safety purposes. Radiological screening will target gross-alpha, -beta, and -gamma radiation. Field screening for alpha, beta, and gamma radiation will be conducted within 6 in. from the core material and will be performed using appropriate field instruments calibrated in accordance with the Laboratory's Health Physics Operations Group procedures. All instrument calibration activities will be documented daily in the field logbooks in accordance with EP-ERSS-SOP-5181, Notebook Documentation for Waste and Environmental Services Technical Field Activities.

5.3.3 Metals Field Screening (XRF)

A field-portable XRF instrument will be used to field screen for a few specific metals (e.g., barium, copper, and lead) previously detected at sites and typically associated with firing-site activities in accordance with the manufacturer's instructions. An elevated detection for XRF analysis is defined as an instrument reading that exceeds 2 times the BV of the sample matrix. The XRF field-screening results will be recorded on the field boring or test pit logs, as well as in SCLs. The instrument will be operated in accordance with the manufacturer's instructions, including collecting and preparing samples and analyzing standard samples. XRF-screening surveys will be performed as described in the proposed activities in section 4.0 of this work plan.

5.3.4 HE Screening

EnSys RDX and TNT colorometric test kits will be used to field screen soil samples quantitatively for RDX, TNT, and related compounds. The RDX test kits utilize EPA Method 8510 and have an assay range of 1 mg/kg to 30 mg/kg total RDX. The TNT test kits use EPA Method 8515 and have an assay range of 1 mg/kg to 30 mg/kg total TNT. All assays will be conducted following the manufacturer's instructions, including equipment calibration, equipment use, sample dilution, and reagent storage. An elevated result is defined as 2 times the estimated quantitation limit (approximately 2 mg/kg). Field-screening results will be recorded on the field boring or test pit logs, as well as on SCLs.

5.4 Sample Collection

5.4.1 Surface Samples

Samples will be placed in appropriate containers in accordance with EP-ERSS-SOP-5056, Sample Container and Preservation. Quality assurance/quality control (QA/QC) samples will include field duplicate samples, equipment/rinsate blanks, and trip blanks. These samples will be collected following the current version of EP-ERSS-SOP 5059, Field Quality Control Samples, and will comply with a frequency of 10% of total samples collected for field duplicates and rinsate blanks. Trip blanks will be supplied and remain with analytical samples when samples are collected for VOC analysis. QA/QC samples are used to monitor the validity of the sample collection procedures.

Surface and shallow subsurface soil and sediment samples will be collected in accordance with SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples. Stainless-steel shovels, spades, scoops, and bowls will be used for ease of decontamination. Decontamination will be completed

using a dry decontamination method with disposable paper towels and an over-the-counter cleaner, such as Fantastik or an equivalent. If the surface location is at bedrock, an axe or hammer and chisel will be used to collect samples.

5.4.2 Subsurface Samples

Subsurface samples will be collected using hand- or hollow-stem auger or direct-push methods, depending on the depth of the samples and the material being sampled. A brief description of these methods is provided below.

5.4.2.1 Hand Auger

Hand augers may be used to bore shallow holes (e.g., 0 to 10 ft). The hand auger is advanced by turning or pounding the auger into the soil until the barrel is filled. The auger is removed and the sample is dumped out into a clean bowl. Hand-auger samples will be collected in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler.

5.4.2.2 Direct Push

Direct push is a subsurface sampling method that pushes a tool string into the ground using the weight of a truck in combination with a hydraulic ram or hammer. Various tool strings can be used to collect discrete samples, continuous samples, both discrete and continuous samples, and groundwater samples. The direct-push core samples collected in this investigation will be continuous. The inside of the continuous sampler is exposed to the subsurface environment as it is advanced to the sampling interval. This is a dual-tube sampler, so named because it uses two sets of rods to collect soil cores. The outer rods receive the driving force from the hydraulic pushing method and provide a sealed hole from which soil samples may be recovered without the threat of cross-contamination or cave-in. The inner set of rods is placed within the outer rods and holds a sampler in place as the outer rods are driven to the sample interval. The inner rods are then retracted to retrieve the soil core. The direct-push methods will follow the American Society of Testing and Materials D18 Subcommittee on Direct Push Sampling (D18.21.01) (ASTM 1997, 057511).

5.4.2.3 Hollow-Stem Auger

Hollow-stem augers will be used to collect subsurface samples where hand-augering is impractical because of the depth or the material being sampled. 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 the auger 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.

During sampling, the auger will be advanced to just above the desired sampling interval. The sample will then be collected by driving a split-spoon sampler into undisturbed soil/tuff to the desired depth in accordance with SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials. All borehole cuttings will be managed as IDW, as described in Appendix B of this work plan.

Field documentation will include detailed borehole logs for each borehole drilled. The borehole logs will document the matrix material in detail and will include the results of all field screening; fractures and matrix samples will be assigned unique identifiers. All field documentation will be completed in

accordance with the current version of SOP-12.01, Field Logging, Handling, and Documentation of Borehole Materials.

Borehole Abandonment

All hollow-stem auger boreholes will be abandoned in accordance with EP-ERSS-SOP-5034, Monitor Well and RFI Borehole Abandonment, by one of the following methods.

- Shallow boreholes, with a total depth of 20 ft or less, will be abandoned by filling the borehole with bentonite chips and then hydrating the chips in 1- to 2 ft lifts. The borehole will be visually inspected as the bentonite chips are being added to ensure bridging does not occur.
- Boreholes greater than 20 ft in depth 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 respect to volumes (calculated and actual), intervals of placement, and additives used to enhance backfilling. All borehole abandonment information will be presented in the investigation report.

5.4.3 Sediment Samples

Sediment samples will be collected using SOP-06.09, Spade and Scoop Method for Collection of Soil 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. The locations will be selected based on geomorphic relationships in areas likely to have been affected by discharges from Laboratory operations. Preliminary sediment sampling locations have been selected and are shown in section 4 figures. As sediment systems are dynamic and subject to redistribution by runoff events, however, some locations may need to be adjusted when this work plan is implemented. In the course of collecting sediment samples, it may be determined that the selected location is not appropriate because of conditions observed during excavation of the sediment (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 may be adjusted as appropriate. Any changes to sediment sampling locations will be documented as deviations from this work plan in the investigation report.

5.4.4 Test Pit and/or Trench Samples

Excavations or test pits will be completed using a track excavator or backhoe to locate inactive landfills and septic tanks. Excavated soil will be staged a minimum of 3 ft from the edge of the excavation, and excavations deeper than 4 ft bgs will be appropriately benched to allow access and egress, if necessary. Confirmation samples will be collected from the walls and bottom of the excavation using SOP-06.09, Spade and Scoop Method for Collection of Soil Samples. After field screening, confirmation sampling, and any necessary overexcavation work are completed, the test pits and/or trenches will be backfilled. The soil removed from the excavation will be returned to the excavation provided sampling shows it is not hazardous waste and residential SSLs are not exceeded. Otherwise, the excavations will be backfilled with clean fill material.

5.5 Laboratory Methods

The analytical suites vary by site as specified in section 4 and are summarized in Table 4.0-1. All analytical suites are presented in the statement of work for analytical laboratories (LANL 2000, 071233). The specific analytical methods to be used are specified in Table 4.0-1. Sample collection and analysis will be coordinated with the Laboratory's Sample Management Office.

5.6 Health and Safety

The field investigations described in this 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 performed.

5.7 Equipment Decontamination

Equipment for drilling and sampling will be decontaminated before and after drilling and sampling activities (as well as between drilling boreholes) to minimize the potential for cross-contamination. Dry decontamination methods are preferred and will be given priority because they do not generate liquid wastes. Residual material adhering to the equipment will be removed using dry decontamination methods, including wire-brushing and scraping, as described in EP-ERSS-SOP-5061, Field Decontamination of Equipment. Dry decontamination of sampling equipment may include use of a nonphosphate detergent such as Fantastik on a paper towel, and the equipment is wiped so no liquid waste is generated.

If dry decontamination methods are not effective, the equipment may be decontaminated by steam-cleaning or hot water pressure-washing, as described in EP-ERSS-SOP-5061. Wet decontamination methods will be conducted 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.

5.8 IDW

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

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

5.9 Cleanup Activities

SWMUs 06-001(a), 06-001(b), 22-010(a), 22-015(b), and 40-001(b) 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. The general sequence of activities for waste excavation, transportation, disposal, and confirmation sampling is summarized below.

5.9.1 Removal of Surficial and Buried Waste, Inactive Units, Contaminated Soil and Sediment

The general sequence of waste-removal activities as appropriate 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 waste. First, the original waste limit coordinates will be surveyed and staked, as determined in the RFI report and reported in the HIR (LANL 2010, 108330). Next, excavation and potholing with visual examination and screening using methods described in section 5.1 will be conducted to establish or to confirm waste boundaries only where the original boundaries are inadequately defined to implement cleanup.
    - ❖ Identify underground utilities
    - ❖ Mobilize heavy equipment to site
- Site preparation
    - ❖ Install fencing
    - ❖ Install stormwater controls
    - ❖ Abandon/relocate utilities, if necessary
    - ❖ Conduct preexcavation survey
- Removal of waste
    - ❖ Excavate waste
    - ❖ Stockpile and load rolloff container
    - ❖ Characterize waste for dispositioning
    - ❖ Transport waste to off-site disposal facility
    - ❖ Survey boundaries of excavation
    - ❖ Conduct confirmation sampling
    - ❖ Establish subgrade and conduct survey
- Backfill
    - ❖ Backfill and compact
    - ❖ Vegetate surface
    - ❖ Survey finished surface

- Demobilize

5.9.2 Waste Management and Disposal

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

5.9.3 Transportation

All waste will be hauled in U.S Department of Transportation–approved containers directly to the approved disposal facility.

5.9.4 Confirmation Sampling

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

6.0 MONITORING PROGRAMS

Groundwater, sediment, and surface water monitoring is occurring within the Twomile Canyon Aggregate Area as part of other environmental activities. This monitoring is described briefly below.

6.1 Groundwater

The only groundwater monitoring well currently in the Twomile Canyon Aggregate Area is intermediate well 03-B-13 located near SWMU 03-010(a) (section 4.1.1). The nearest regional well is well R-46, located on Mesita del Buey in TA-63, approximately 500 ft east of the aggregate area. Other regional wells near the aggregate area are R-17, located with alluvial well PCI-2 in Pajarito Canyon below the confluence of Twomile and Pajarito Canyons, approximately 1000 ft east of the aggregate area, and R 18, located in TA-14, near Pajarito Canyon, approximately 1500 ft south of the aggregate area.

6.2 Stormwater

Monitoring of stormwater in Twomile Canyon Aggregate Area is being performed under the NPDES MSGP and FFCA/Administrative Order (AO). The MSGP and FFCA/AO are being replaced by a new NPDES individual permit (IP). Monitoring under the MSGP, FFCA/AO, and IP is performed using site-monitoring areas (SMAs) that monitor stormwater runoff from individual SWMUs and AOCs or groups of SWMUs and AOCs, and gage stations, which are used for watershed-scale monitoring in canyons and drainages. SWMUs and AOCs in the Twomile Canyon Aggregate Area subject to SMA monitoring under the MSGP, FFCA/AO, and IP are listed in Table 6.2-1, along with the corresponding SMAs. Monitoring is also conducted at gage station E243, located in Twomile Canyon above the confluence with Pajarito Canyon. The monitoring requirements for each SMA and gage are contained in a Site Drainage Pollution Prevention Plan (SDPPP) for SWMUs and AOCs and the Storm Water Monitoring Plan, which is updated annually and submitted to EPA. The SDPPP also contains the monitoring results.

7.0 SCHEDULE

The scheduled notice date for NMED to approve this investigation work plan is February 28, 2010. Preparation for field work will not proceed until the work plan is approved. To accommodate potential

delays in field work implementation associated with endangered species and historical structure requirements, the expected duration of field activities is 18 mo. The investigation report for Twomile Canyon Aggregate Area will be submitted within 6 mo of completion of field activities. Therefore, a submittal date of no later than April 30, 2012, is proposed for the 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

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Storm Drain Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Water Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Hypsography, 2, 10, 20, & 100 Foot Contour Intervals; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

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

WQH Drainage_arc; Los Alamos National Laboratory, ENV Water Quality and Hydrology Group; 1:24,000 Scale Data; 03 June 2003; Additional drainage data contained within WES GIS Team project folder 08-0030.

Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2009-0162; 13 March 2009; Proposed sampling and modified/new point feature data contained within WES GIS Team project folder 09-0109.

Individual Permit (IP) Site Monitoring Area (SMA) Samplers; Los Alamos National Laboratory, Water Stewardship Program; Currently unpublished 2009 data contained within WES GIS Team project folder 07-0142.

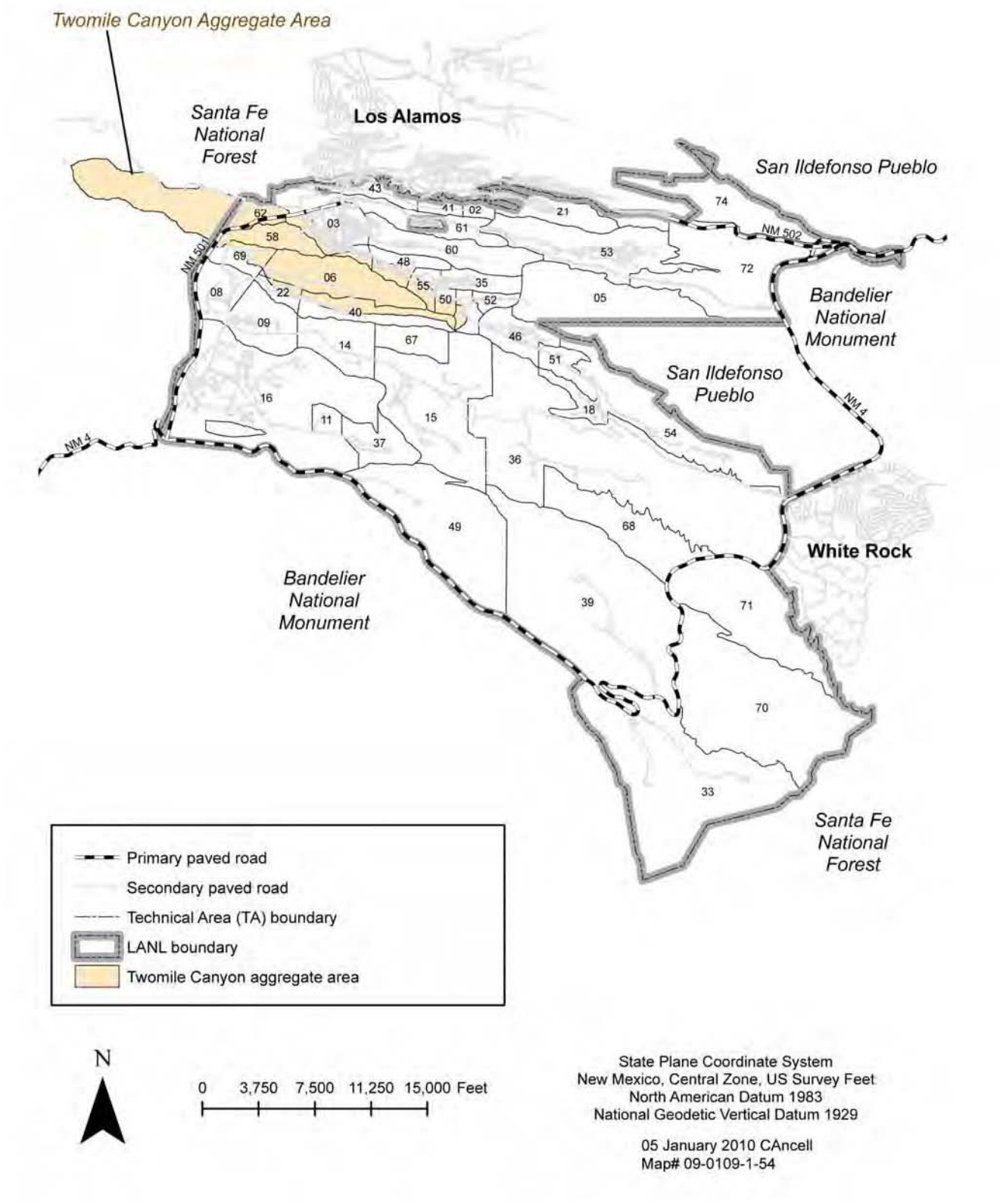


Figure 1.0-1 Twomile Canyon Aggregate Area with respect to Laboratory TAs and surrounding land holdings

<table>
<tr><td rowspan="6">Bandelier Tuff</td><td rowspan="6">Tshirege Member</td><td>Qbt 4</td><td rowspan="5">Ash-Flow Units</td></tr>
<tr><td>Qbt 3</td></tr>
<tr><td>Qbt 2</td></tr>
<tr><td>Qbt 1v</td></tr>
<tr><td>Qbt 1g</td></tr>
<tr><td colspan="2">Tsankawi Pumice Bed</td></tr>
<tr><td colspan="2">Cerro Toledo Interval</td><td colspan="2">Volcaniclastic Sediments and Ash-Falls</td></tr>
<tr><td rowspan="2">Bandelier Tuff</td><td rowspan="2">Otowi member</td><td colspan="2">Ash-Flow Units</td></tr>
<tr><td colspan="2">Guaje Pumice Bed</td></tr>
<tr><td rowspan="4">Puye Formation</td><td>Fanglomerate</td><td colspan="2">Fanglomerate Facies includes sand, gravel, conglomerate, and tuffaceous sediments</td></tr>
<tr><td>Basalt and Andesite</td><td colspan="2">Cerros del Rio Basalts intercalated within the Puye Formation, includes up to four interlayered basaltic flows. Andesites of the Tschicoma Formation present in western part of plateau</td></tr>
<tr><td>Fanglomerate</td><td colspan="2">Fanglomerate Facies includes sand, gravel, conglomerate, and tuffaceous sediments; includes “Old Alluvium”</td></tr>
<tr><td>Axial facies deposits of the ancestral Rio Grande</td><td colspan="2">Totavi Lentil</td></tr>
<tr><td rowspan="8">Santa Fe Group</td><td>Coarse Sediments</td><td colspan="2" rowspan="7">Coarse-Grained Upper Facies
(formerly called the “Chaquehui Formation” by Purtymun 1995, 045344)</td></tr>
<tr><td>Basalt</td></tr>
<tr><td>Coarse Sediments</td></tr>
<tr><td>Basalt</td></tr>
<tr><td>Coarse Sediments</td></tr>
<tr><td>Basalt</td></tr>
<tr><td>Coarse Sediments</td></tr>
<tr><td>Arkosic clastic sedimentary deposits</td><td colspan="2">Undivided Santa Fe Group
(includes Chamita[?] and Tesuque Formations)</td></tr>
</table>

Figure 3.2-1 Generalized stratigraphy of bedrock units

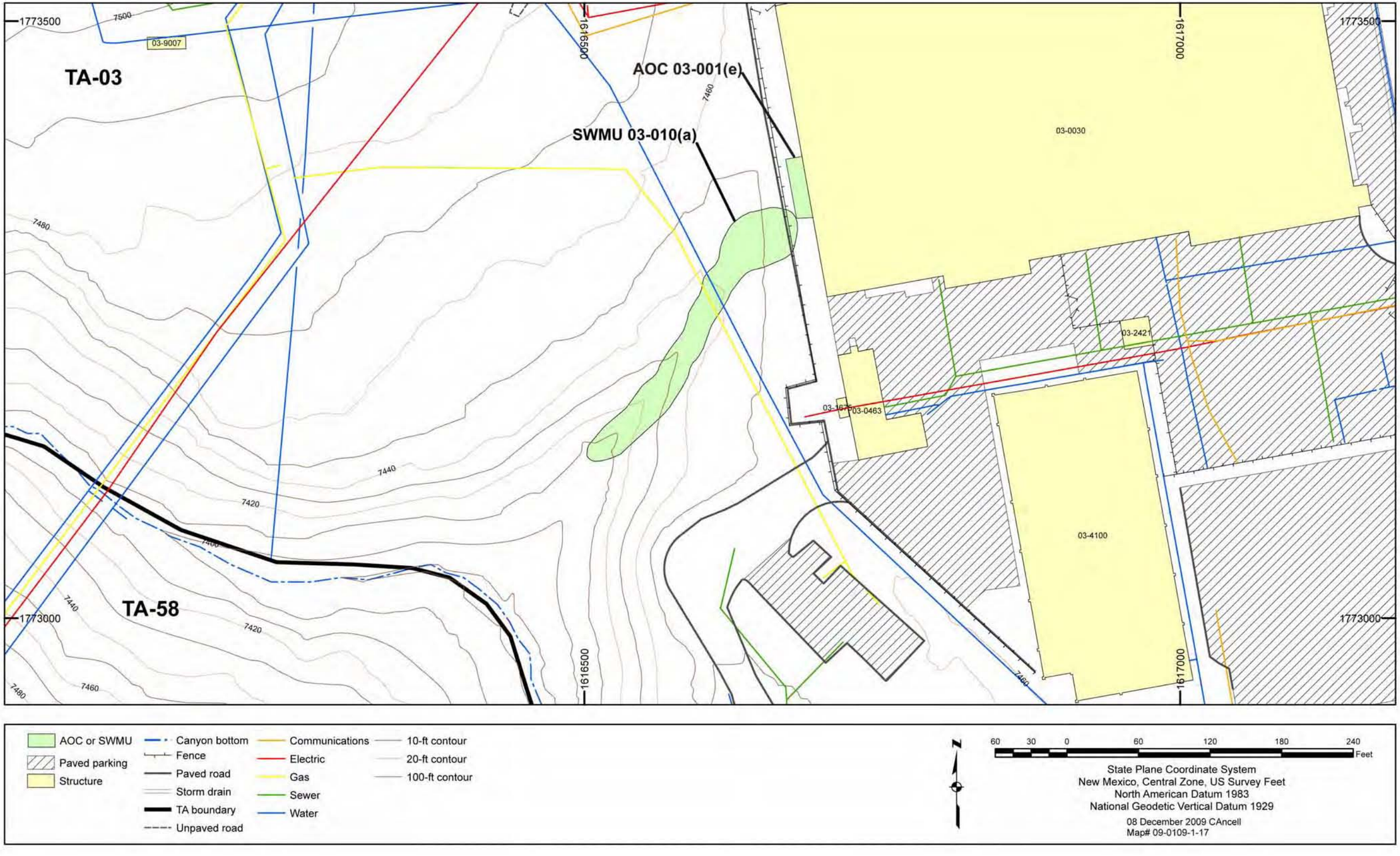


Figure 4.1-1 Site features for SWMU 03-010(a) and AOC 03-001(e)

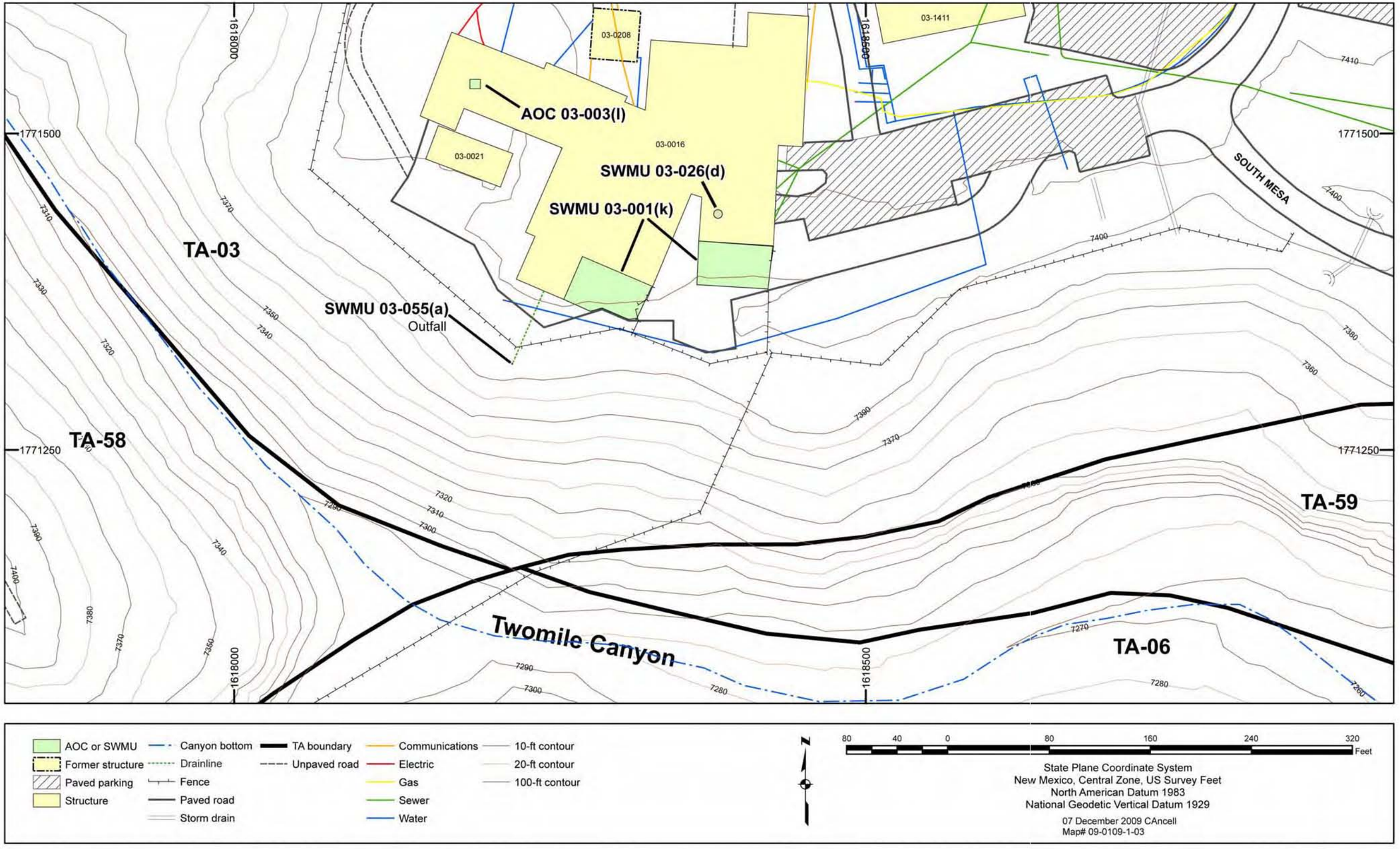


Figure 4.1-2 Site features for SWMUs 03-001(k), 03-026(d), and 03-055(a), and AOC 03-003(l)

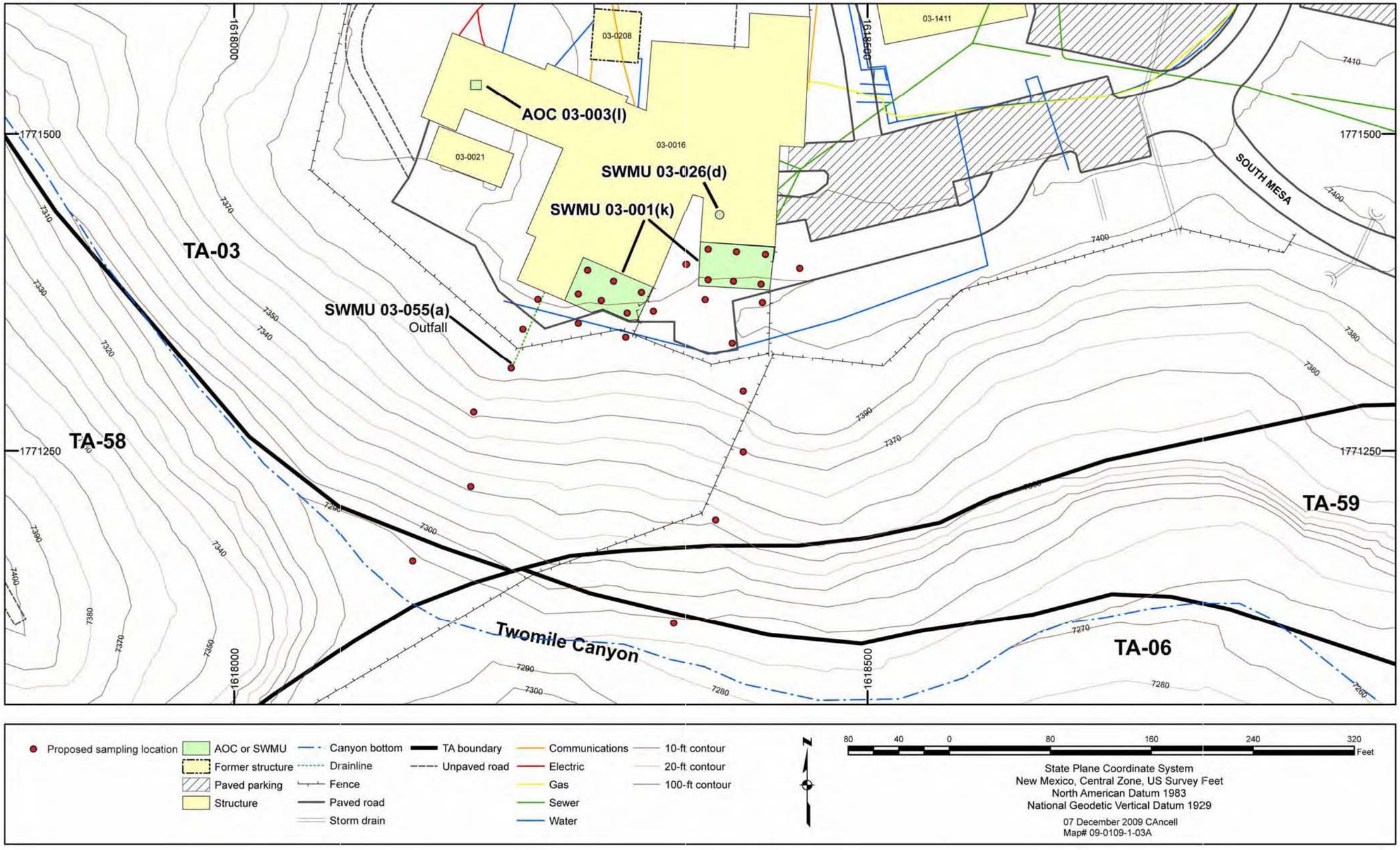


Figure 4.1-3 Proposed sampling locations at SWMU 03-001(k) and 03-055(a)

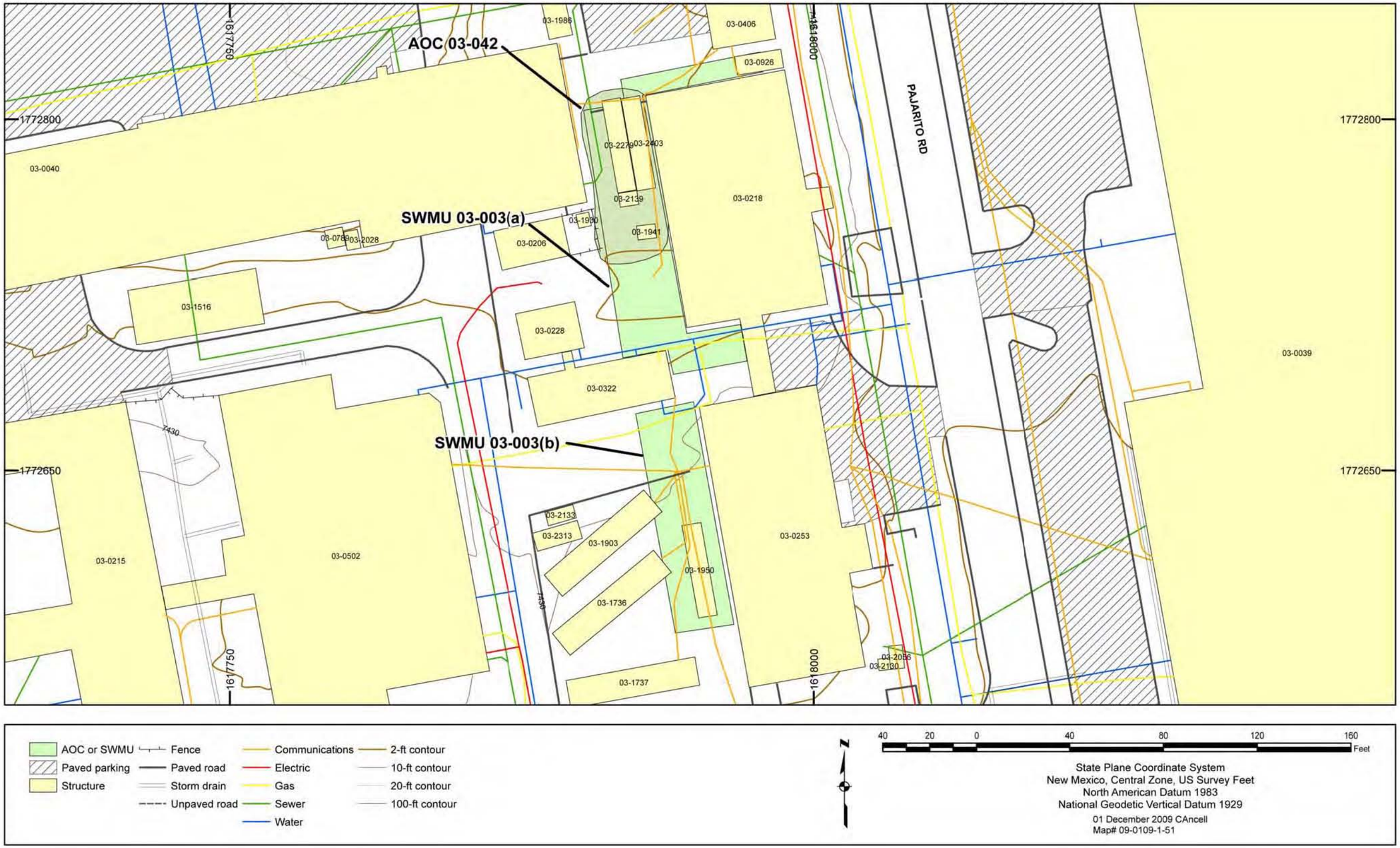


Figure 4.1-4 Site features for SWMUs 03-003(a) and 03-003(b) and AOC 03-042

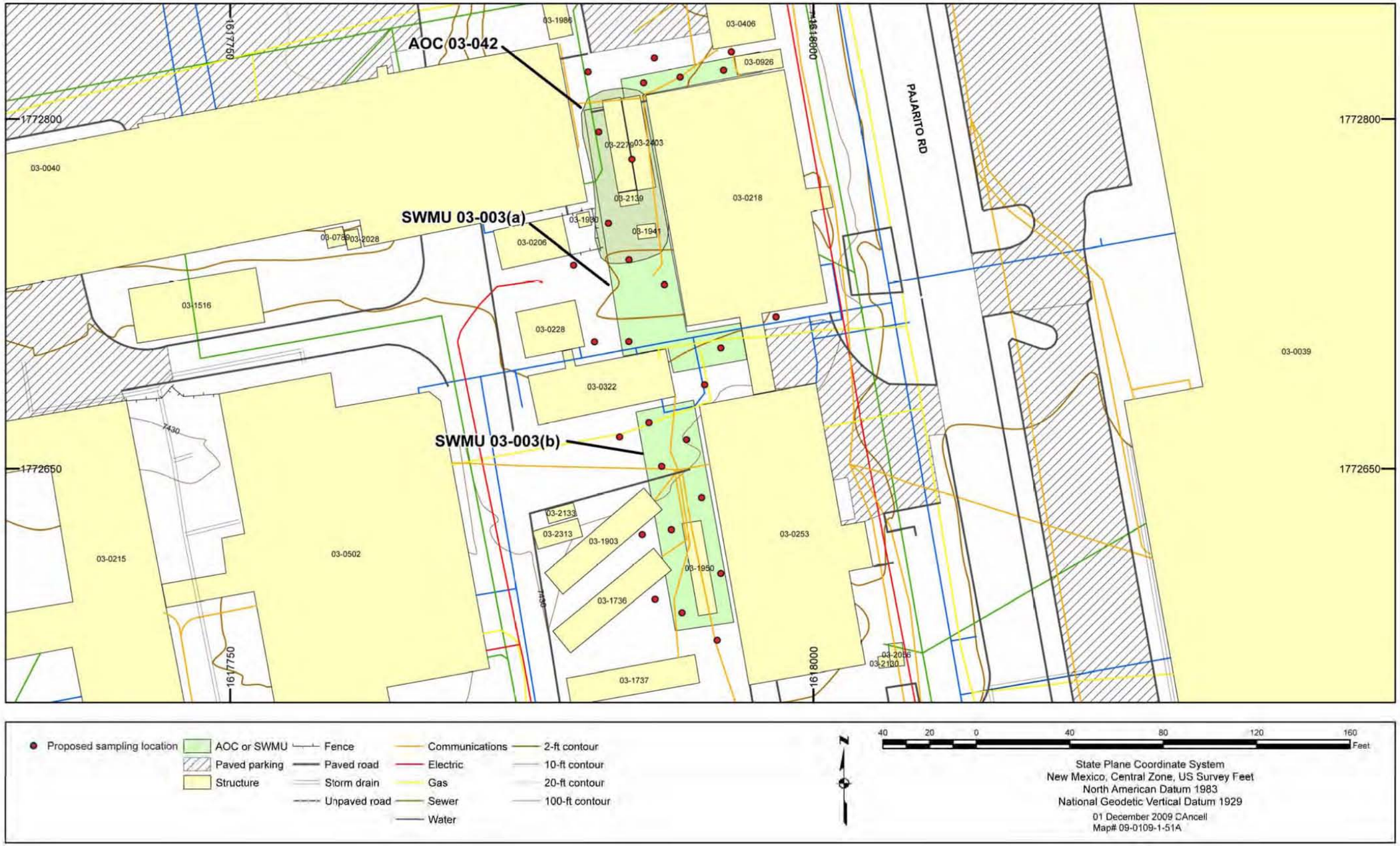


Figure 4.1-5 Proposed sampling locations at SWMUs 03-003(a) and 03-003(b) and AOC 03-042

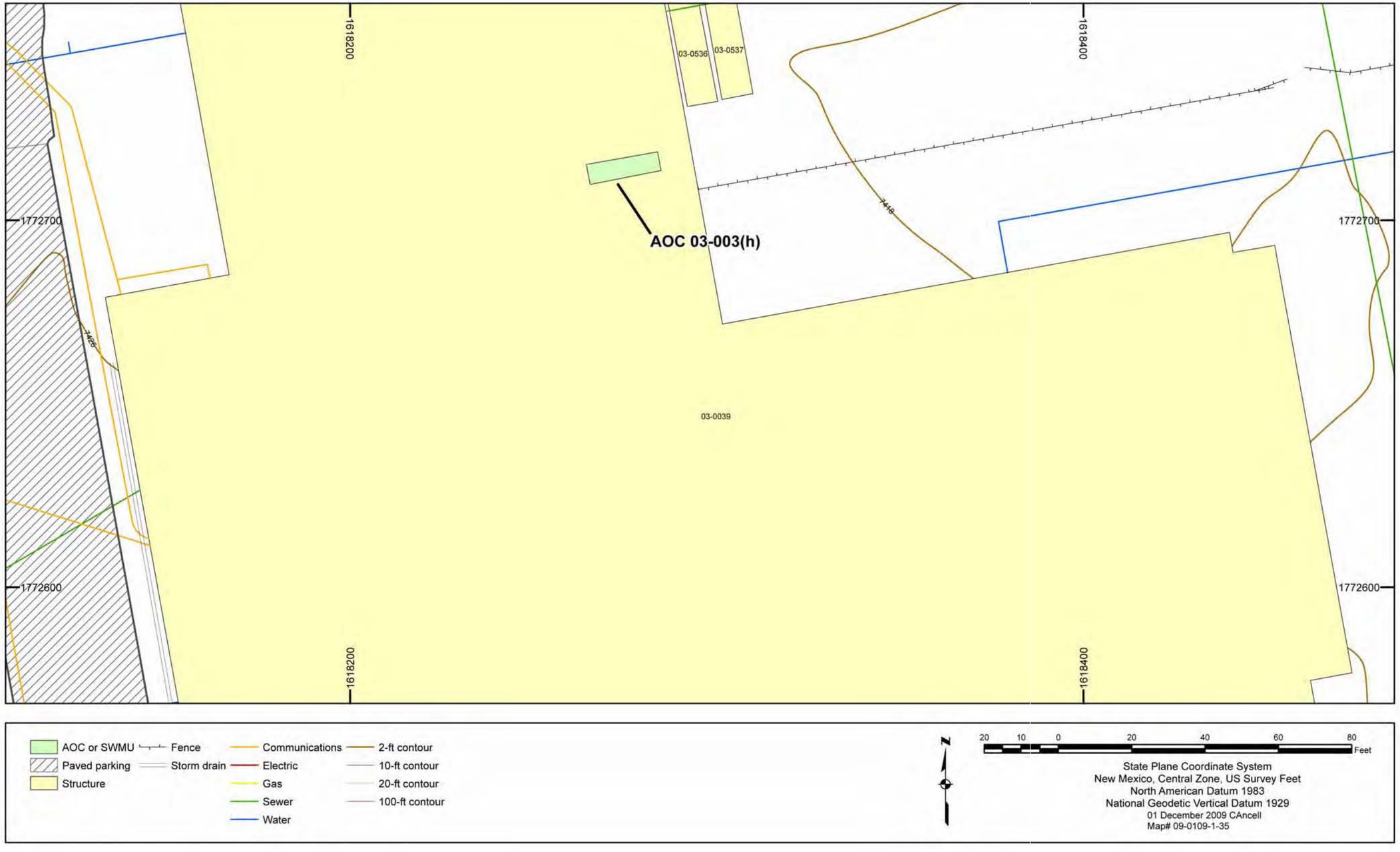


Figure 4.1-6 Site features for AOC 03-003(h)

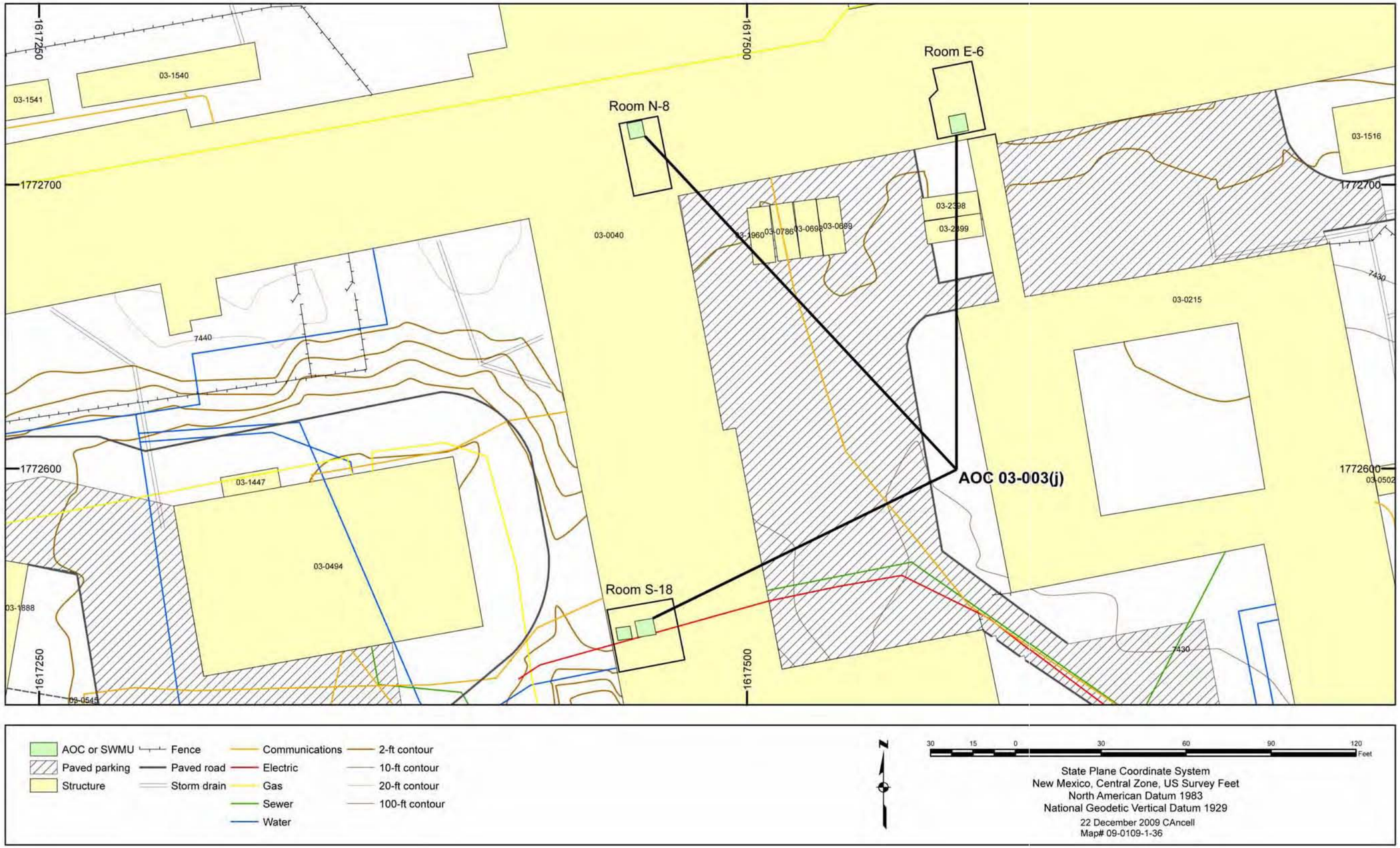


Figure 4.1-7 Site features for AOC 03-003(j)

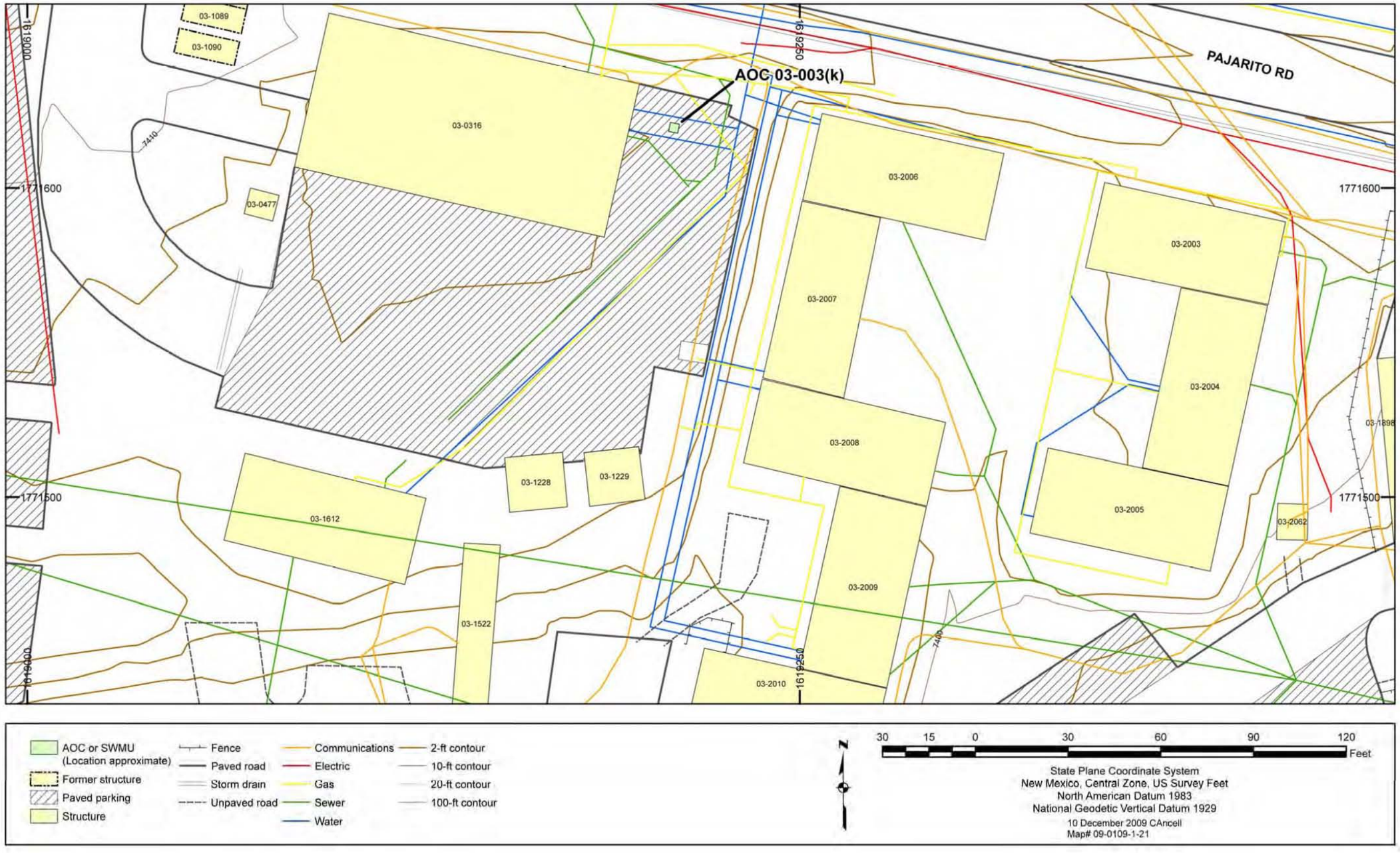


Figure 4.1-8 Site features for AOC 03-003(k)

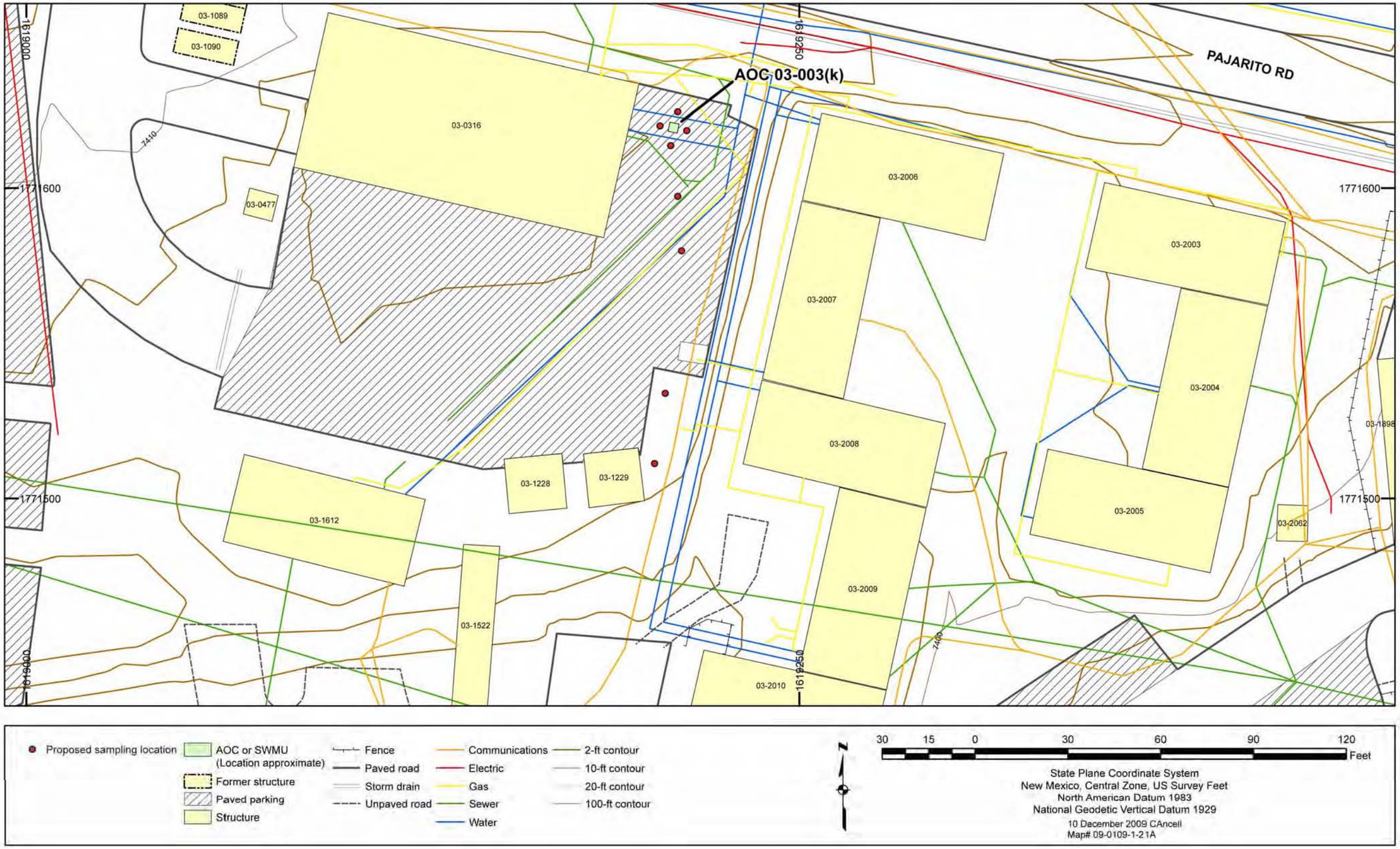


Figure 4.1-9 Proposed sampling locations at AOC 03-003(k)

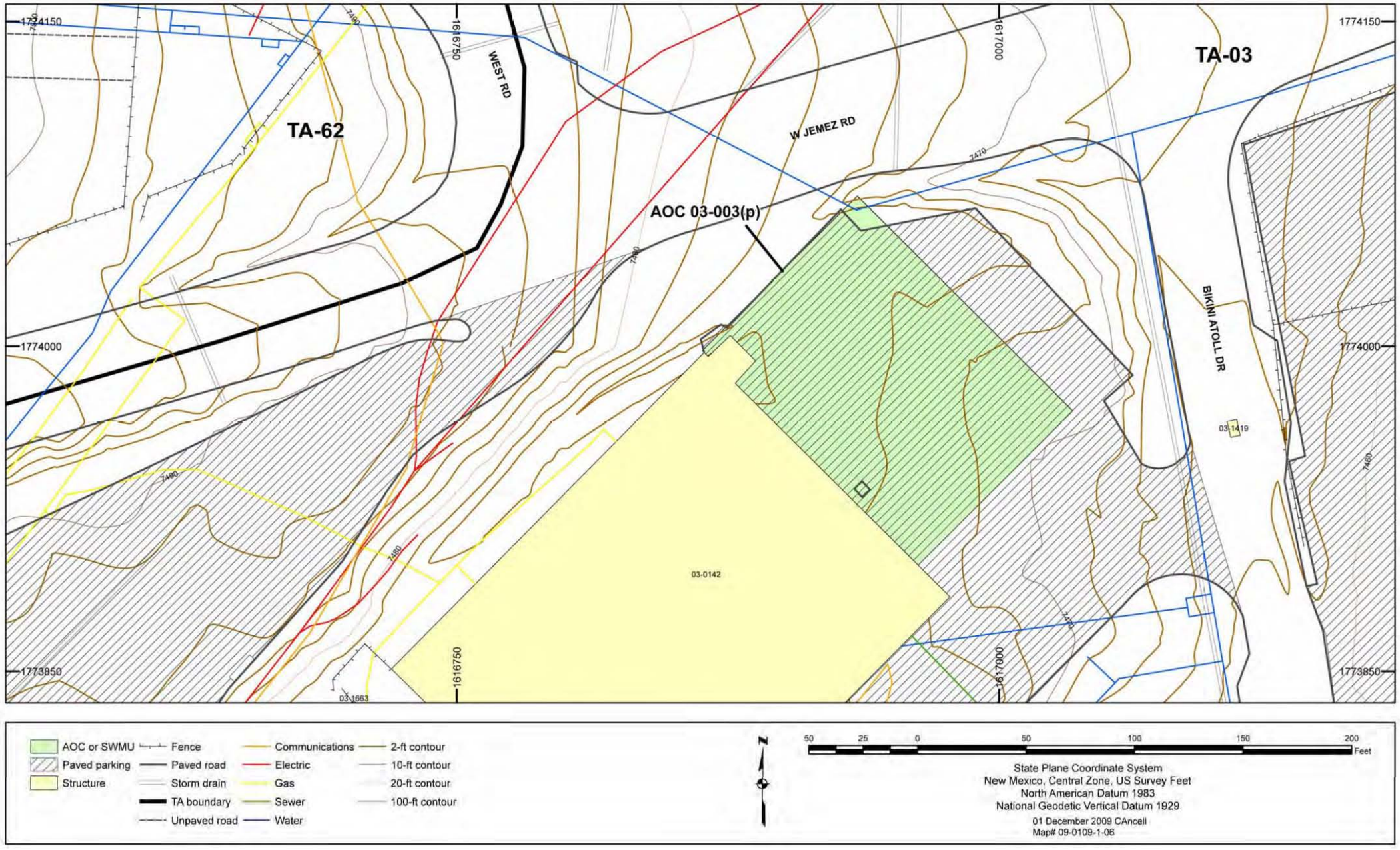


Figure 4.1-10 Site features for AOC 03-003(p)

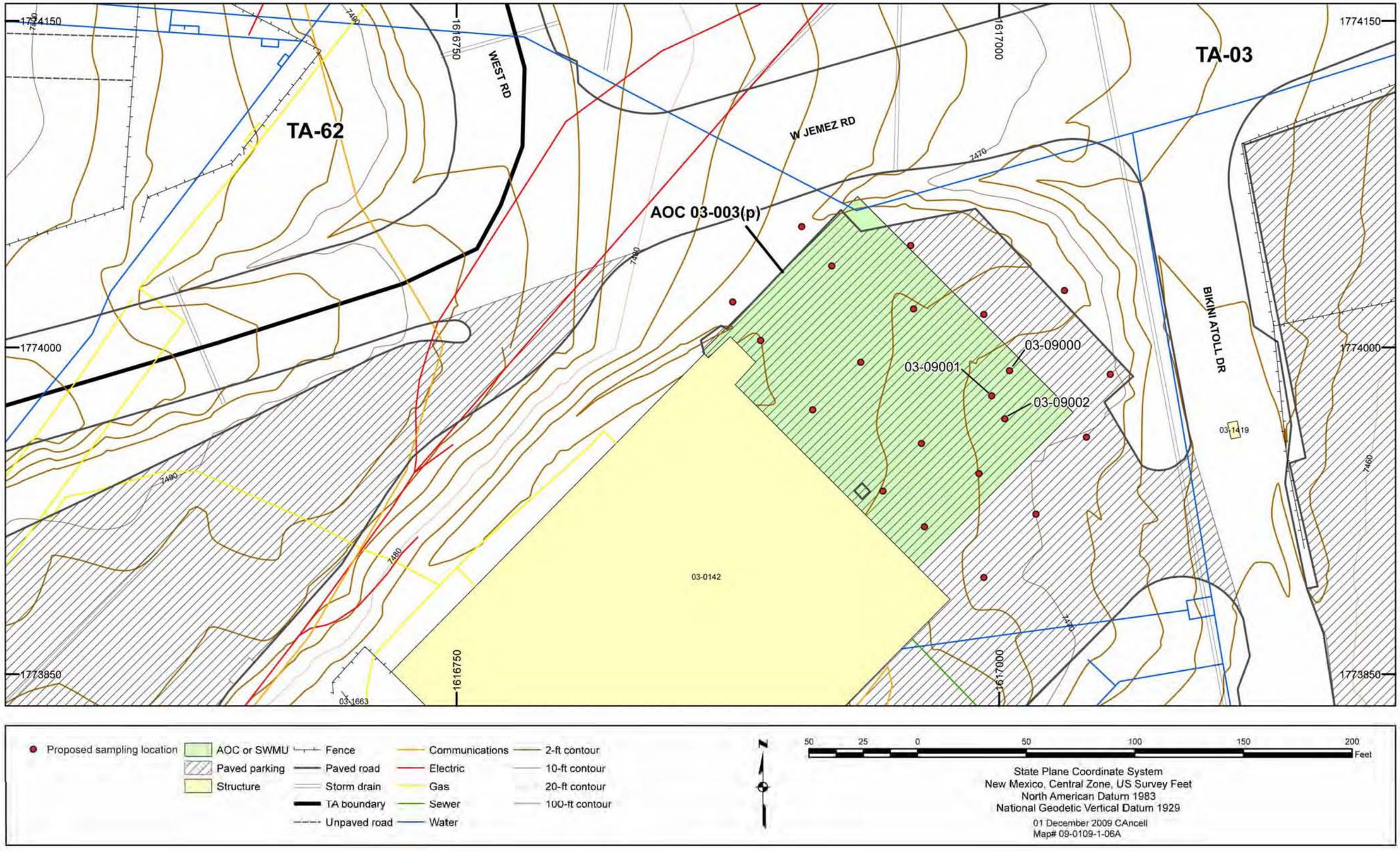


Figure 4.1-11 Proposed sampling locations at AOC 03-003(p)

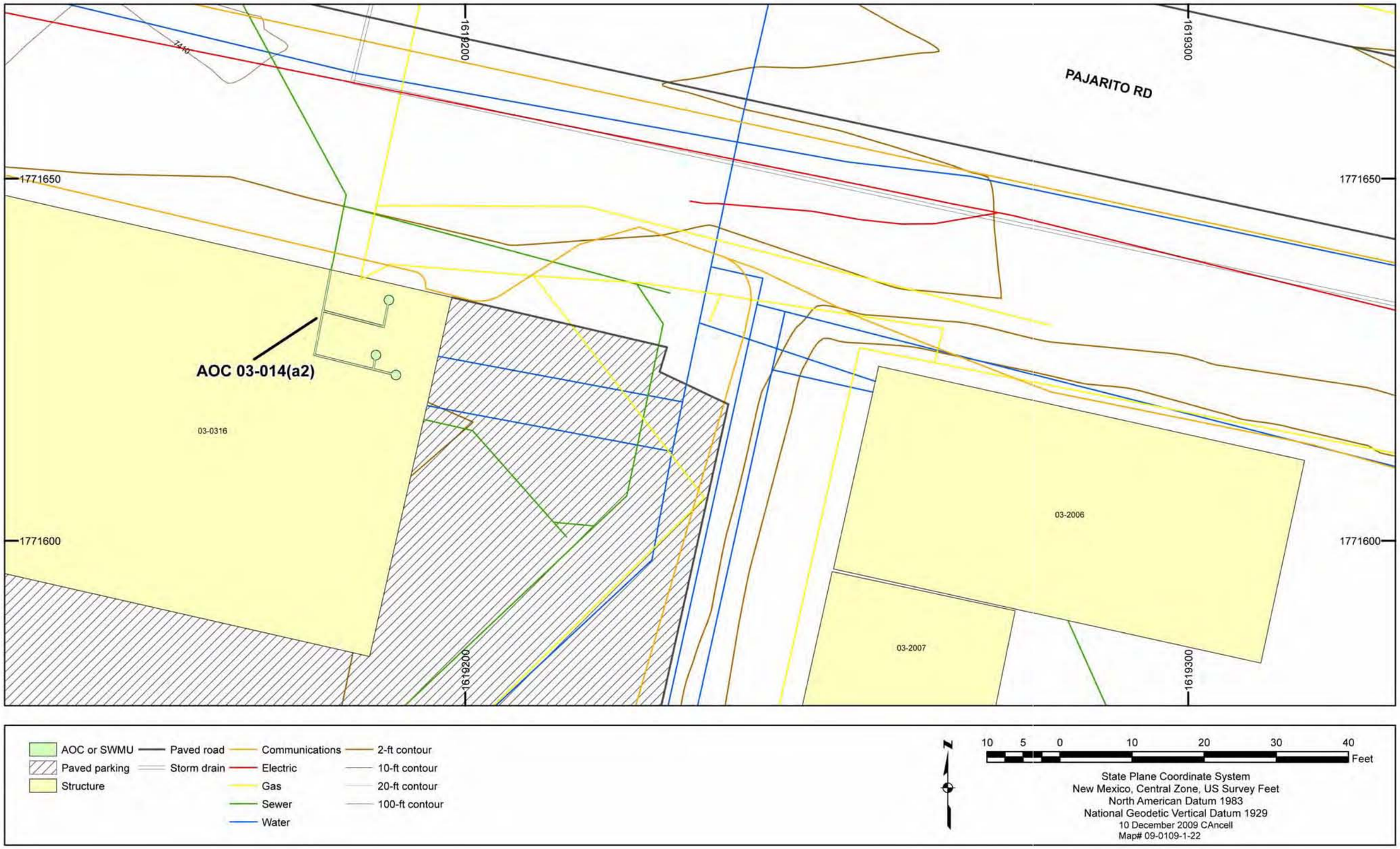


Figure 4.1-12 Site features for AOC 03-014(a2)

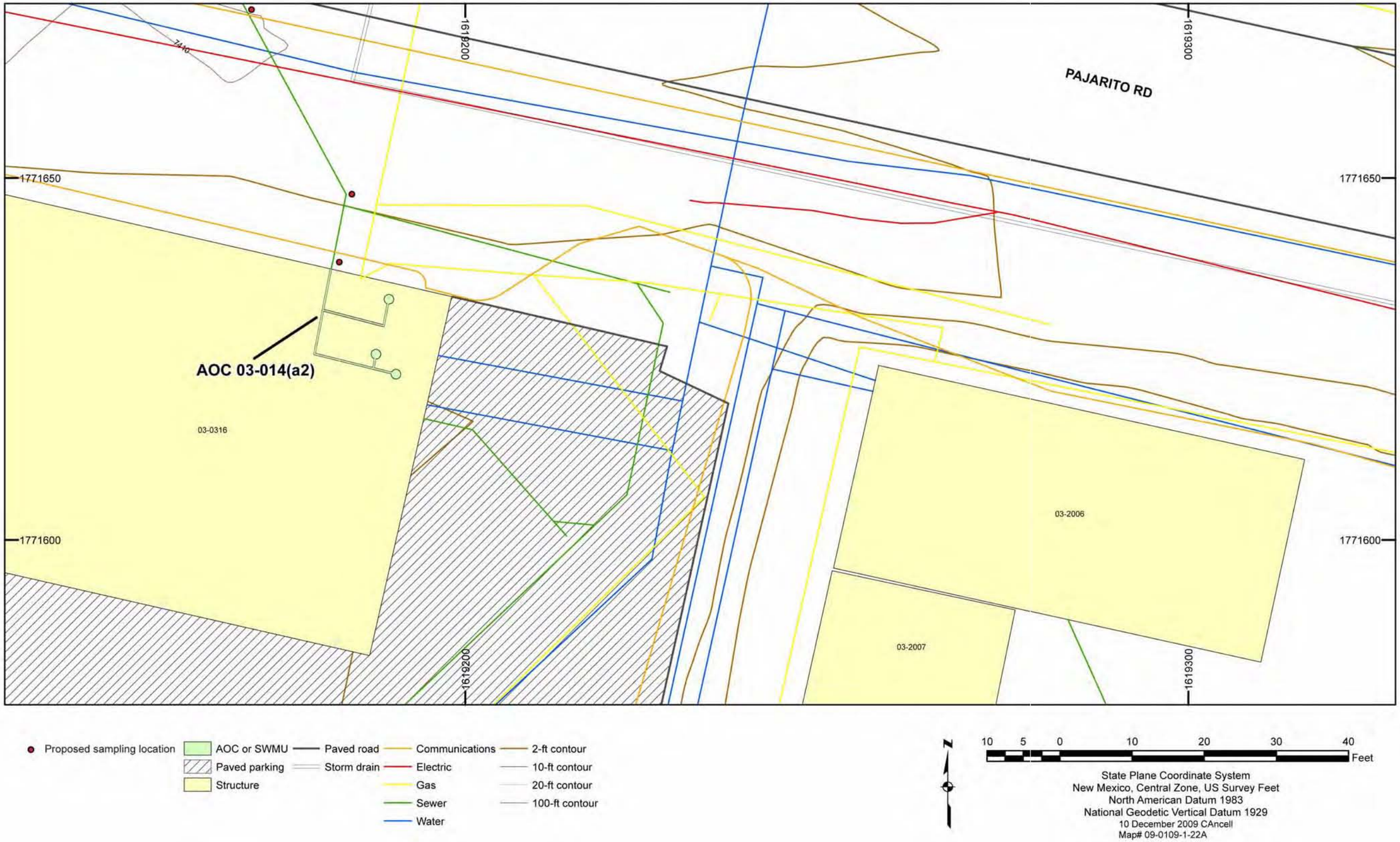


Figure 4.1-13 Proposed sampling locations at AOC 03-014(a2)

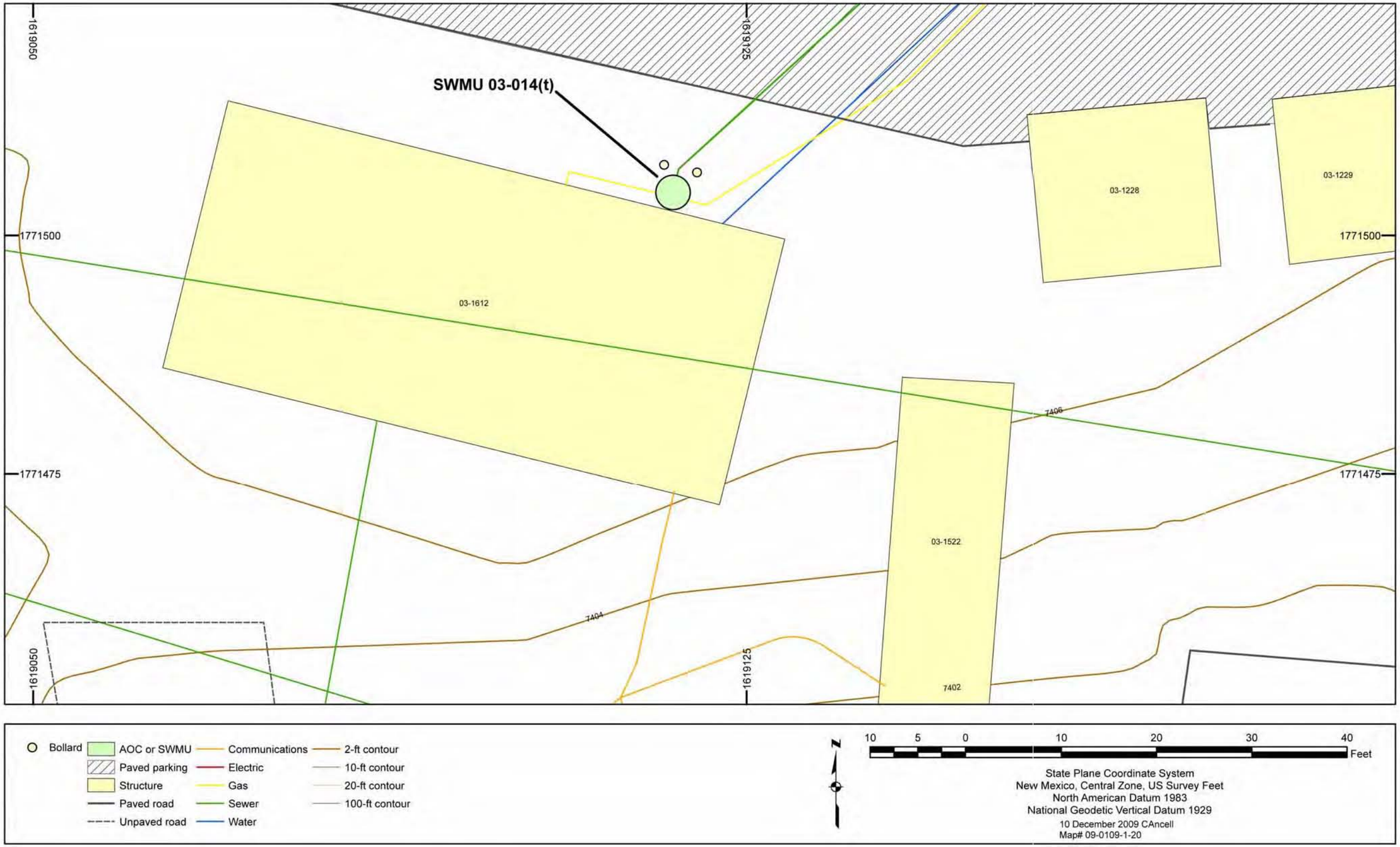


Figure 4.1-14 Site features for SWMU 03-014(t)

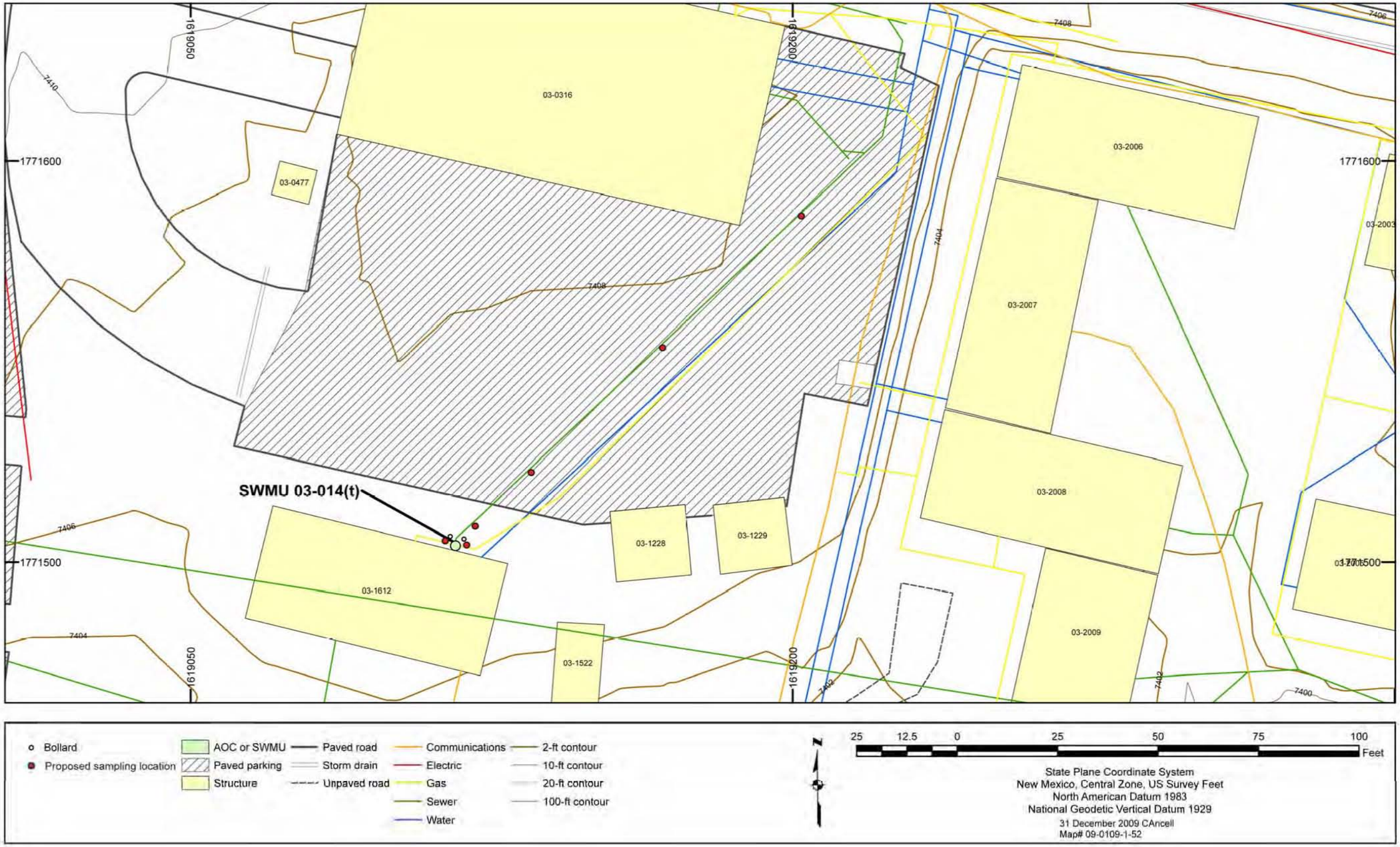


Figure 4.1-15 Proposed sampling locations at SWMU 03-014(t)

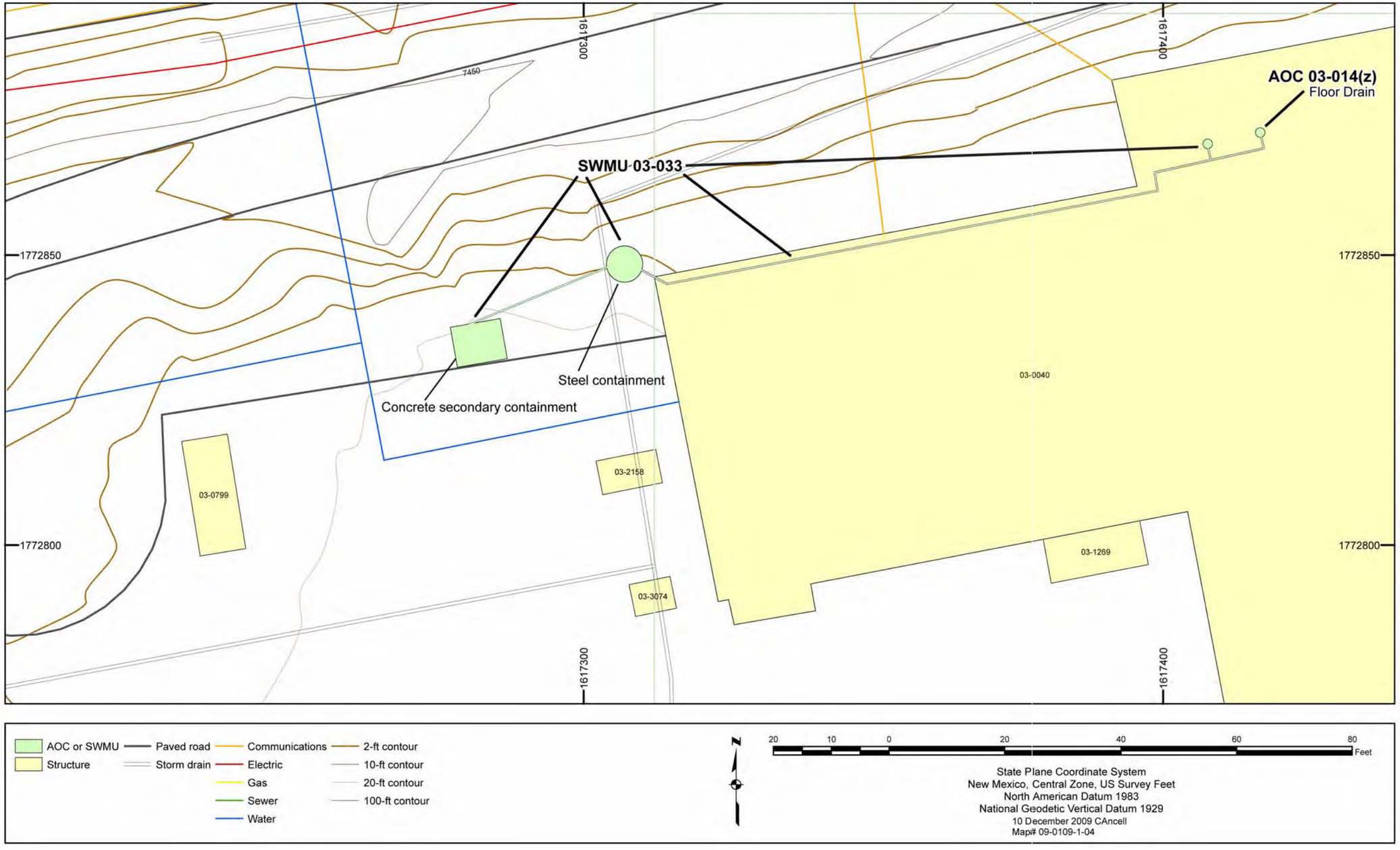


Figure 4.1-16 Site features for SWMU 03-033 and AOC 03-014(z)

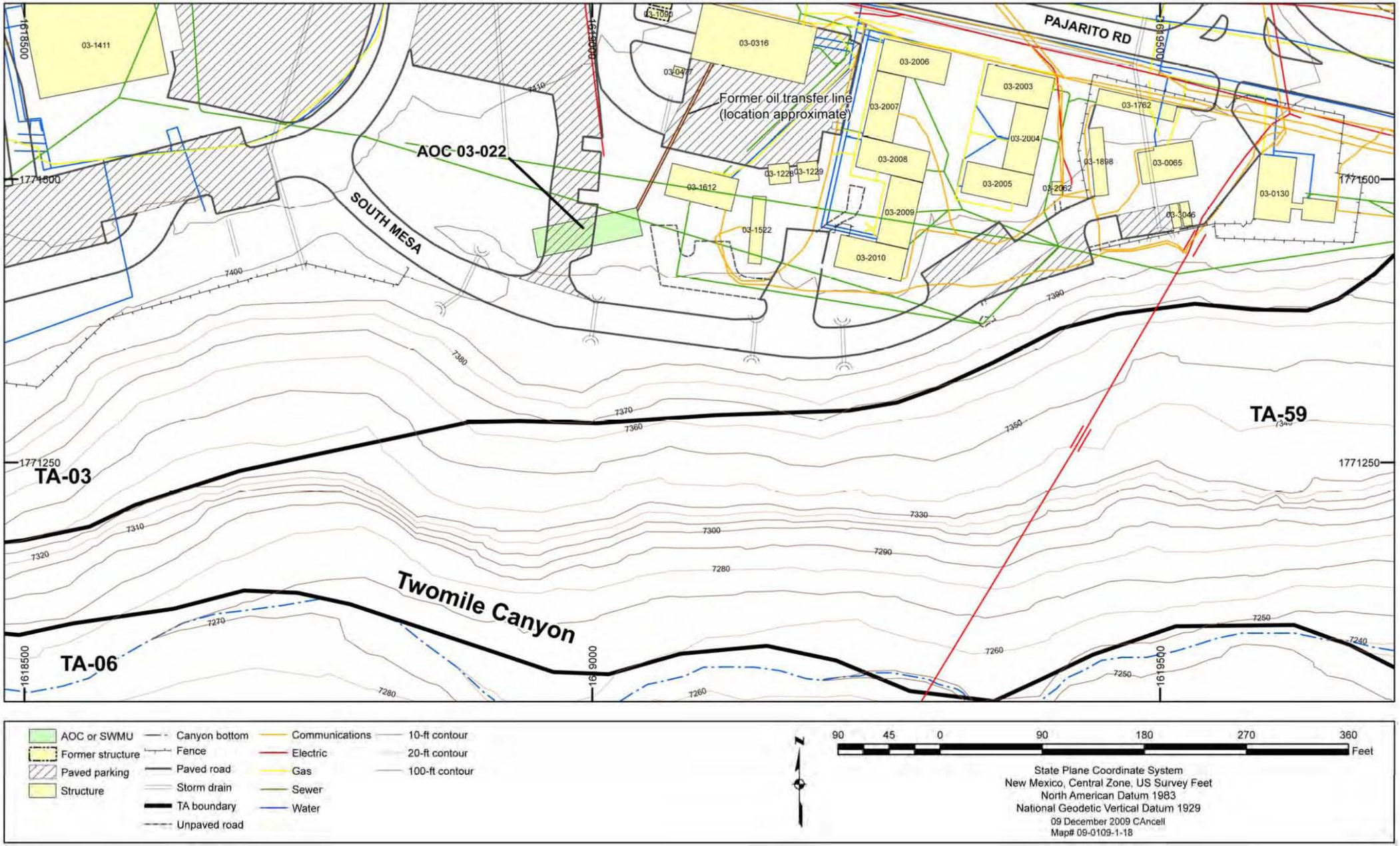


Figure 4.1-17 Site features for AOC 03-022

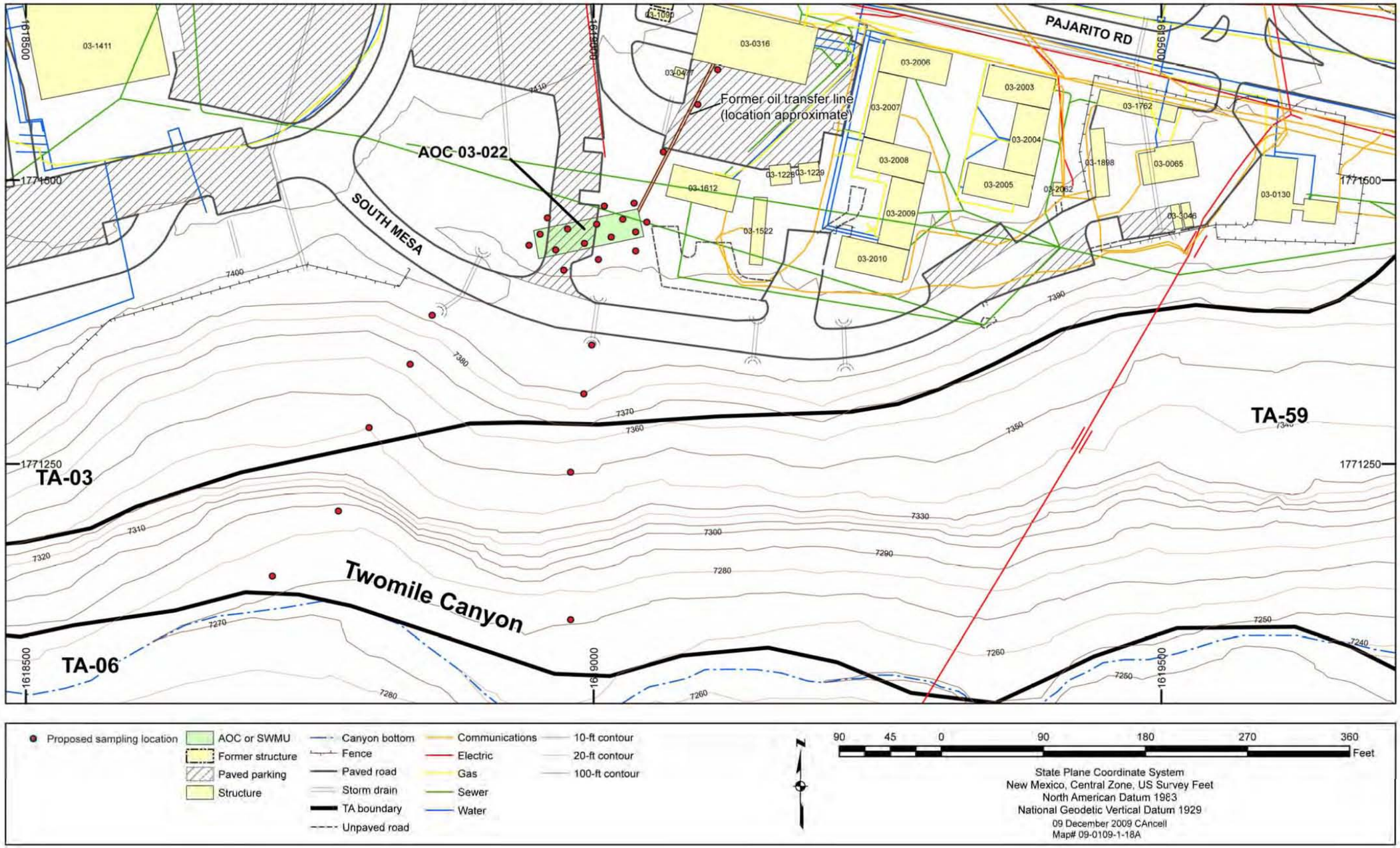


Figure 4.1-18 Proposed sampling locations at AOC 03-022

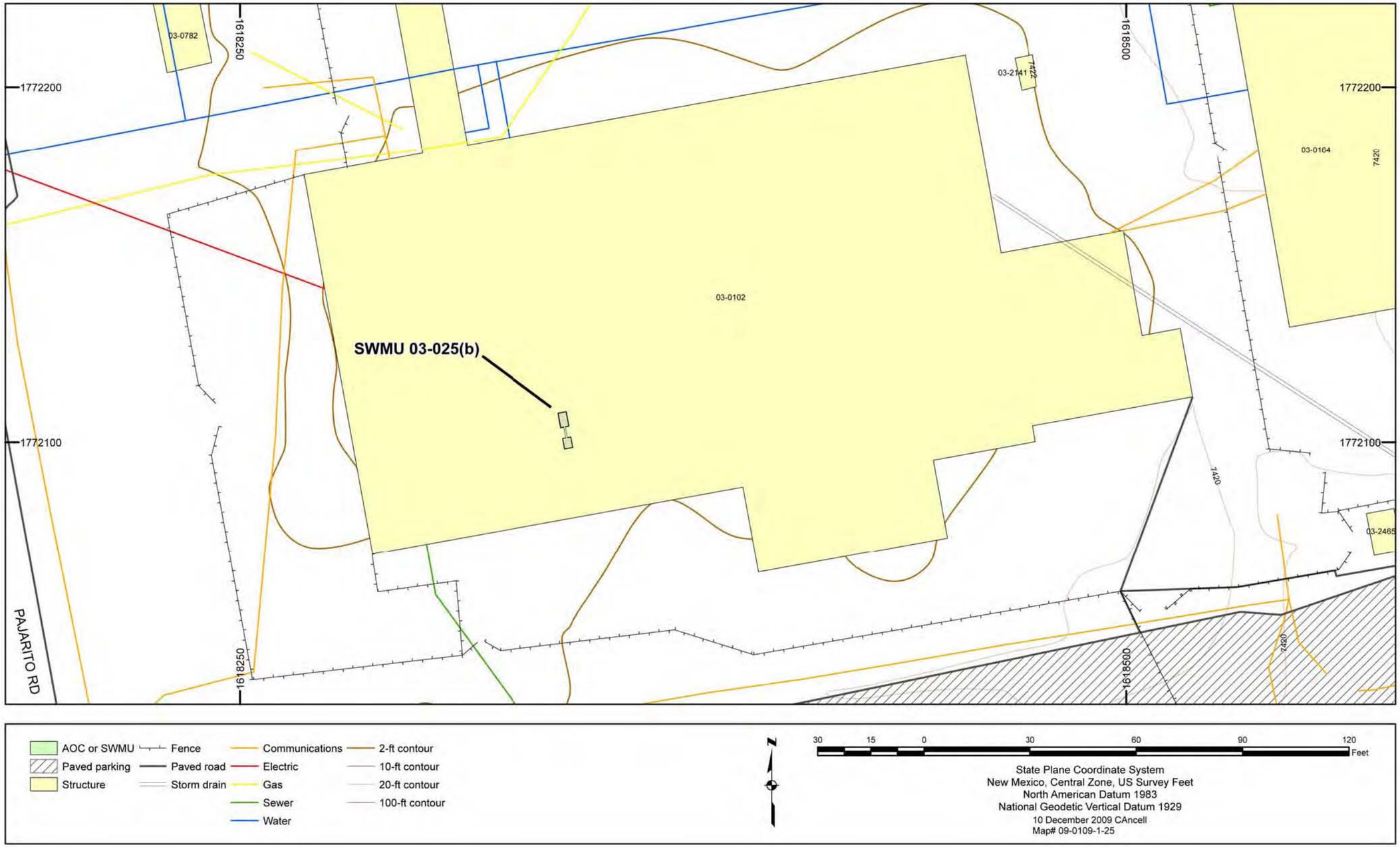


Figure 4.1-19 Site features for SWMU 03-025(b)

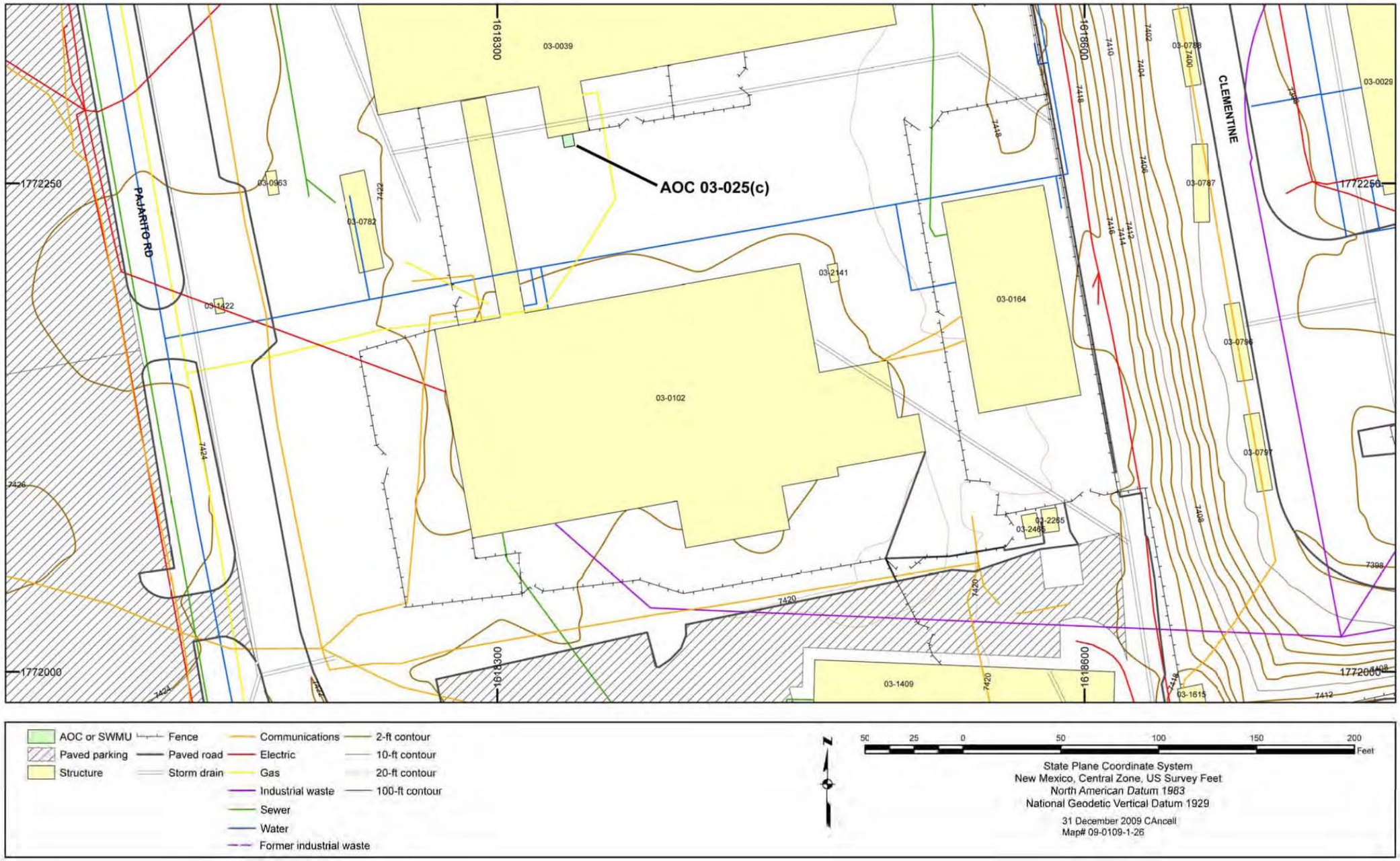


Figure 4.1-20 Site features for AOC 03-025(c)

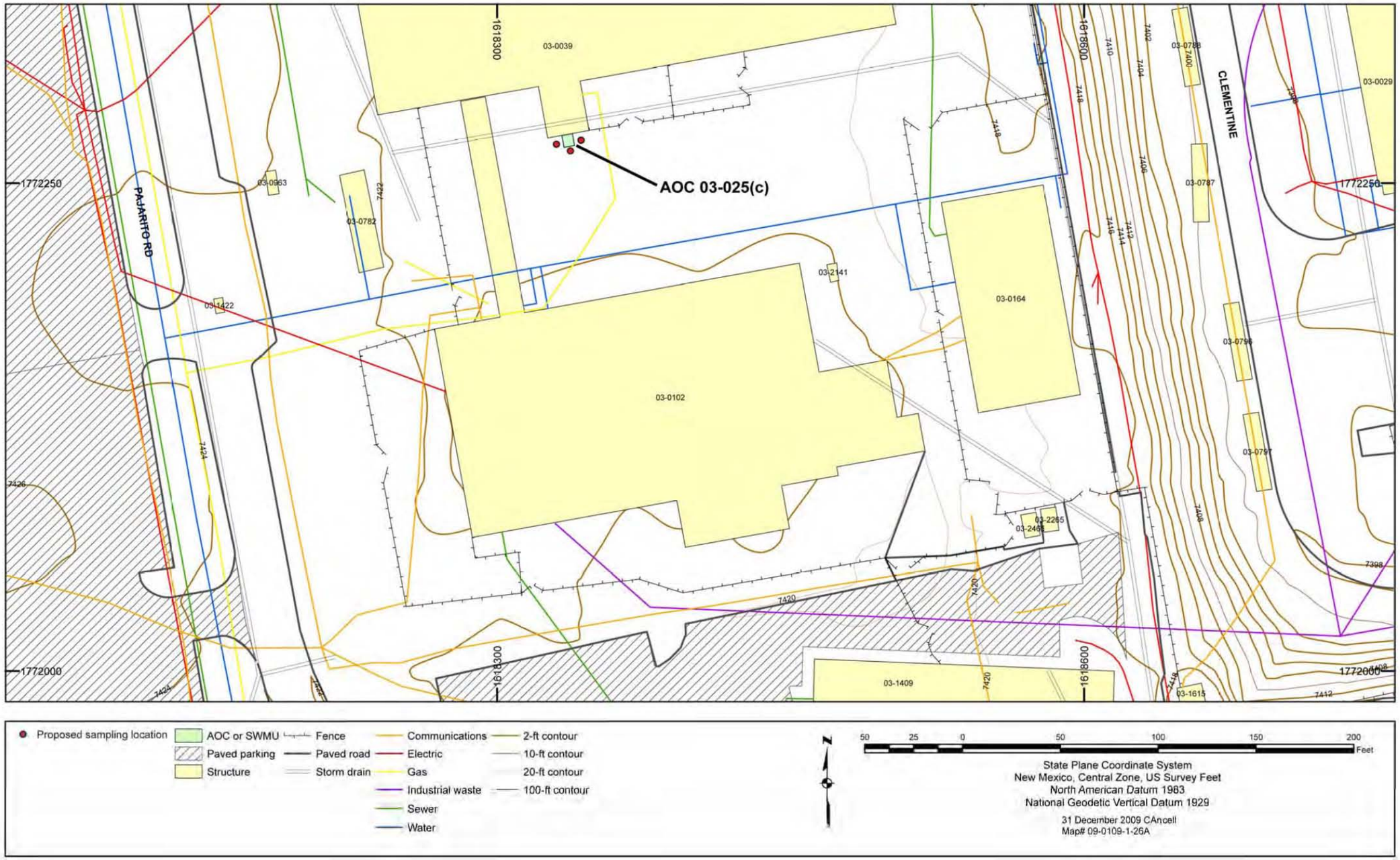


Figure 4.1-21 Proposed sampling locations at AOC 03-025(c)

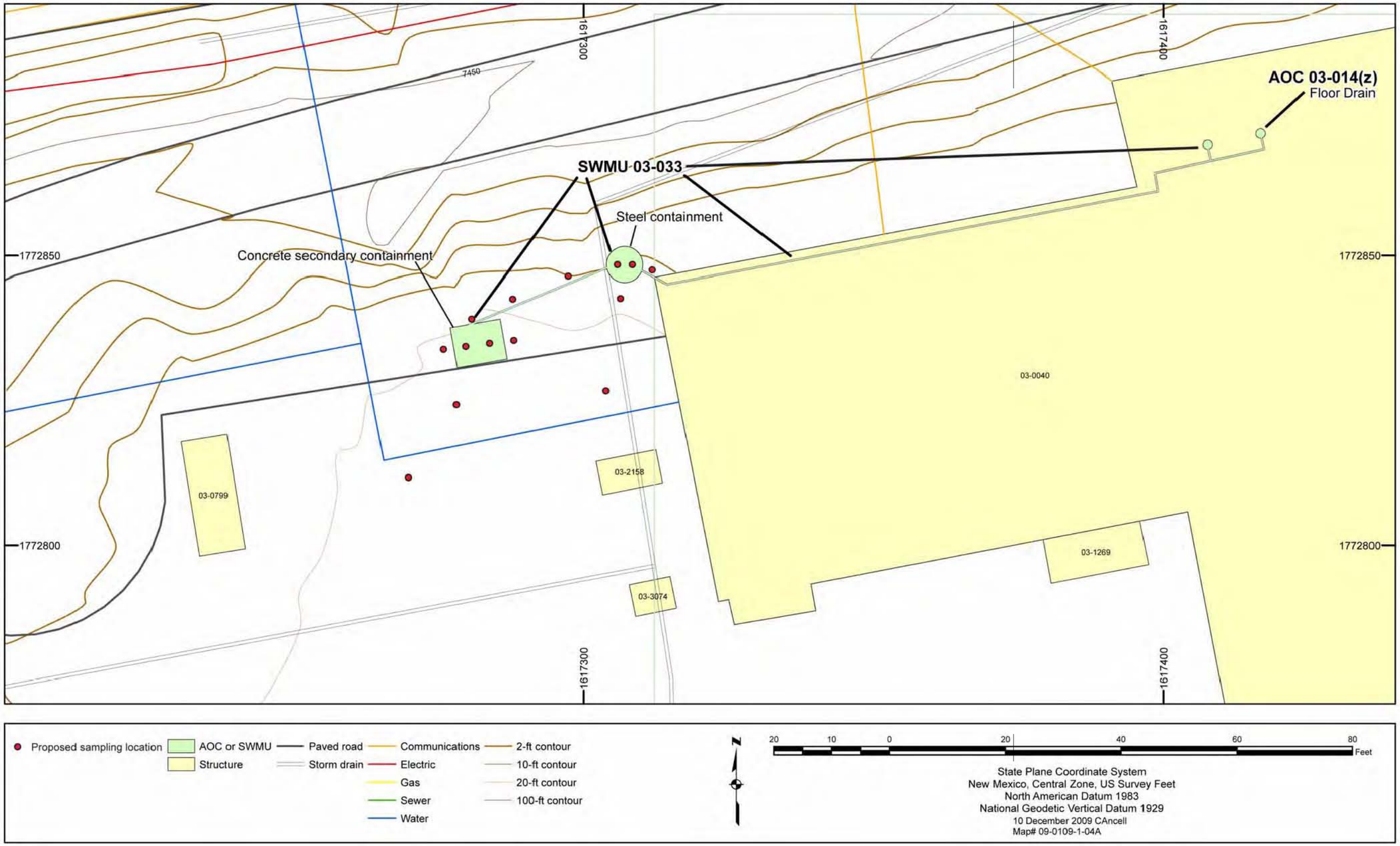


Figure 4.1-22 Proposed sampling locations at SWMU 03-033

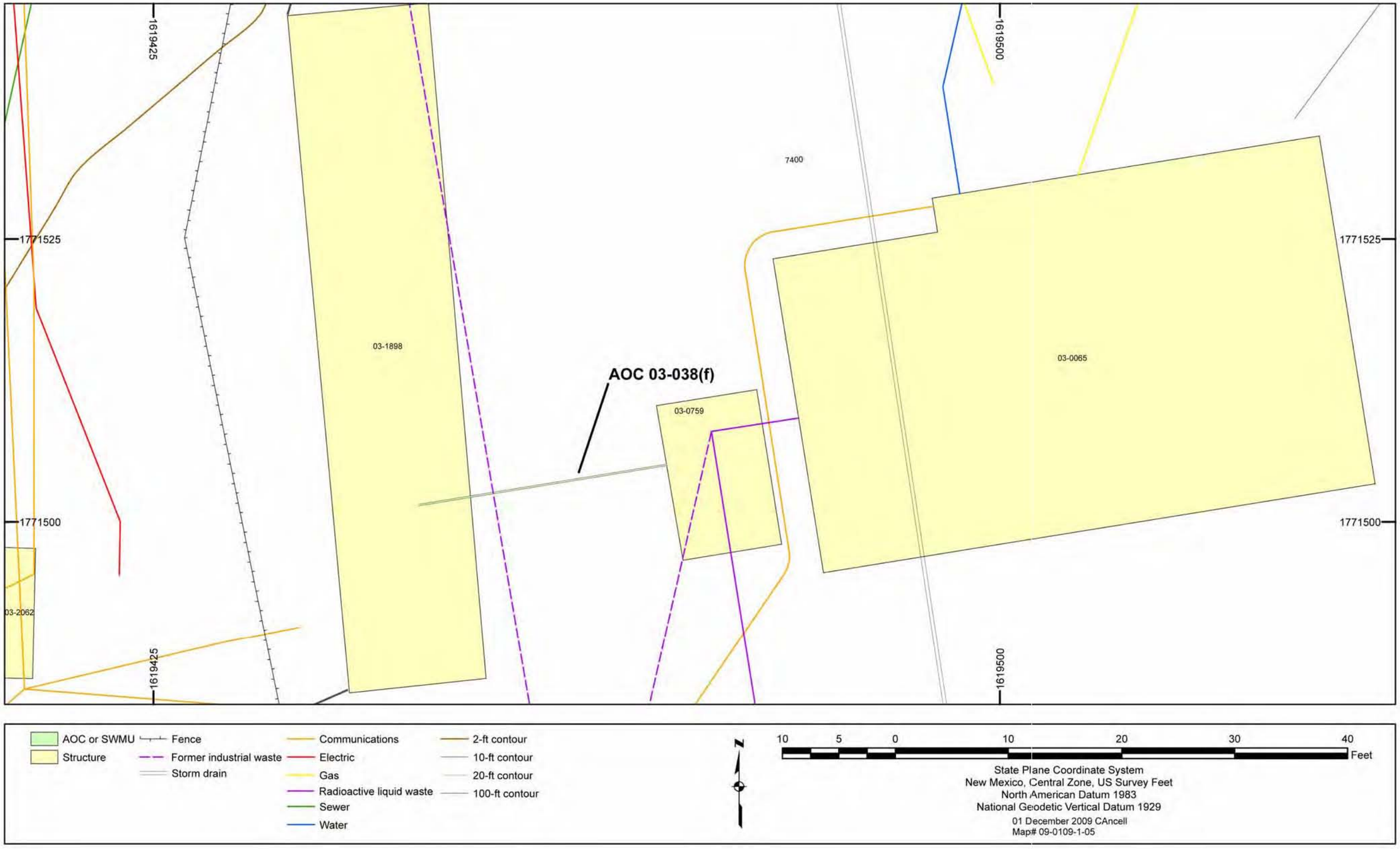


Figure 4.1-23 Site features for AOC 03-038(f)

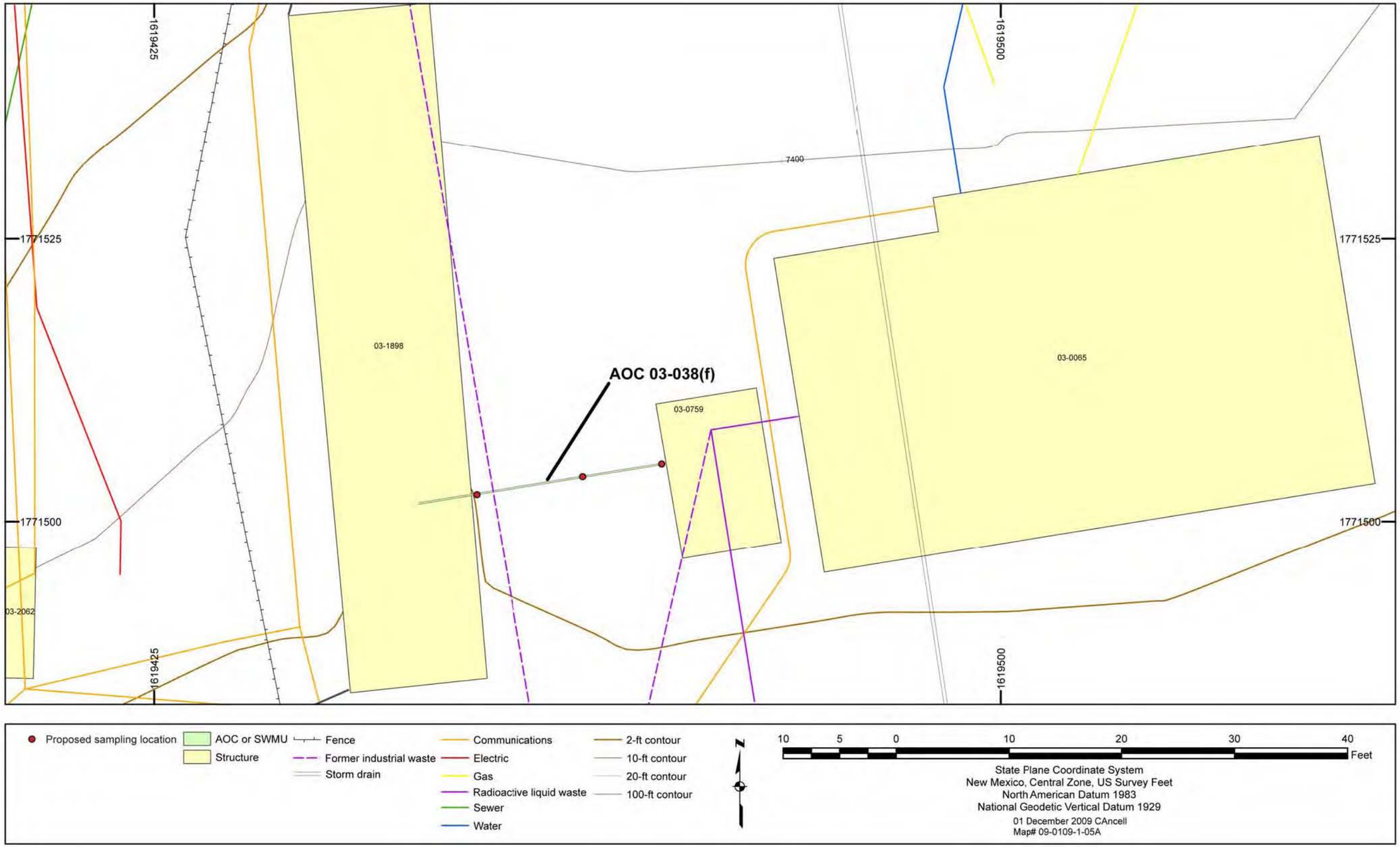


Figure 4.1-24 Proposed sampling locations at AOC 03-038(f)

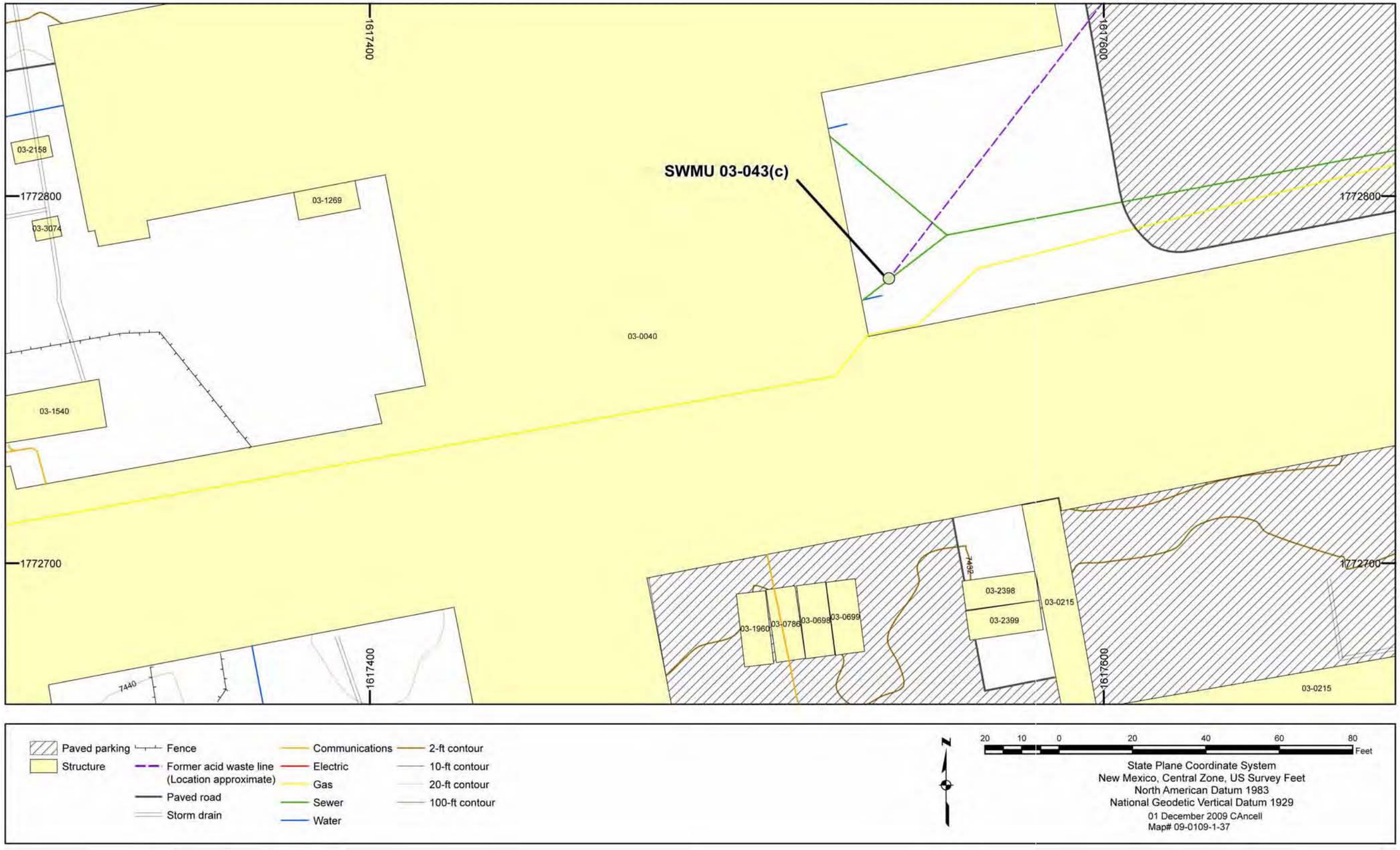


Figure 4.1-25 Site features for SWMU 03-043(c)

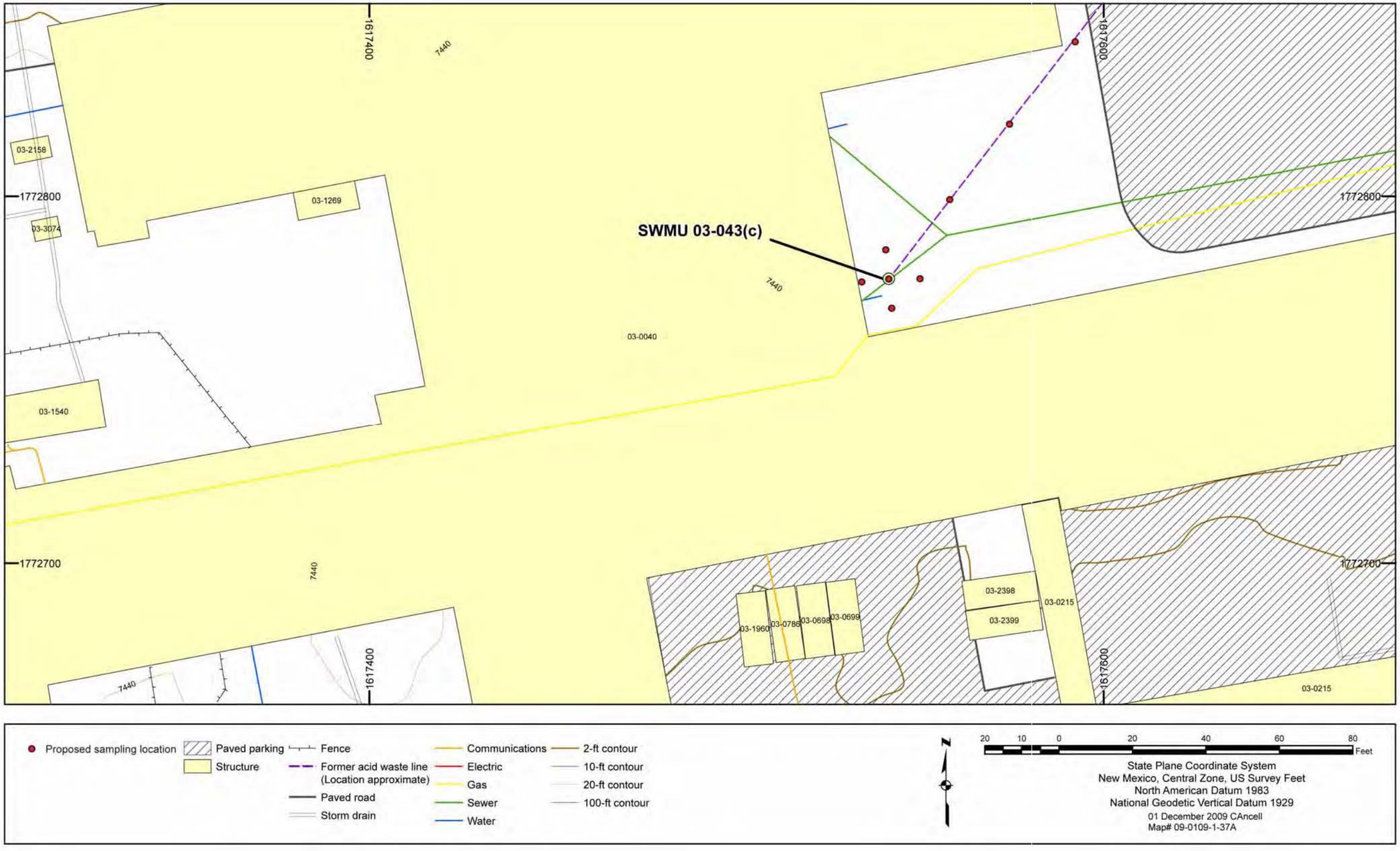


Figure 4.1-26 Proposed sampling locations at SWMU 03-043(c)

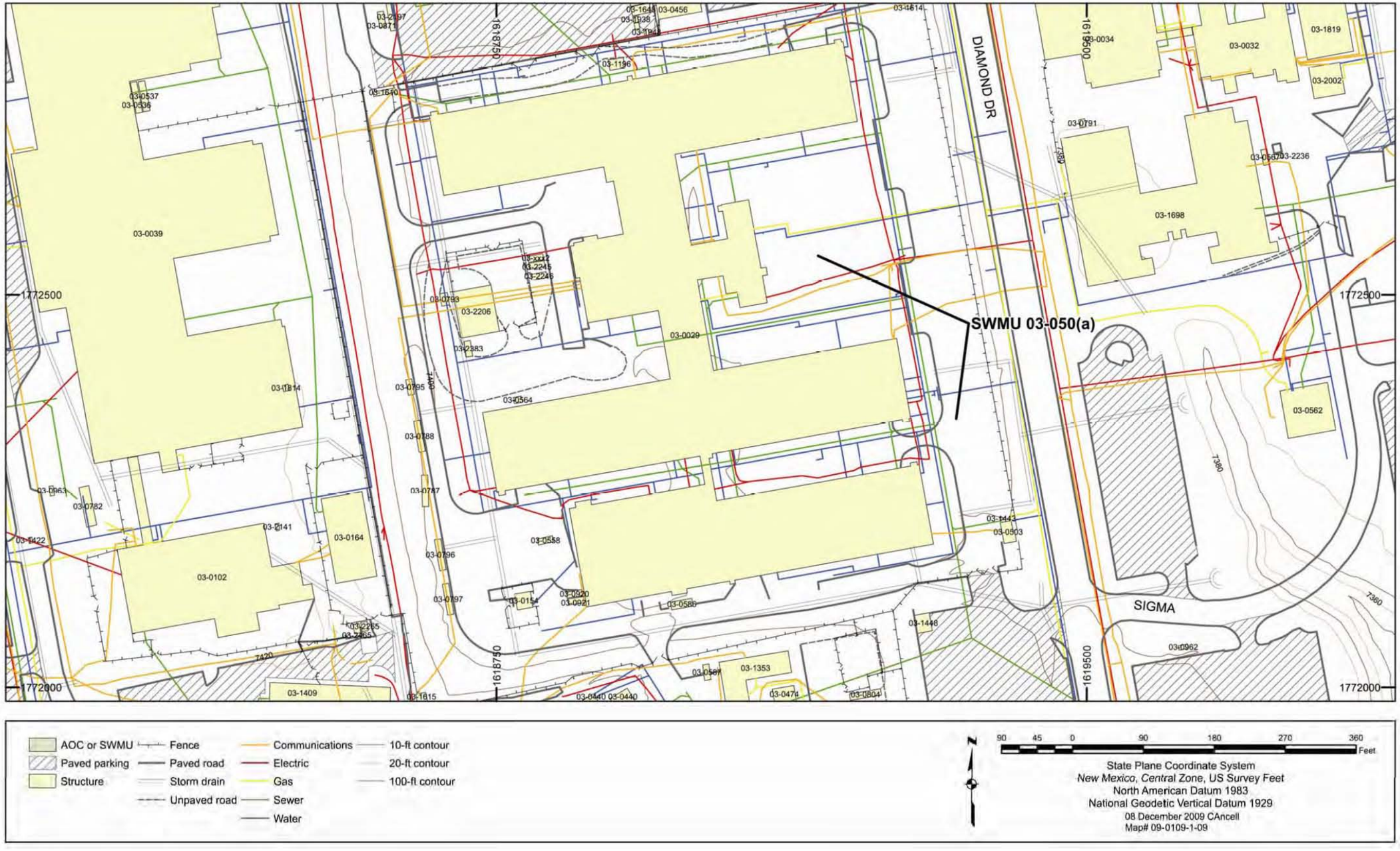


Figure 4.1-27 Site features for SWMU 03-050(a)

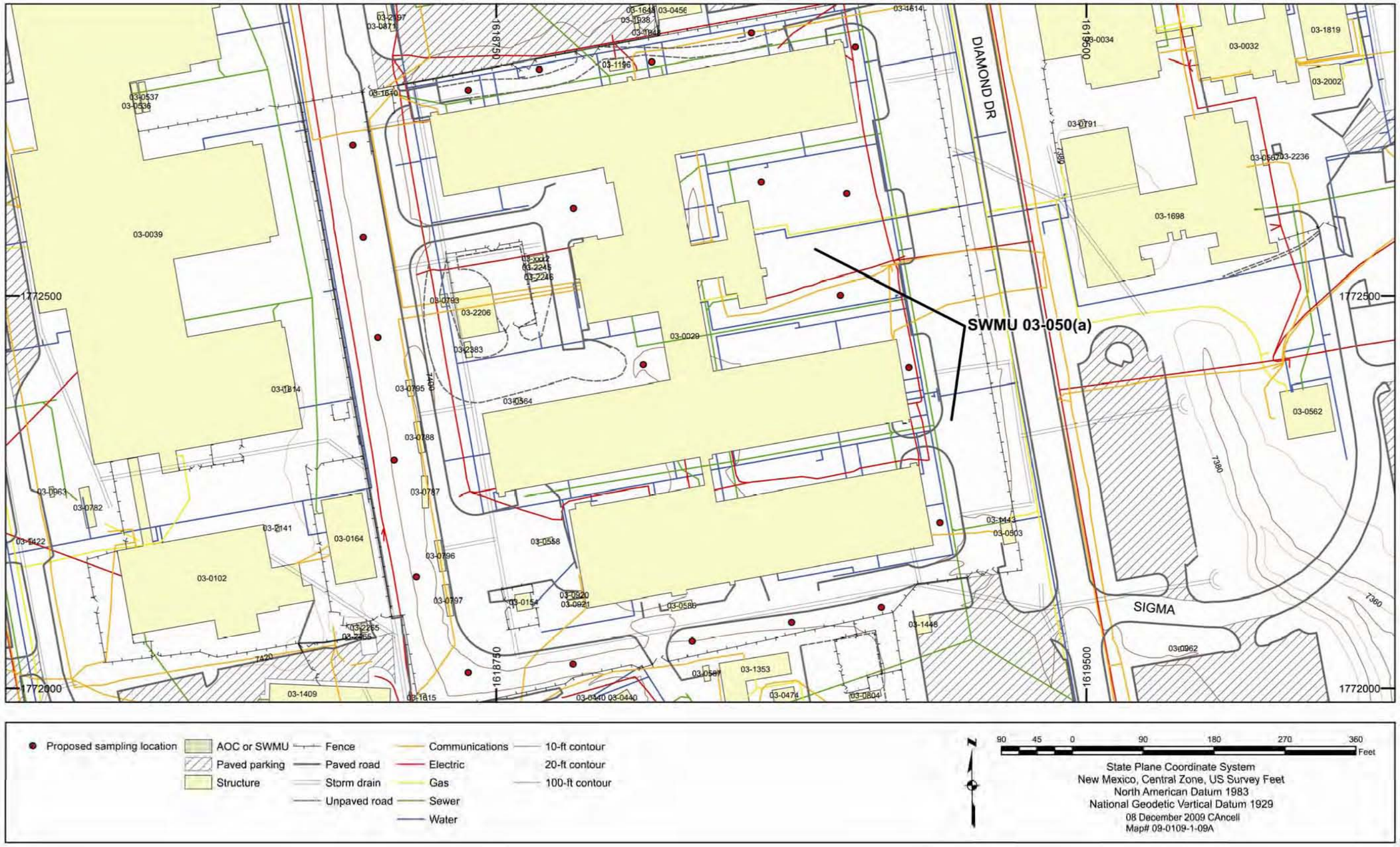


Figure 4.1-28 Proposed sampling locations at SWMU 03-050(a)

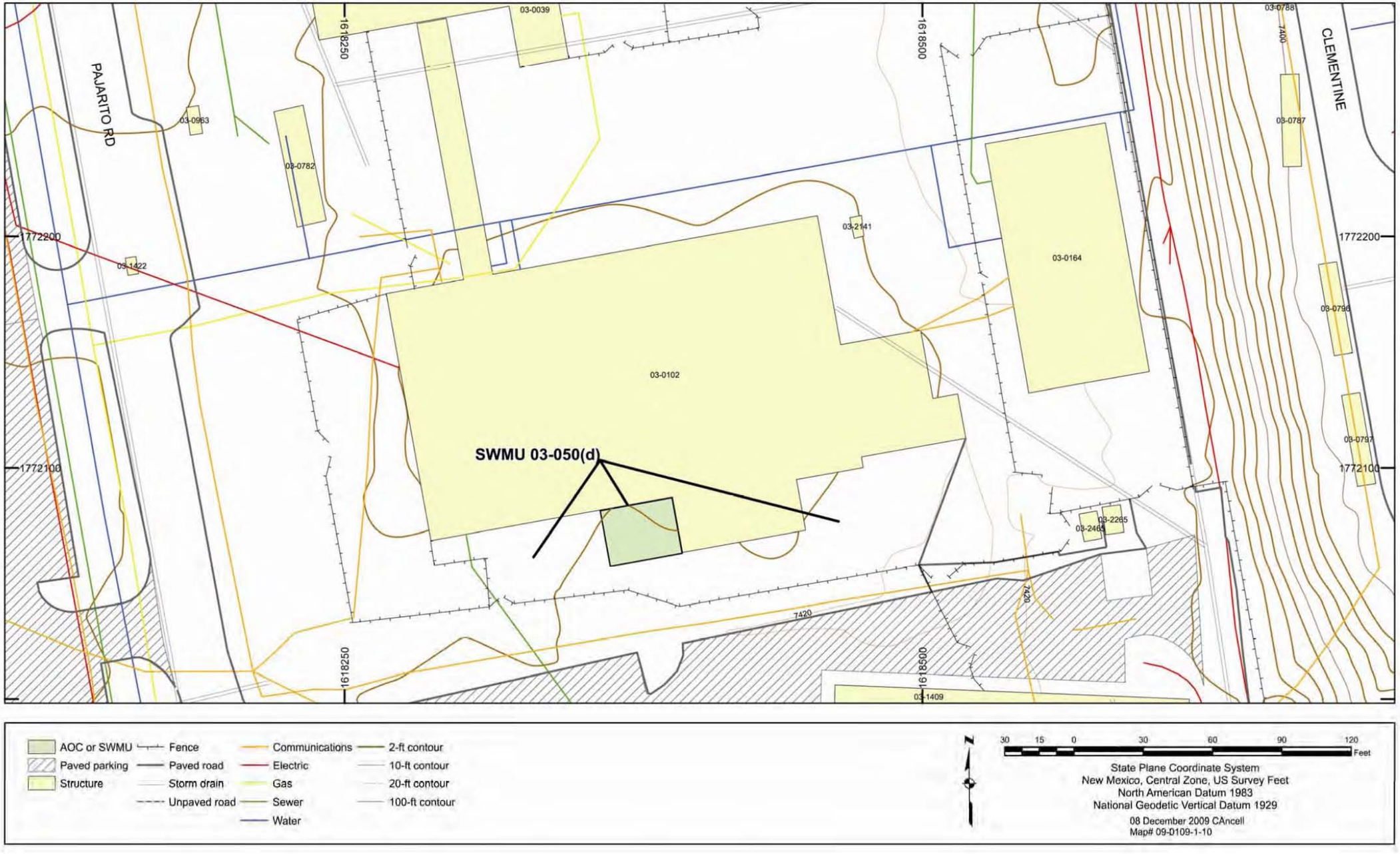


Figure 4.1-29 Site features for SWMU 03-050(d)

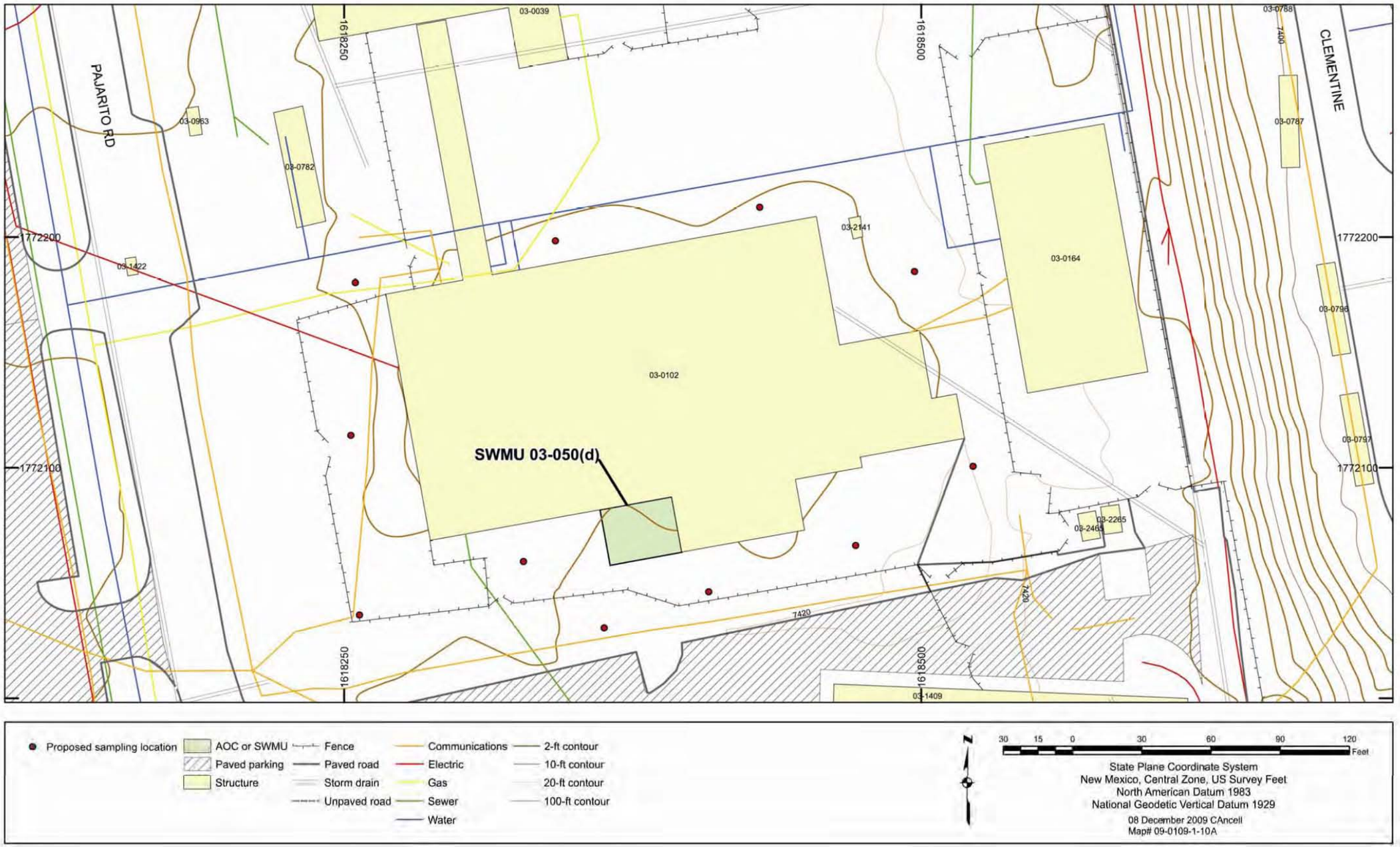


Figure 4.1-30 Proposed sampling locations at SWMU 03-050(d)

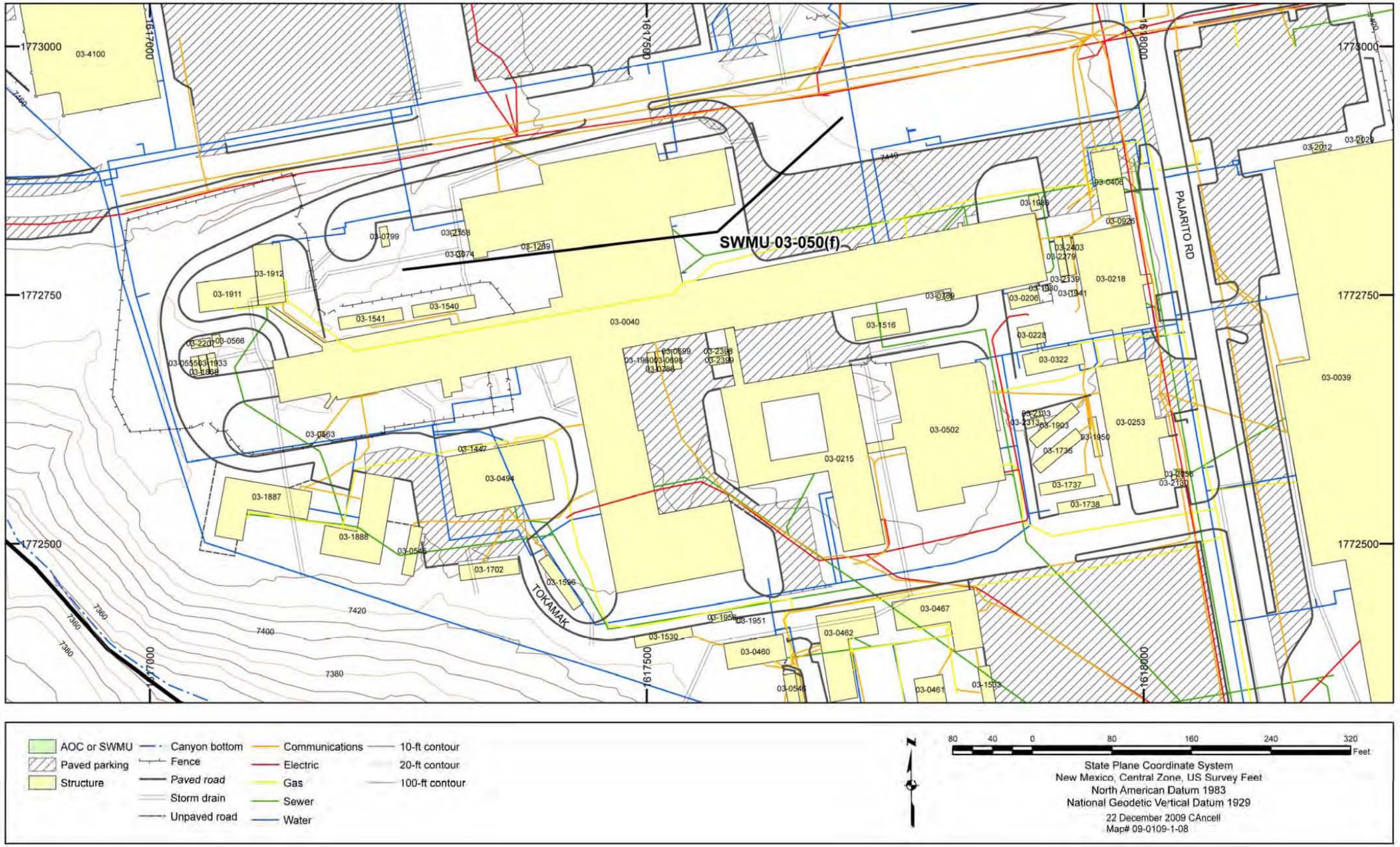


Figure 4.1-31 Site features for SWMU 03-050(f)



Figure 4.1-32 Proposed sampling locations at SWMU 03-050(f)

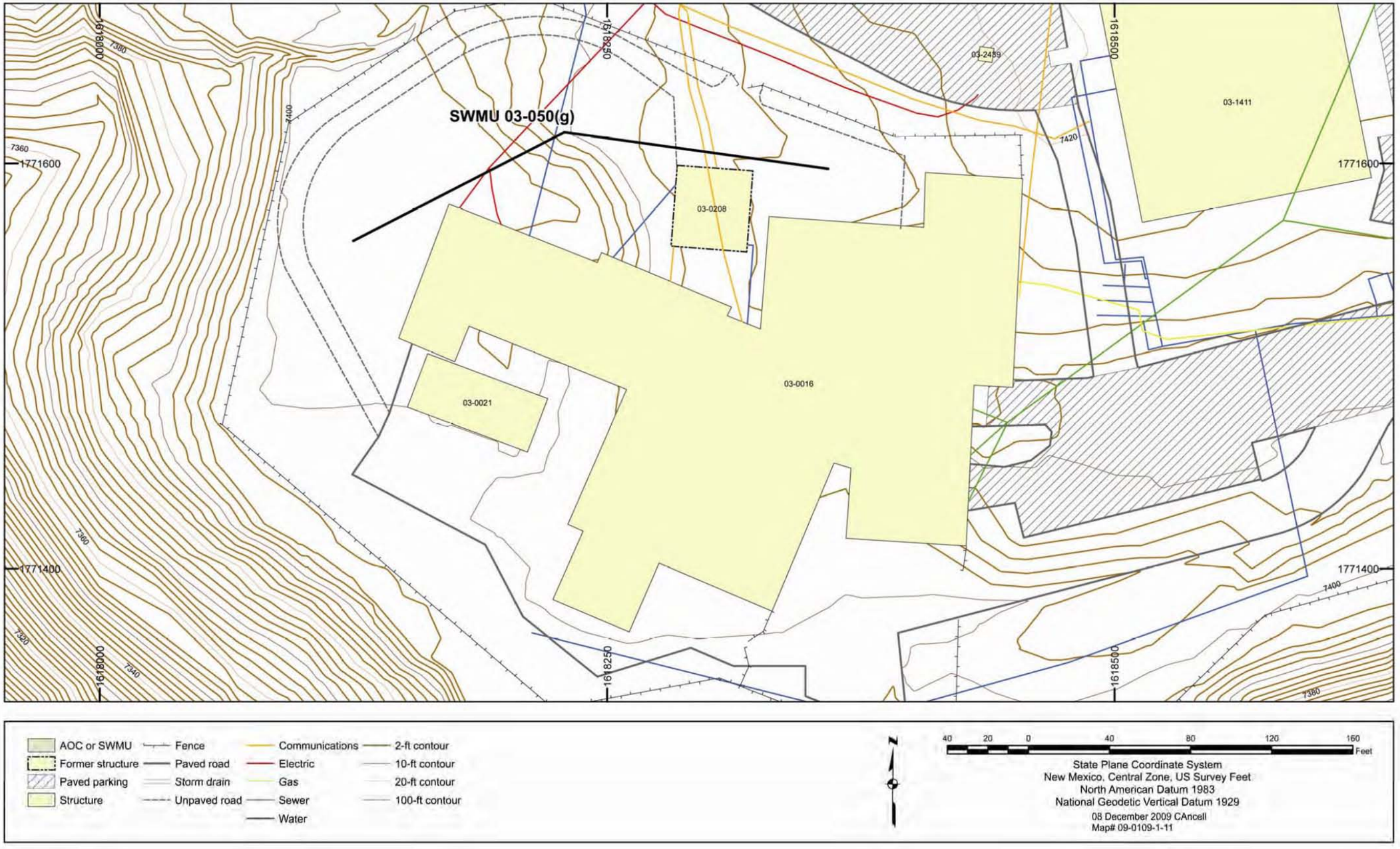


Figure 4.1-33 Site features for SWMU 03-050(g)

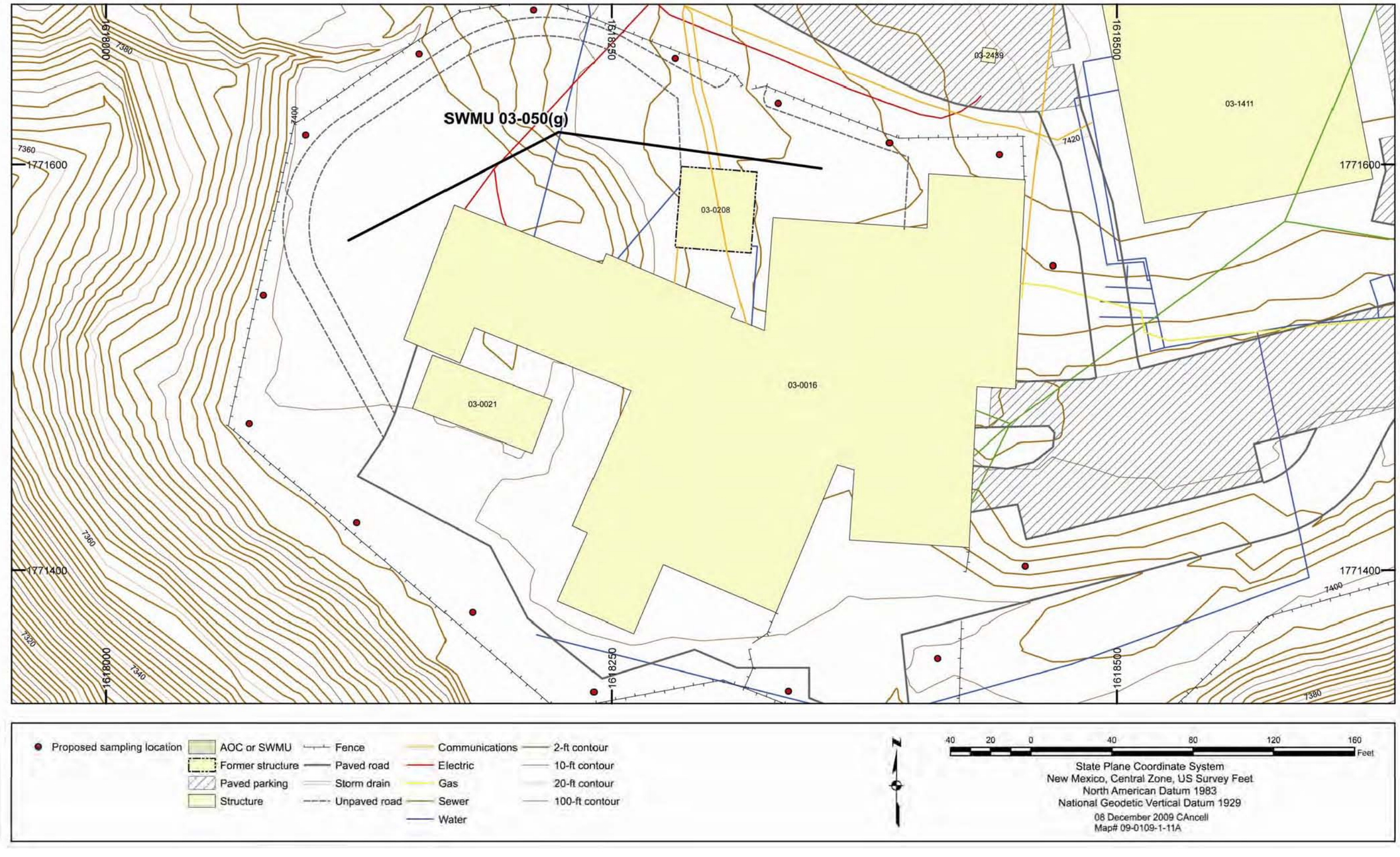


Figure 4.1-34 Proposed sampling locations at SWMU 03-050(g)

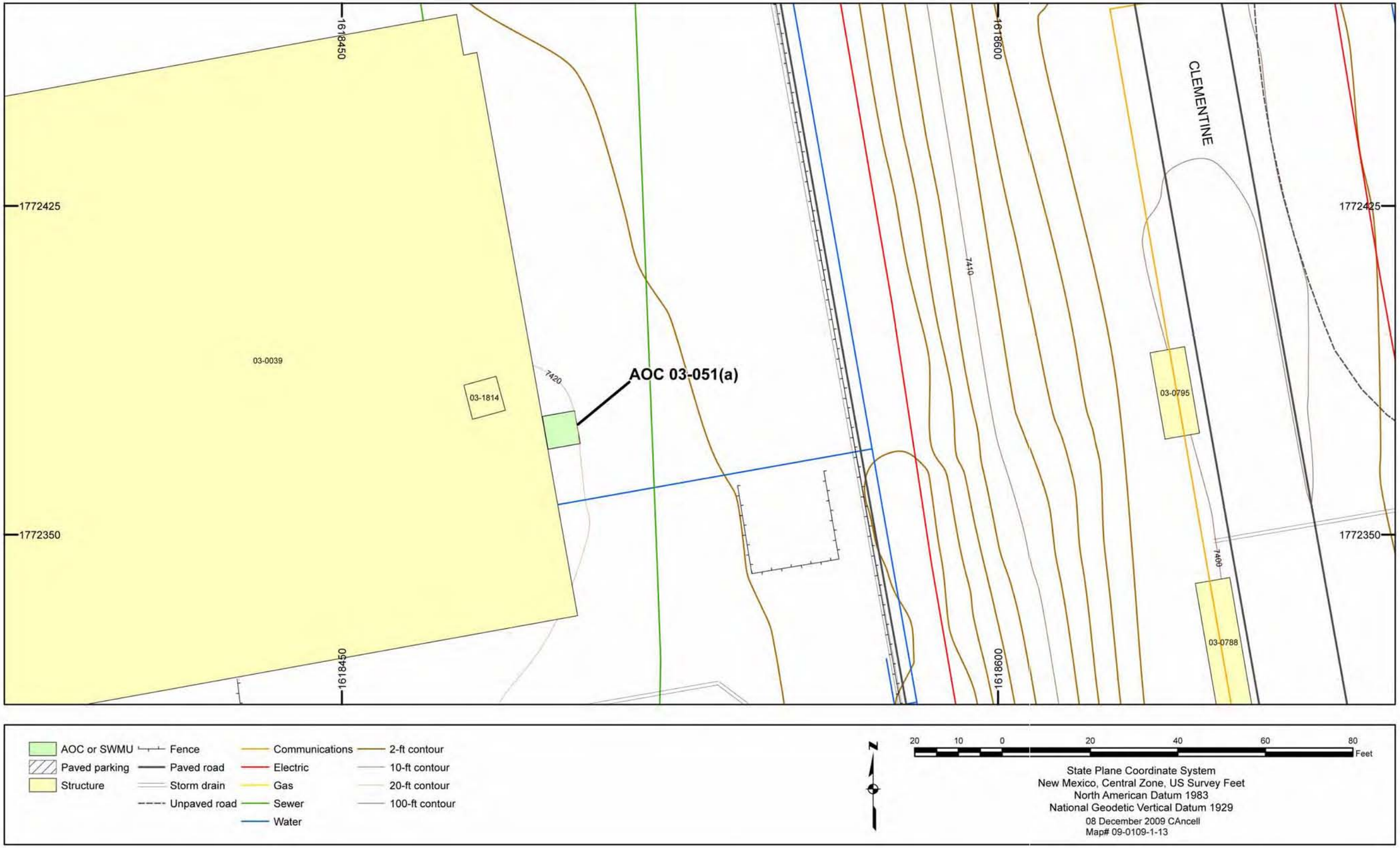


Figure 4.1-35 Site features for AOC 03-051(a)

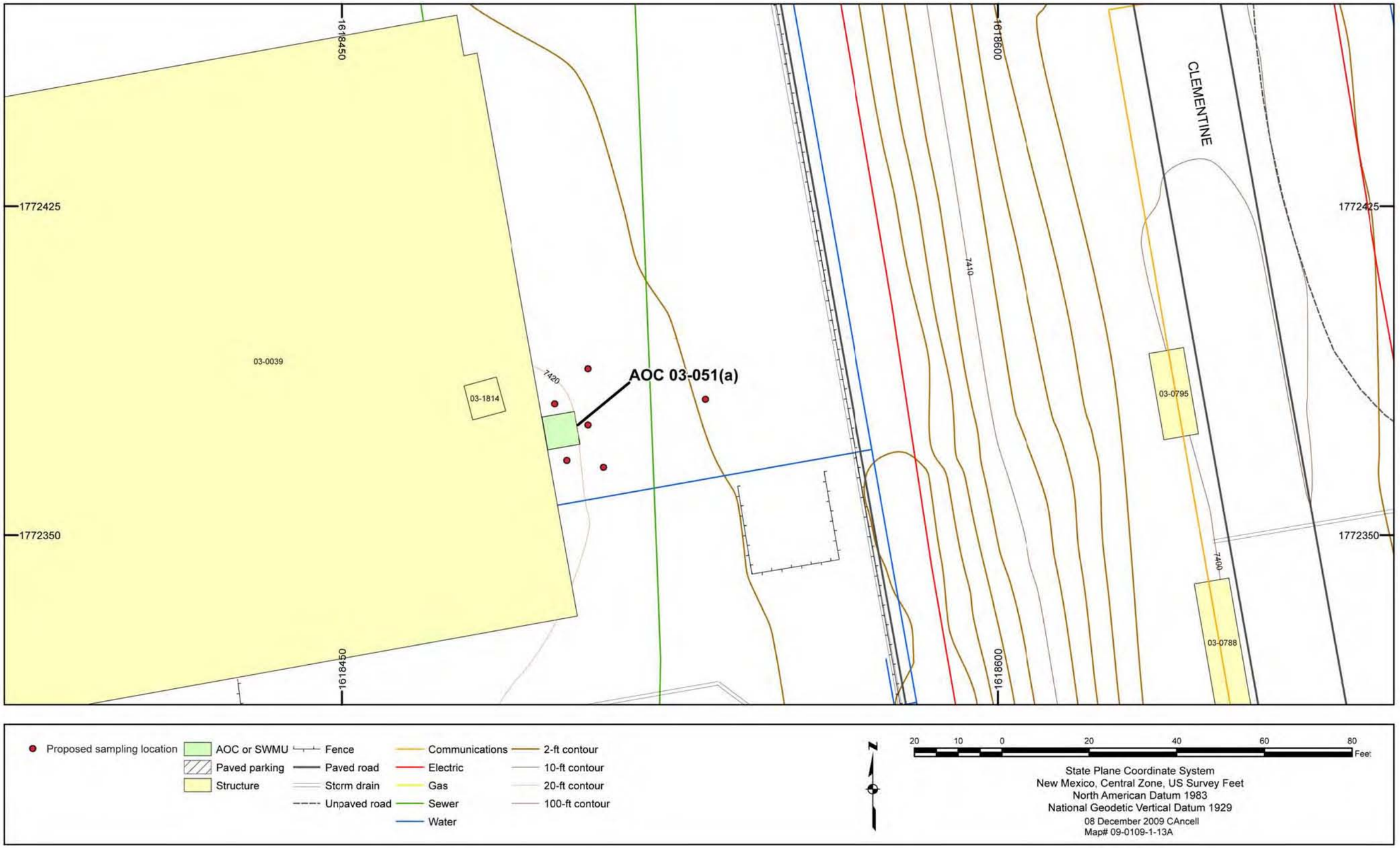


Figure 4.1-36 Proposed sampling locations at AOC 03-051(a)

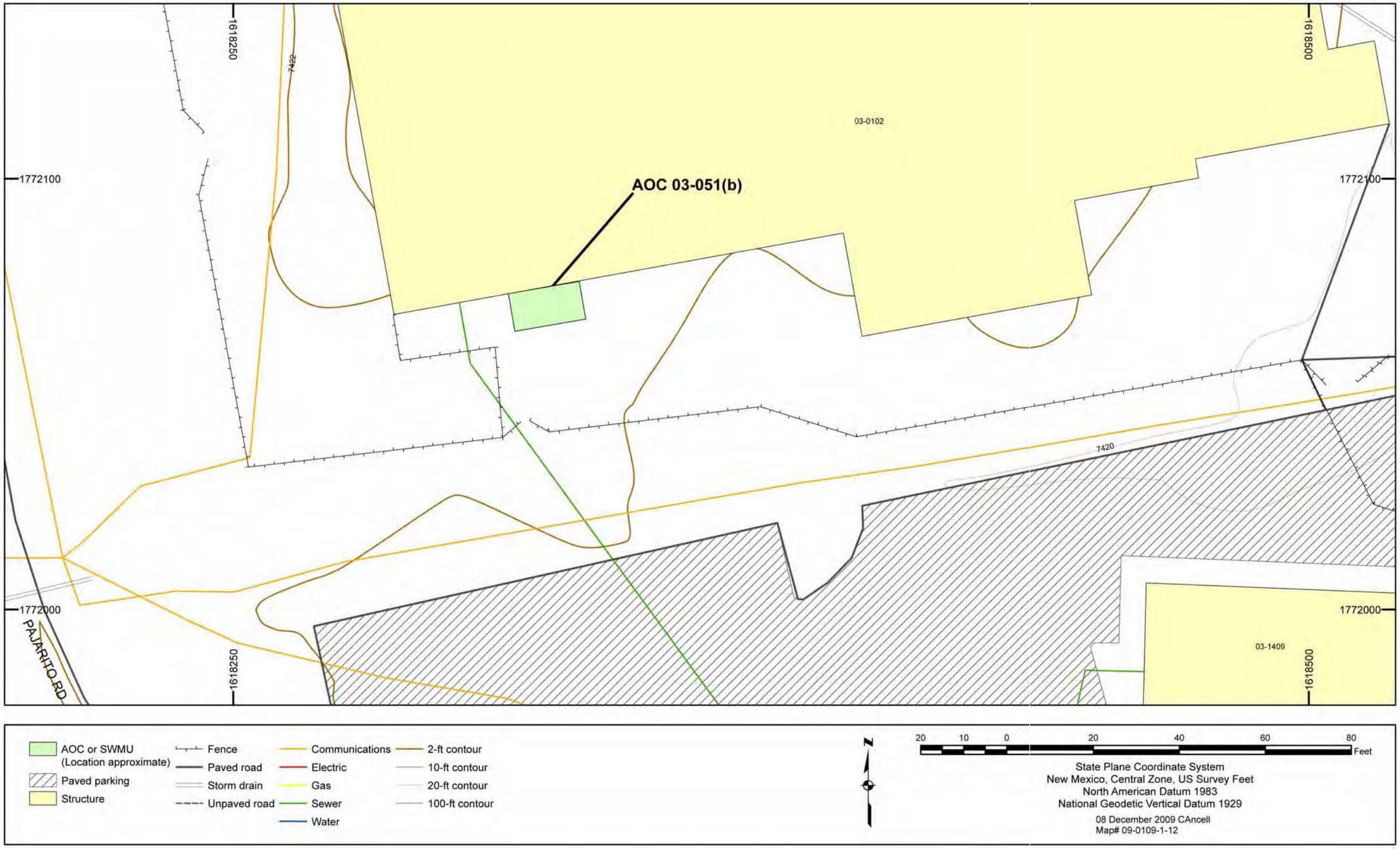


Figure 4.1-37 Site features for AOC 03-051(b)

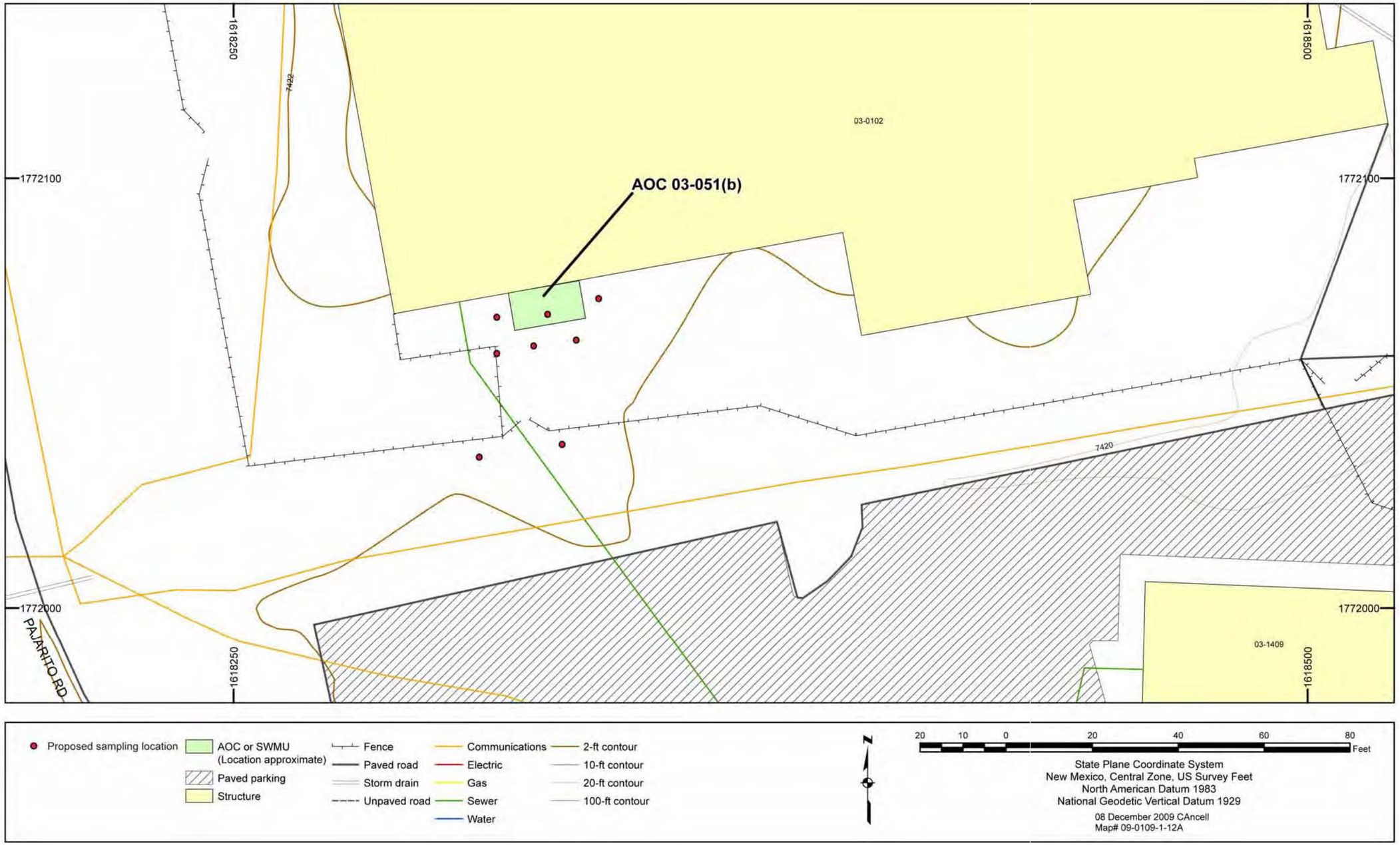


Figure 4.1-38 Proposed sampling locations at AOC 03-051(b)

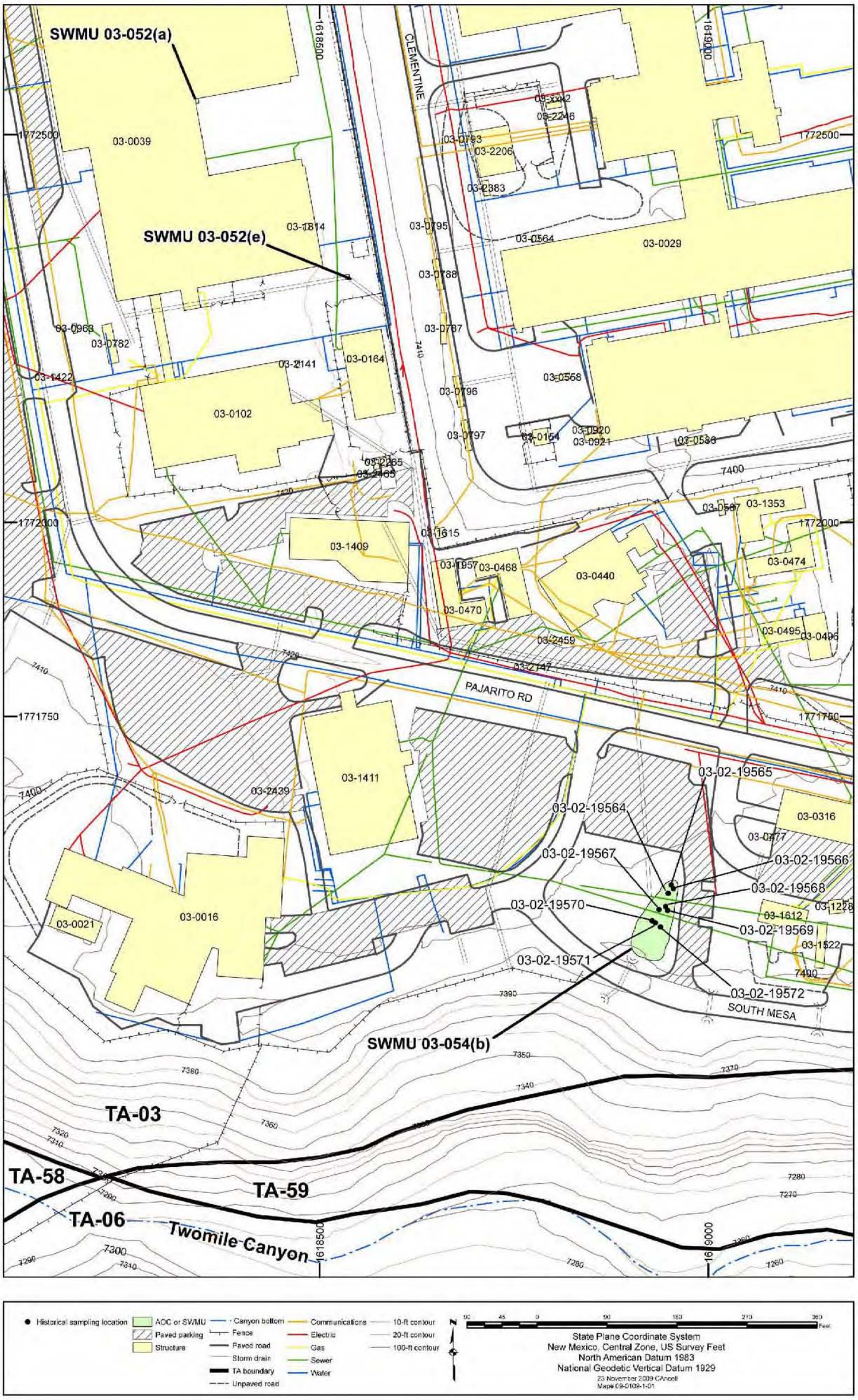


Figure 4.1-39 Site features and historical sampling locations for Consolidated Unit 03-052(a)-00

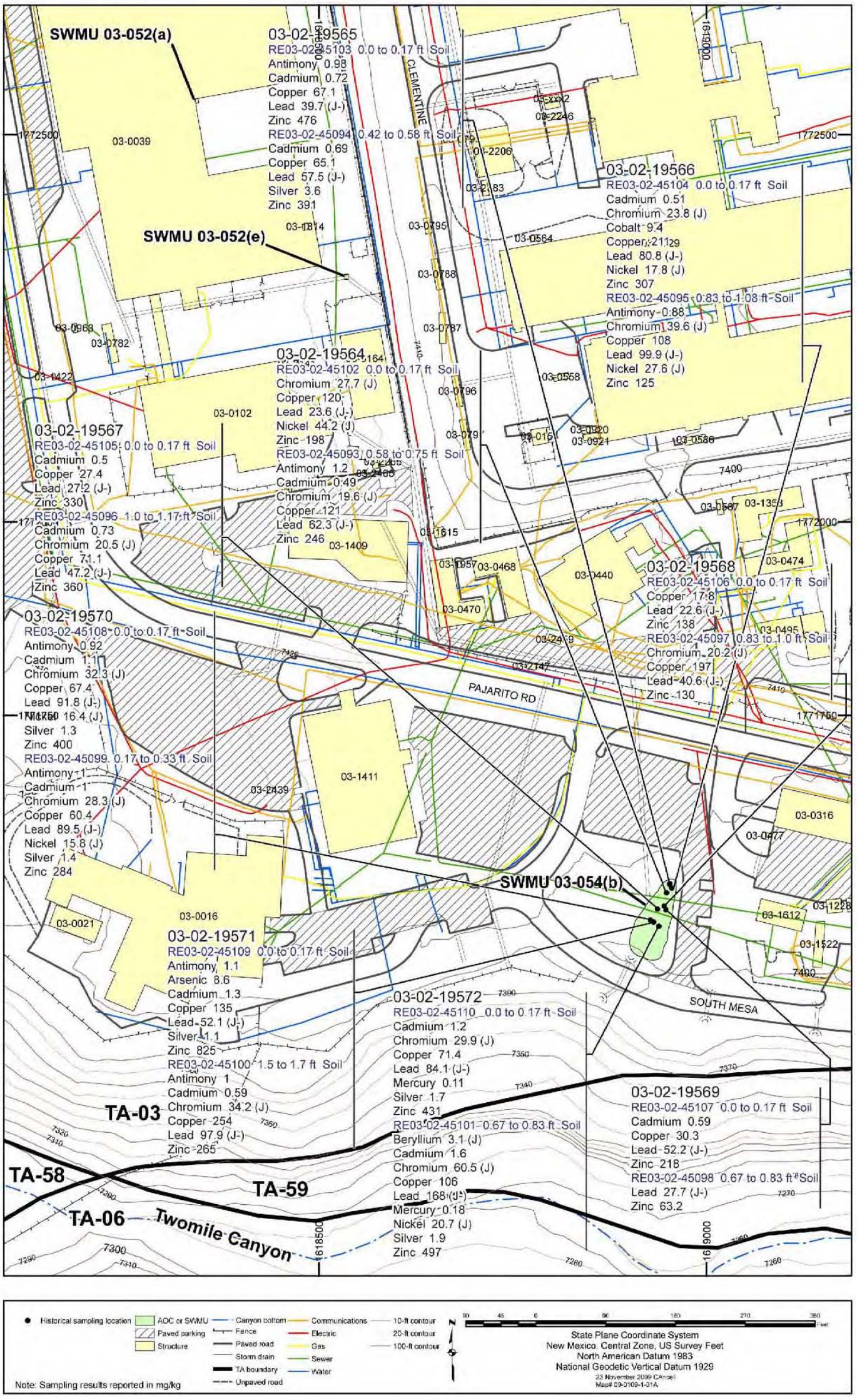


Figure 4.1-40 Inorganic chemicals detected above BVs at SWMU 03-054(b)

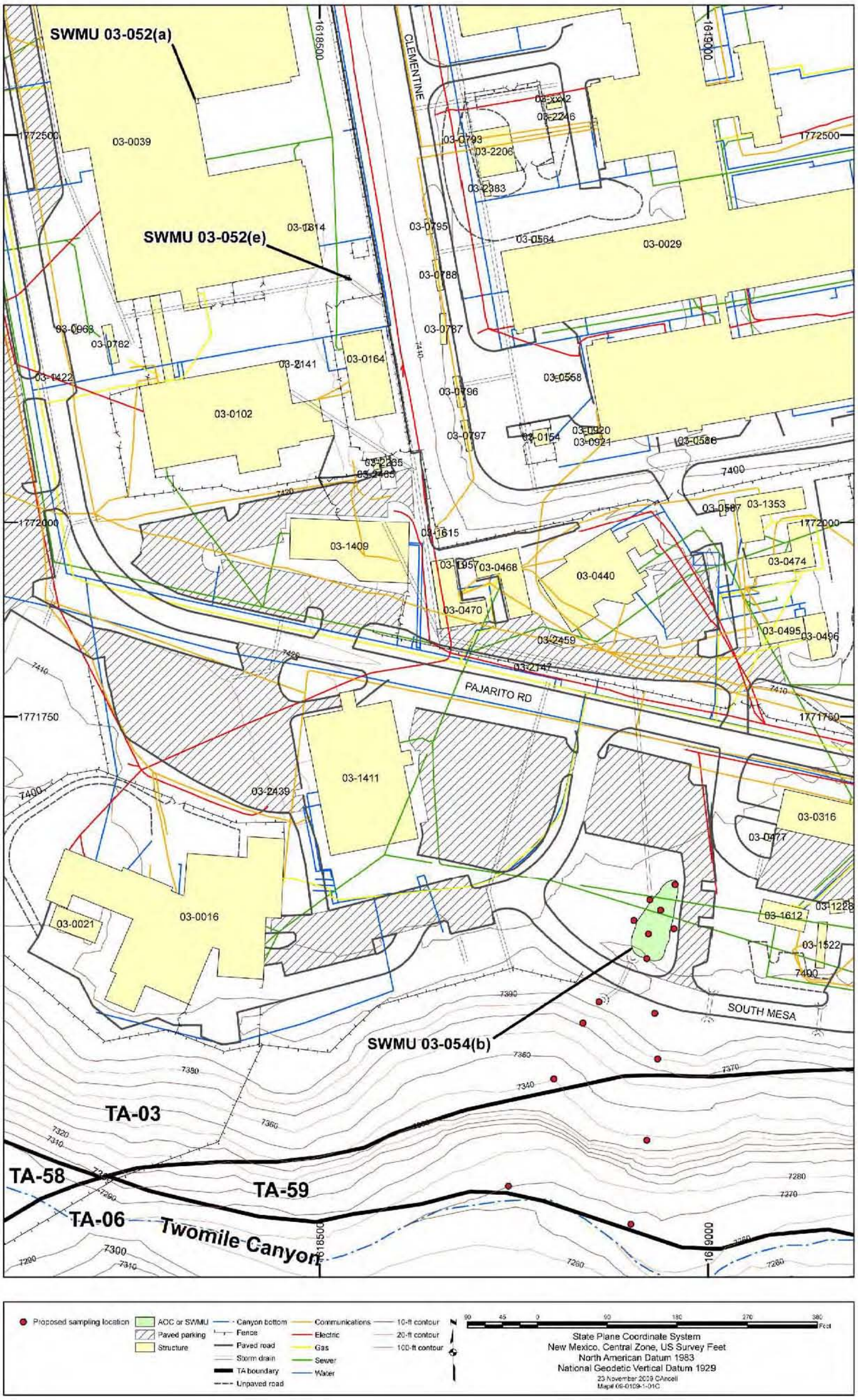


Figure 4.1-41 Proposed sampling locations at Consolidated Unit 03-052(a)-00

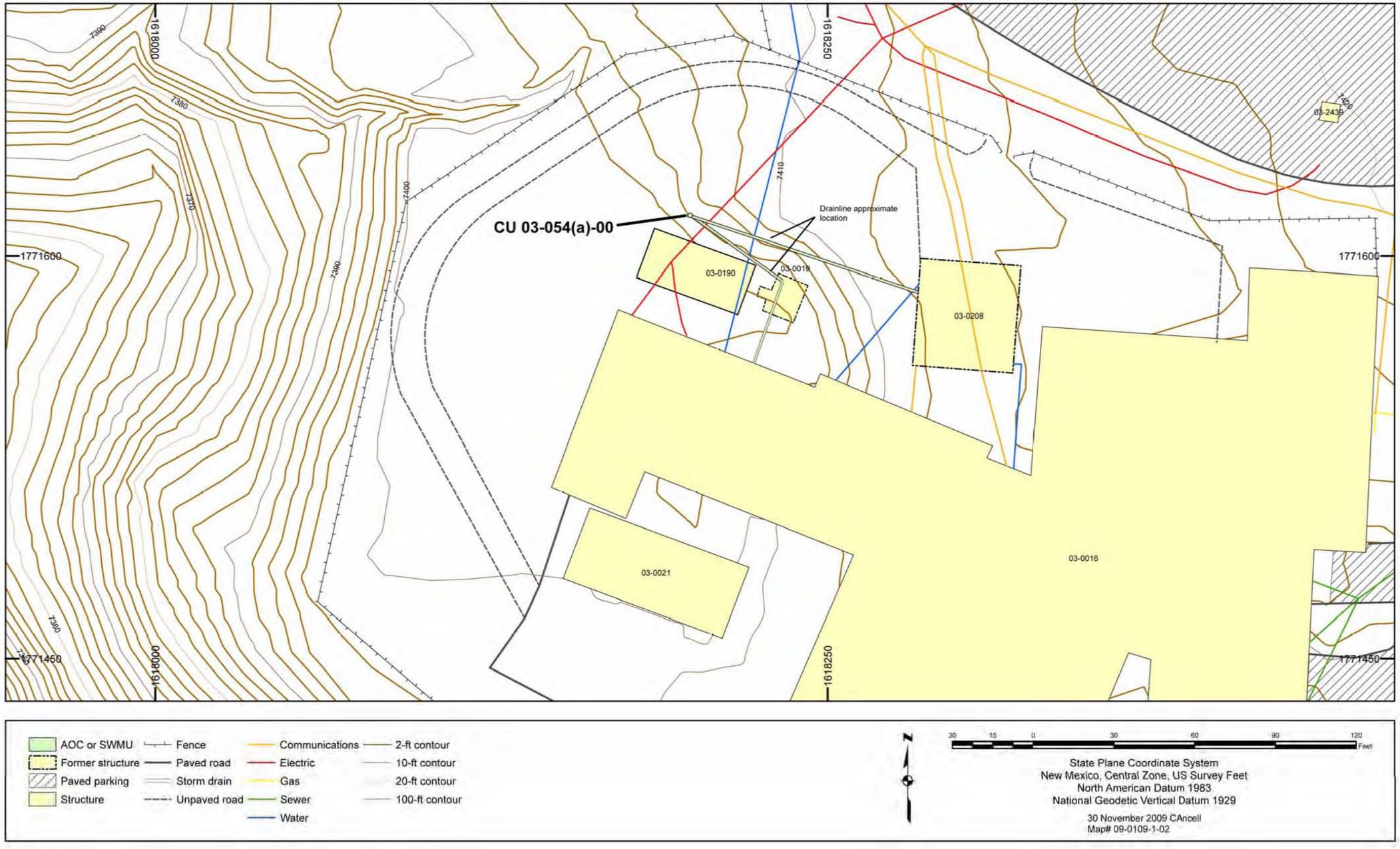


Figure 4.1-42 Site features for Consolidated Unit 03-054(a)-00

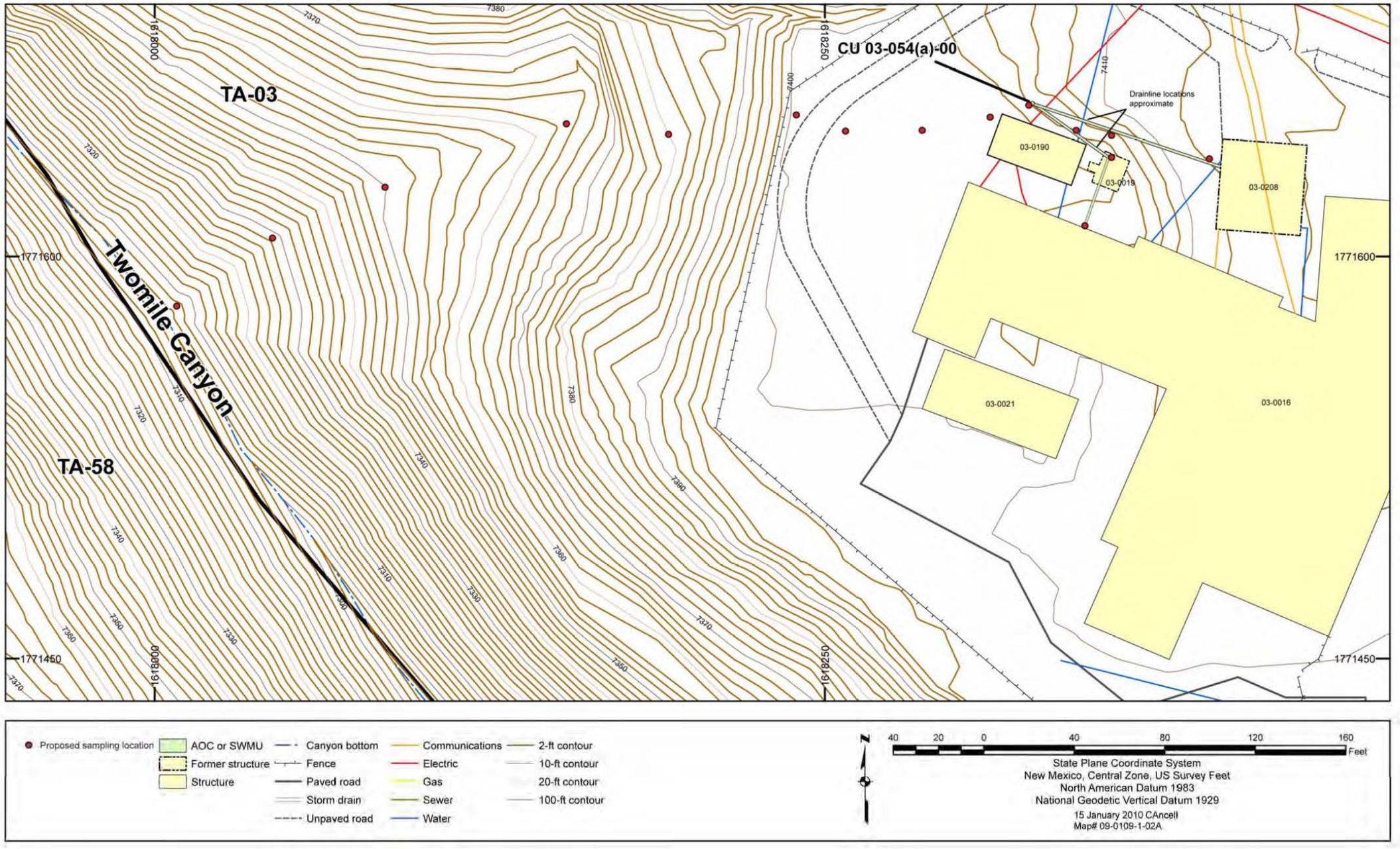


Figure 4.1-43 Proposed sampling locations at Consolidated Unit 03-054(a)-00

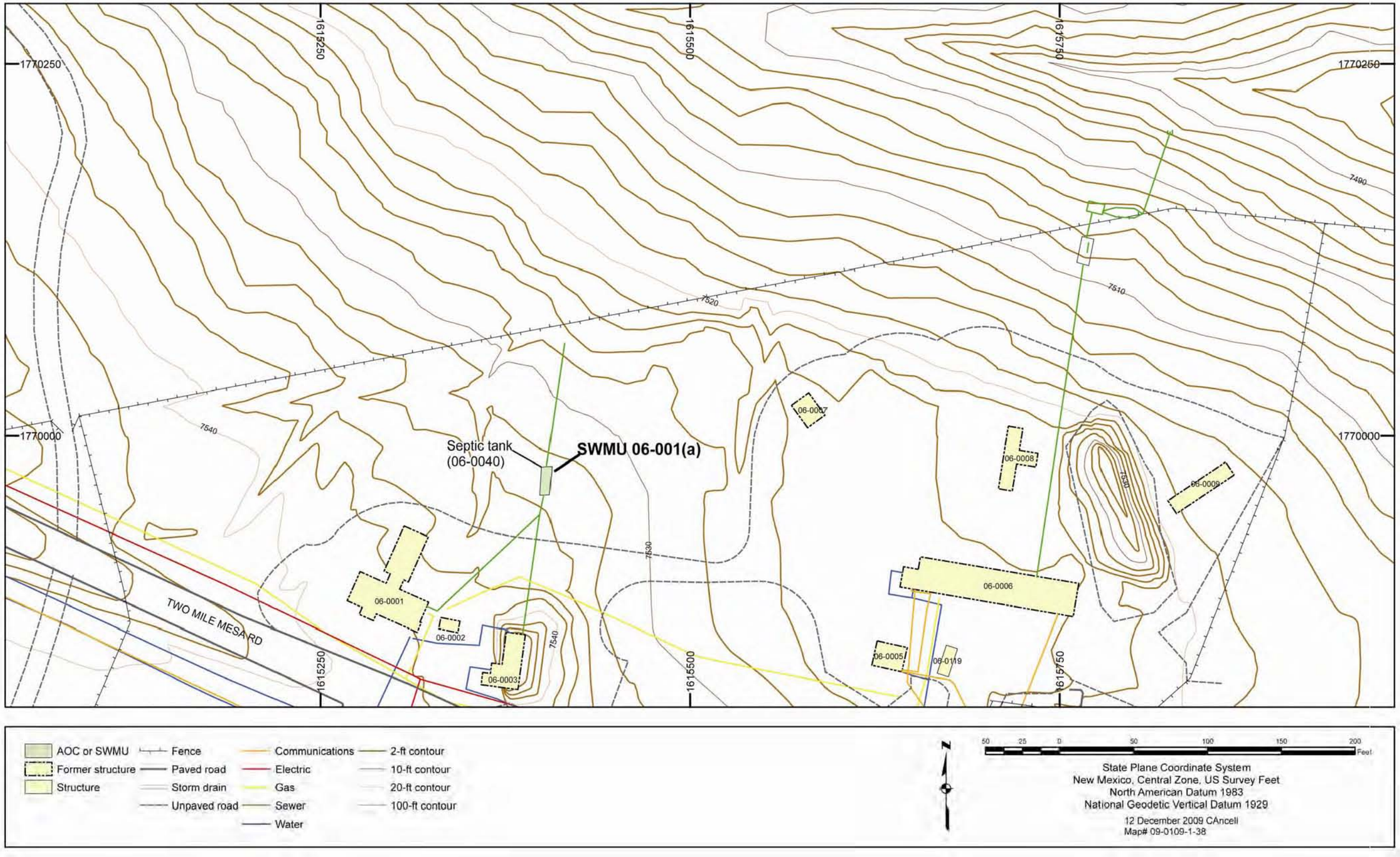


Figure 4.2-1 Site features for SWMU 06-001(a)

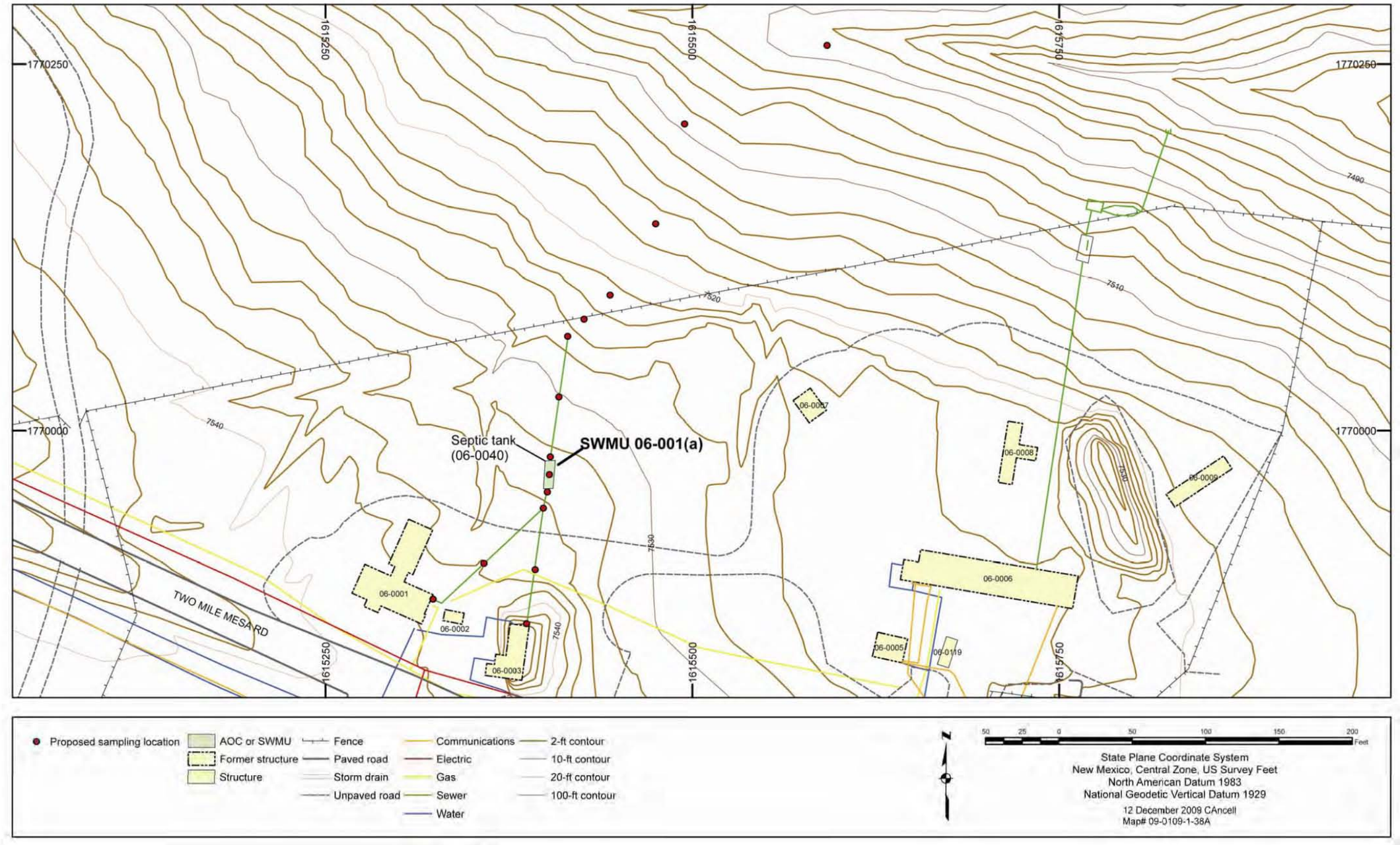


Figure 4.2-2 Proposed sampling locations at SWMU 06-001(a)

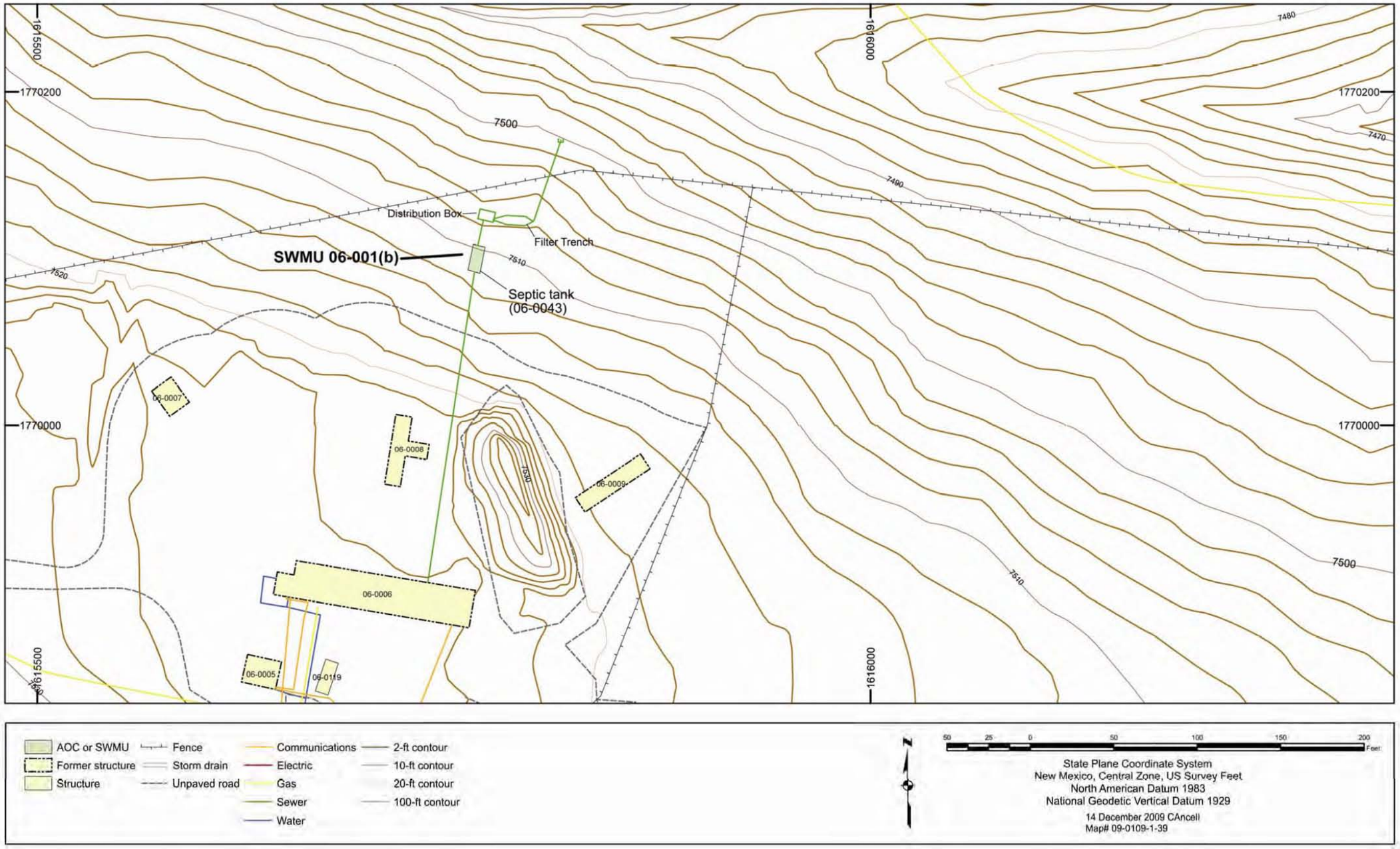


Figure 4.2-3 Site features for SWMU 06-001(b)

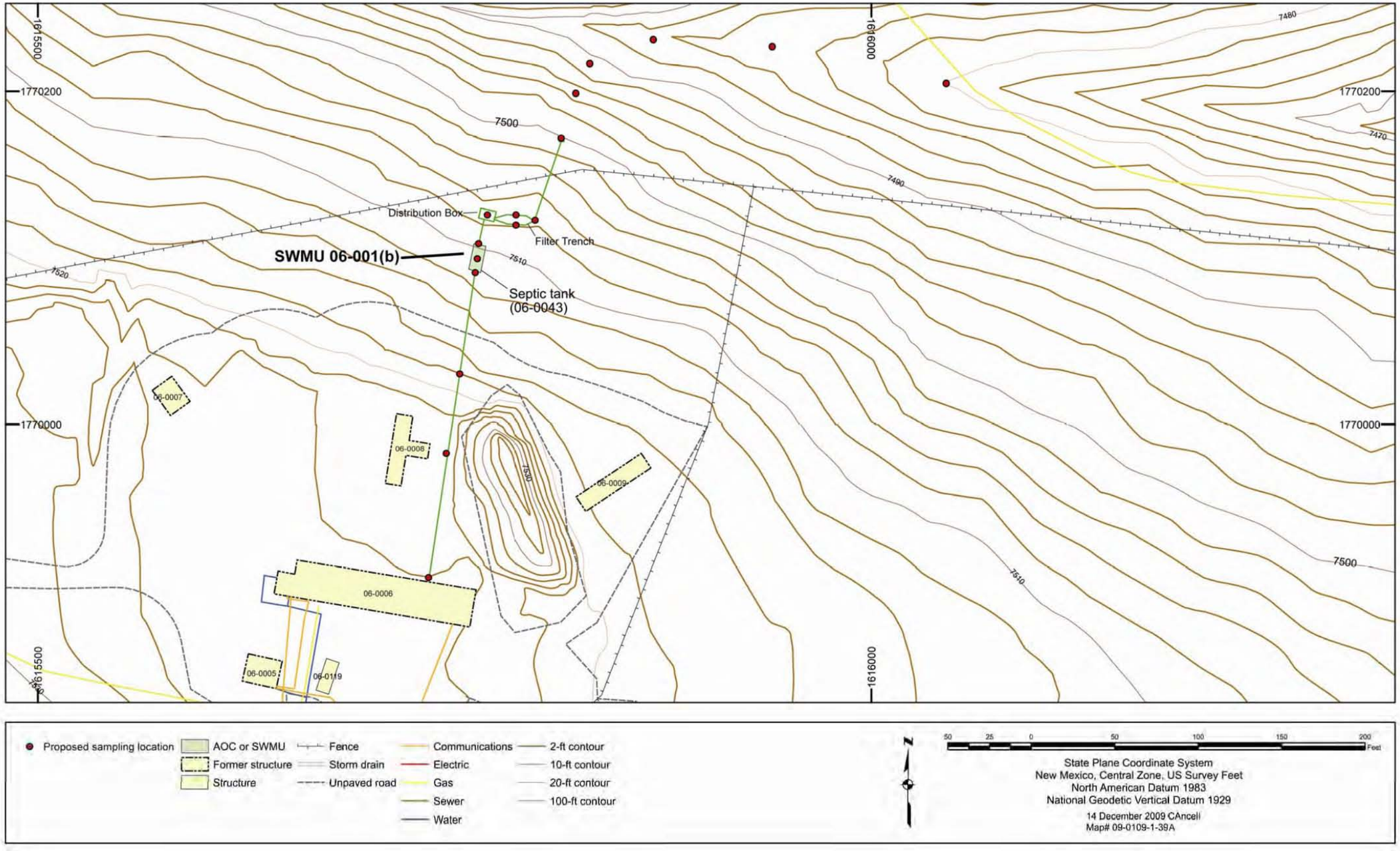


Figure 4.2-4 Proposed sampling locations at SWMU 06-001(b)

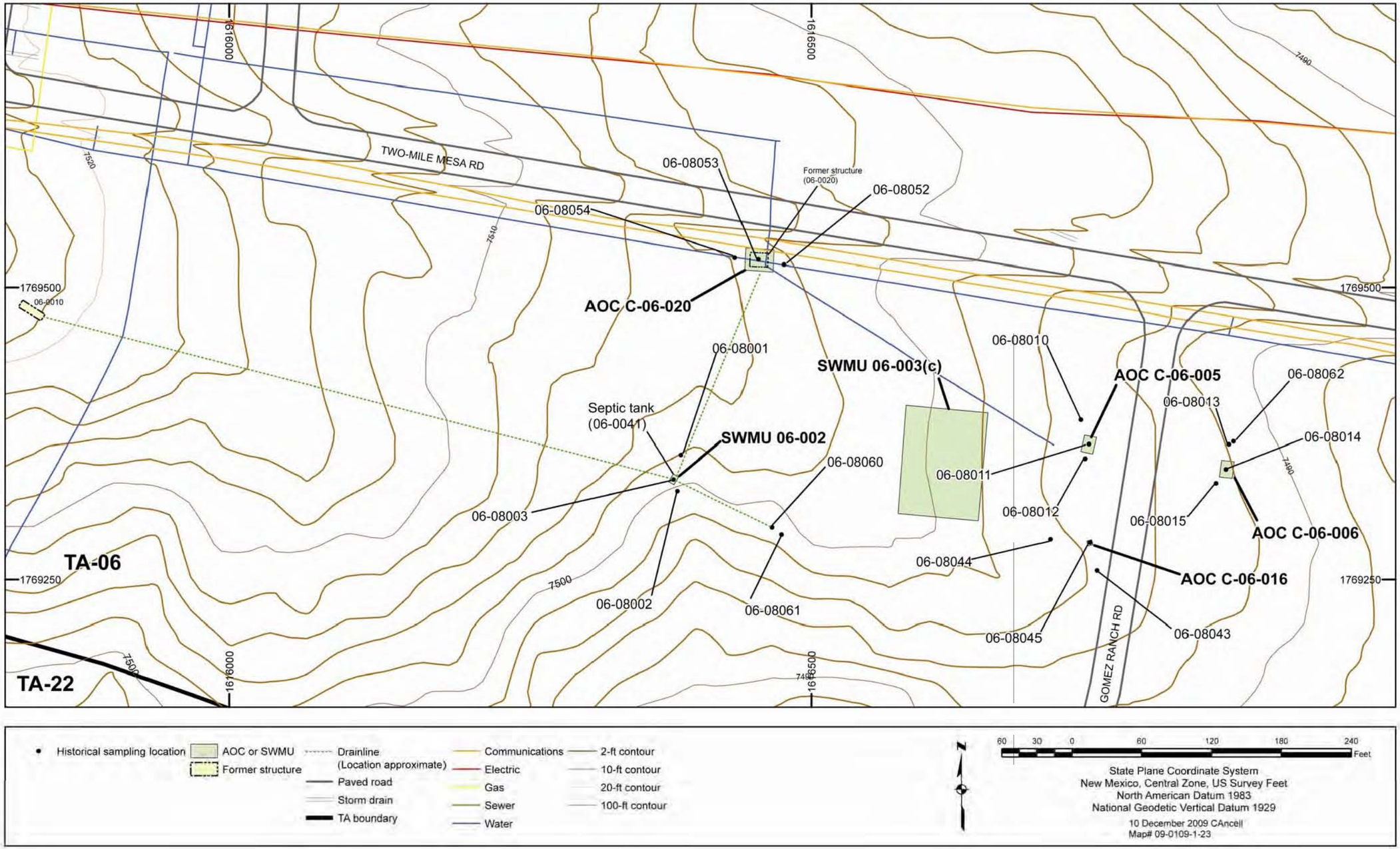


Figure 4.2-5 Site features and historical sampling locations for Consolidated Unit 06-002-00

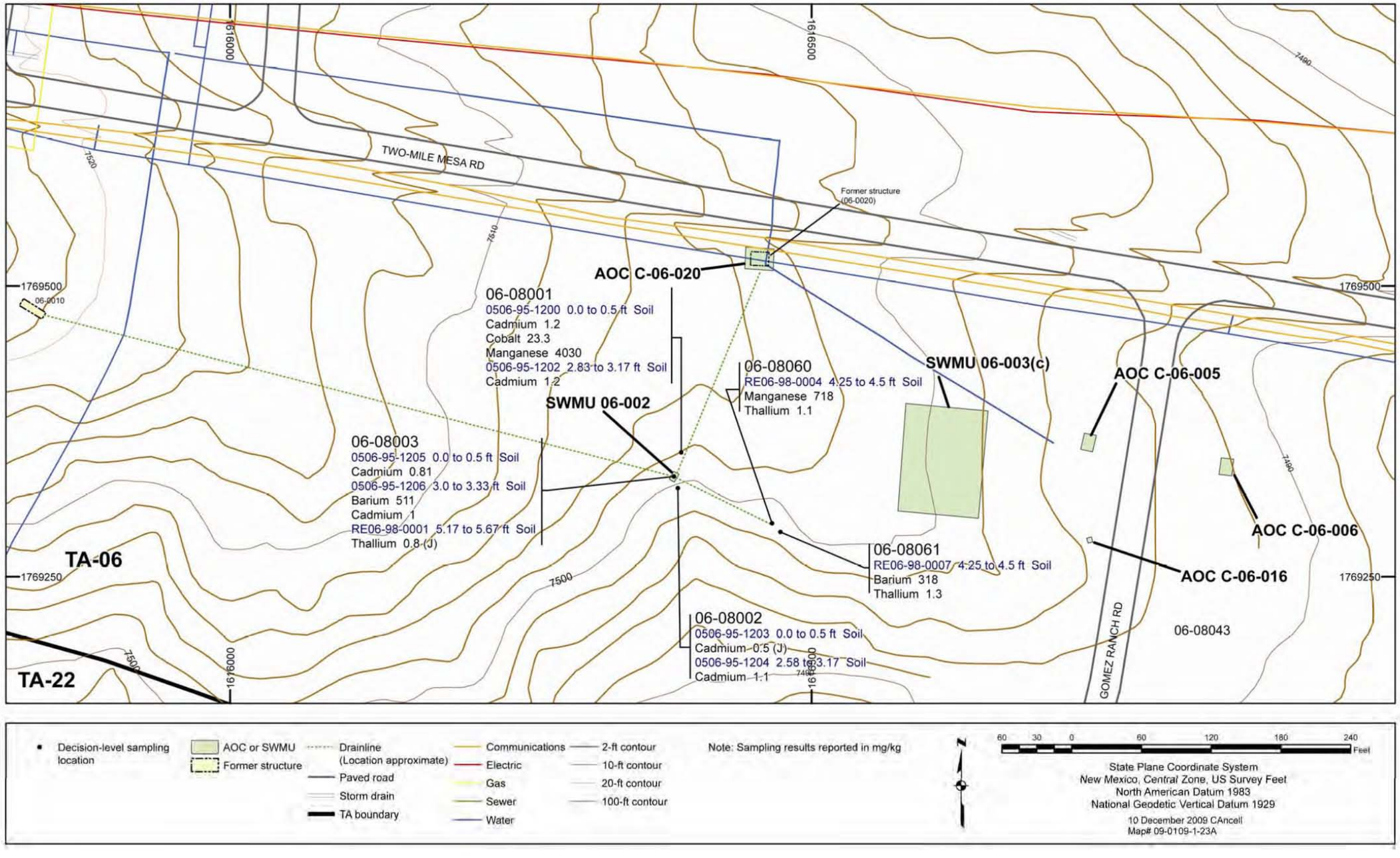


Figure 4.2-6 Inorganic chemicals detected above BVs at SWMU 06-002

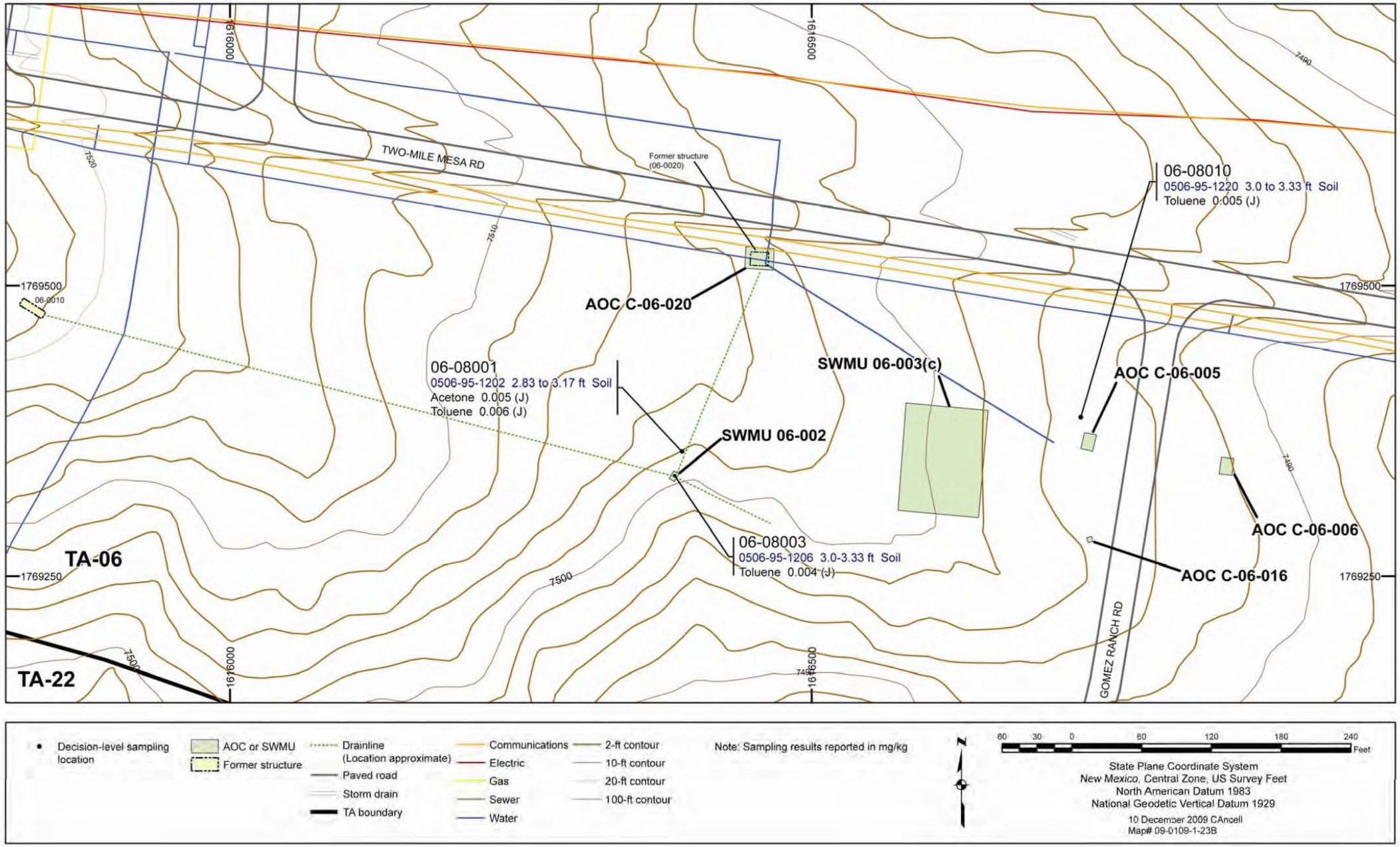


Figure 4.2-7 Organic chemicals detected at SWMU 06-002 and AOC C-06-005

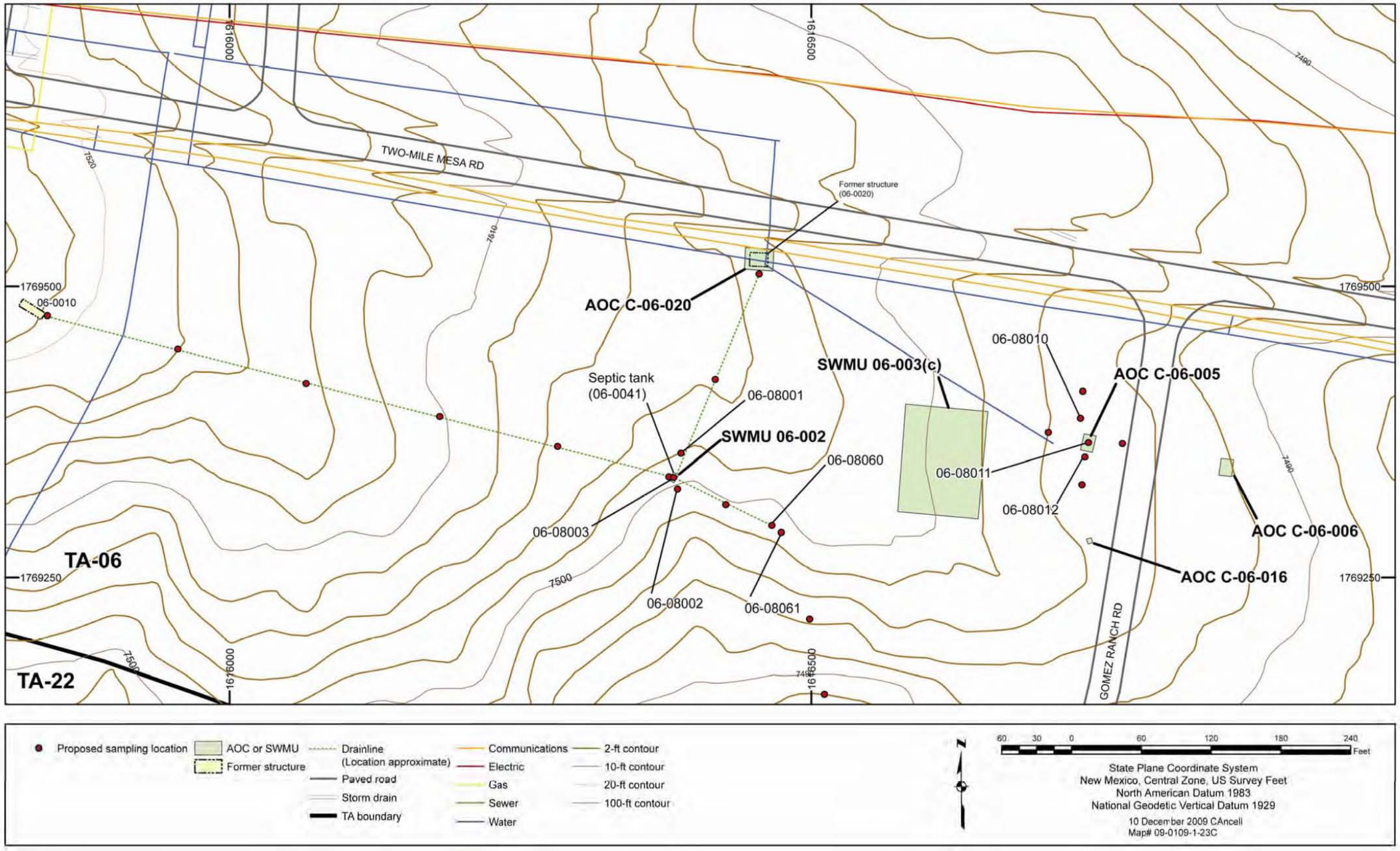


Figure 4.2-8 Proposed sampling locations at SWMU 06-002 and AOC C-06-005

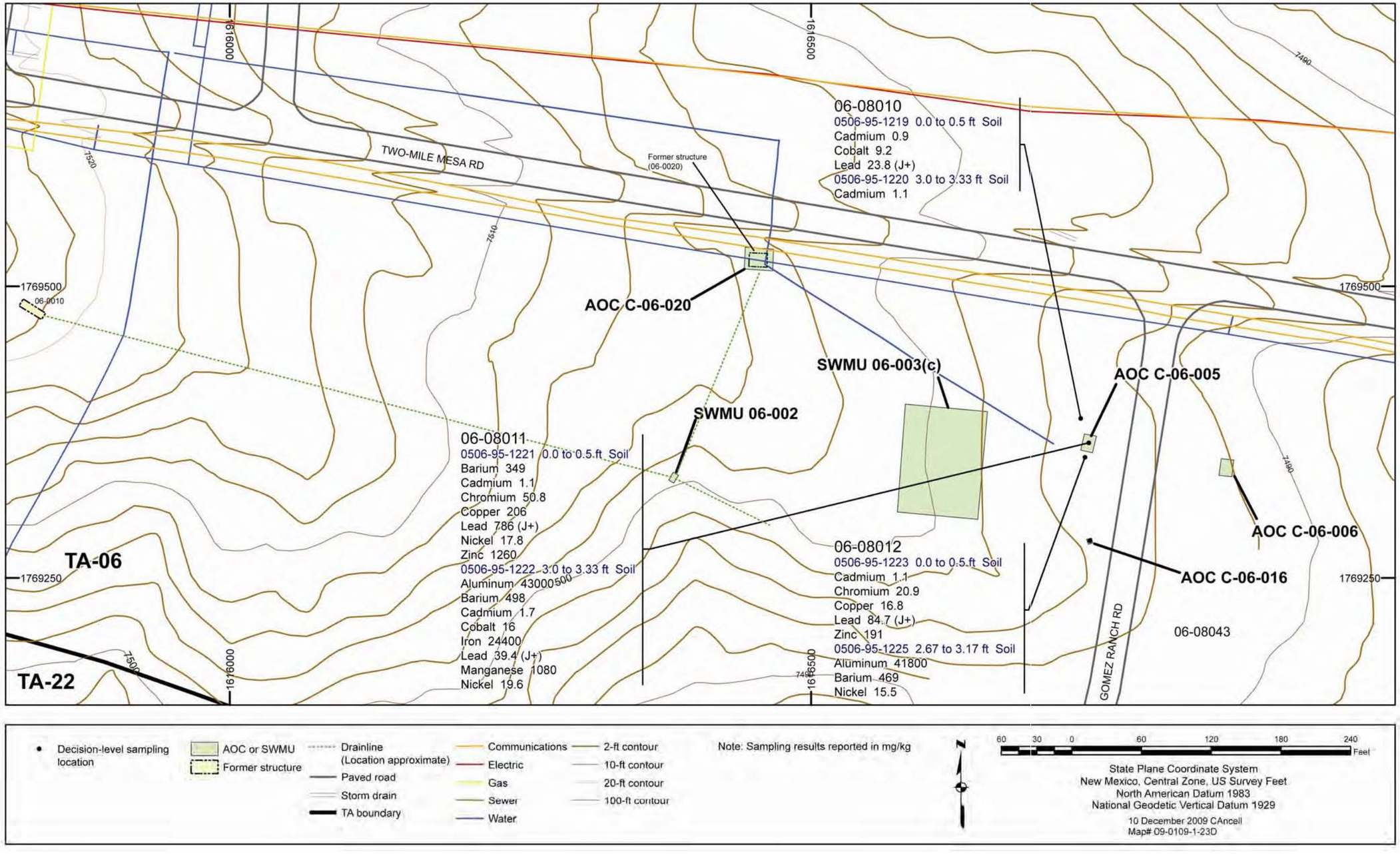


Figure 4.2-9 Inorganic chemicals detected above BVs at AOC C-06-005

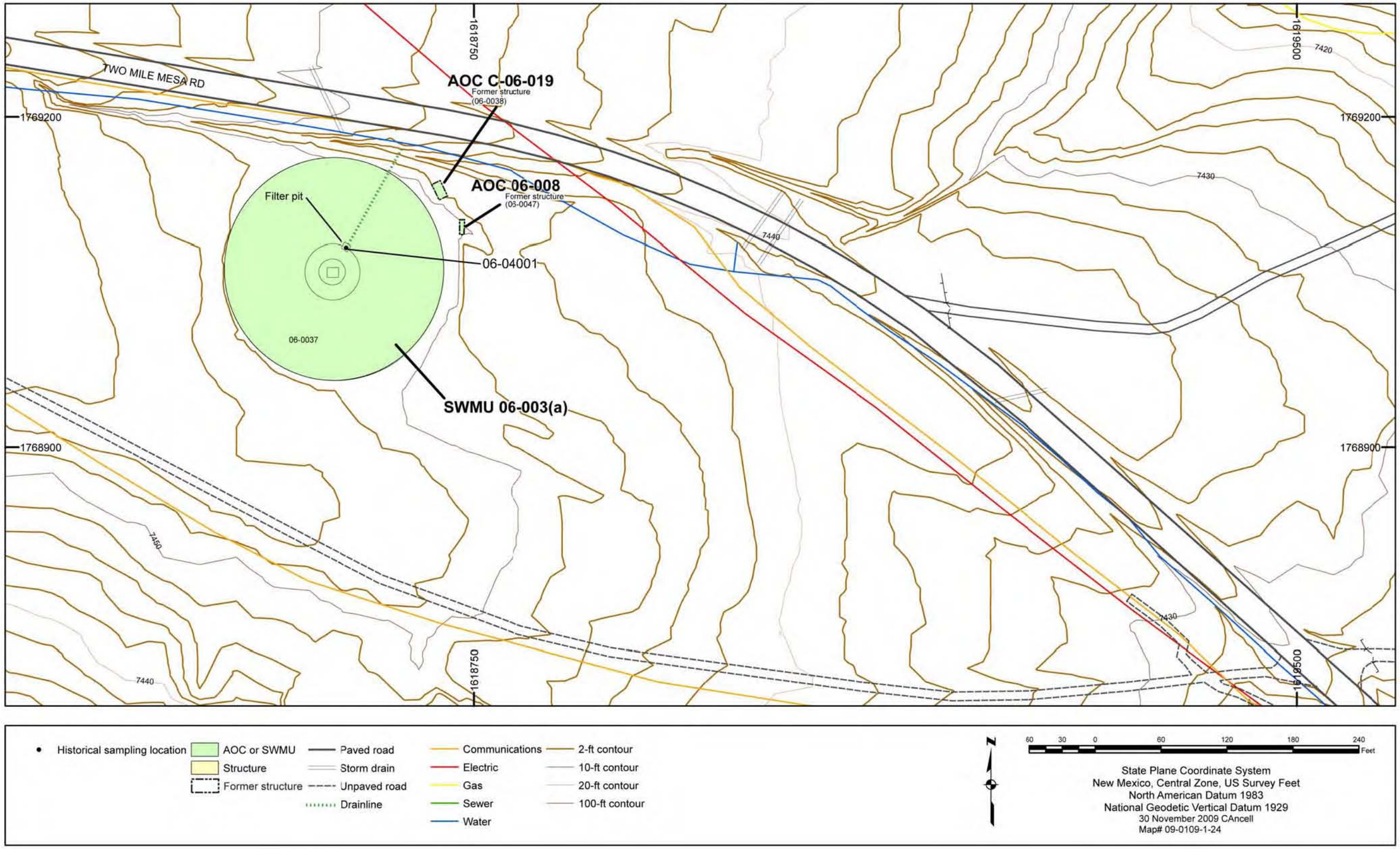


Figure 4.2-10 Site features and historical sampling locations for Consolidated Unit 06-003(a)-99

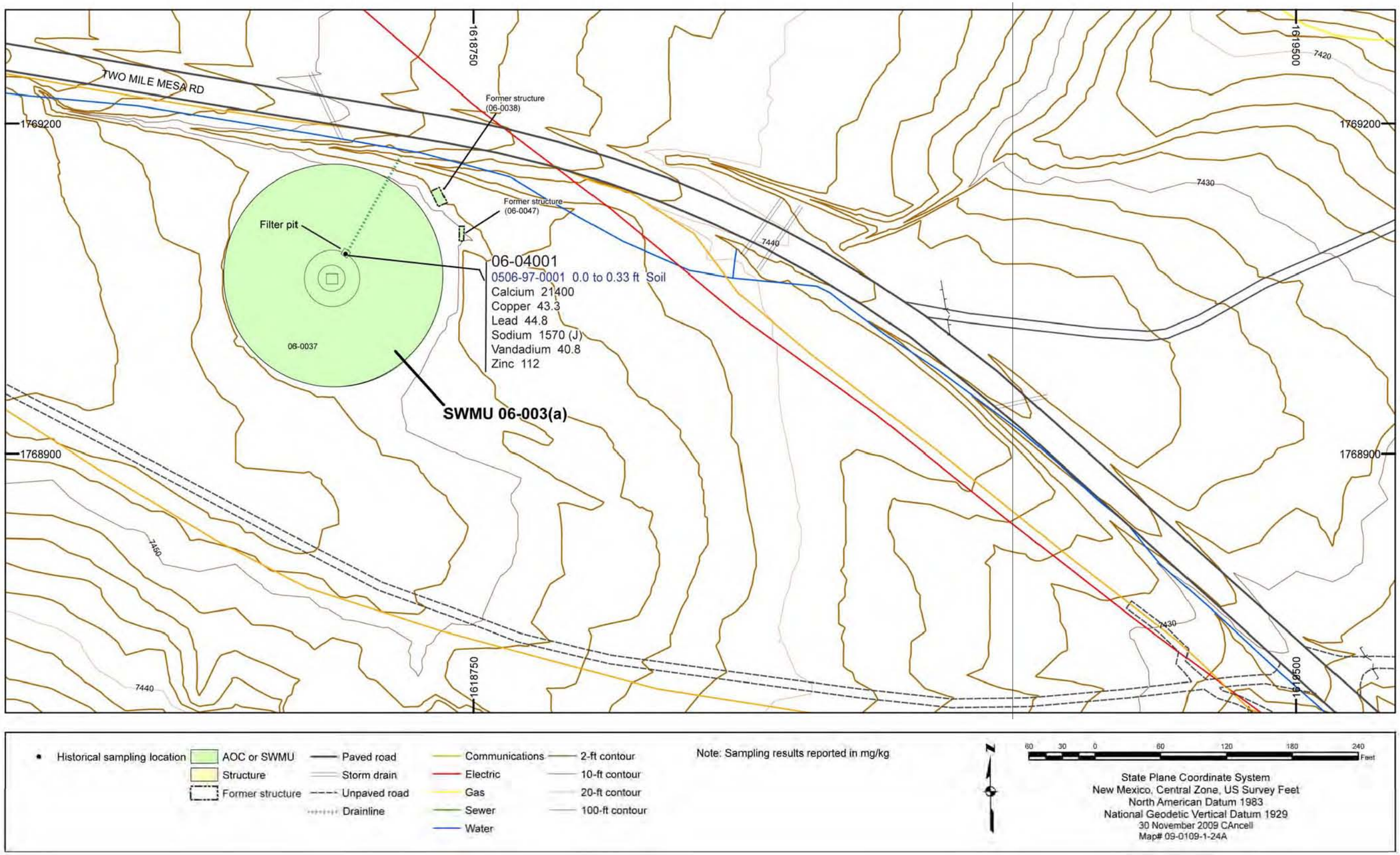


Figure 4.2-11 Inorganic chemicals detected above BVs at SWMU 06-003(a)

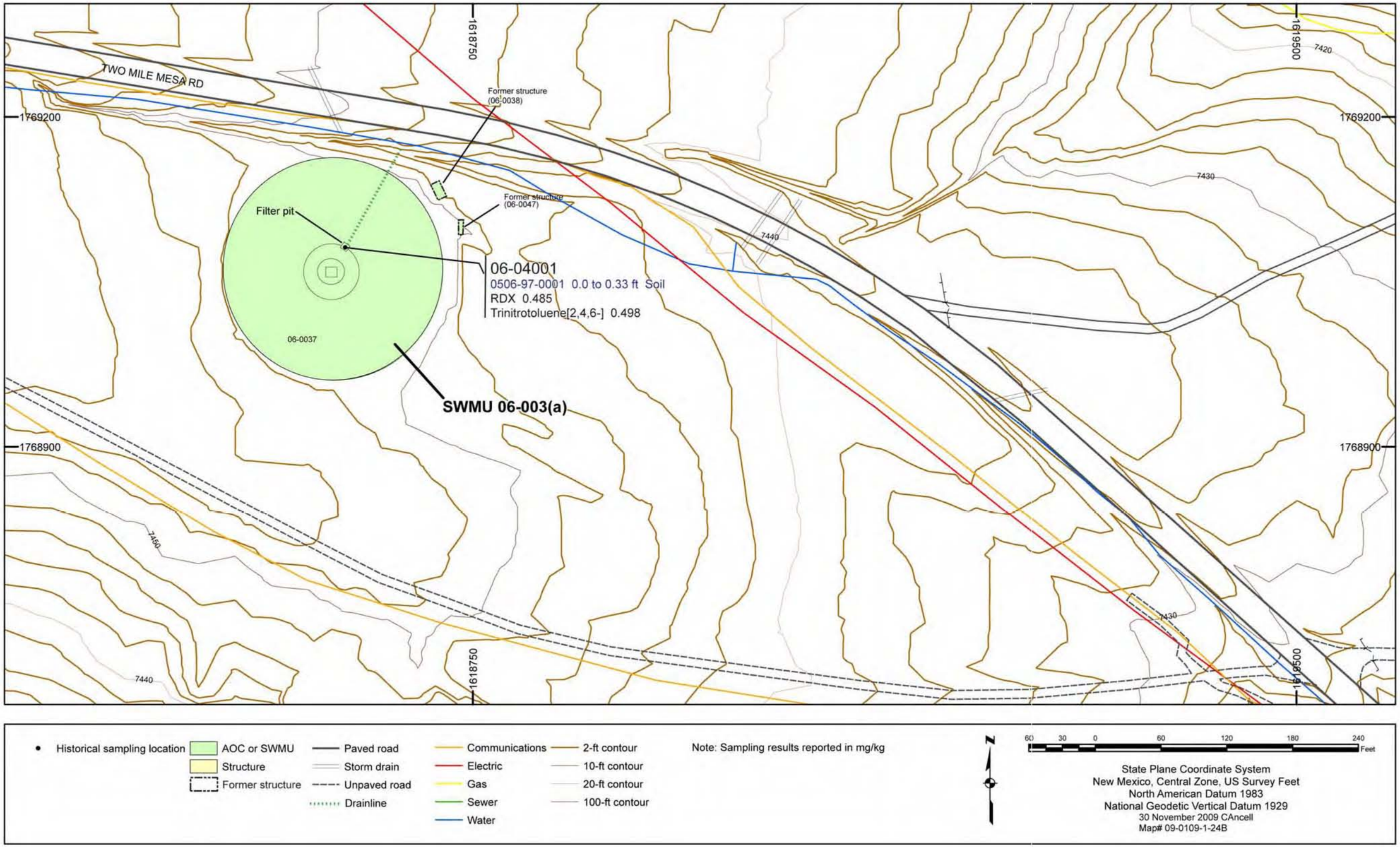


Figure 4.2-12 Organic chemicals detected at SWMU 06-003(a)

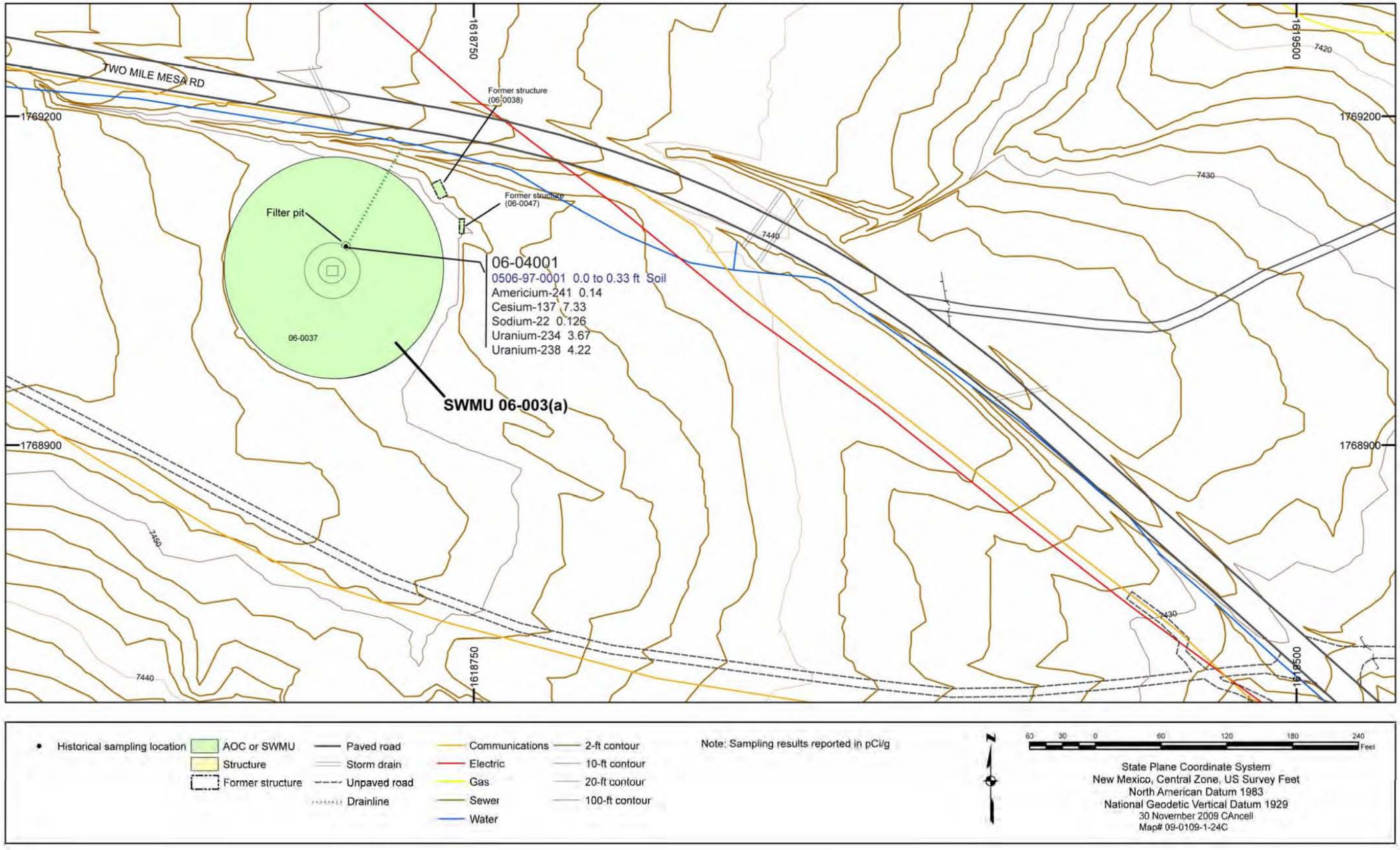


Figure 4.2-13 Radionuclides detected or detected above BVs/FVs at SWMU 06-003(a)

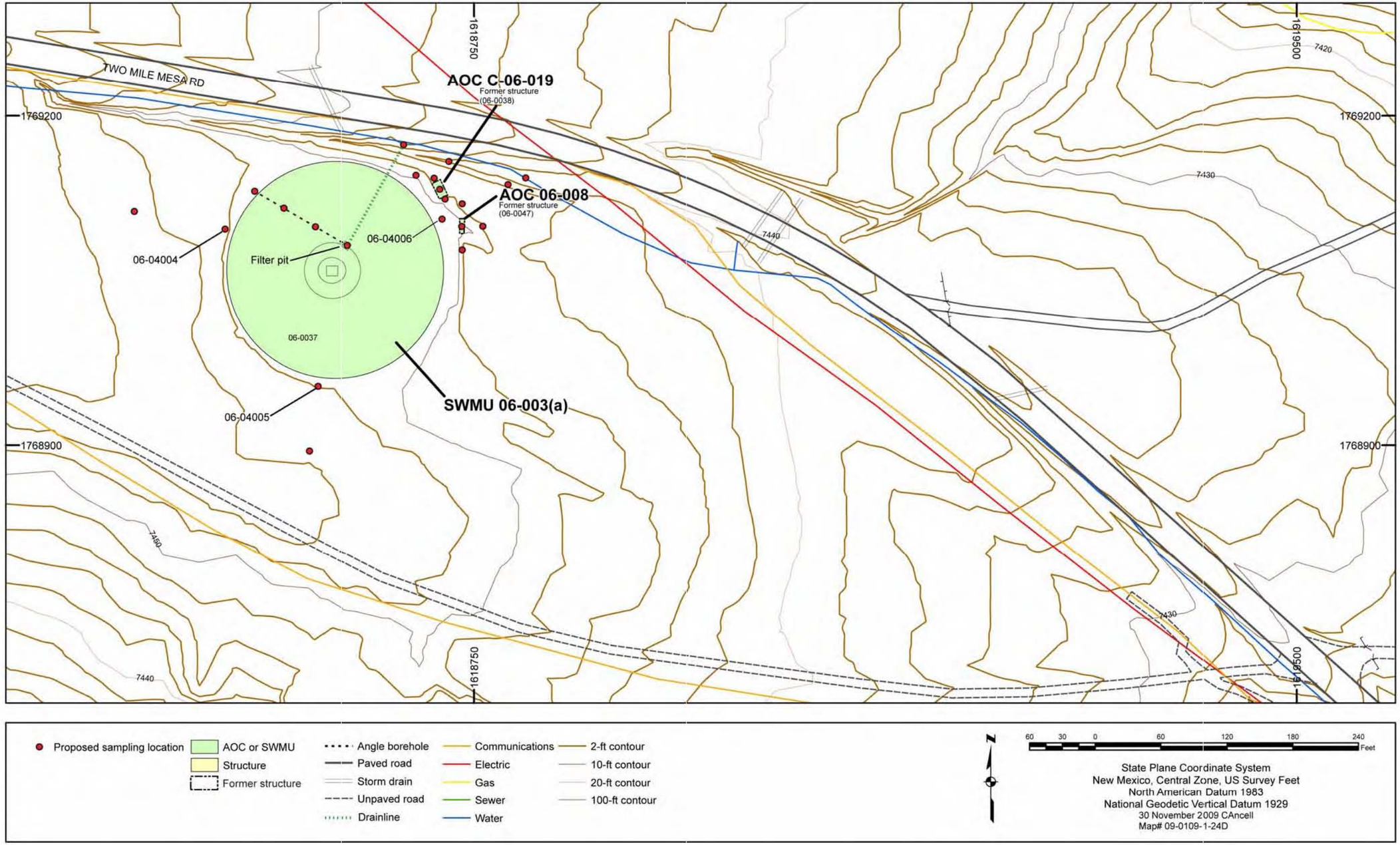


Figure 4.2-14 Proposed sampling locations at Consolidated Unit 06-003(a)-99

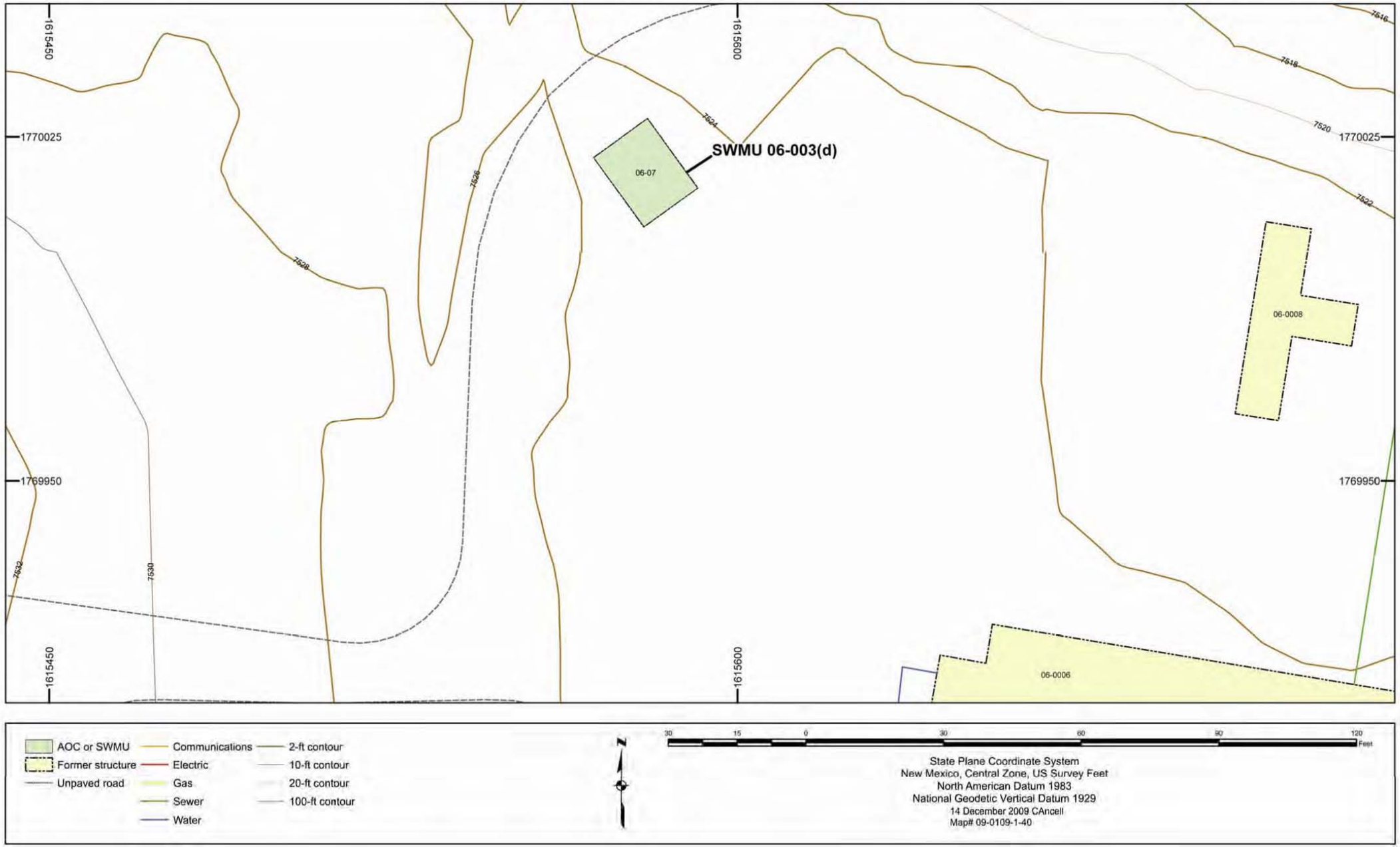


Figure 4.2-15 Site features for SWMU 06-003(d)

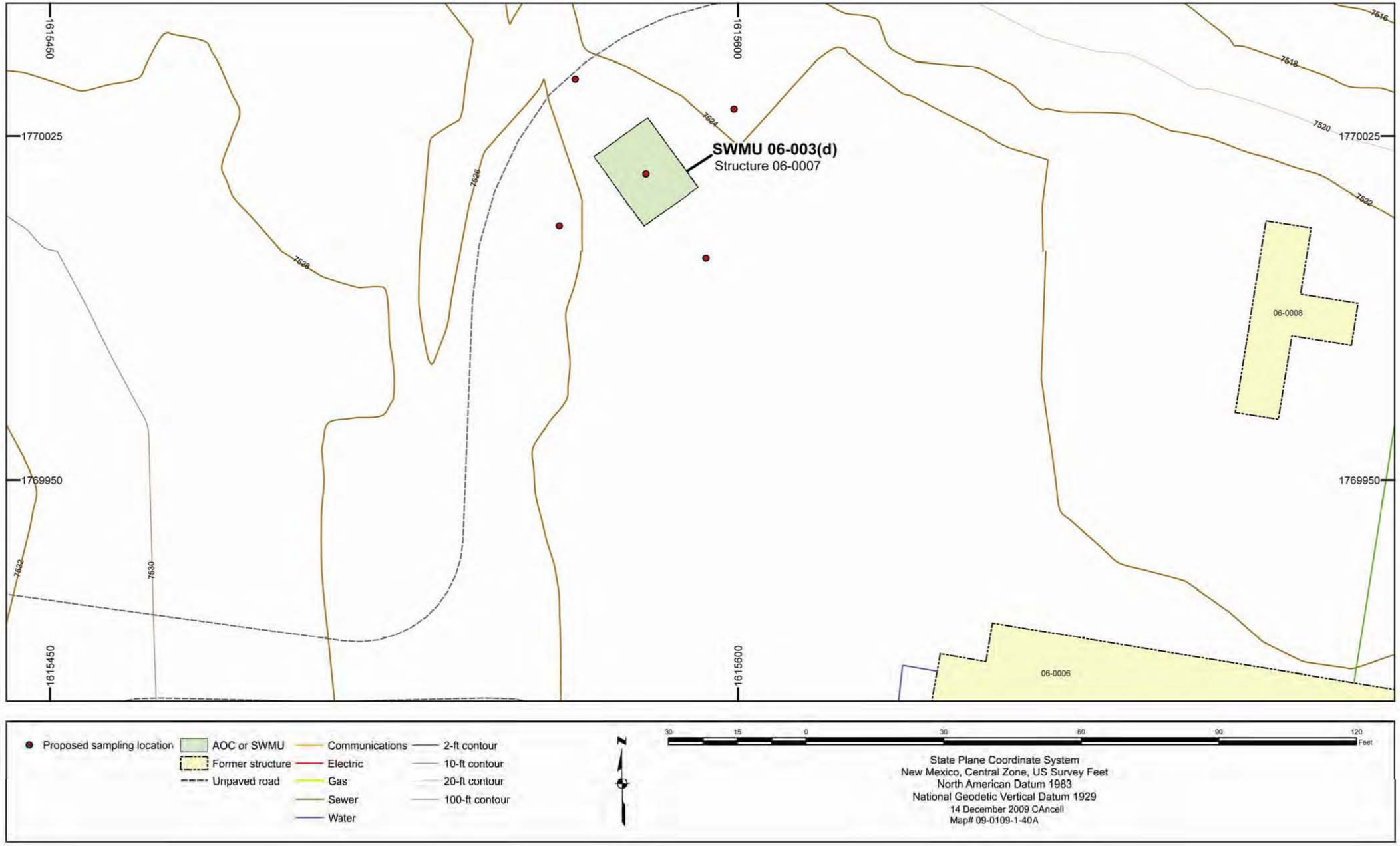


Figure 4.2-16 Proposed sampling locations at SWMU 06-003(d)

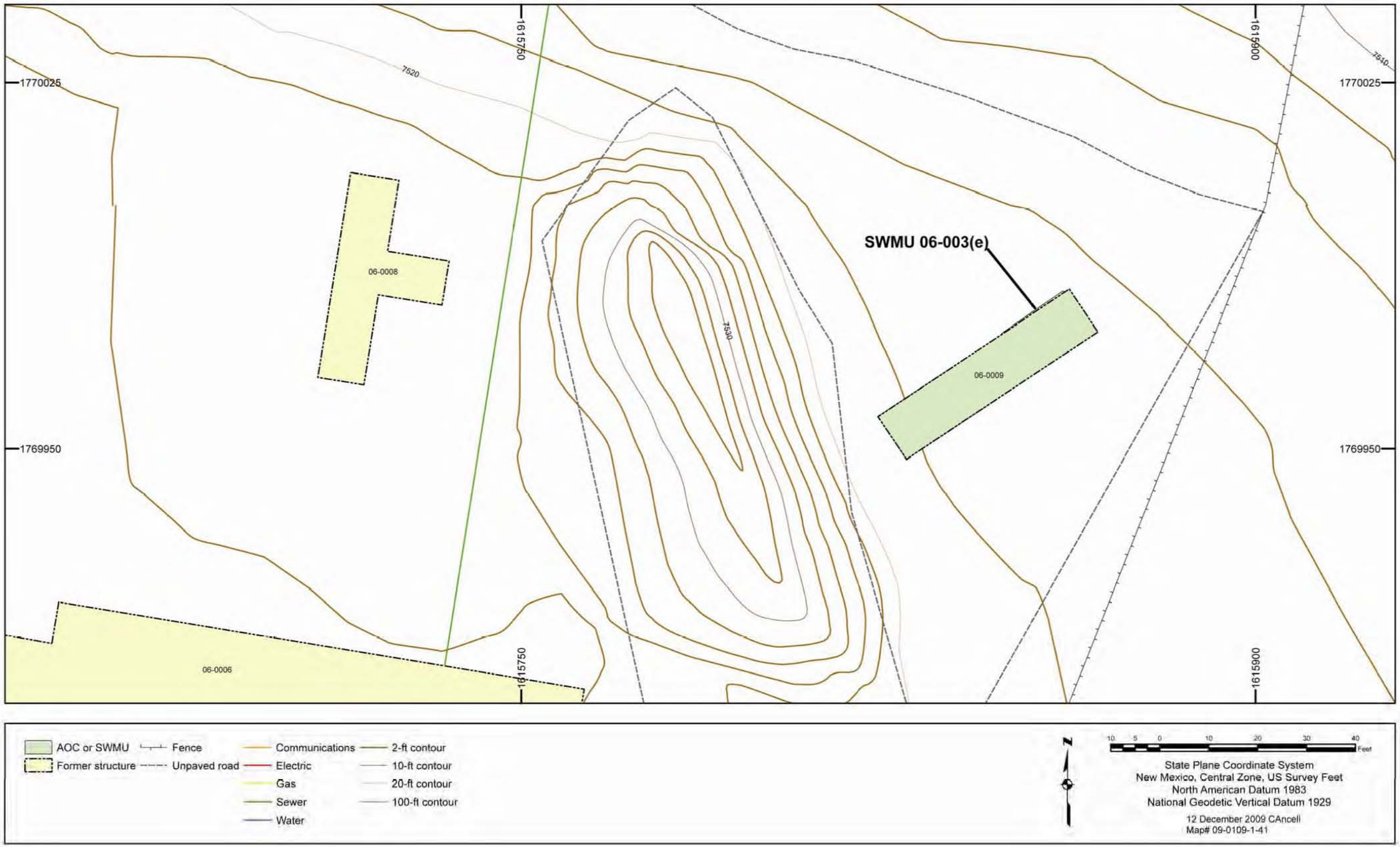


Figure 4.2-17 Site features for SWMU 06-003(e)

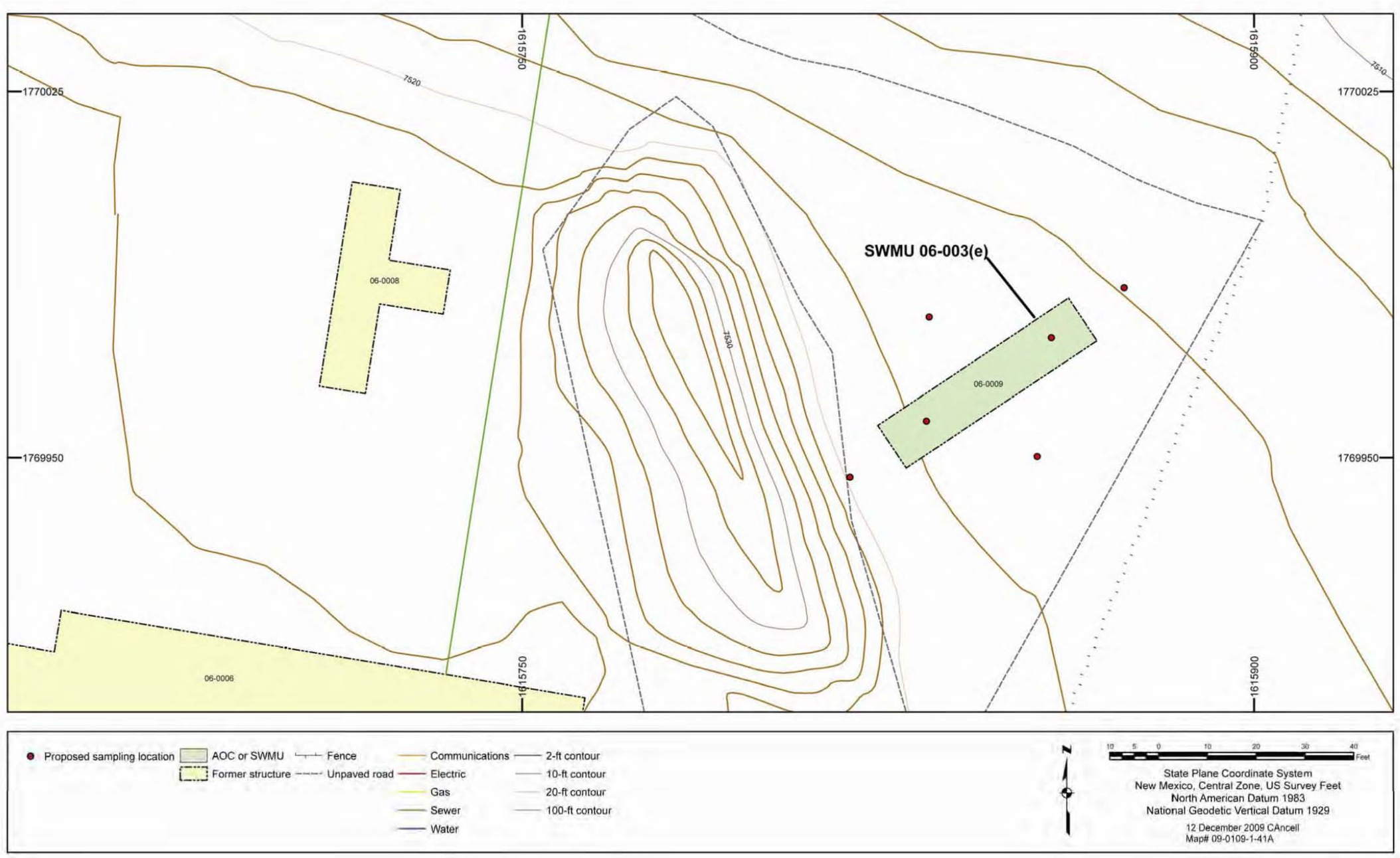


Figure 4.2-18 Proposed sampling locations at SWMU 06-003(e)

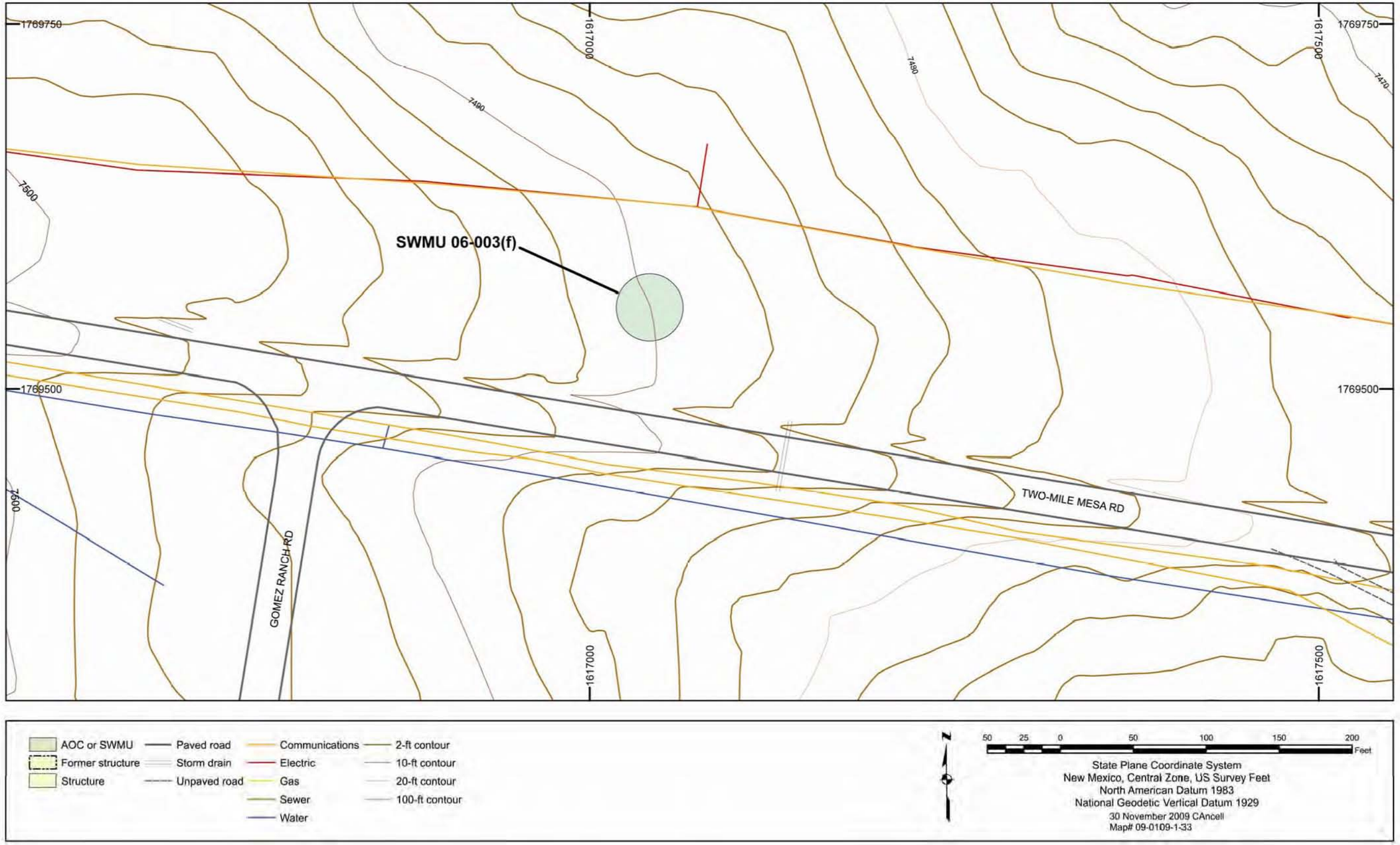


Figure 4.2-19 Site features for SWMU 06-003(f)

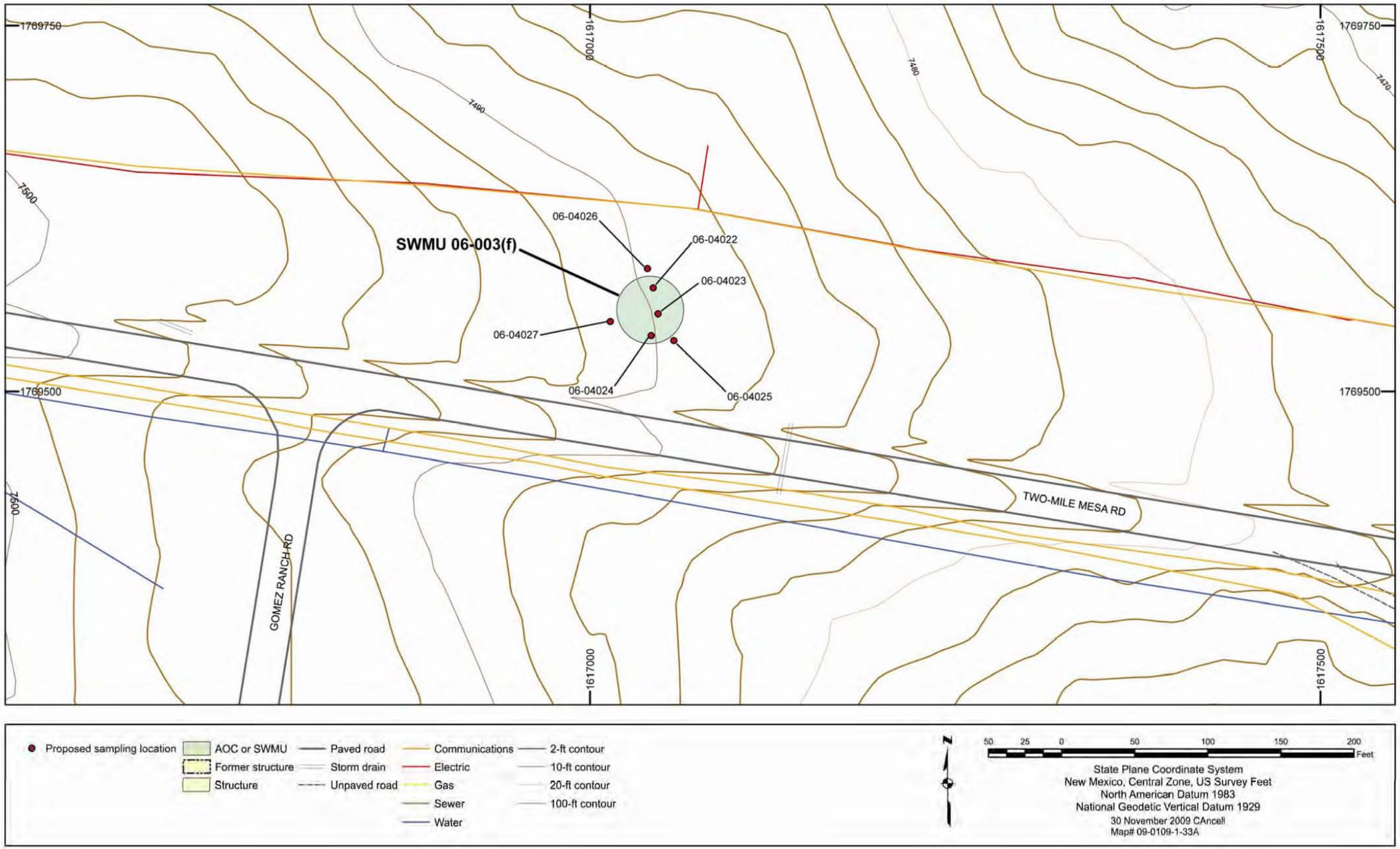


Figure 4.2-20 Proposed sampling locations at SWMU 06-003(f)

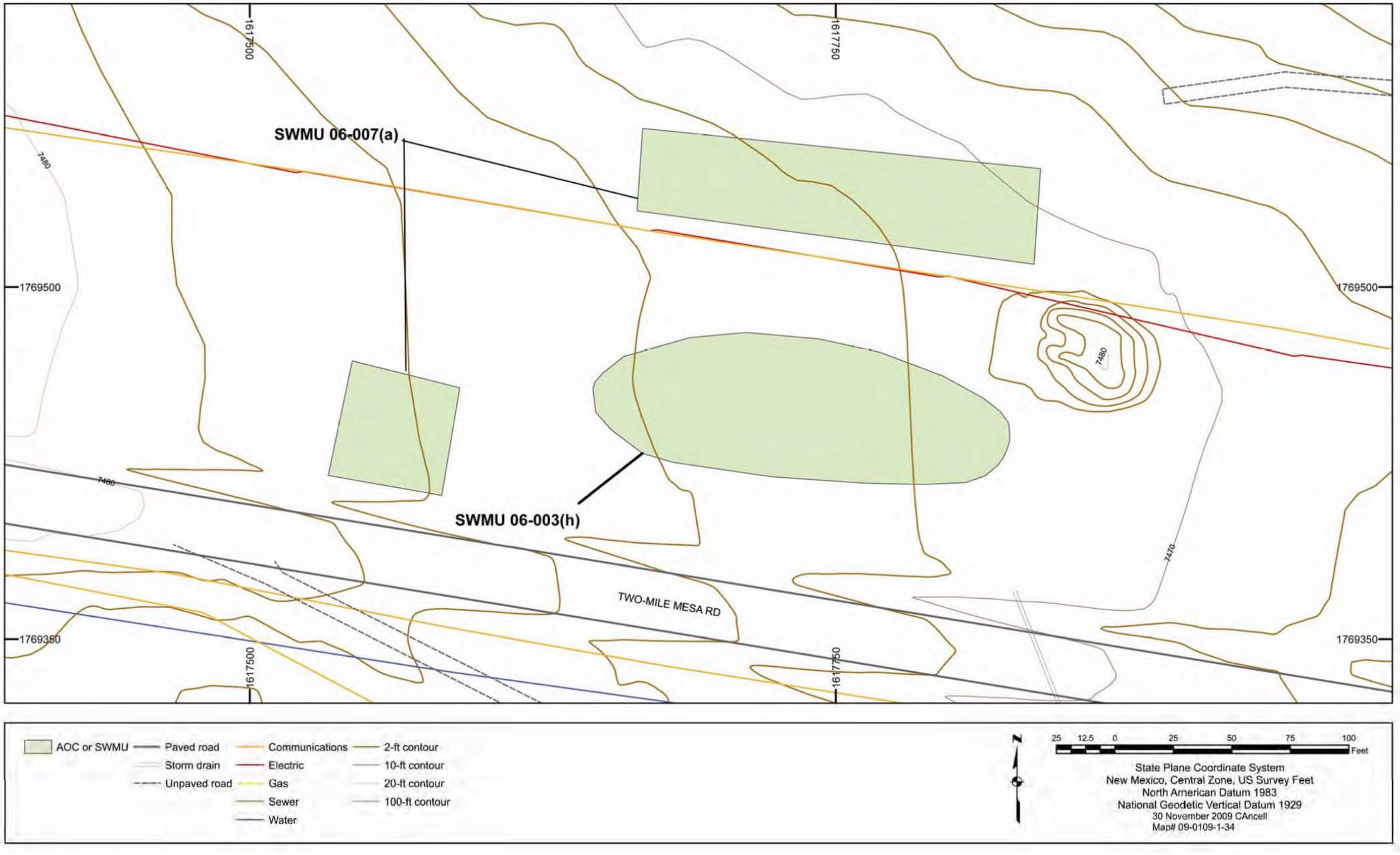


Figure 4.2-21 Site features for SWMU 06-003(h)

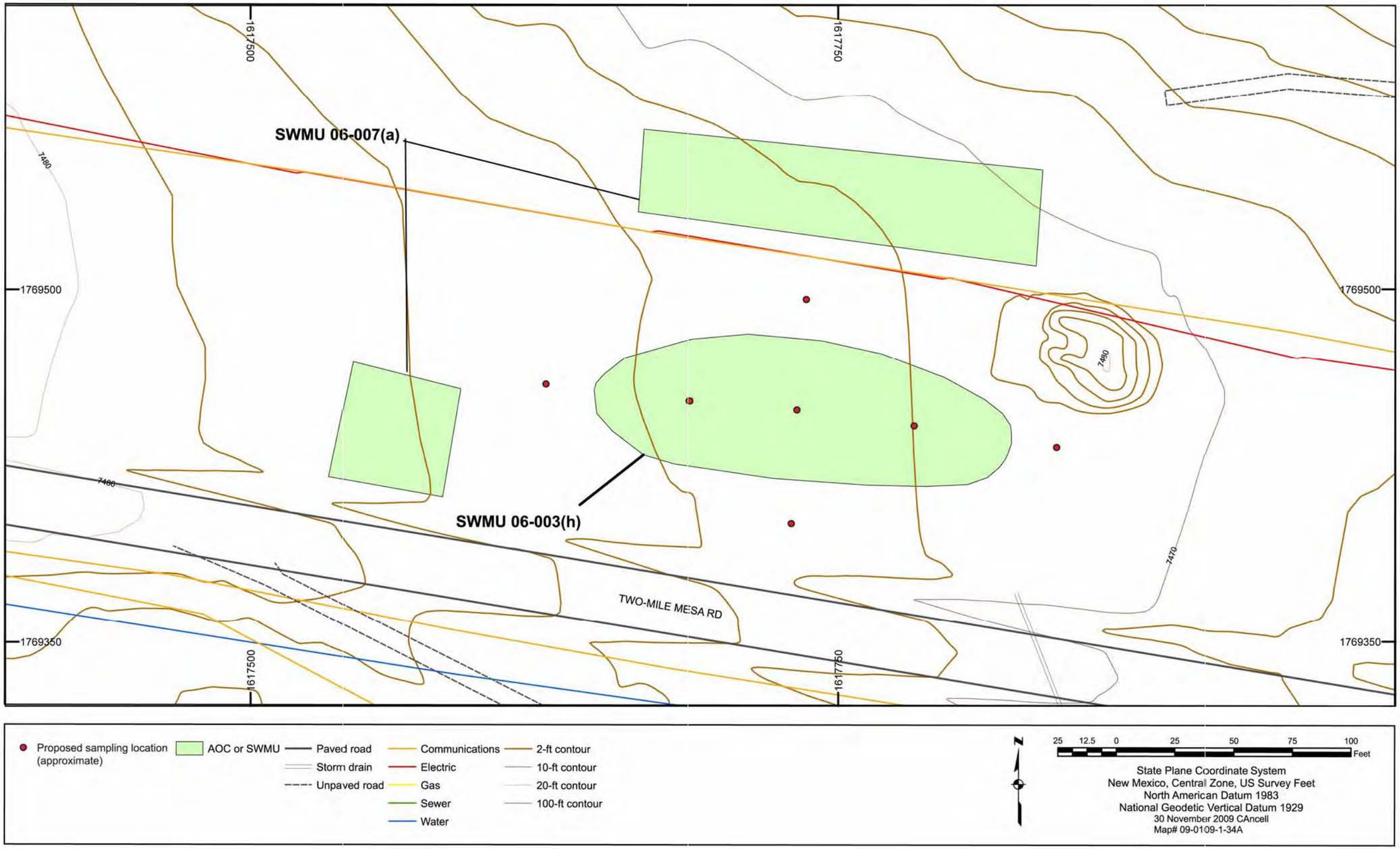


Figure 4.2-22 Proposed sampling locations at SWMU 06-003(h)

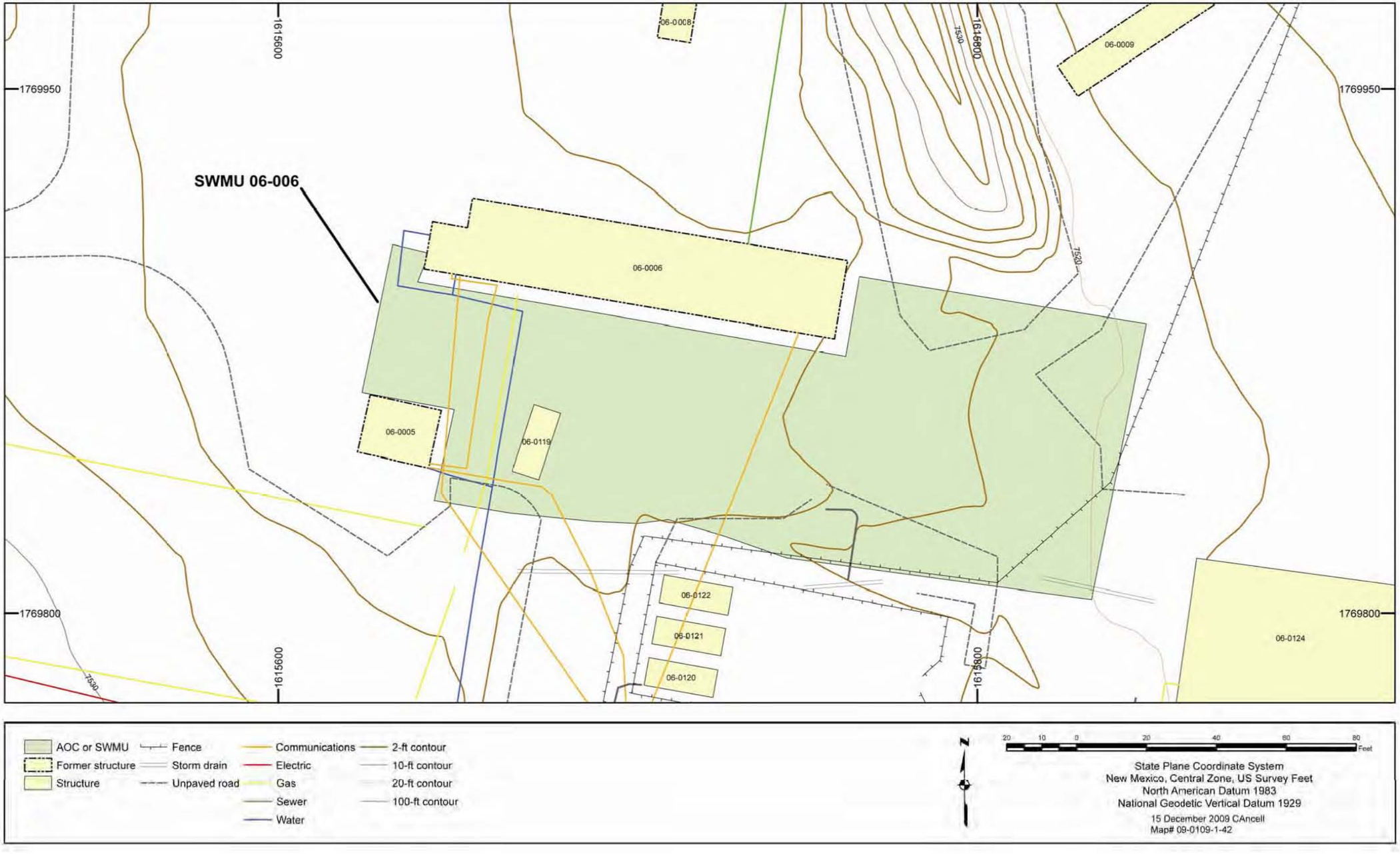


Figure 4.2-23 Site features for SWMU 06-006

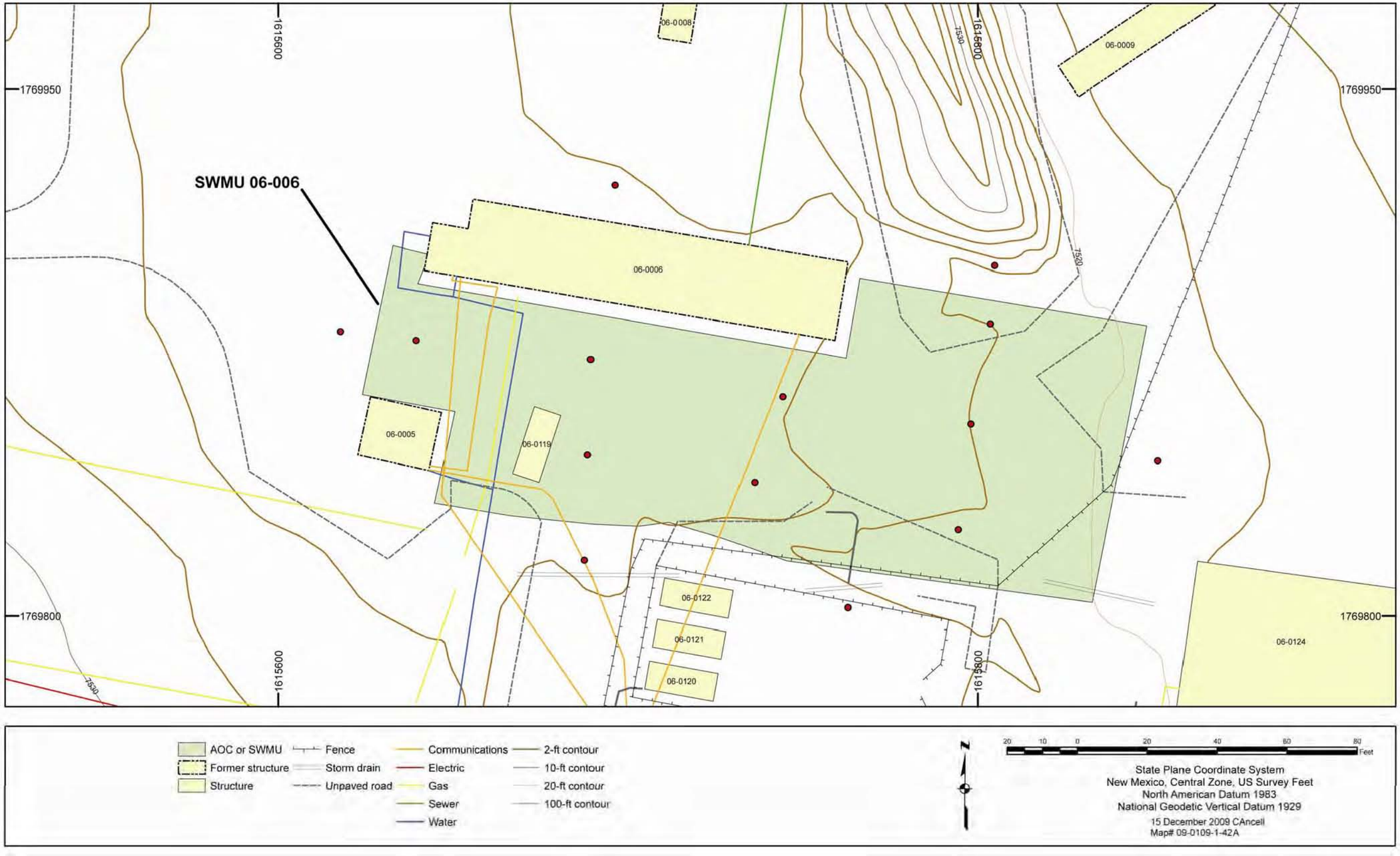


Figure 4.2-24 Proposed sampling locations at SWMU 06-006

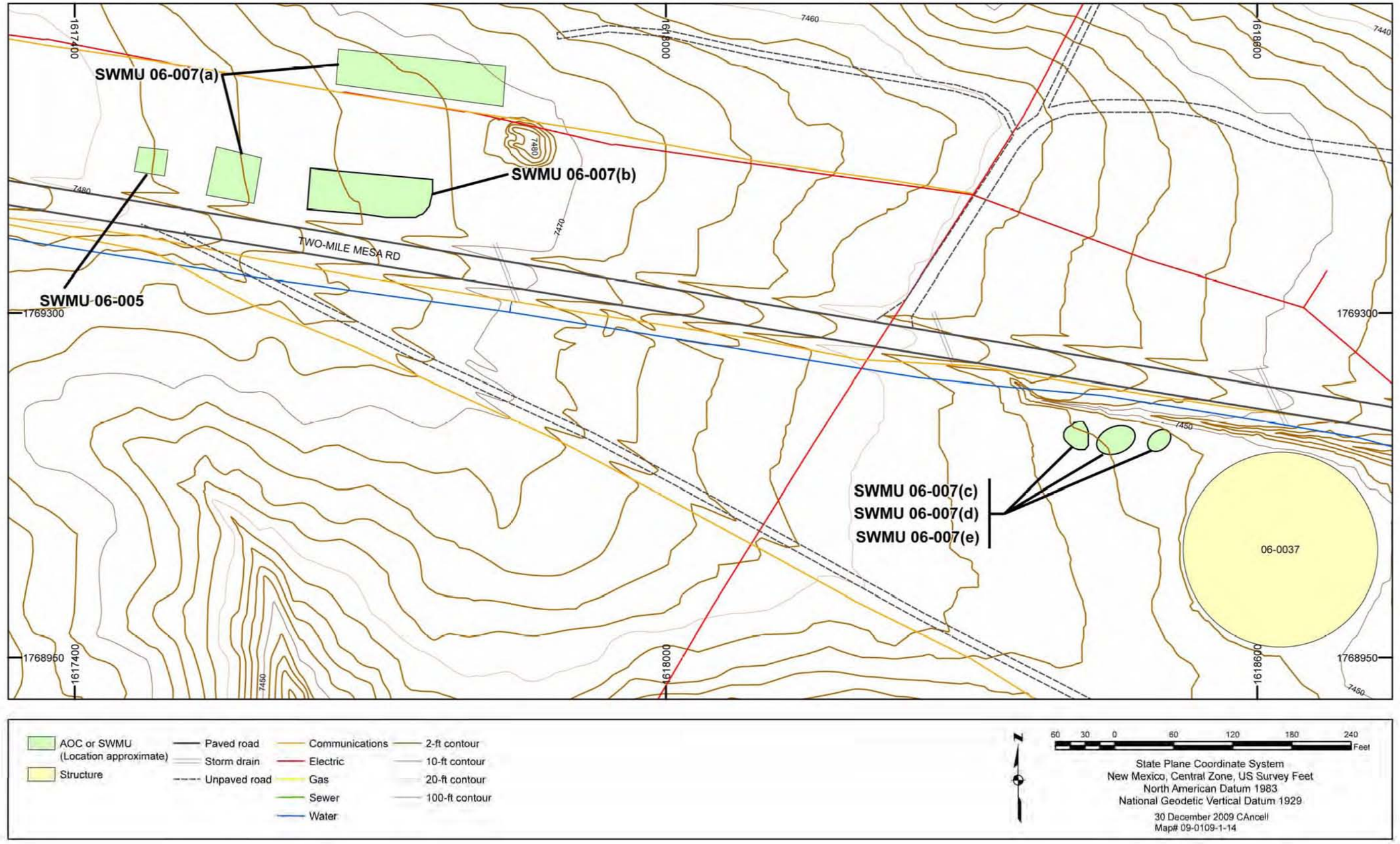


Figure 4.2-25 Site features for Consolidated Unit 06-007(a)-99

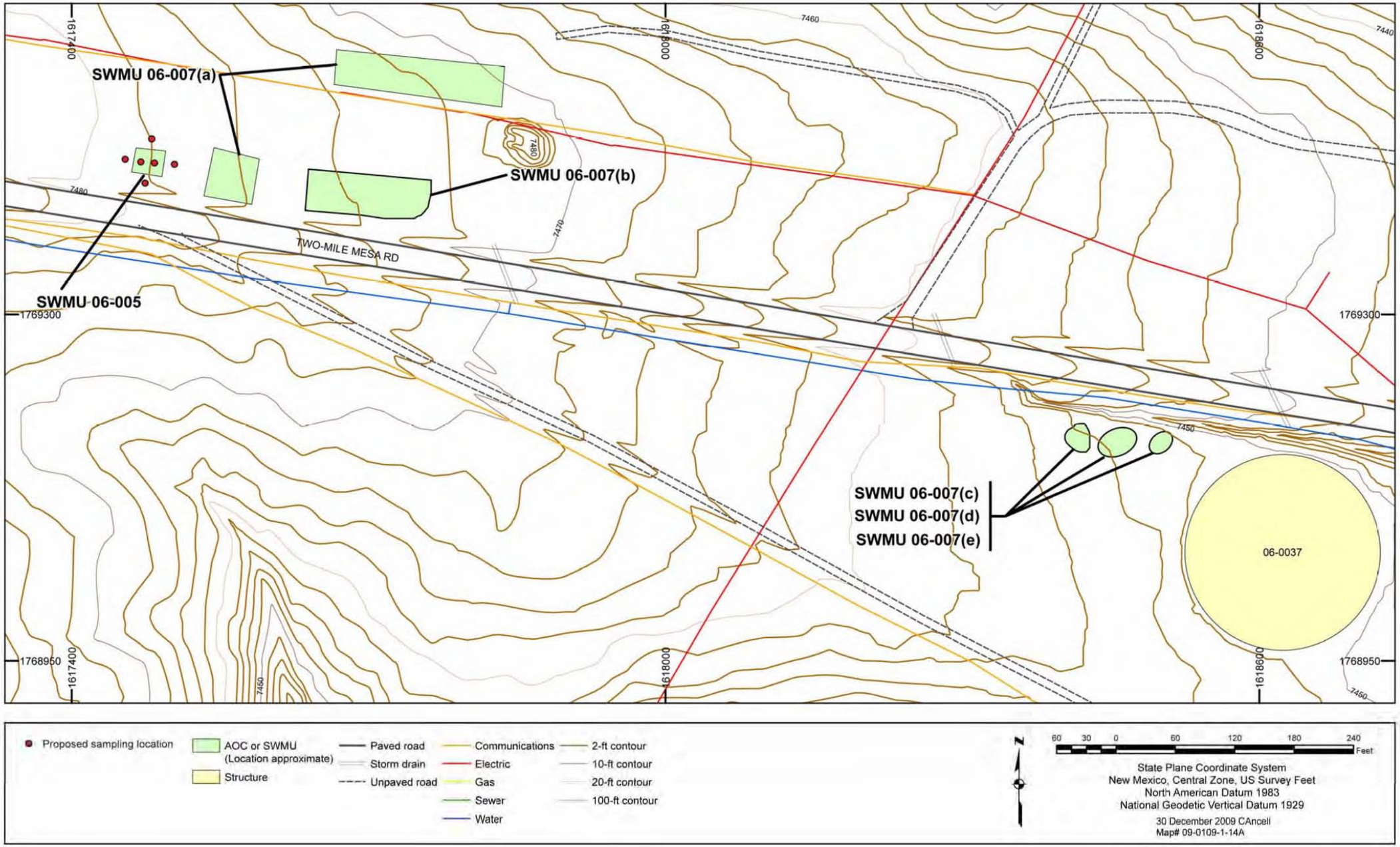


Figure 4.2-26 Proposed sampling locations at SWMU 06-005

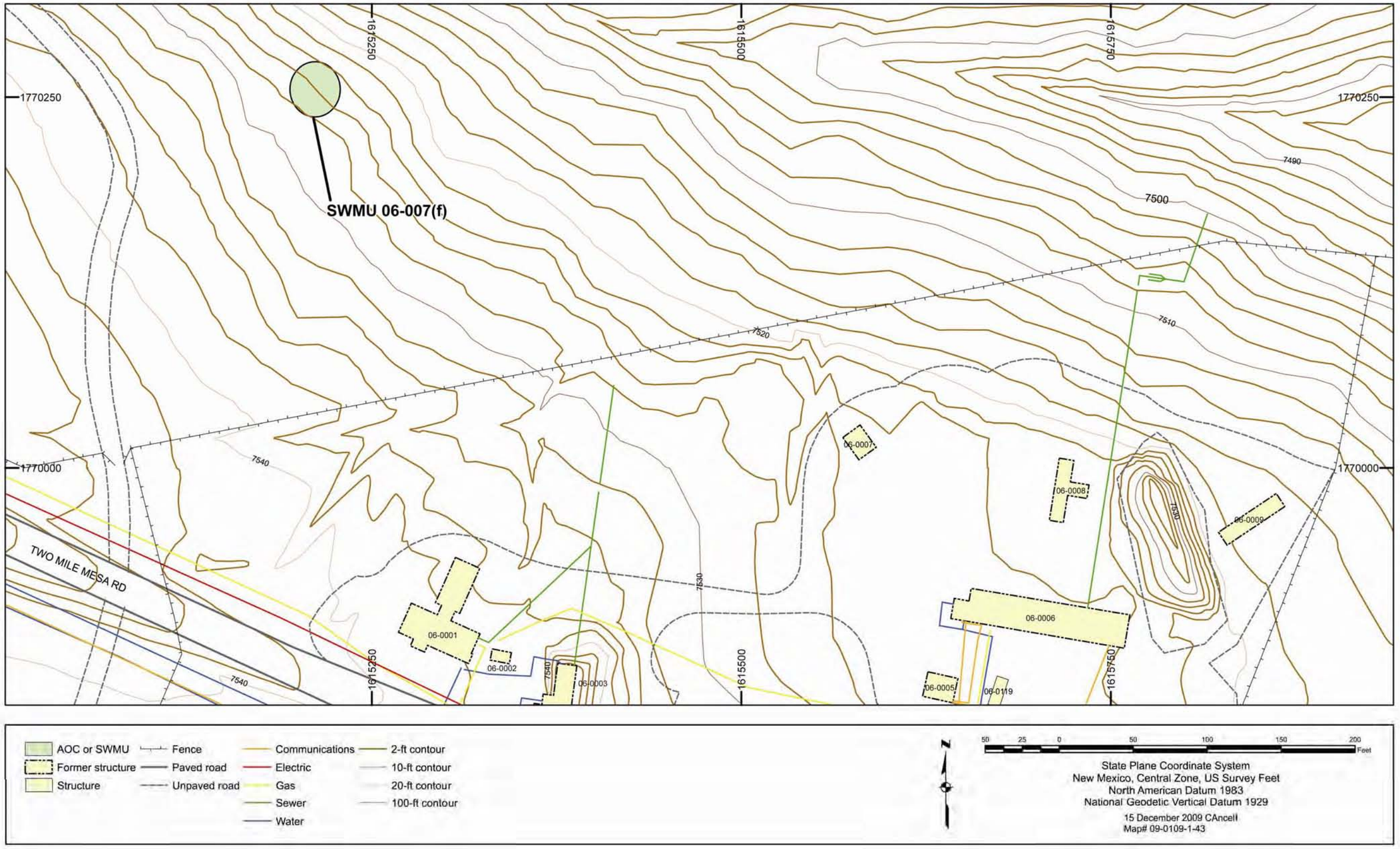


Figure 4.2-27 Site features for SWMU 06-007(f)

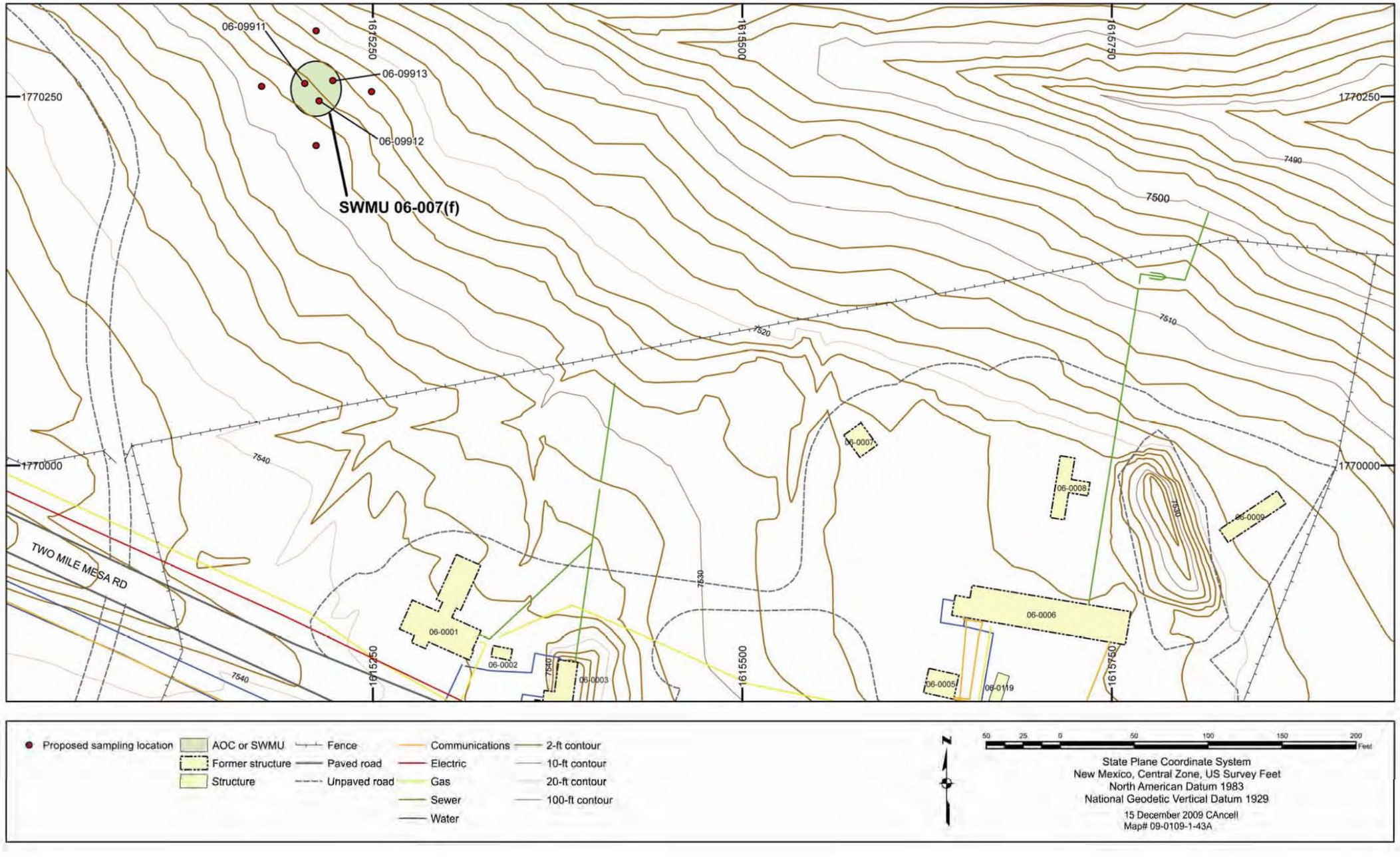


Figure 4.2-28 Proposed sampling locations at SWMU 06-007(f)

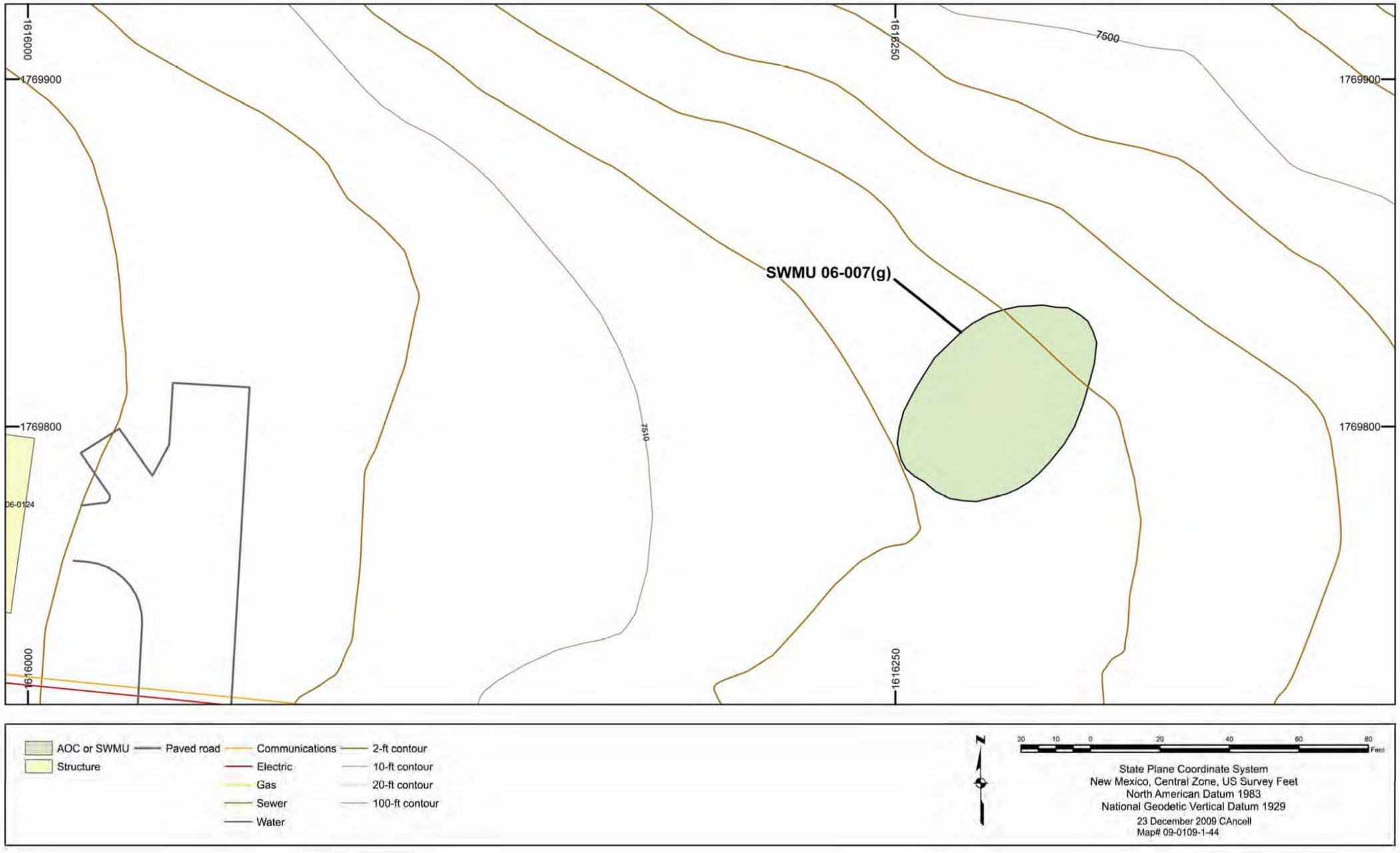


Figure 4.2-29 Site features for SWMU 06-007(g)

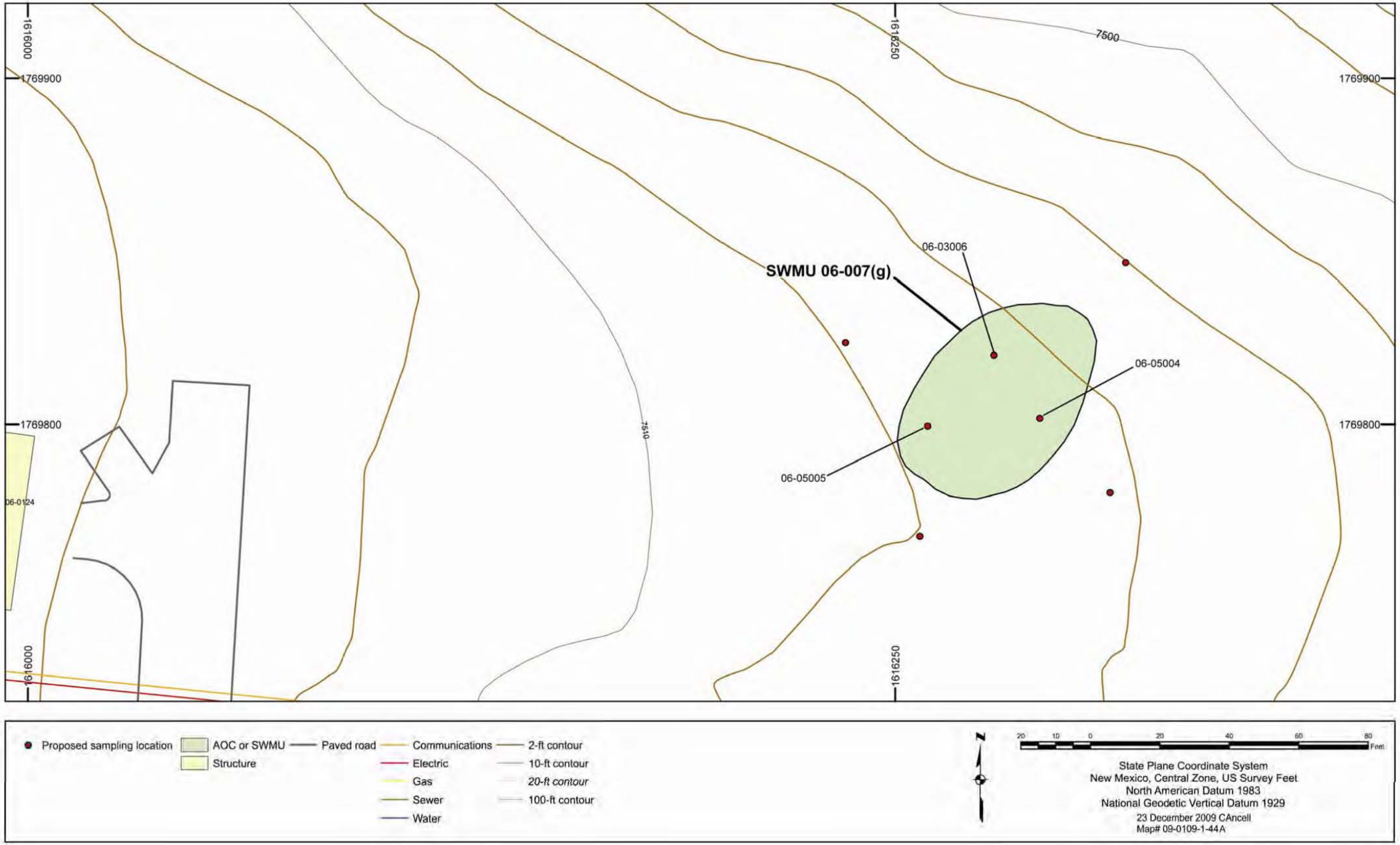


Figure 4.2-30 Proposed sampling locations at SWMU 06-007(g)

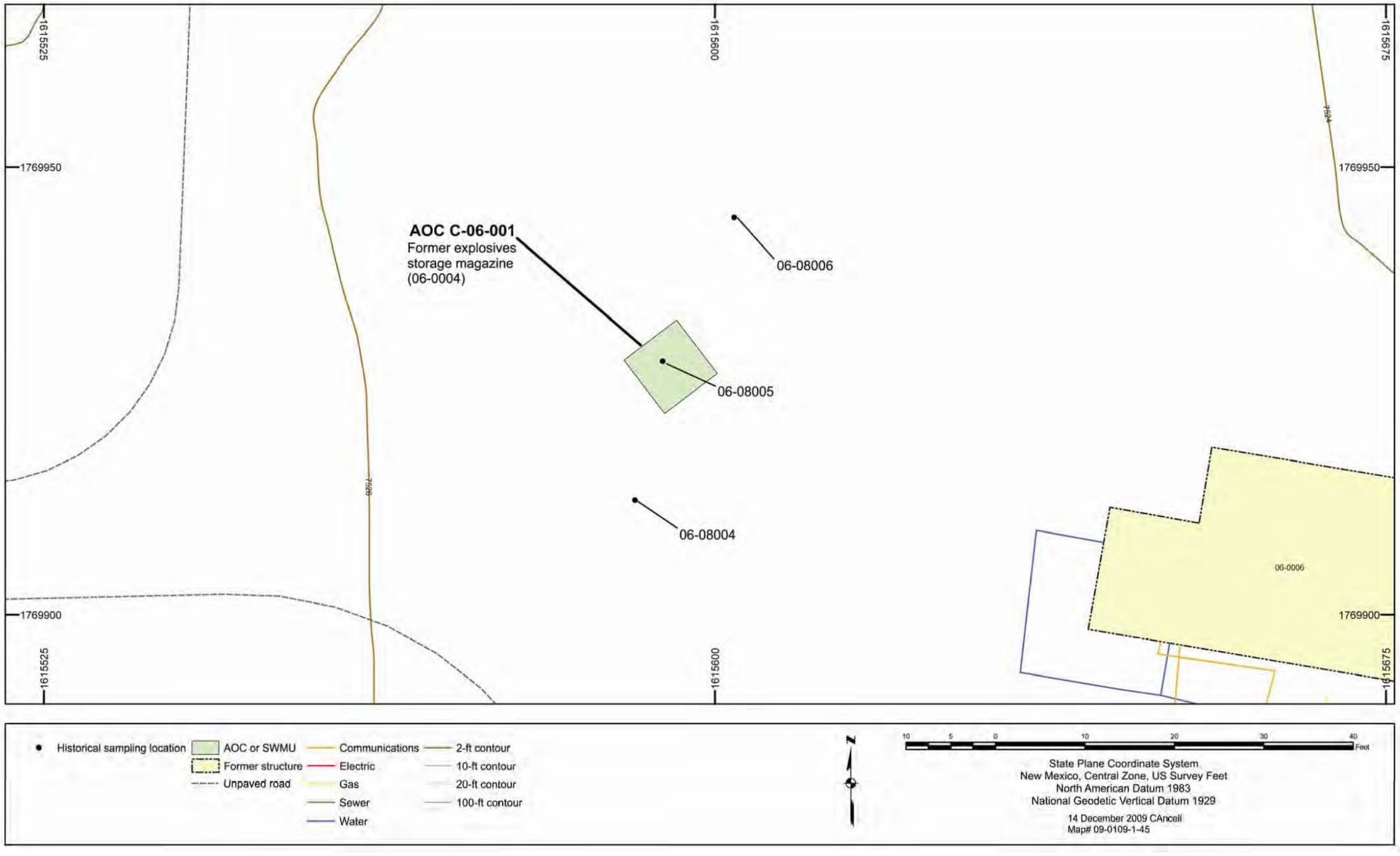


Figure 4.2-31 Site features and historical sampling locations for AOC C-06-001

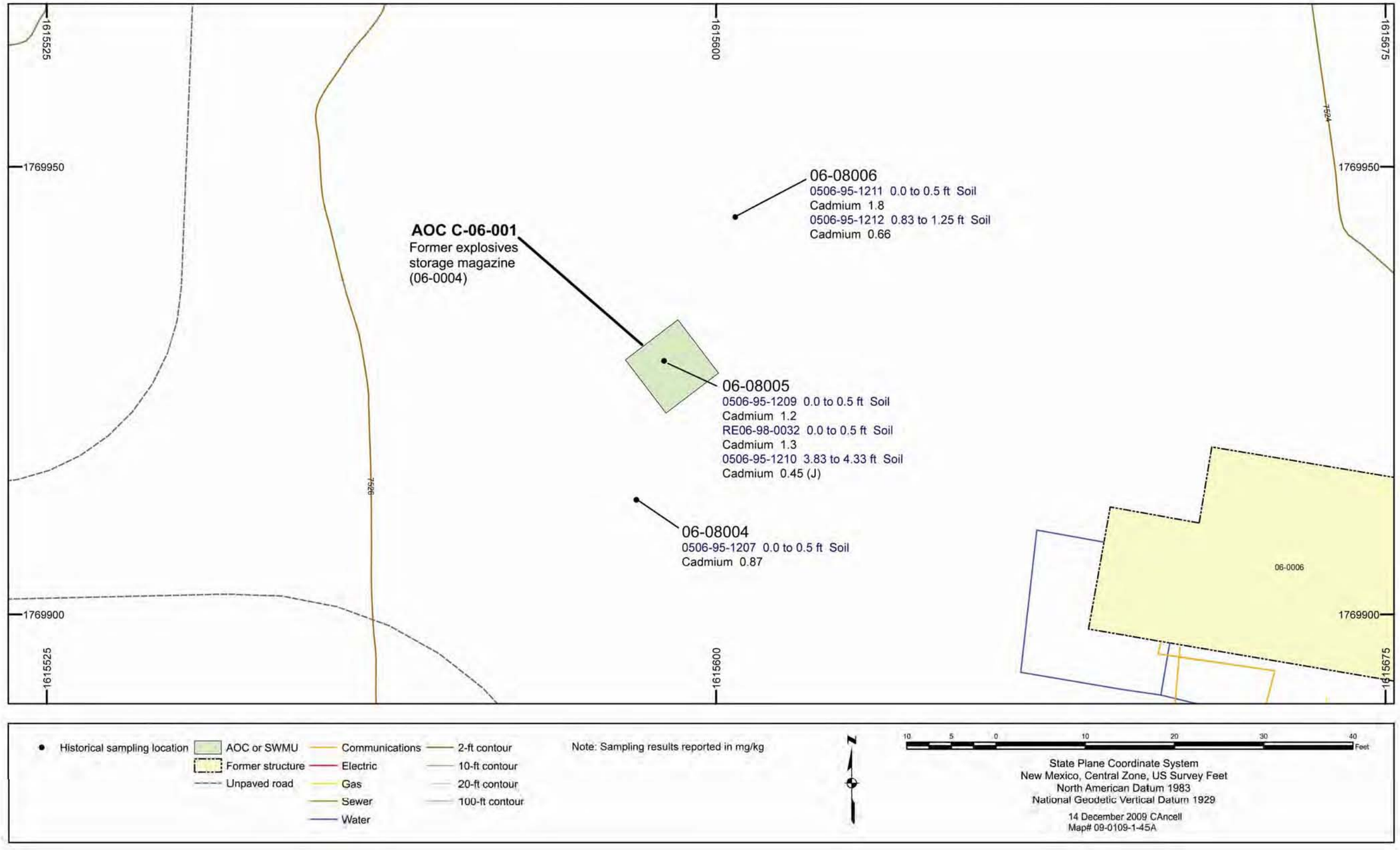


Figure 4.2-32 Inorganic chemicals detected above BVs at AOC C-06-001

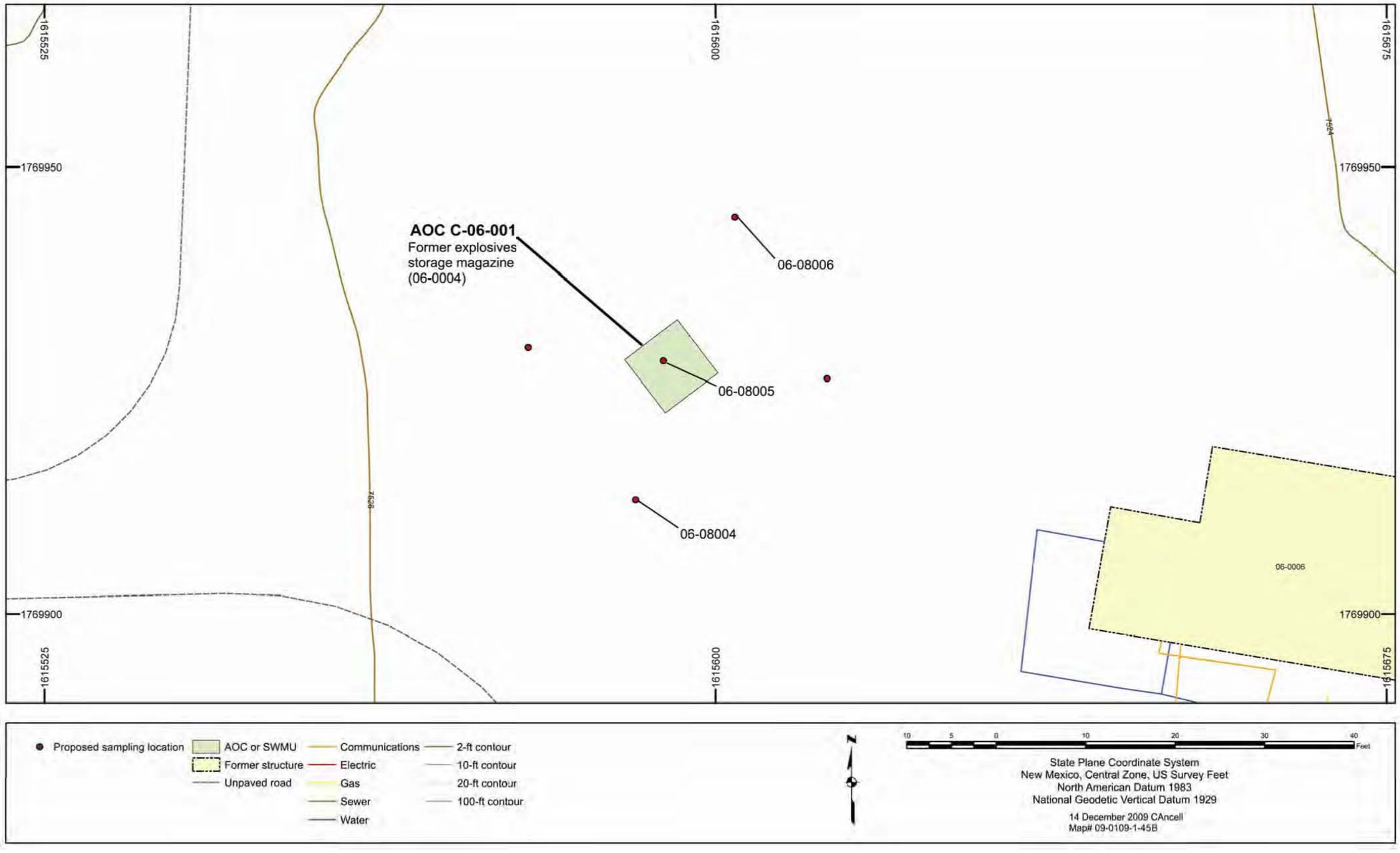


Figure 4.2-33 Proposed sampling locations at AOC 06-001

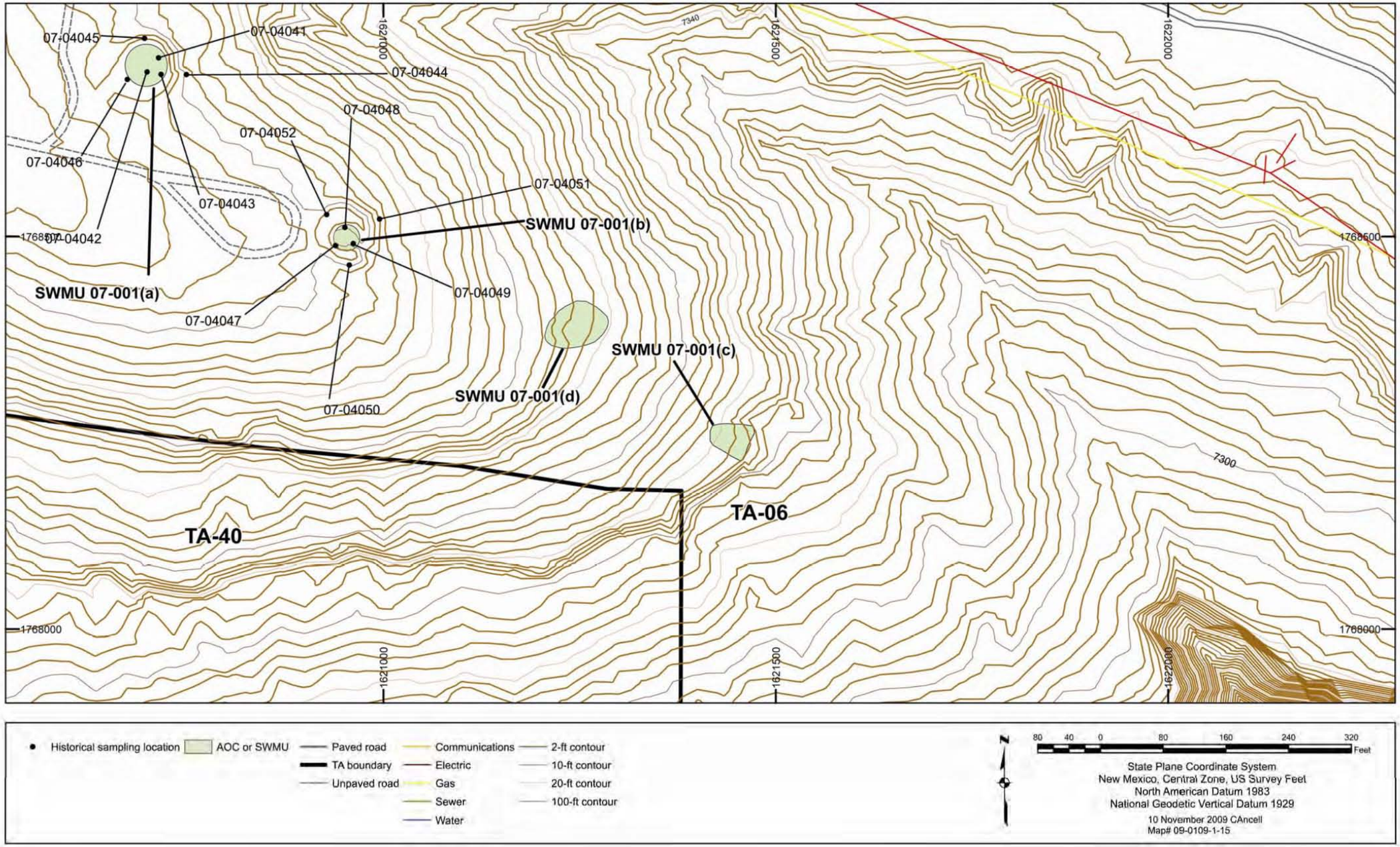


Figure 4.3-1 Site features and historical sampling locations for Consolidated Unit 07-001(a)-99

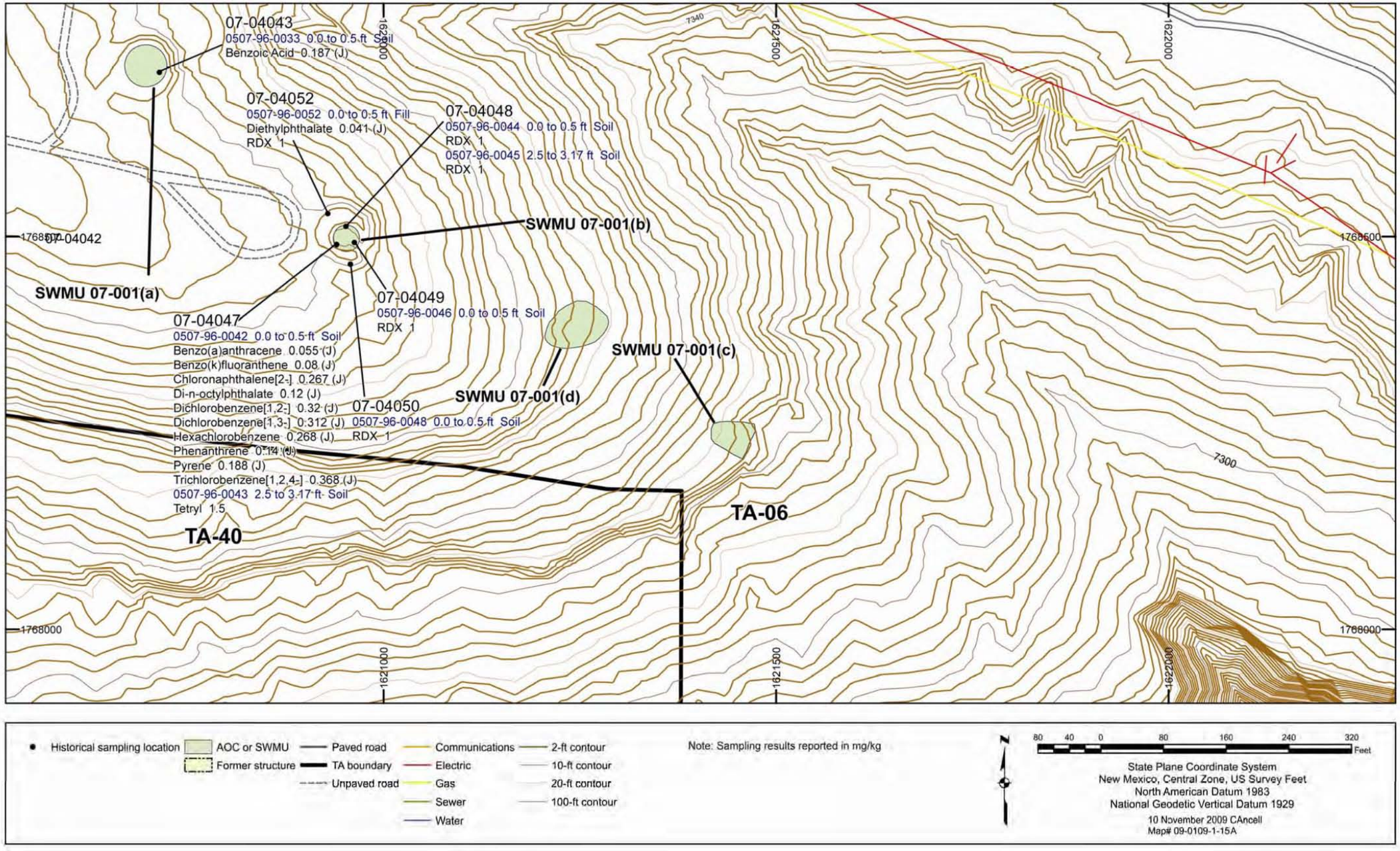


Figure 4.3-2 Organic chemicals detected at SWMUs 07-001(a) and 07-001(b)

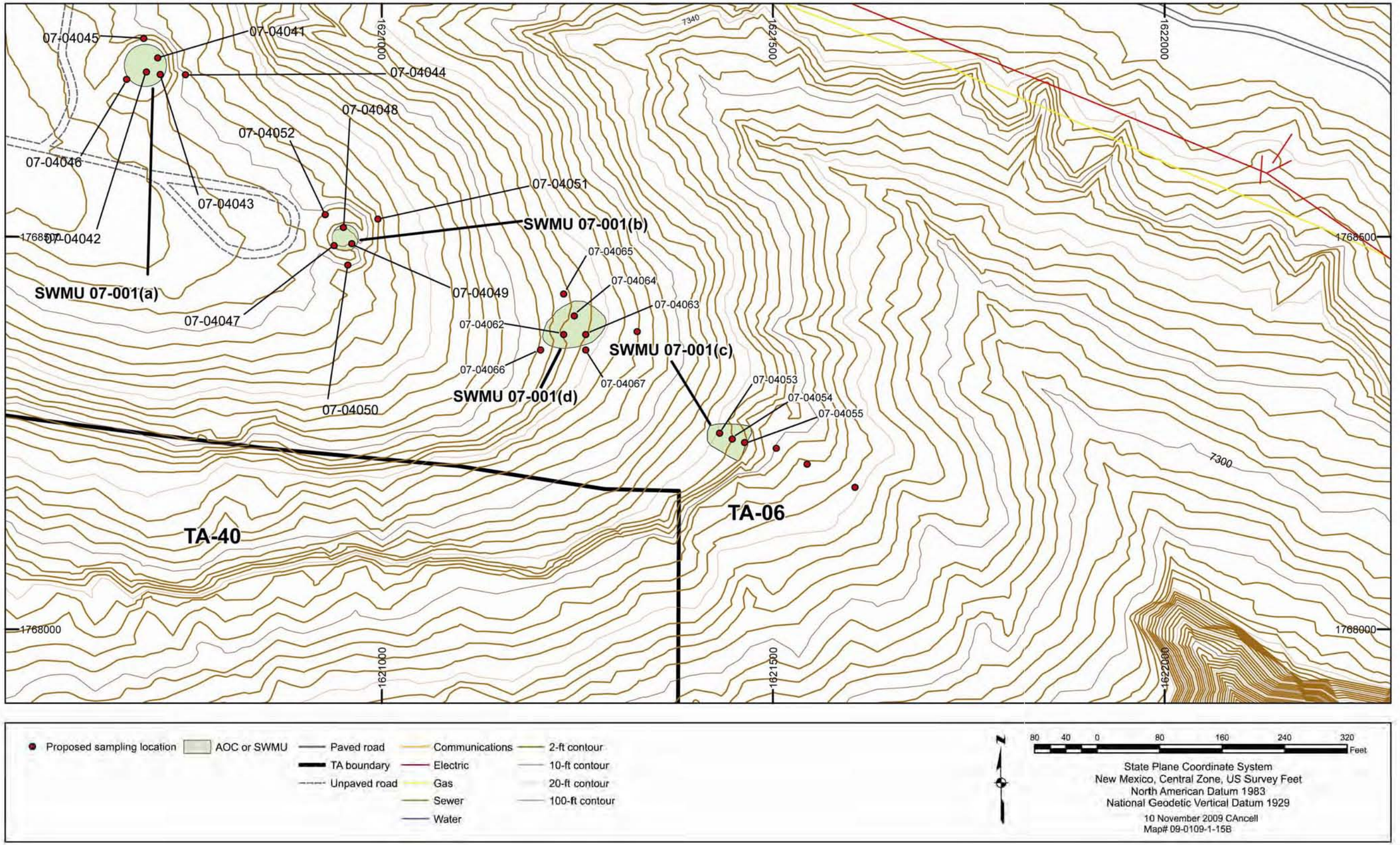


Figure 4.3-3 Proposed sampling locations at Consolidated Unit 07-001(a)-99

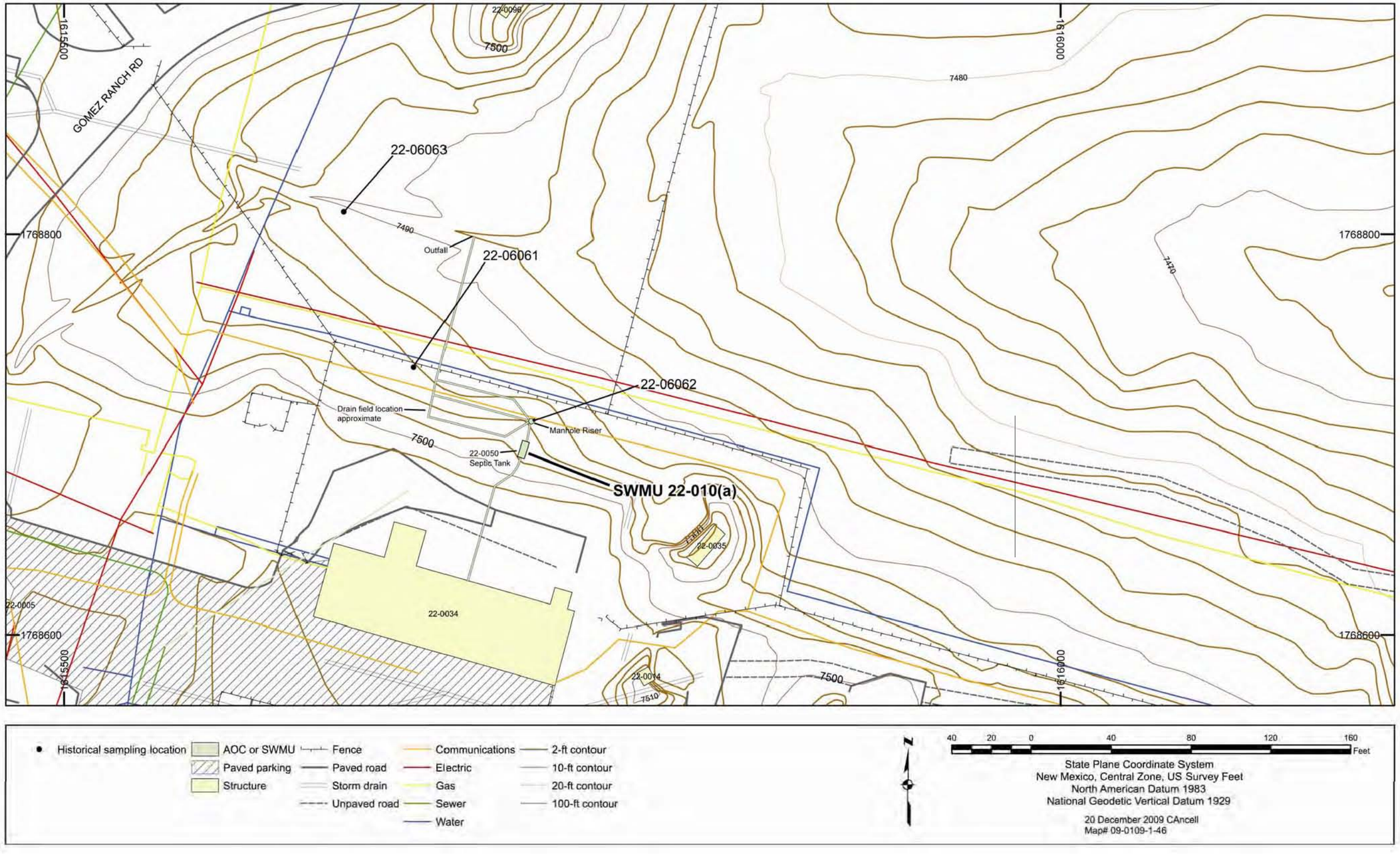


Figure 4.4-1 Site features and historical sampling locations for SWMU 22-010(a)

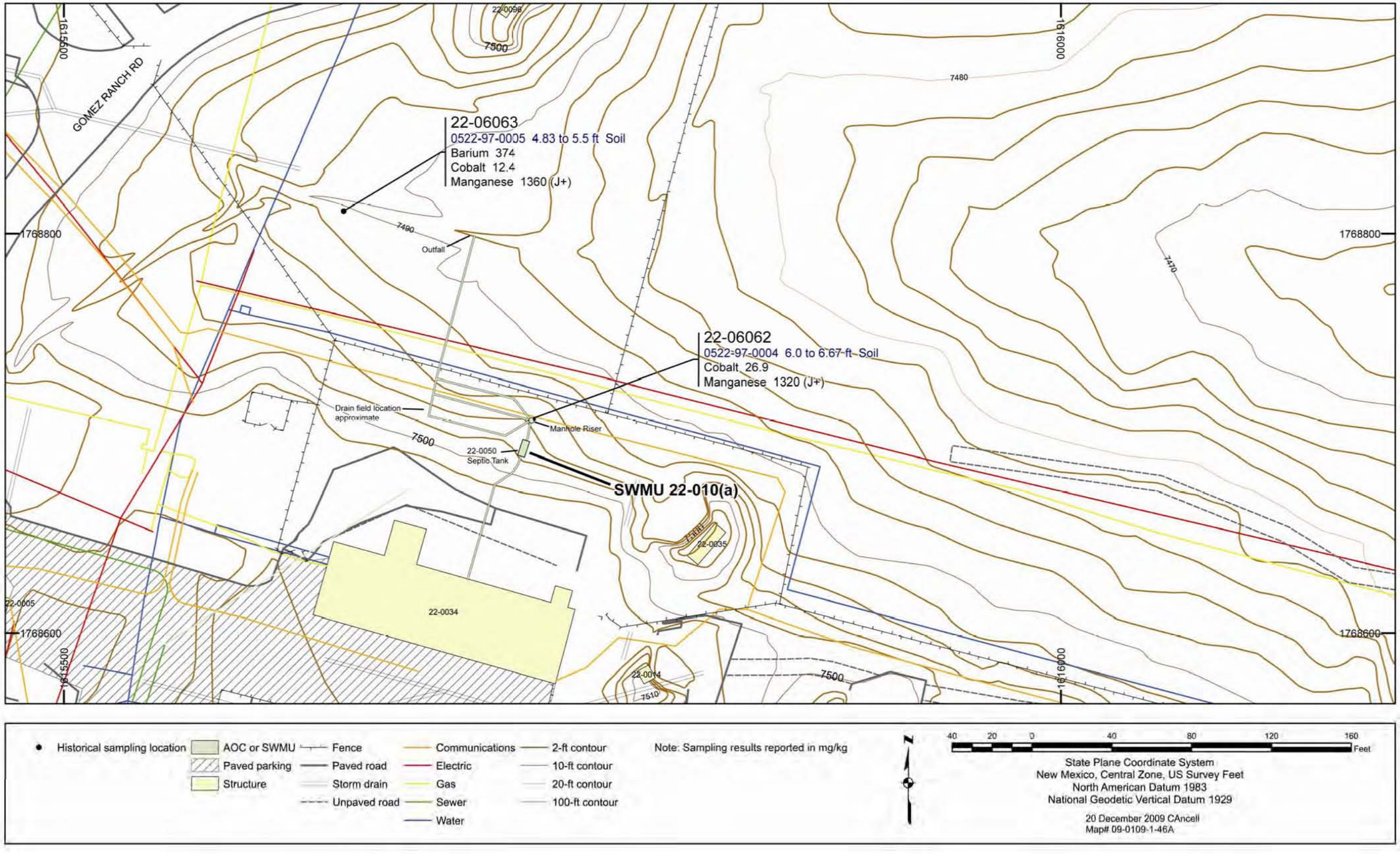


Figure 4.4-2 Inorganic chemicals detected above BVs at SWMU 22-010(a)

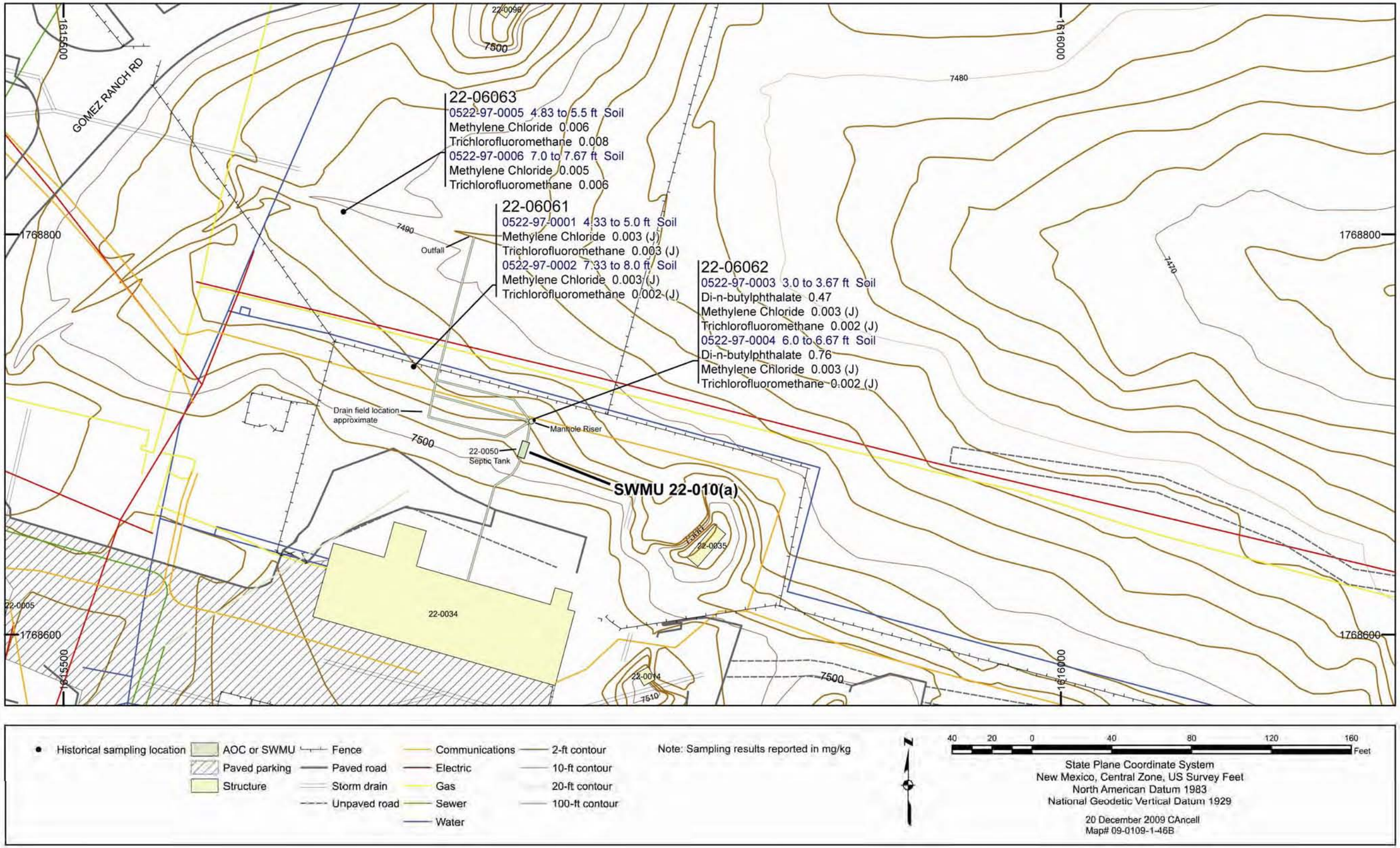


Figure 4.4-3 Organic chemicals detected at SWMU 22-010(a)

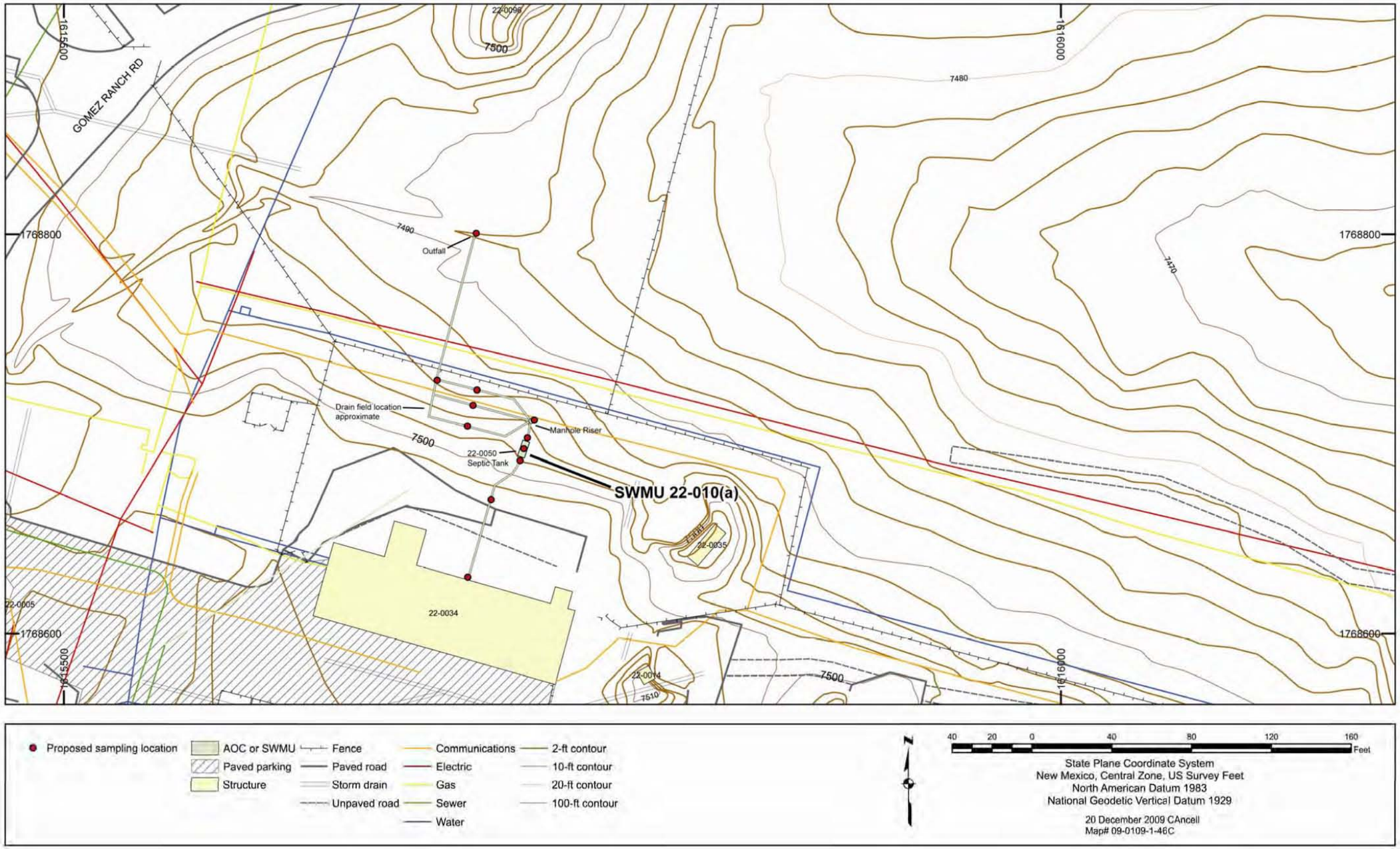


Figure 4.4-4 Proposed sampling locations at SWMU 22-010(a)

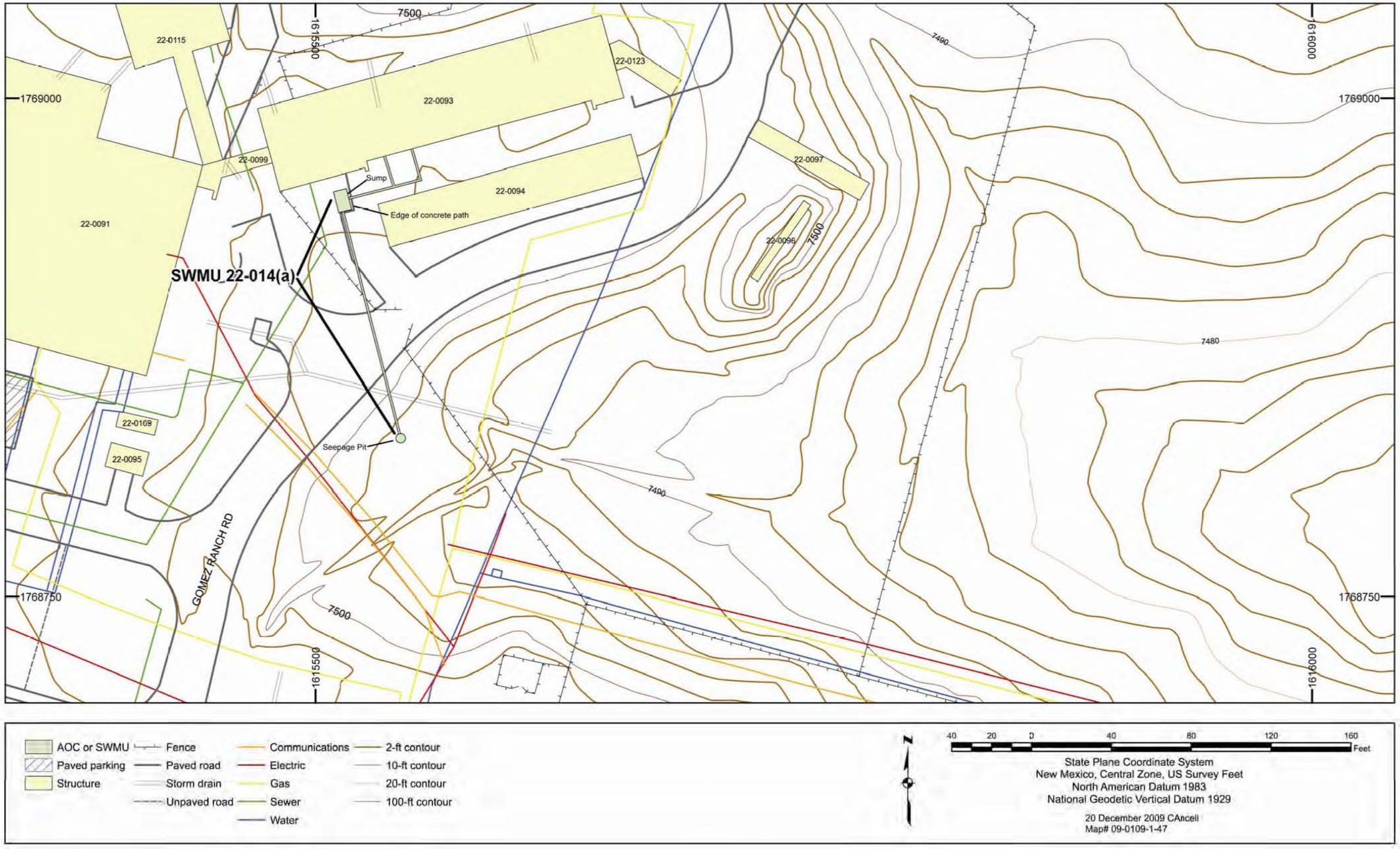


Figure 4.4-5 Site features for SWMU 22-014(a)

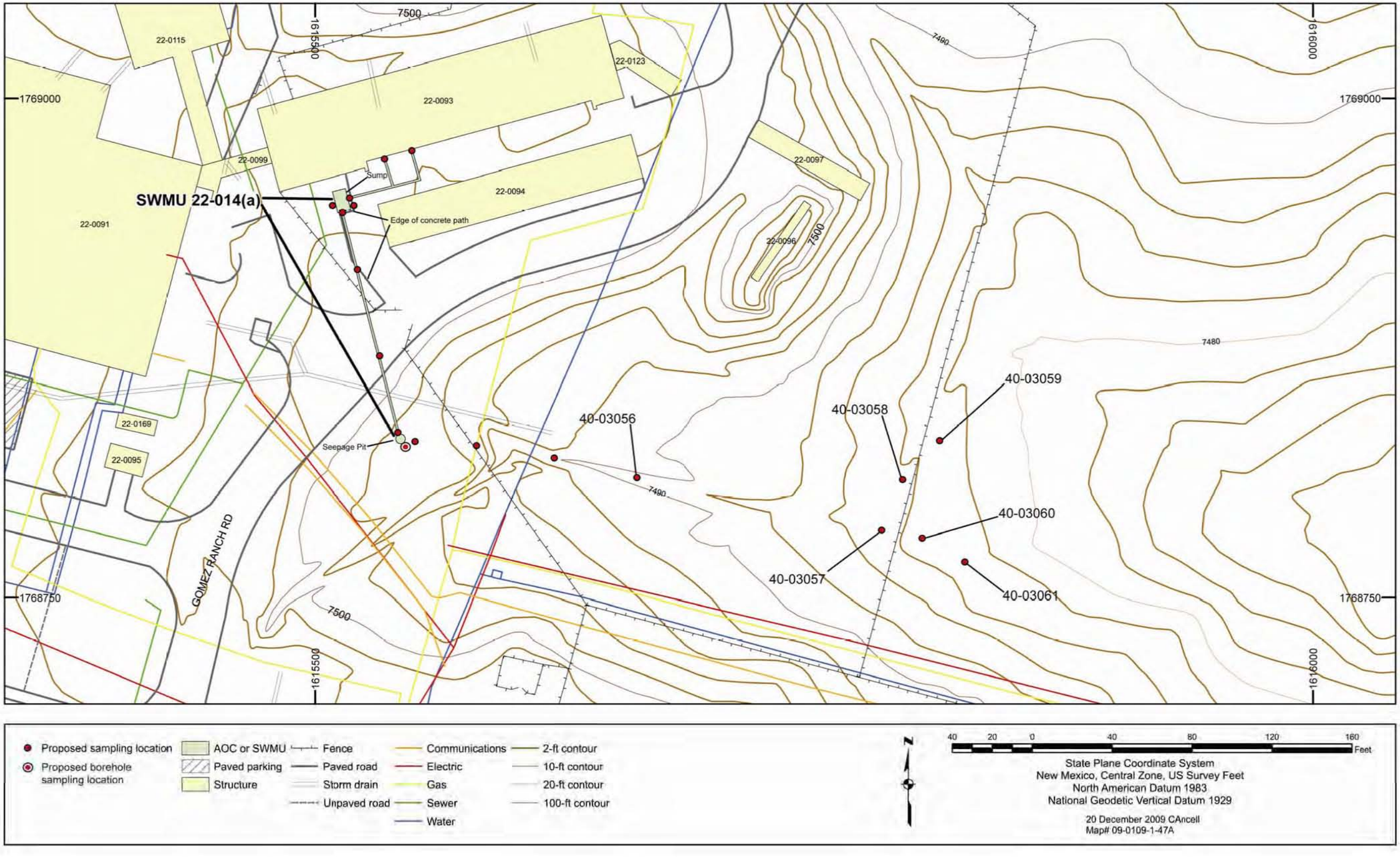


Figure 4.4-6 Proposed sampling locations at SWMU 22-014(a)

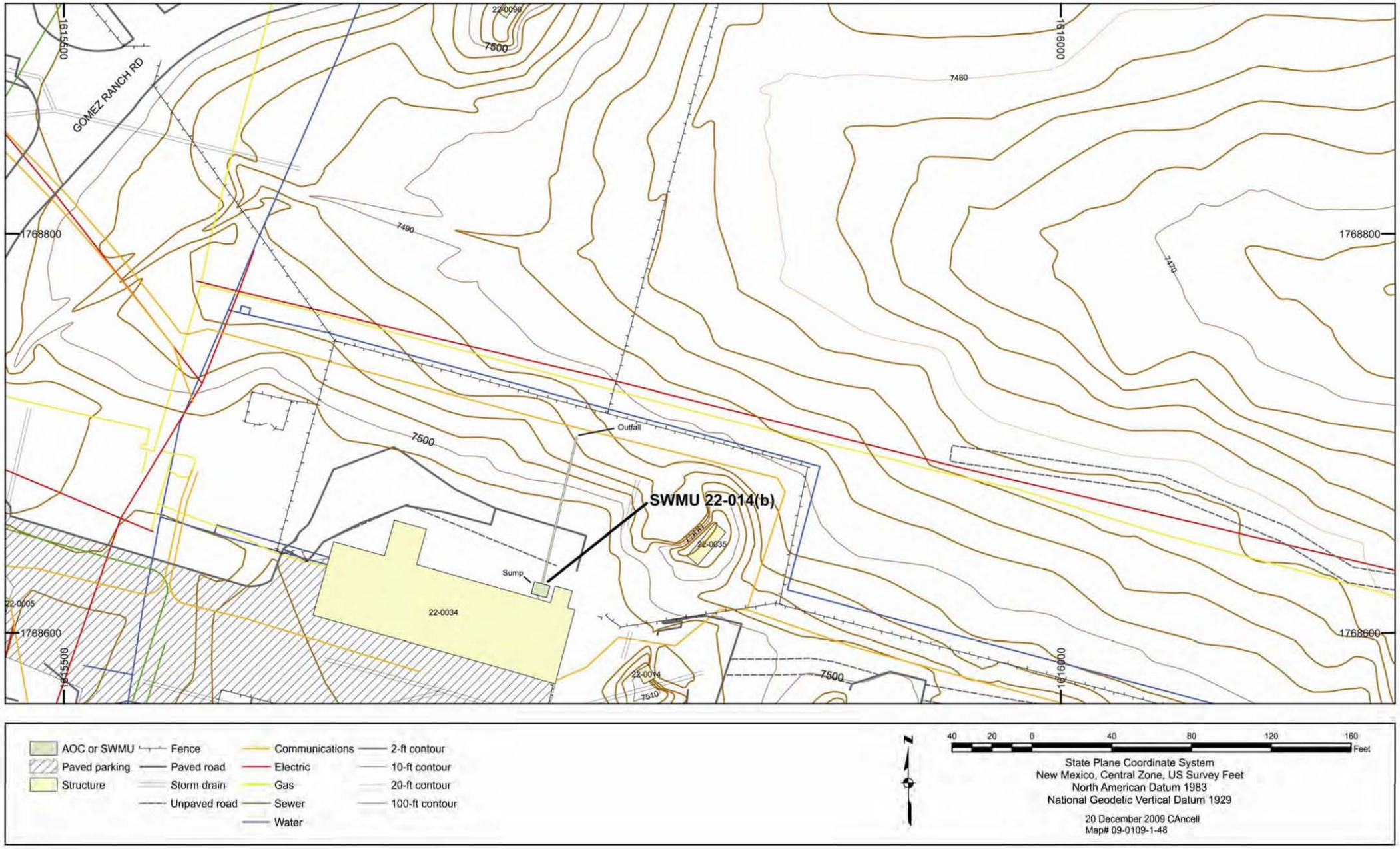


Figure 4.4-7 Site features for SWMU 22-014(b)

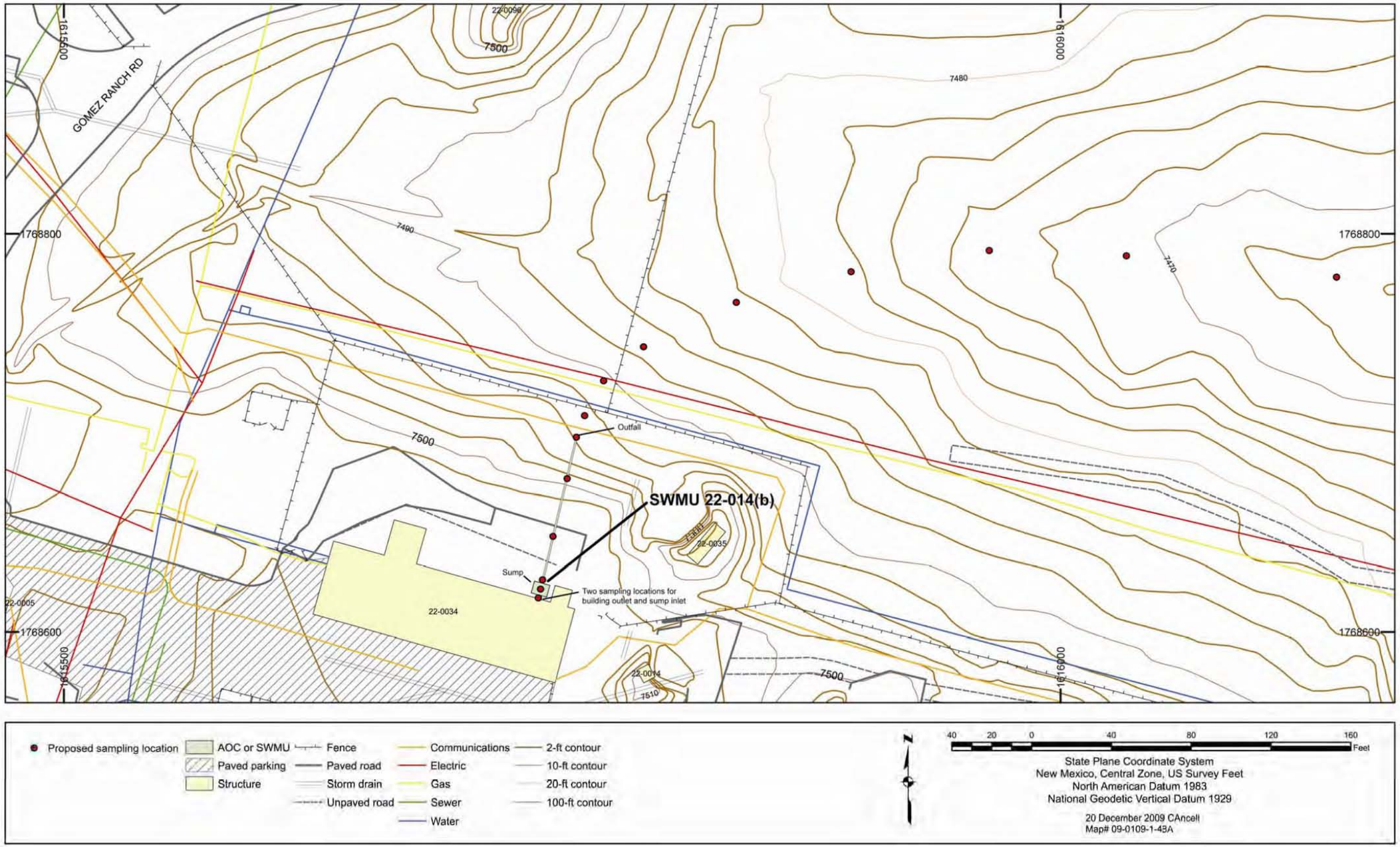


Figure 4.4-8 Proposed sampling locations at SWMU 22-014(b)

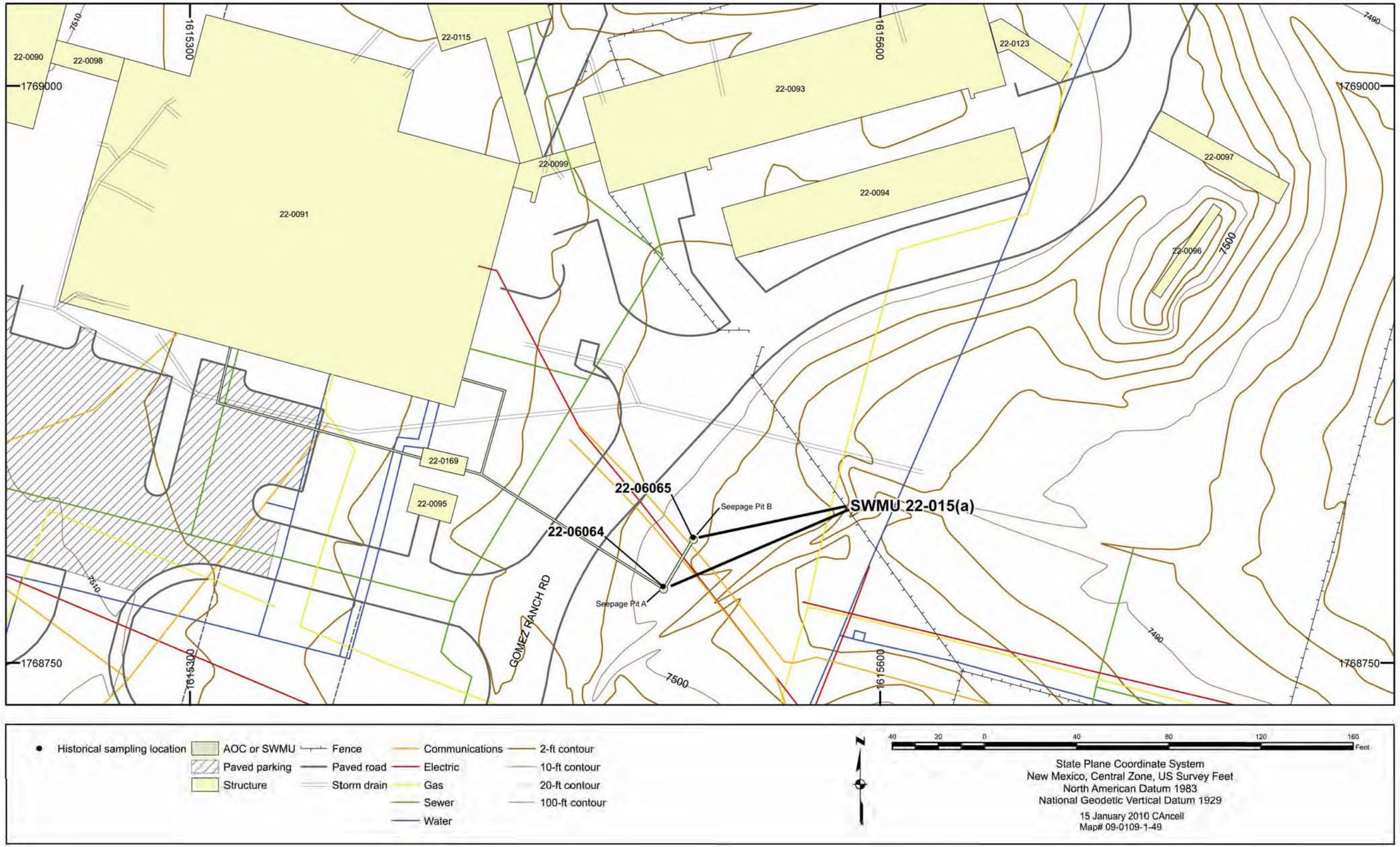


Figure 4.4-9 Site features and historical sampling locations for SWMU 22-015(a)

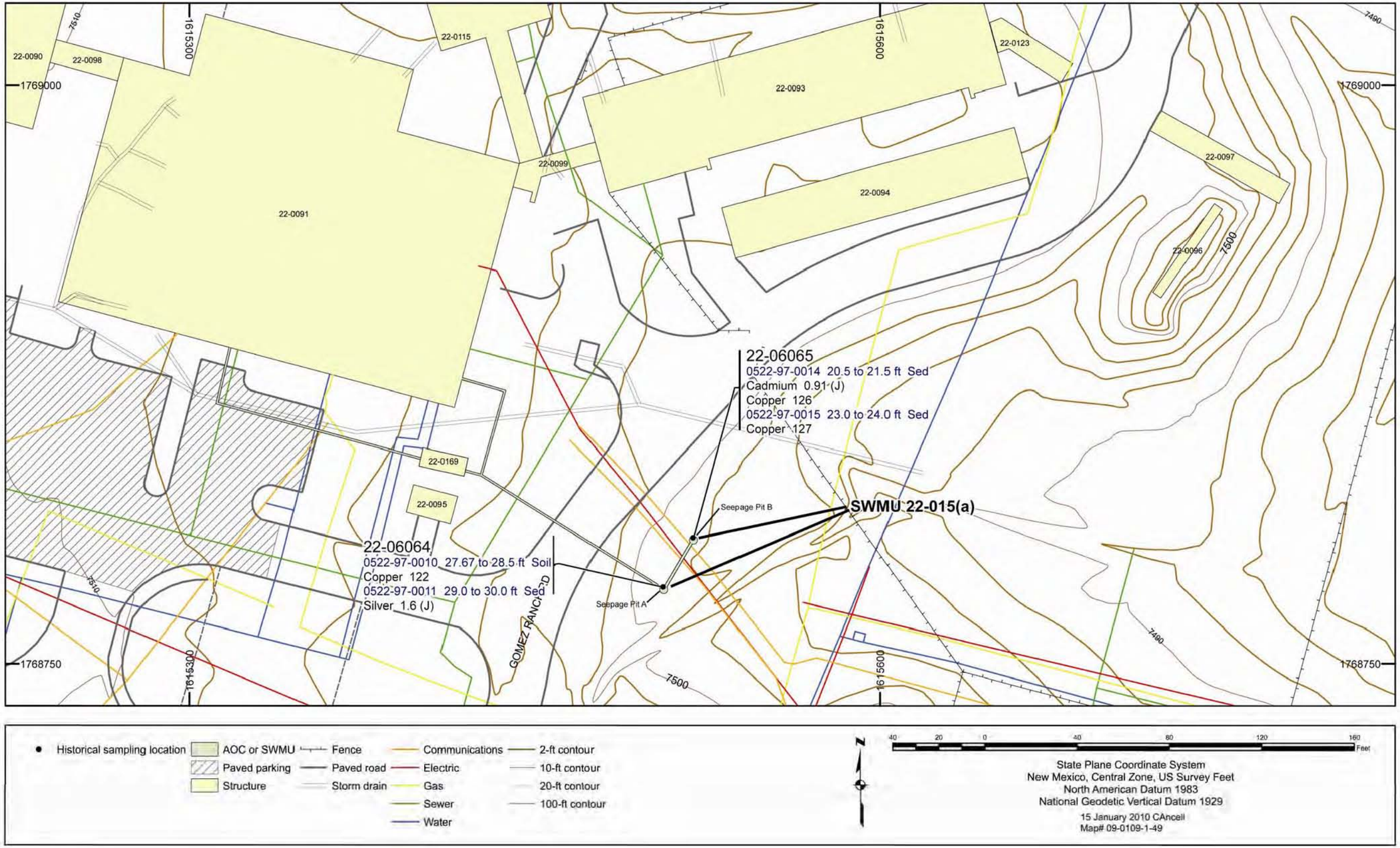


Figure 4.4-10 Inorganic chemicals detected above BVs at SWMU 22-015(a)

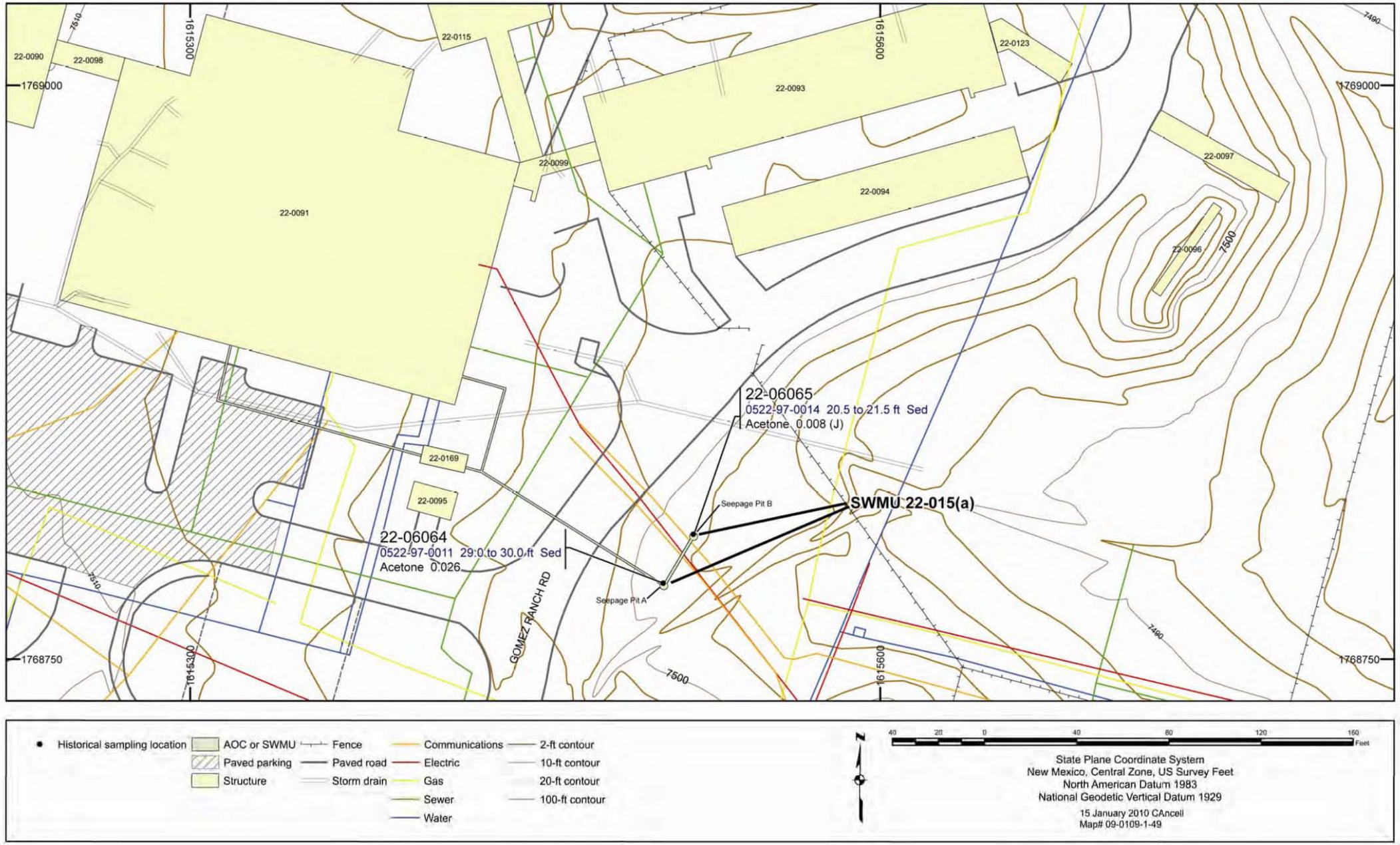


Figure 4.4-11 Organic chemicals detected at SWMU 22-015(a)

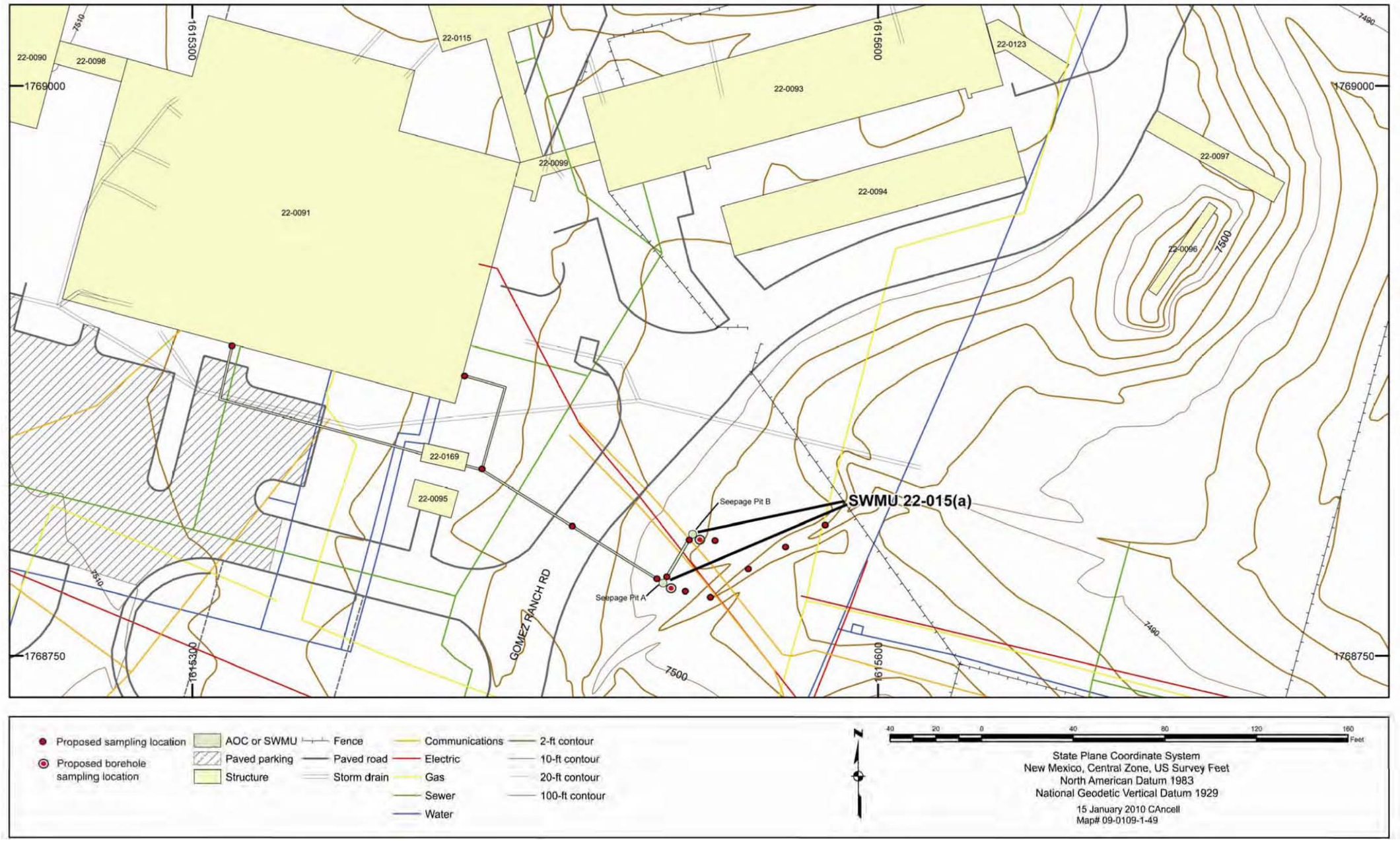


Figure 4.4-12 Proposed sampling locations at SWMU 22-015(a)

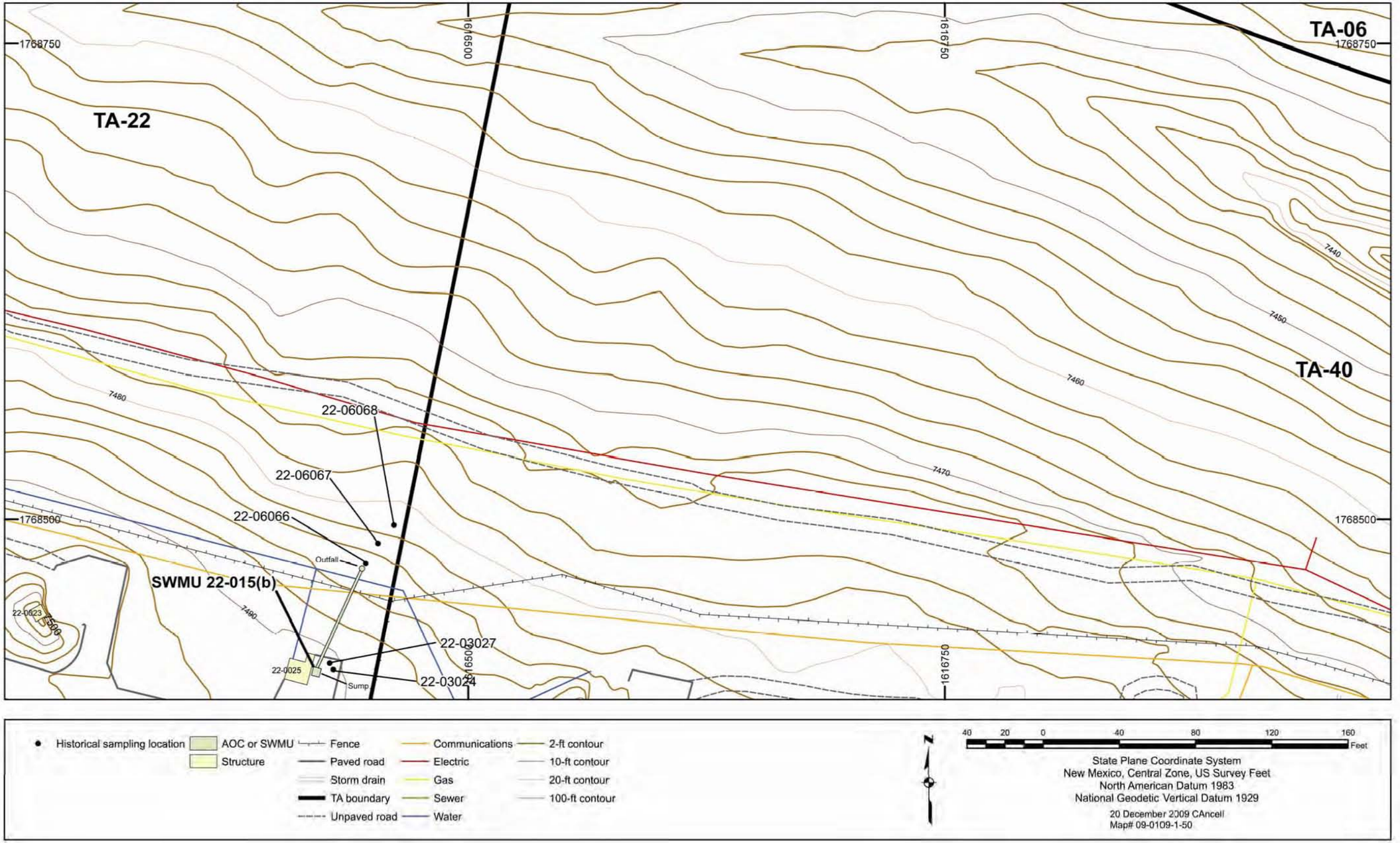


Figure 4.4-13 Site features and historical sampling locations for SWMU 22-015(b)

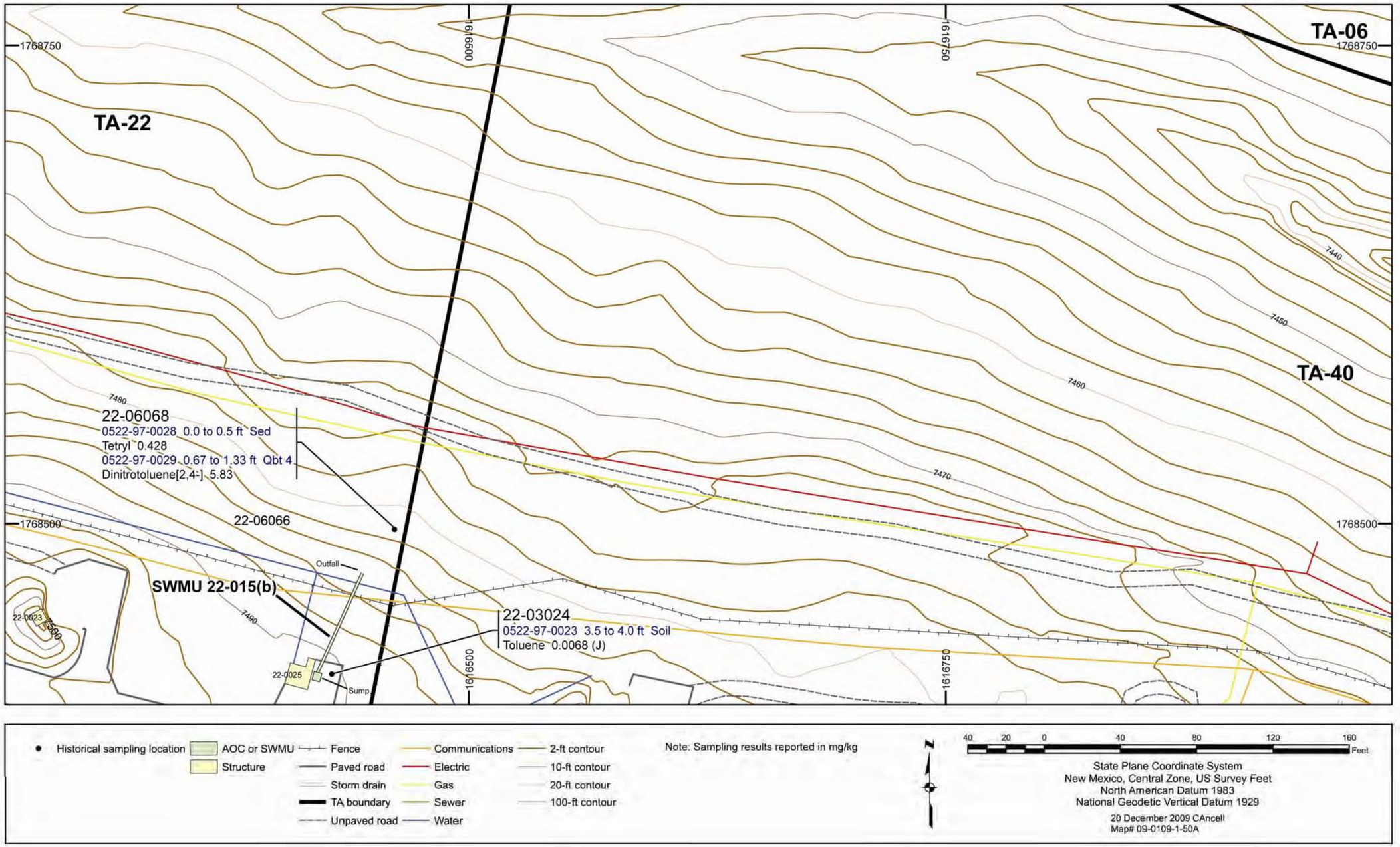


Figure 4.4-14 Organic chemicals detected at SWMU 22-015(b)

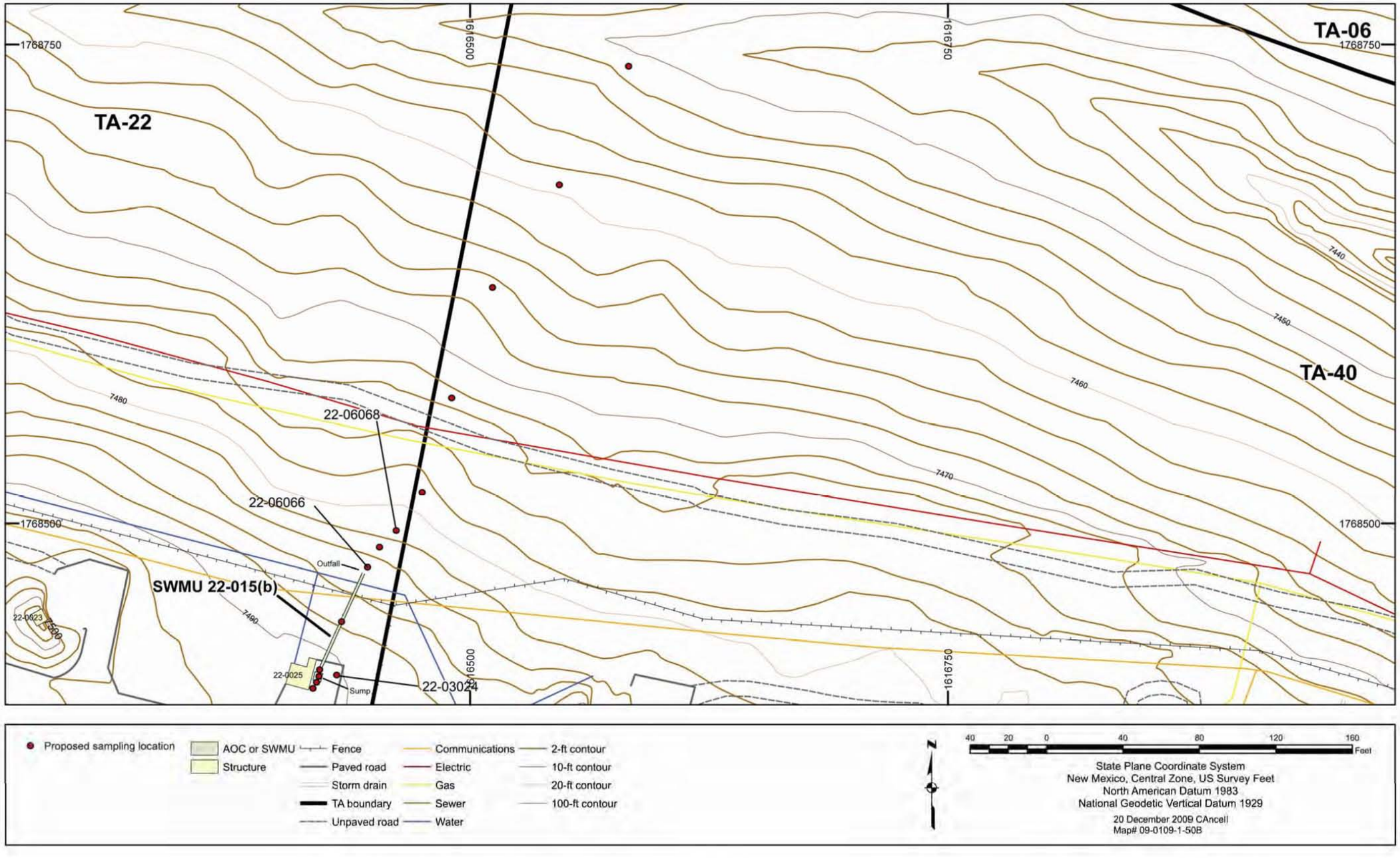


Figure 4.4-15 Proposed sampling locations at SWMU 22-015(b)

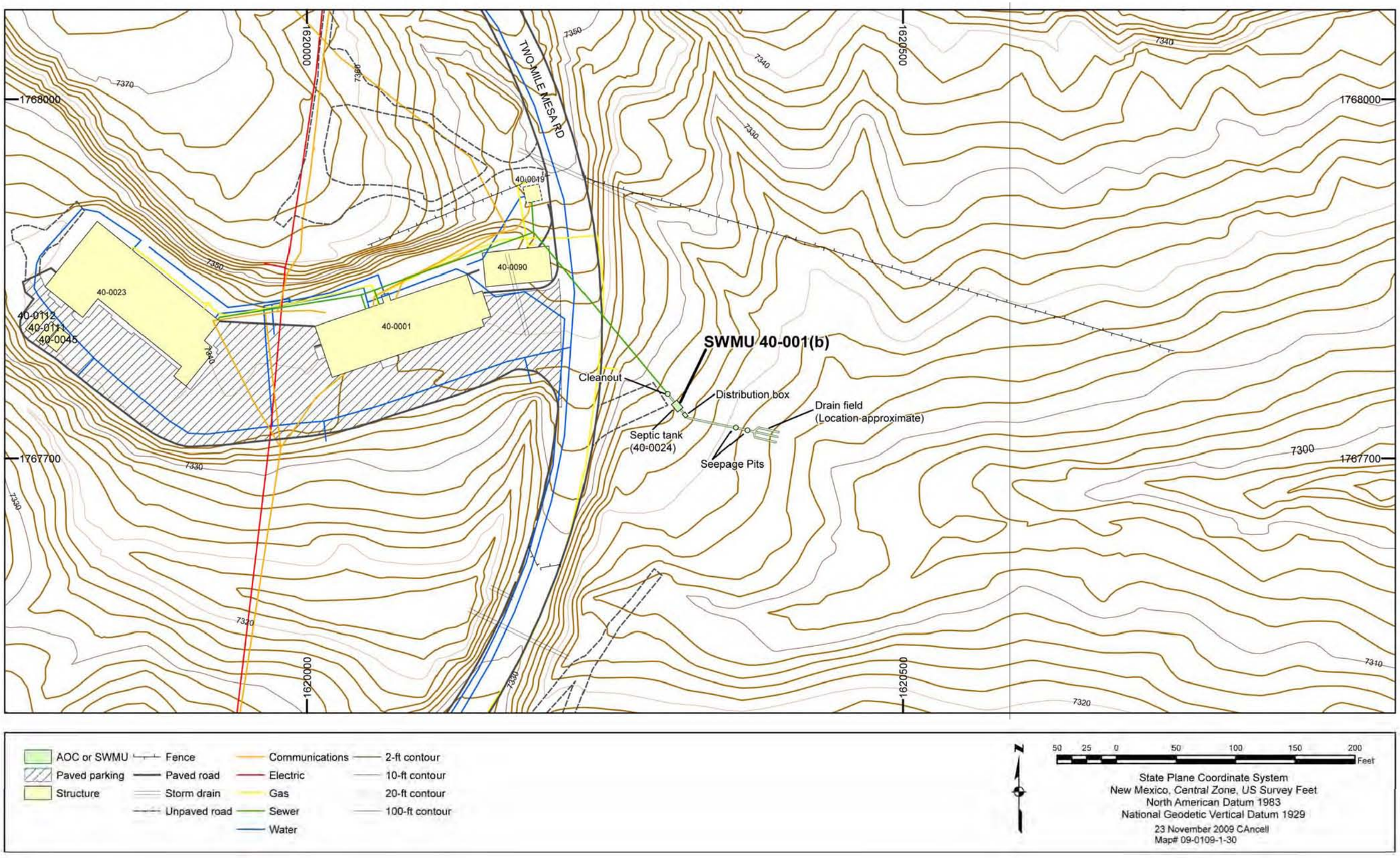


Figure 4.5-1 Site features for SWMU 40-001(b)

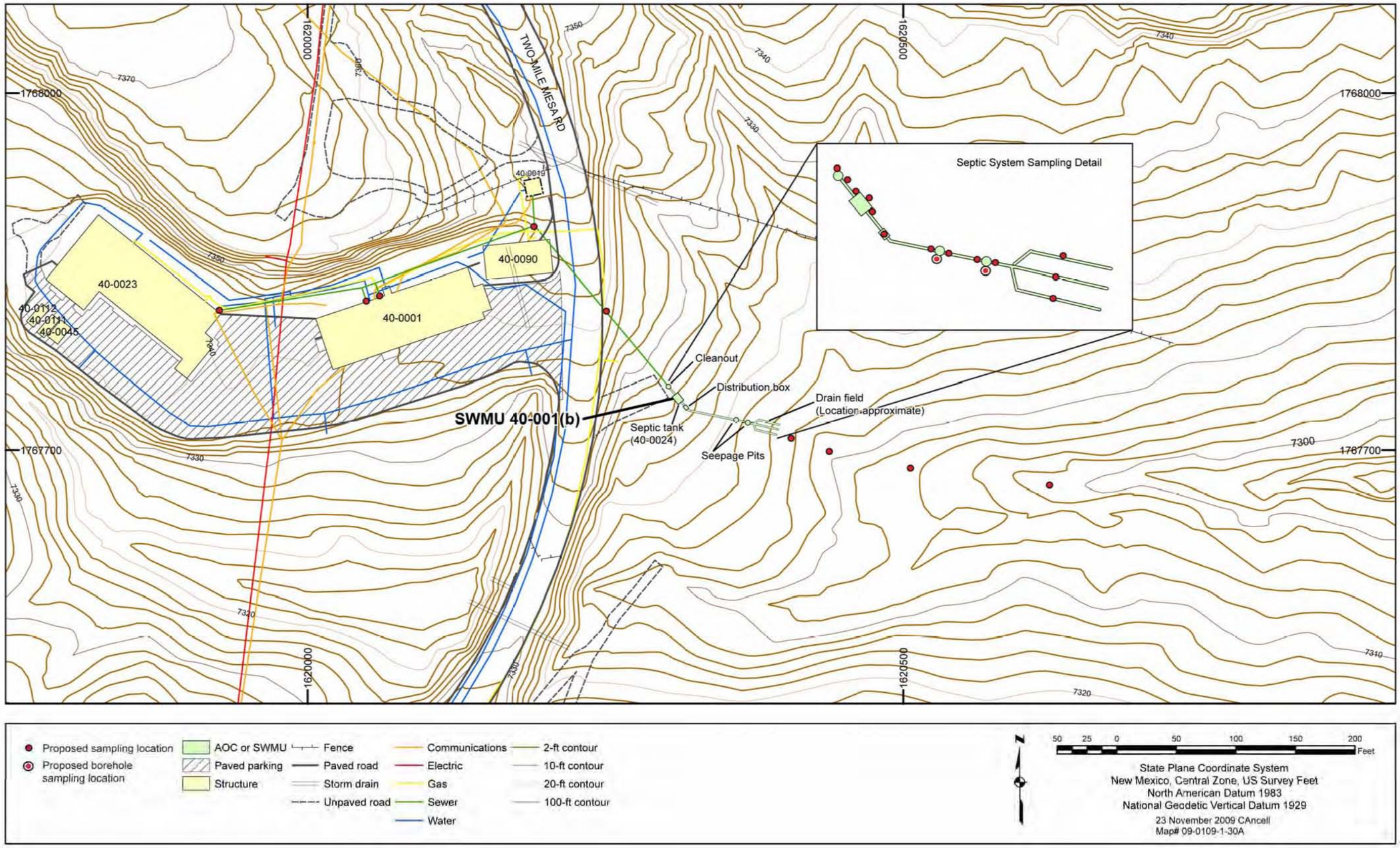


Figure 4.5-2 Proposed sampling locations at SWMU 40-001(b)

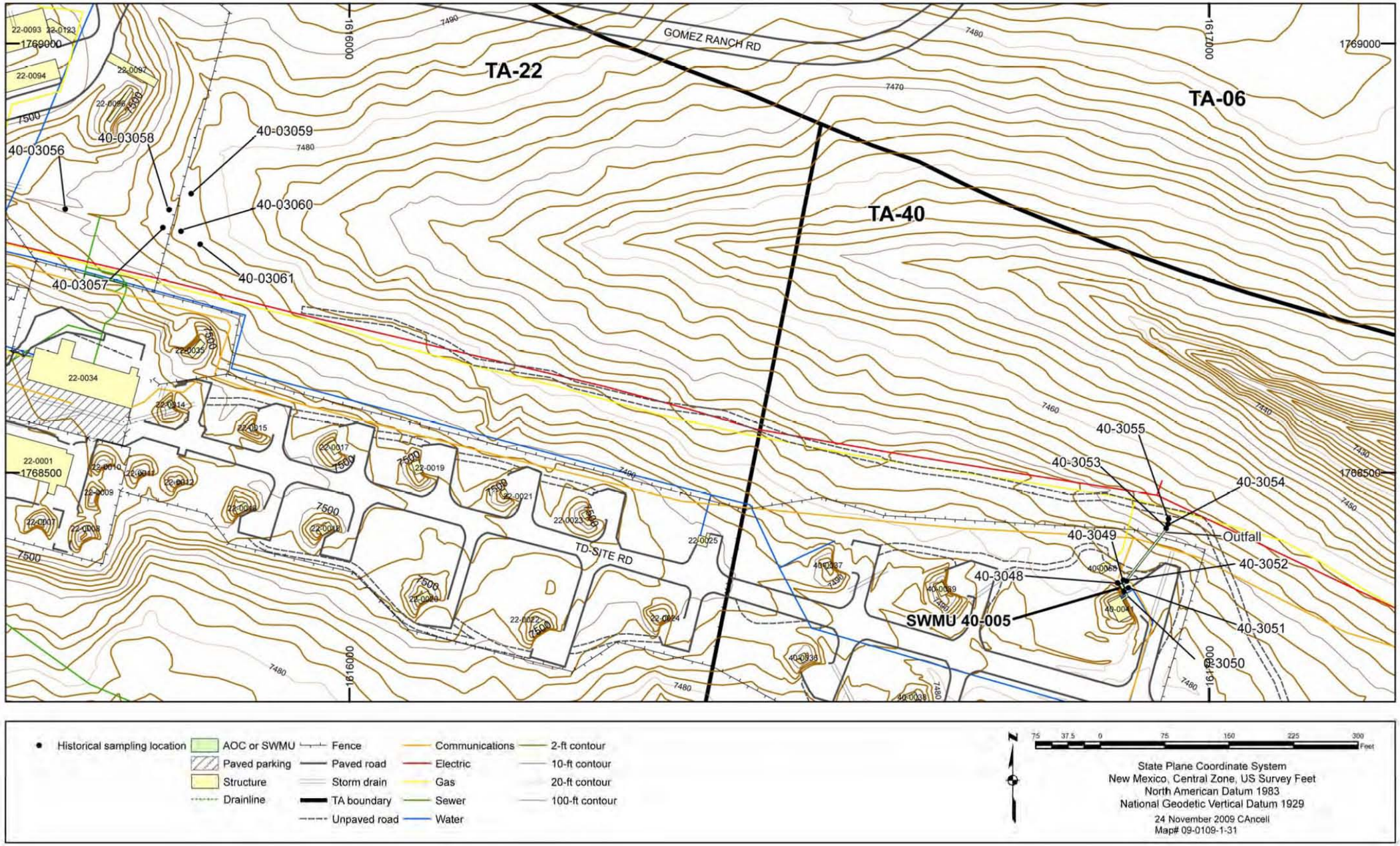


Figure 4.5-3 Site features and historical sampling locations for SWMU 40-005

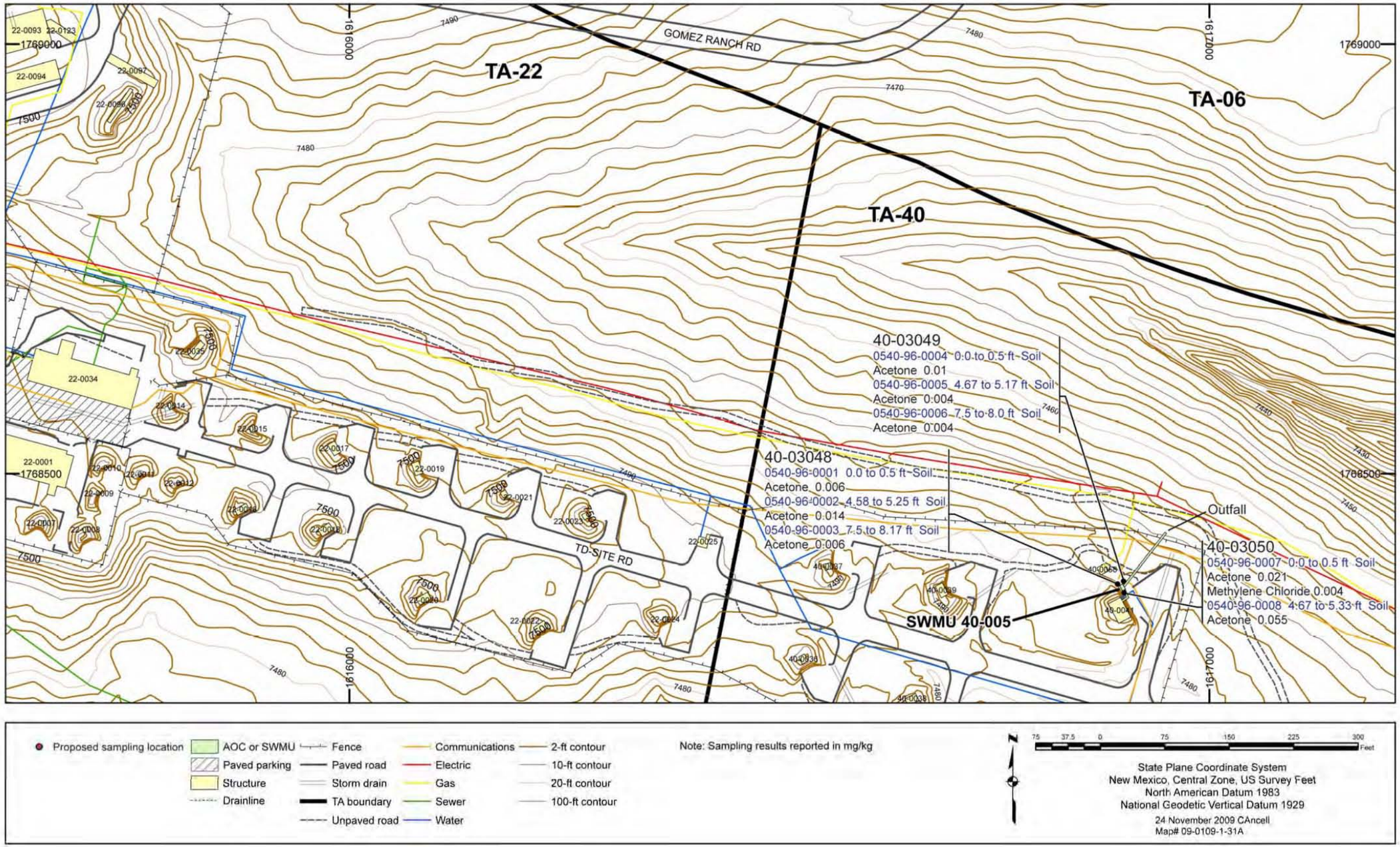


Figure 4.5-4 Organic chemicals detected at SWMU 40-005

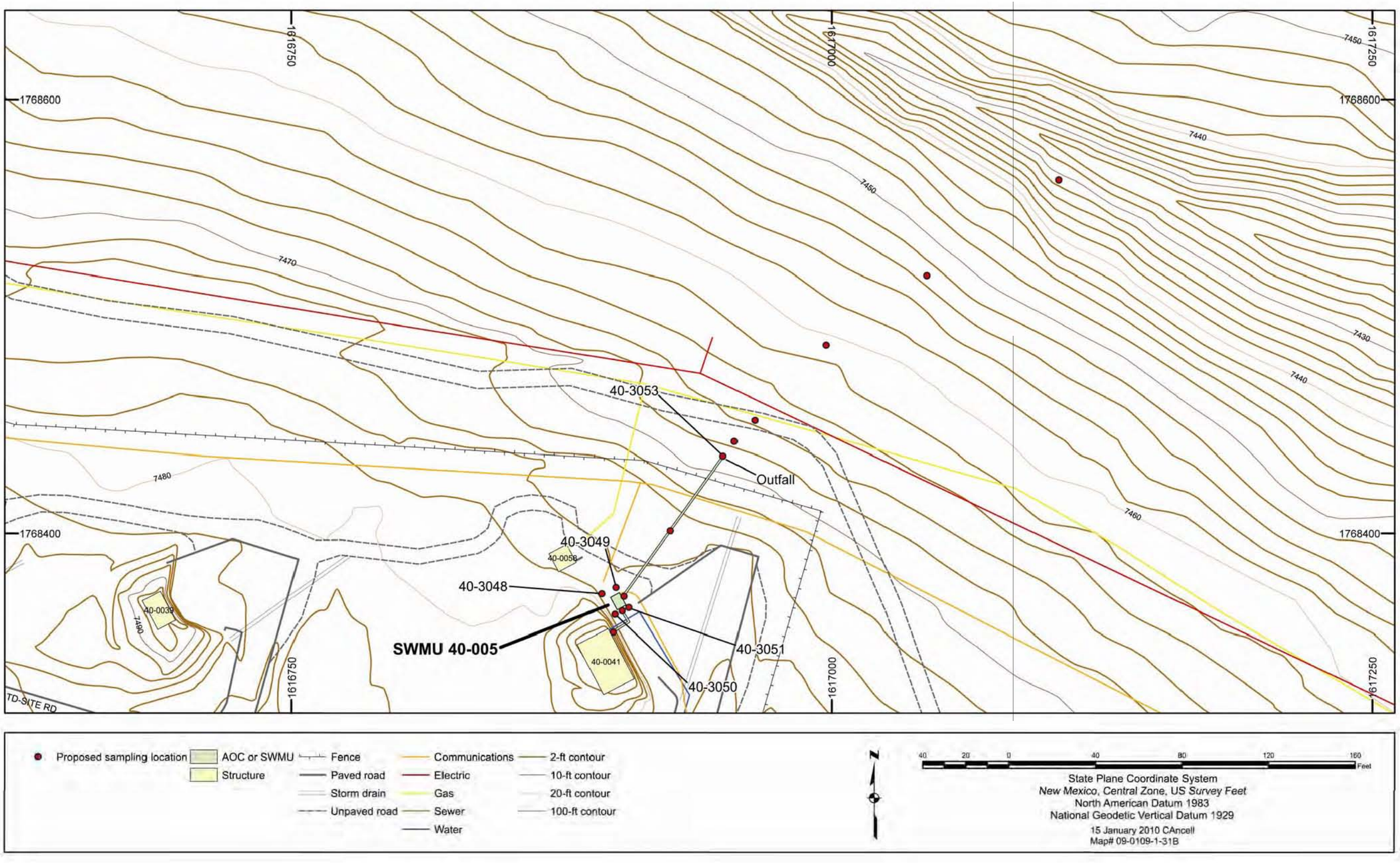


Figure 4.5-5 Proposed sampling locations at SWMU 40-005

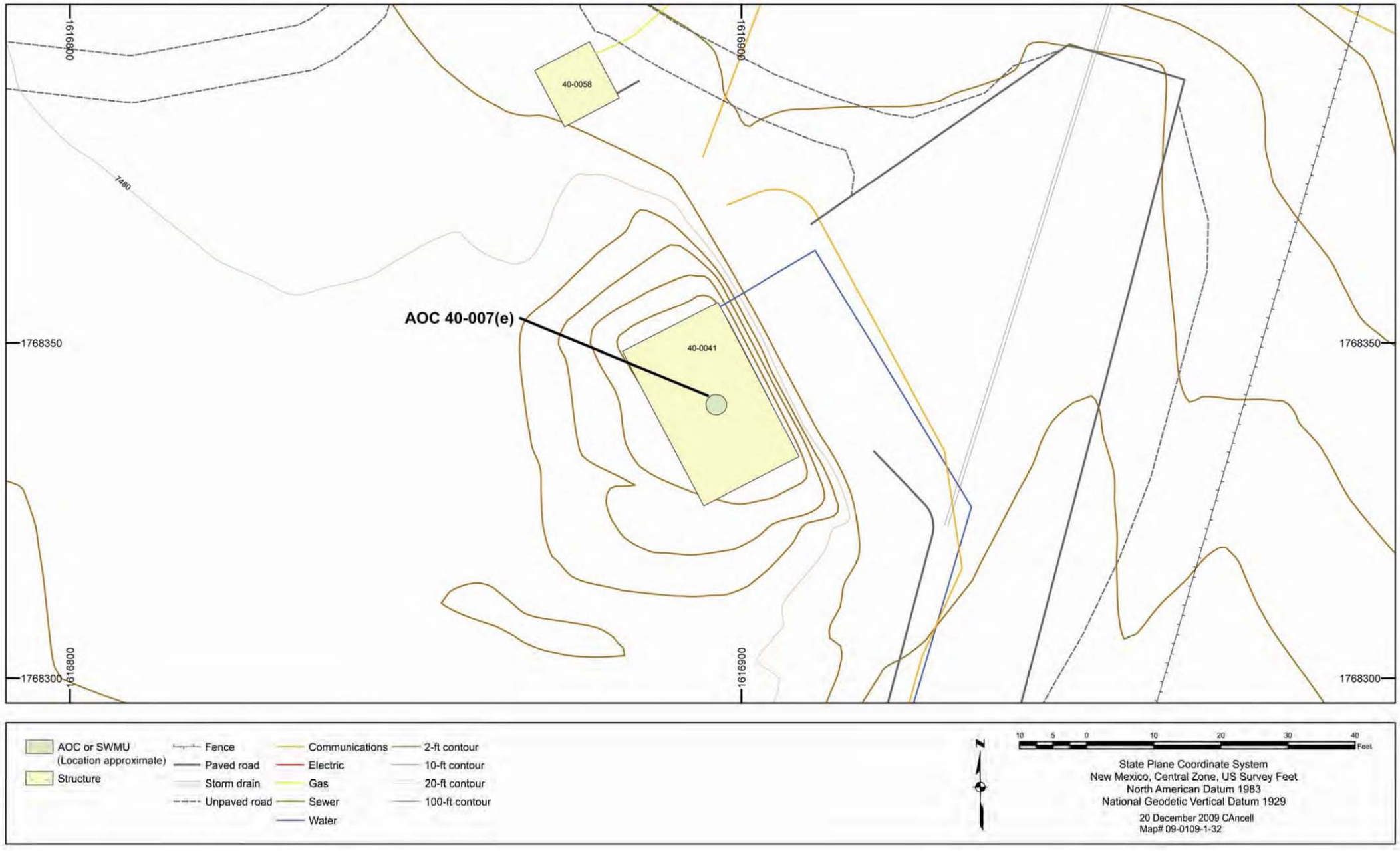


Figure 4.5-6 Site features for AOC 40-007(e)

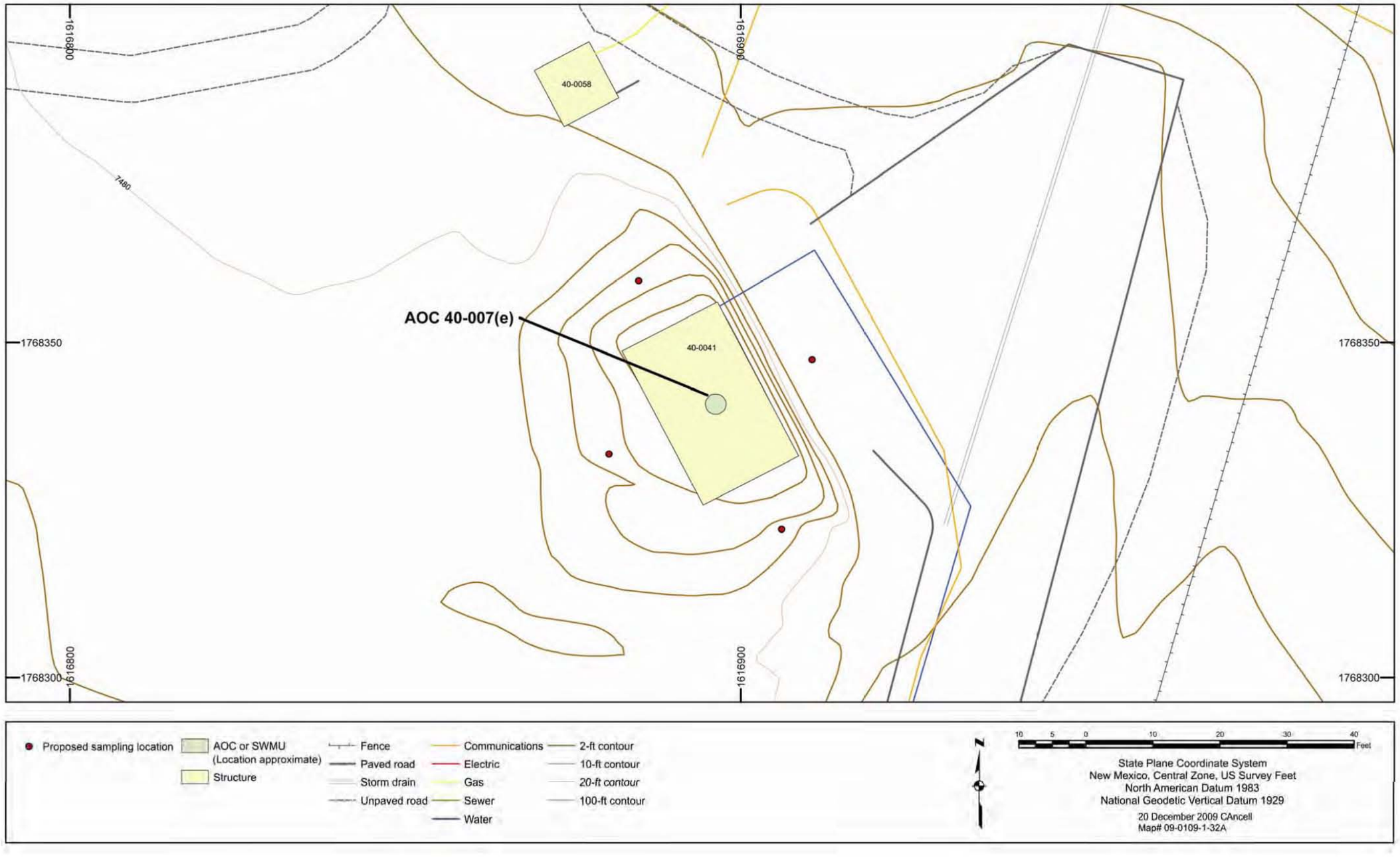


Figure 4.5-7 Proposed sampling locations at AOC 40-007(e)

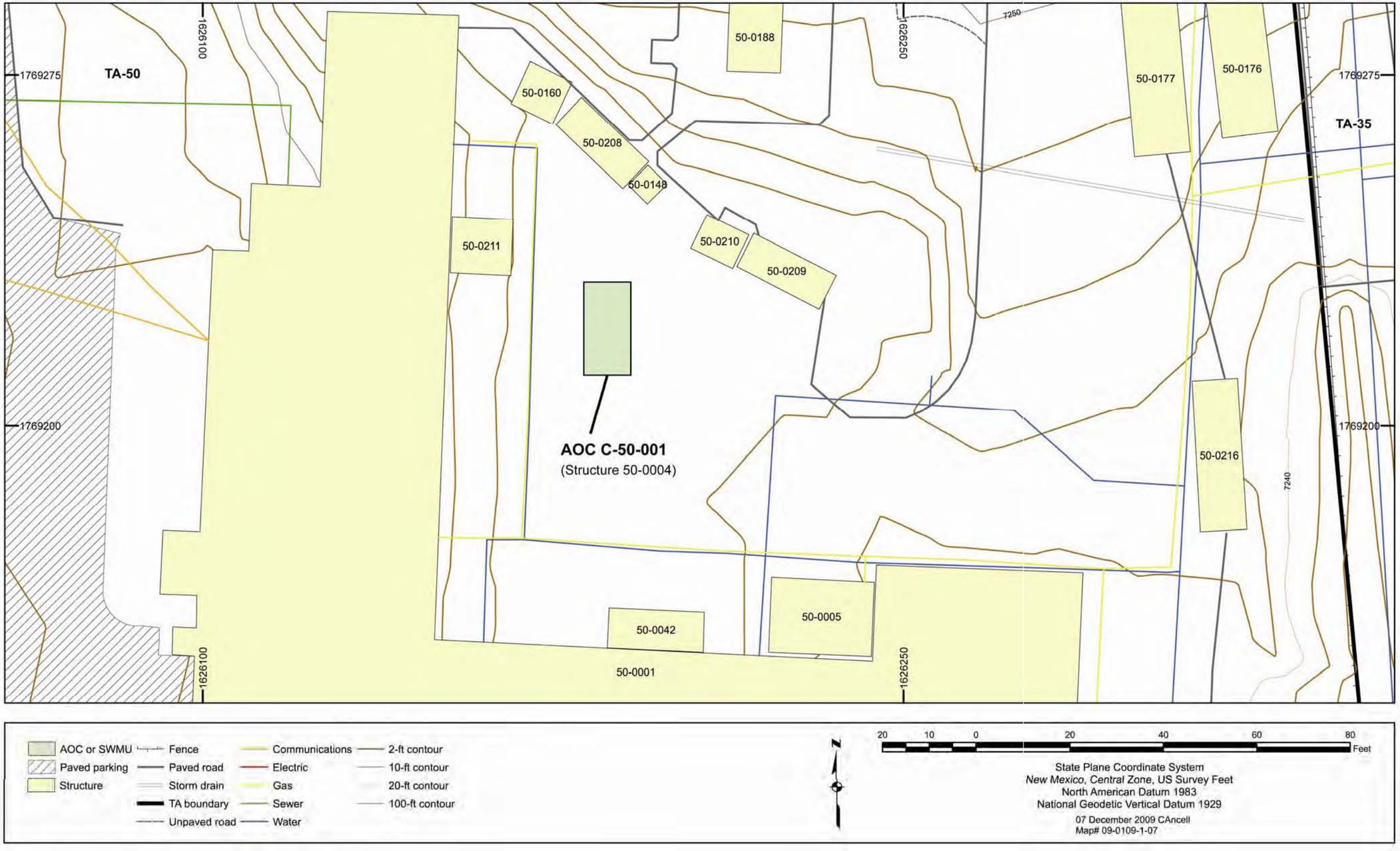


Figure 4.6-1 Site features for AOC C-50-001

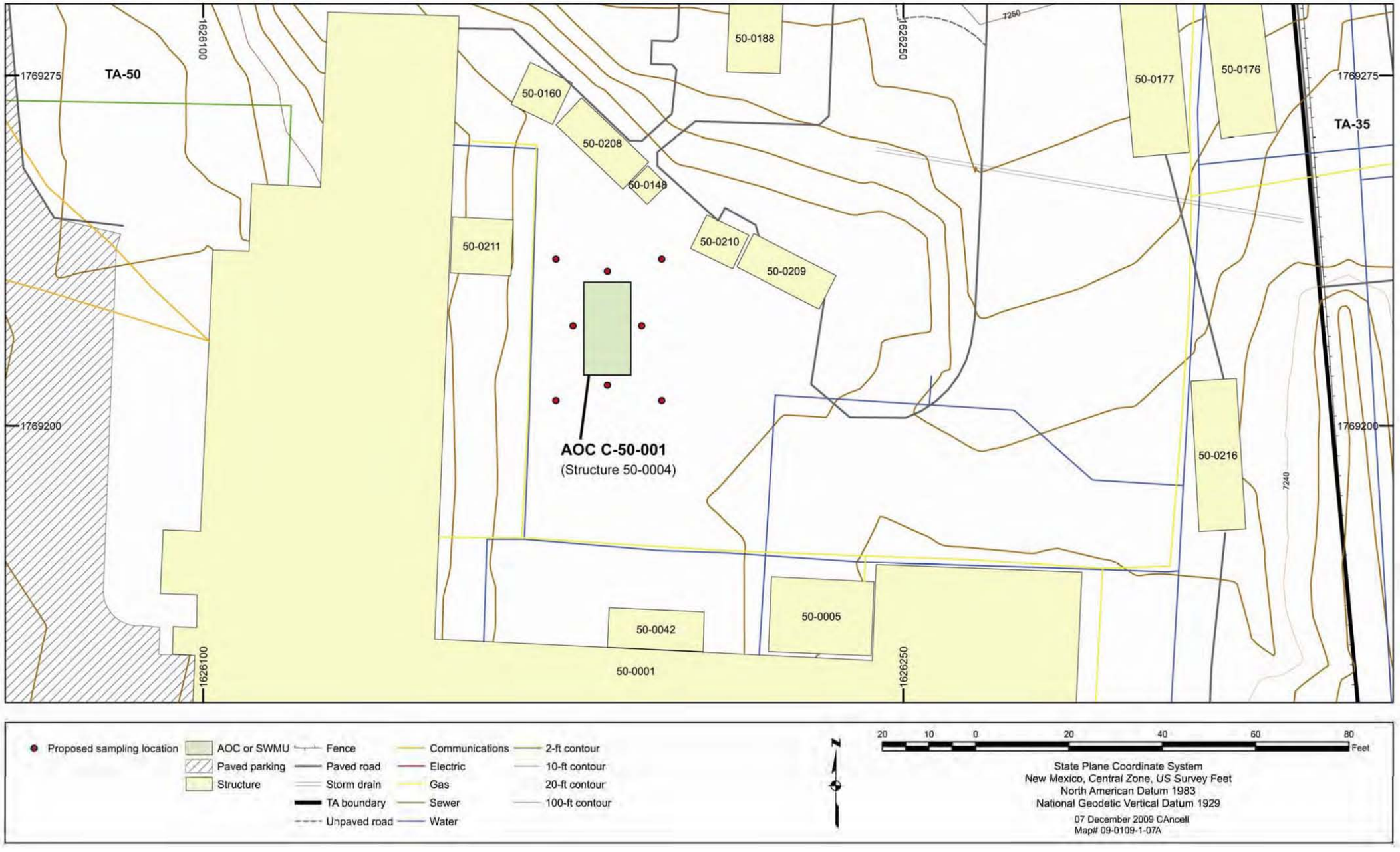


Figure 4.6-2 Proposed sampling locations at AOC C-50-001

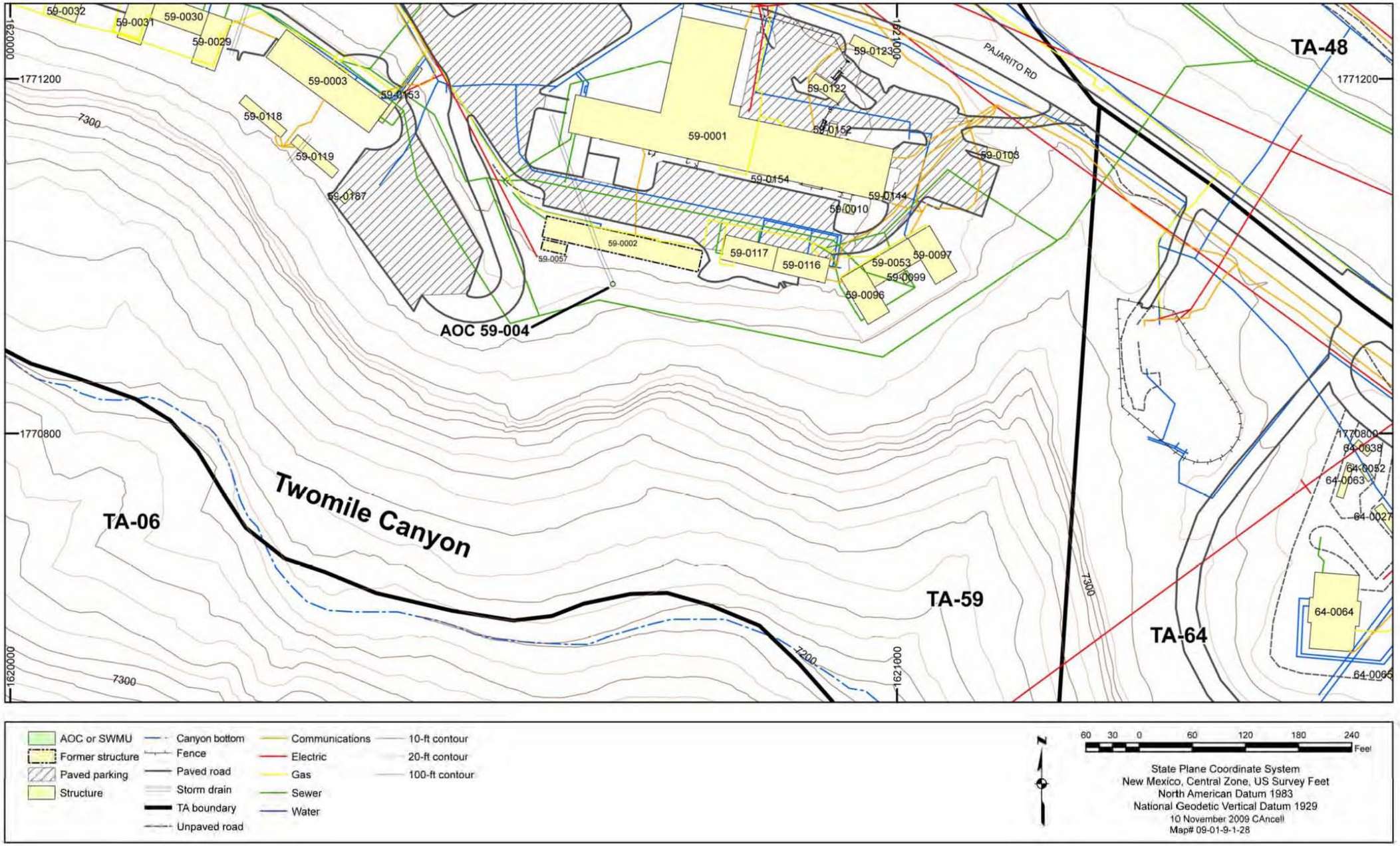


Figure 4.7-1 Site features for AOC 59-004

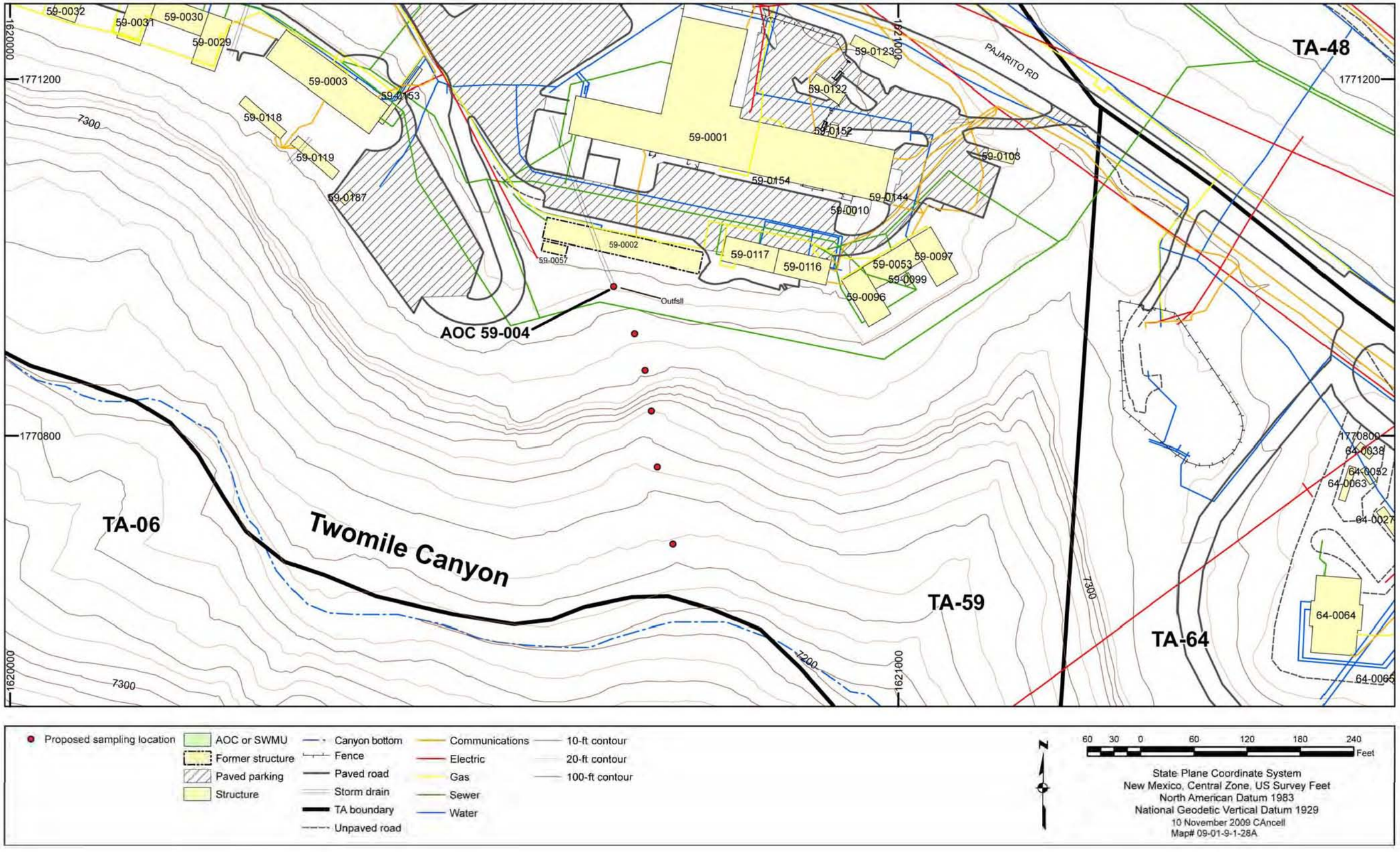


Figure 4.7-2 Proposed sampling locations at AOC 59-004

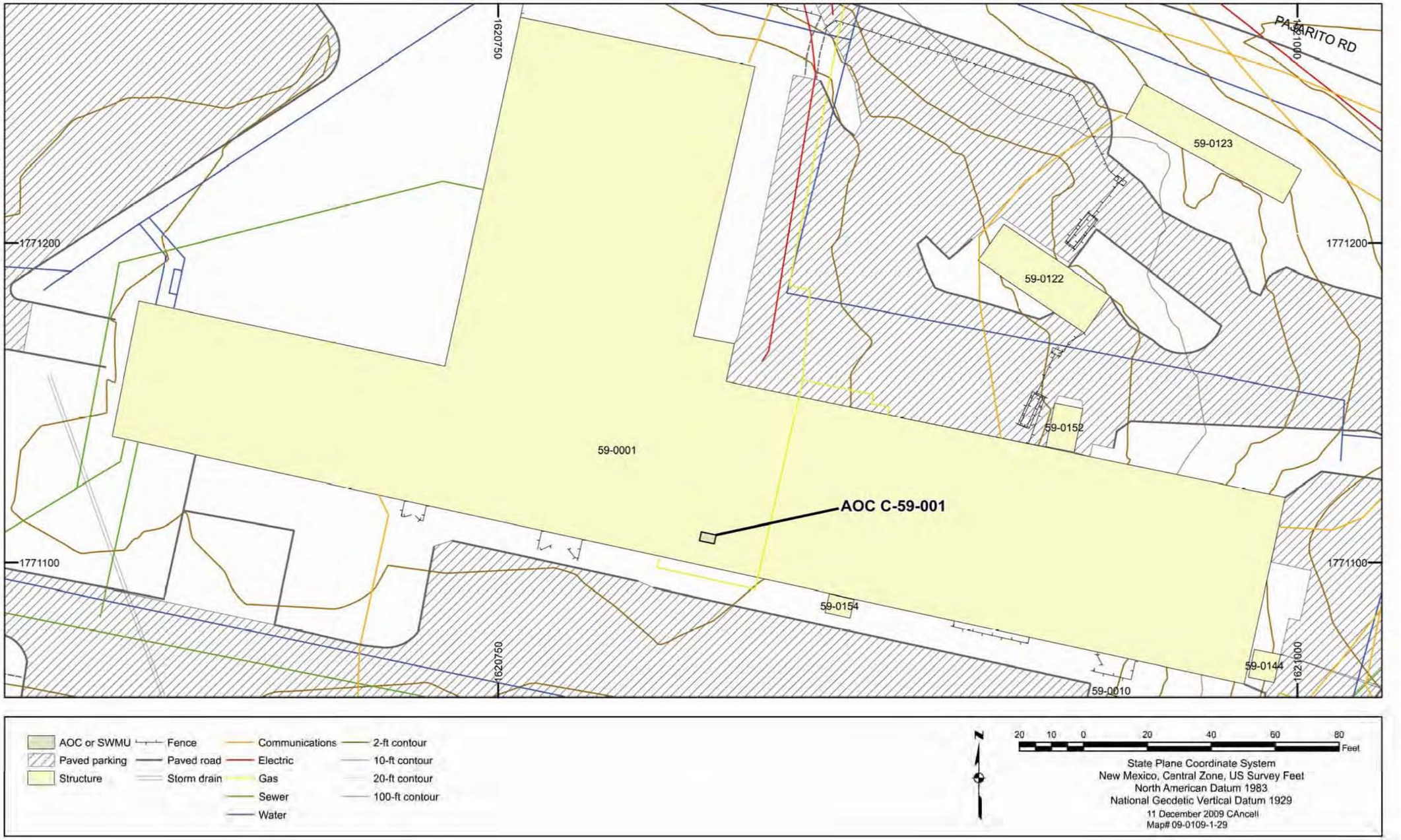


Figure 4.7-3 Site features for AOC C-59-001

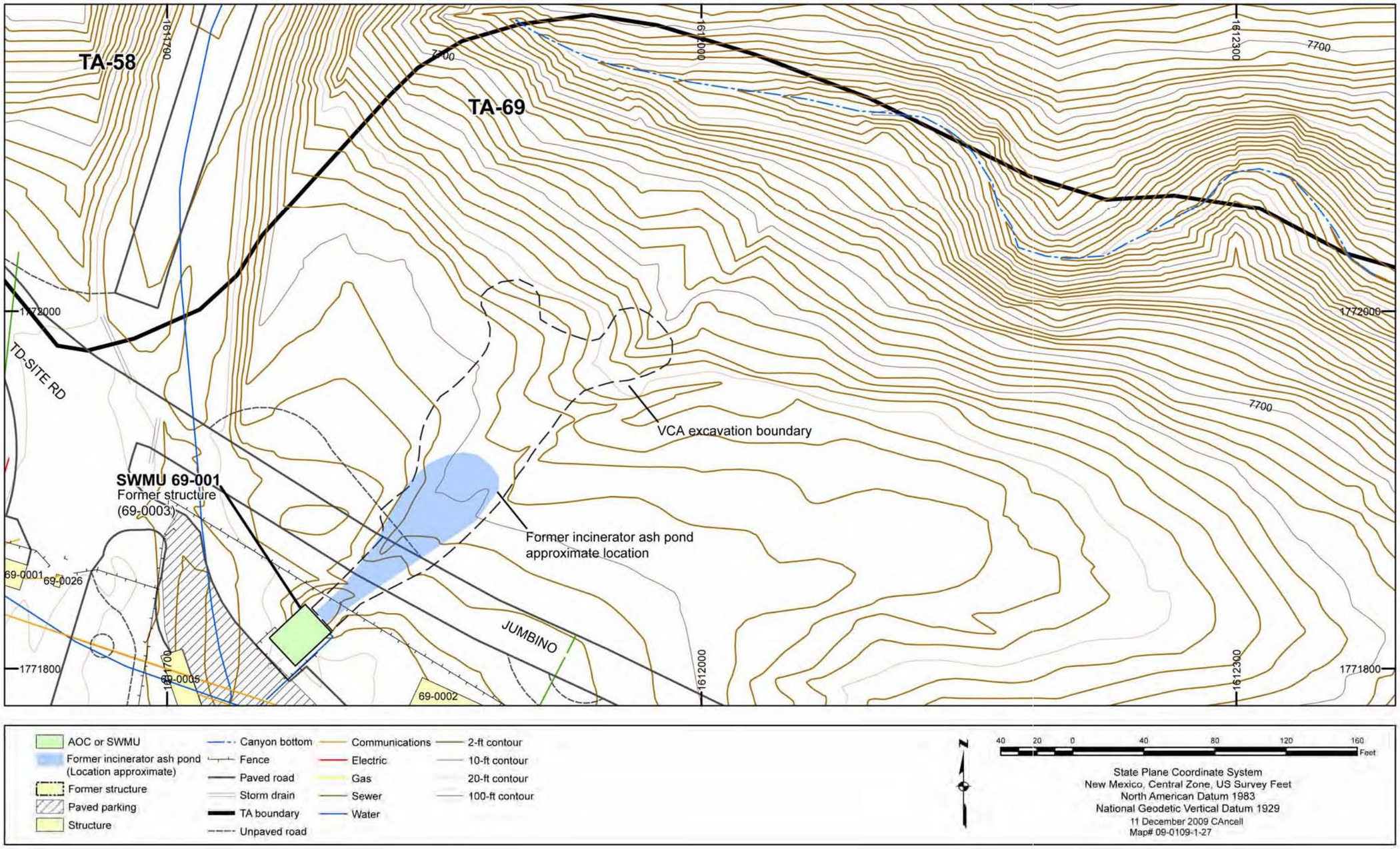


Figure 4.8-1 Site features for SWMU 69-001

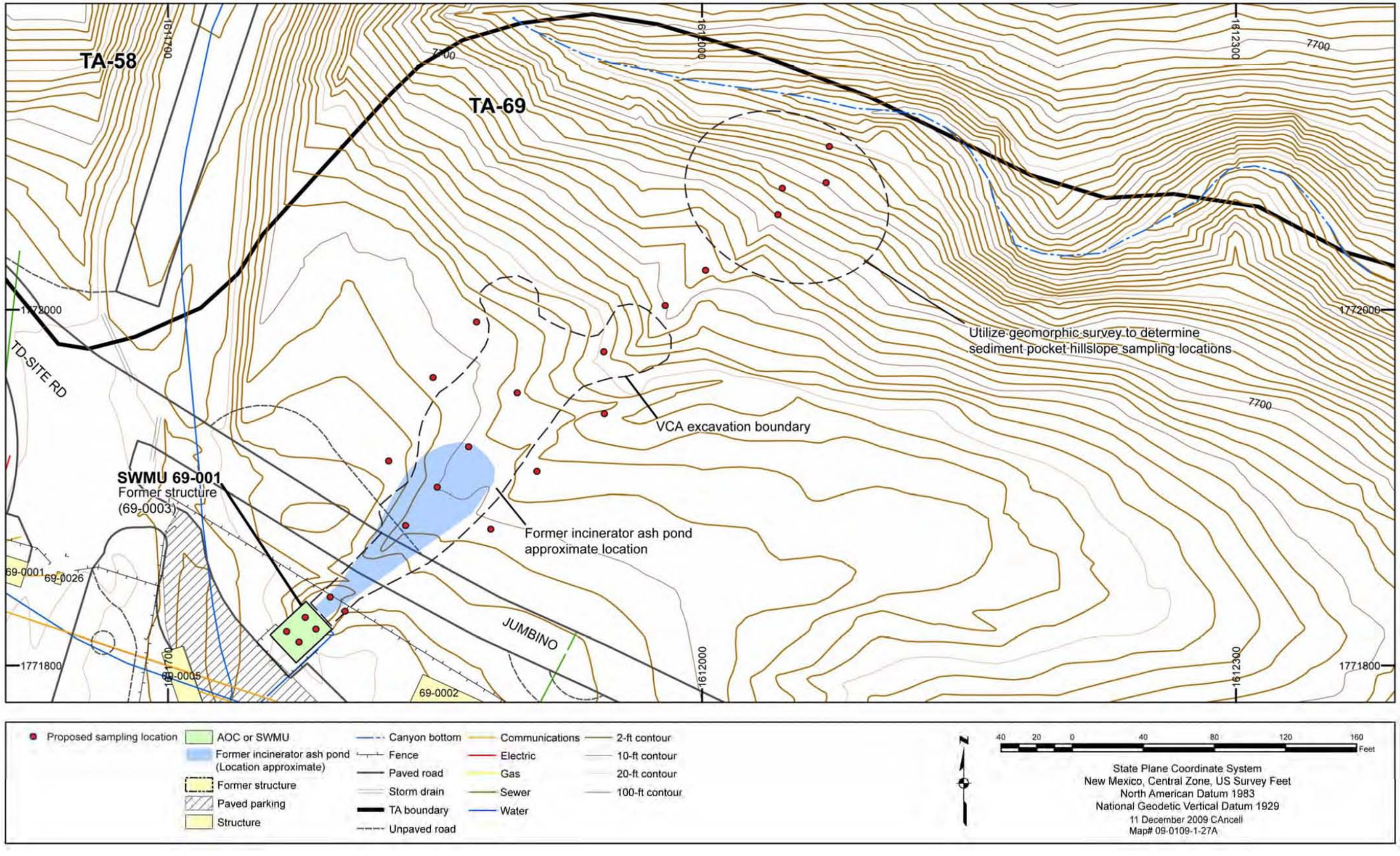


Figure 4.8-2 Proposed sampling locations at SWMU 69-001

Table 1.1-1
Status of SWMUs and AOCs in Twomile Canyon Aggregate Area

Consolidated Unit	Site ID	Brief Description	Site Status	IWP Reference
TA-03				
	SWMU 03-001(a)	Less-than-90-day storage	Removed from the Module VIII of the Laboratory's Hazardous Waste Facility Permit (HWFP), 12/23/98	NMED 1998, 063042
	SWMU 03-001(b)	SAA	Removed from the Module VIII of the Laboratory's HWFP, 12/23/98	NMED 1998, 063042
	SWMU 03-001(c)	Less-than-90-day storage	Removed from the Module VIII of the Laboratory's HWFP, 12/23/98	NMED 1998, 063042
	AOC 03-001(e)	Former storage area	Under Investigation	Section 4.1.1
	AOC 03-001(g)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	SWMU 03-001(k)	Former storage area	Under Investigation	Section 4.1.2
	AOC 03-001(l)	Less-than-90-day storage	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-001(s)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-001(t)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-001(u)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-001(w)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	SWMU 03-002(d)	Former storage area	Removed from the Module VIII of the Laboratory's HWFP, 05/02/01	NMED 2001, 070010
	SWMU 03-003(a)	Former storage area	Under Investigation	Section 4.1.3
	SWMU 03-003(b)	Former storage area	Under Investigation	Section 4.1.4
	AOC 03-003(h)	Transformers	Under Investigation	Section 4.1.5
	AOC 03-003(j)	Transformers	Under Investigation	Section 4.1.6
	AOC 03-003(k)	Area of potential soil contamination	Under Investigation	Section 4.1.7
	AOC 03-003(l)	Transformers	Under Investigation	Section 4.1.8
	AOC 03-003(p)	Former Storage Area	Under Investigation	Section 4.1.9
	SWMU 03-009(d)	Surface Disposal Site	Removed from Module VIII of the Laboratory's HWFP, 4/22/07	NMED 2007, 095495
	SWMU 03-009(f)	Surface disposal site	Removed from the Module VIII of the Laboratory's HWFP, 12/23/98	NMED 1998, 063042
	SWMU 03-009(g)	Soil fill area	Removed from the Module VIII of the Laboratory's HWFP, 05/02/01	NMED 2001, 070010
	SWMU 03-010(a)	Surface disposal area/drainage	Under Investigation	Section 4.1.1

Table 1.1-1 (continued)

Consolidated Unit	Site ID	Brief Description	Site Status	IWP Reference
	SWMU 03-011	Operational release	NFA Approved, 01/23/08	NMED 2008, 100116
	AOC 03-013(g)	Operational release	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-013(h)	Operational release	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-014(a2)	Floor drains associated with former WWTP	Under Investigation	Section 4.1.10
	SWMU 03-014(t)	Lift station associated with former WWTP	Under Investigation	Section 4.1.11
	AOC 03-014(z)	Former floor drain associated with former WWTP	Under Investigation	Section 4.1.12
	AOC 03-016(a)	Septic system	NFA Approved, 01/21/05	EPA 2005, 088464
	SWMU 03-018	Septic system	Removed from the Module VIII of the Laboratory's HWFP, 12/23/98	NMED 1998, 063042
	SWMU 03-019	Septic system	Removed from the Module VIII of the Laboratory's HWFP, 05/02/01	NMED 2001, 070010
	AOC 03-022	Former containment sump	Under Investigation	Section 4.1.13
	SWMU 03-025(b)	Oil/water separators	Under Investigation	Section 4.1.14
	AOC 03-025(c)	Oil/water separators	Under Investigation	Section 4.1.15
	SWMU 03-026(d)	Sump/lift station	Under Investigation	Section 4.1.16
	SWMU 03-033	Former liquid waste collection system	Under Investigation	Section 4.1.17
	AOC 03-038(e)	Waste lines	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-038(f)	Drainline	Under Investigation	Section 4.1.18
	AOC 03-039(c)	Silver recovery unit	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-040(a)	Storage area	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-042	Former containment area	Under Investigation	Section 4.1.3
	SWMU 03-043(c)	Area of potential soil contamination from former manhole	Under Investigation	Section 4.1.19
	AOC 03-043(i)	Aboveground tank	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-044(b)	Container storage	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-047(j)	Drum storage	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-047(k)	Drum storage	NFA Approved, 01/21/05	EPA 2005, 088464
03-050(a)-00	SWMU 03-050(a)	Area of potential soil contamination from stack emissions	Under Investigation	Section 4.1.20.1
	SWMU 03-050(d)	Area of potential soil contamination from stack emissions	Under Investigation	Section 4.1.20.2

Table 1.1-1 (continued)

Consolidated Unit	Site ID	Brief Description	Site Status	IWP Reference
03-050(a)-00 (cont.)	SWMU 03-050(f)	Area of potential soil contamination from stack emissions	Under Investigation	Section 4.1.20.3
	SWMU 03-050(g)	Area of potential soil contamination from stack emissions	Under Investigation	Section 4.1.20.4
	SWMU 03-050(e)	Filter unit (inactive)	Removed from the Module VIII of the Laboratory's HWFP, 05/02/01	NMED 2001, 070010
	AOC 03-051(a)	Area of potential soil contamination	Under Investigation	Section 4.1.21
	AOC 03-051(b)	Area of potential soil contamination	Under Investigation	Section 4.1.22
	AOC 03-051(d)	Soil contamination (oil from leaking compressor)	NFA Approved, 01/21/05	EPA 2005, 088464
03-052(a)-00	SWMU 03-052(a)	Storm drain	Under Investigation	Section 4.1.23
	SWMU 03-052(e)	Storm drain	Under Investigation	Section 4.1.23
	SWMU 03-054(b)	Outfall	Under Investigation	Section 4.1.23
03-054(a)-00	SWMU 03-054(a)	Former cooling tower outfall	Under Investigation	Section 4.1.24
	SWMU 03-054(d)	Outfall	Under Investigation	Section 4.1.24
	SWMU 03-055(a)	Outfall	Under Investigation	Section 4.1.25
	AOC 03-055(b)	Outfall	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-056(f)	Drum storage	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-056(g)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 03-056(j)	Storage area	NFA Approved, 01/21/05	EPA 2005, 088464
	SWMU 03-056(m)	Drum storage area (inactive)	Removed from the Module VIII of the Laboratory's HWFP, 05/02/01	NMED 2001, 070010
	AOC C-03-003	One-time spill, stained asphalt	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC C-03-008	Storage area / rad contaminated	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC C-03-010	Outfall	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC C-03-019	Underground storage tank	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC C-03-021	Underground storage tank	NFA Approved, 01/21/05	EPA 2005, 088464
TA-06				
	SWMU 06-001(a)	Septic system	Under Investigation	Section 4.2.1
	SWMU 06-001(b)	Septic system	Under Investigation	Section 4.2.2
06-002-00	SWMU 06-002	Septic system	Under Investigation	Section 4.2.3.1
	SWMU 06-003(c)	Firing site	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-005	Area of potential soil contamination	Under Investigation	Section 4.2.3.2

Table 1.1-1 (continued)

Consolidated Unit	Site ID	Brief Description	Site Status	IWP Reference
	AOC C-06-006	Soil contamination from former building 06-0014	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-016	Soil contamination from former building 06-0028	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-020	Soil contamination from former building	NFA Approved, 03/14/00	NMED 2000, 066381
06-003(a)-99	SWMU 06-003(a)	Firing site	Eligible for deferral under Consent Order section IV.A.5.b; Under Investigation	Section 4.2.4.1
	AOC 06-008	Area of potential soil contamination	Under Investigation	Section 4.2.4.2
	AOC C-06-019	Area of potential soil contamination	Under Investigation	Section 4.2.4.3
	SWMU 06-003(b)	Firing site (inactive)	NFA Approved, 01/21/05	EPA 2005, 088464
	SWMU 06-003(d)	Firing Site	Under Investigation	Section 4.2.5
	SWMU 06-003(e)	Firing Site	Under Investigation	Section 4.2.6
	SWMU 06-003(f)	Firing Site	Under Investigation	Section 4.2.7
06-003(g)-00	SWMU 06-003(g)	Firing site and building 06-0010 (inactive)	Removed from the Module VIII of the Laboratory's HWFP, 11/09/01	NMED 2001, 072819
	AOC C-06-003	Building 06-0011, control building for explosive shots	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-007	Building 06-0015, boiler for steam generation	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-008	Building 06-0016, magazine for explosives	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-009	Building 06-0017, magazine	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-010	Building 06-0021, magazines for explosives storage.	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-011	Building 06-0022, magazine	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-012	Building 06-0023, magazine	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-013	Building 06-0024, magazine for explosives storage.	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-014	Building 06-0025, magazine for explosives storage.	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-015	Building 06-0027, magazine for explosives storage.	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-017	Building 06-0029, magazine for explosives storage.	NFA Approved, 03/14/00	NMED 2000, 066381

Table 1.1-1 (continued)

Consolidated Unit	Site ID	Brief Description	Site Status	IWP Reference
06-003(g)-00 (cont.)	AOC C-06-018	Building 06-0030, magazine for explosives storage.	NFA Approved, 03/14/00	NMED 2000, 066381
	AOC C-06-021	Building 06-0026, magazine used for explosives storage.	NFA Approved, 03/14/00	NMED 2000, 066381
	SWMU 06-003(h)	Firing site	Eligible for deferral under Consent Order section IV.A.5.b; Under Investigation	Section 4.2.8
	AOC 06-004	Sump	NFA Approved, 01/21/05	EPA 2005, 088464
	SWMU 06-006	Storage area	Under Investigation	Section 4.2.9
06-007(a)-99	SWMU 06-005	Pit	Under Investigation	Section 4.2.10.1
	SWMU 06-007(a)	MDA F	Under Investigation	Section 4.3.10.2
	SWMU 06-007(b)	Disposal pit	Under Investigation	Section 4.2.10.2
	SWMU 06-007(c)	Disposal pit	Under Investigation	Section 4.2.10.2
	SWMU 06-007(d)	Disposal pit	Under Investigation	Section 4.2.10.2
	SWMU 06-007(e)	Disposal pit	Under Investigation	Section 4.2.10.2
	SWMU 06-007(f)	Surface disposal area	Under Investigation	Section 4.2.11
	SWMU 06-007(g)	Area of potential soil contamination	Under Investigation	Section 4.2.12
	AOC C-06-001	Area of potential soil contamination	Under Investigation	Section 4.2.13
TA-07				
07-001(a)-99	SWMU 07-001(a)	Inactive firing pit	Under Investigation	Section 4.3.1.1
	SWMU 07-001(b)	Inactive firing pit	Under Investigation	Section 4.3.1.2
	SWMU 07-001(c)	Inactive firing site	Eligible for deferral under Consent Order section IV.A.5.b; Under Investigation	Section 4.3.1.3
	SWMU 07-001(d)	Inactive firing site	Eligible for deferral under Consent Order section IV.A.5.b; Under Investigation	Section 4.3.1.4
	SWMU 07-003(c)	Typographical error	Removed from the Module VIII of the Laboratory's HWFP, 12/23/98	NMED 1998, 063042
	SWMU 07-003(d)	Typographical error	Removed from the Module VIII of the Laboratory's HWFP, 12/23/98	NMED 1998, 063042
TA-22				
	AOC 22-003(a)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 22-003(b)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 22-003(c)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 22-003(d)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464

Table 1.1-1 (continued)

Consolidated Unit	Site ID	Brief Description	Site Status	IWP Reference
	AOC 22-003(e)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 22-003(f)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 22-003(g)	SAA	NFA Approved, 01/21/05	EPA 2005, 088464
	SWMU 22-010(a)	Septic system	Under Investigation	Section 4.4.1
	AOC 22-013	Liquid waste treatment/storage	NFA Approved, 01/21/05	EPA 2005, 088464
	SWMU 22-014(a)	Sump system	Under Investigation	Section 4.4.2
	SWMU 22-014(b)	Sump system	Under Investigation	Section 4.4.3
	SWMU 22-015(a)	Seepage pits	Under Investigation	Section 4.4.4
	SWMU 22-015(b)	Sump and outfall	Under Investigation	Section 4.4.5
TA-40				
	SWMU 40-001(a)	Septic system	Removed from the Module VIII of the Laboratory's HWFP, 12/23/98	NMED 1998, 063042
	SWMU 40-001(b)	Septic system	Under Investigation	Section 4.5.1
	AOC 40-002(a)	Container storage area SAA located inside building 40-0023	NFA Approved, 01/21/05	EPA 2005, 088464
	SWMU 40-005	Sump	Under Investigation	Section 4.5.2
	AOC 40-007(e)	Storage area	Under Investigation	Section 4.5.3
TA-50				
	AOC C-50-001	Transformer	Under Investigation	Section 4.6.1
TA-59				
	SWMU 59-001	Decommissioned septic system	NFA Approved, 5/2/01	NMED 2007, 070010
	AOC 59-002	Container storage area	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 59-003	Sump	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 59-004	Outfall	Under Investigation	Section 4.7.1
	AOC C-59-001	Transformer	Under Investigation	Section 4.7.2
TA-64				
	AOC 64-001	Storage area	NFA Approved, 01/21/05	EPA 2005, 088464
TA-69				
	SWMU 69-001	Twomile Incinerator Facility	Under Investigation	Section 4.8.1
	AOC 69-002(a)	Septic system	NFA Approved, 01/21/05	EPA 2005, 088464
	AOC 69-002(b)	Septic system	NFA Approved, 01/21/05	EPA 2005, 088464

Note: Shading denotes approved for NFA or complete with controls.

Table 2.3-1
Industrial SSLs and SALs

Chemical	Industrial SSL[a] (inorganic and organic chemicals) or Industrial SAL[b] (radionuclides)
Inorganic Chemicals (mg/kg)	
Aluminum	1130000
Antimony	454
Arsenic	17.7
Barium	224000
Beryllium	2260
Cadmium	1120
Calcium	na[c]
Chromium	2920[d]
Cobalt	300[e]
Copper	45400
Iron	795000
Lead	800
Manganese	145000
Mercury	49.9[f]
Nickel	22700
Selenium	5680
Silver	5680
Sodium	na
Thallium	74.9
Vanadium	5680
Zinc	341000
Organic Chemicals (mg/kg)	
Acenaphthene	36700
Acenaphthylene	18300[g]
Acetone	851000
Anthracene	183000
Aroclor-1260	8.26
Benzo(a)anthracene	23.4
Benzo(a)pyrene	2.34
Benzo(b)fluoranthene	23.4
Benzo(g,h,i)perylene	18300[h]
Benzo(k)fluoranthene	234
Benzoic acid	2500000[e]
Bis(2-ethylhexyl)phthalate	1370
Butylbenzylphthalate	9100[e]
2-Chloronaphthalene	90800
Chrysene	2340
Di-n-butylphthalate	68400
Di-n-octylphthalate	68400[i]
Dibenz(a,h)anthracene	2.34
Dibenzofuran	1620[j]

Table 2.3-1 (continued)

Chemical	Industrial SSL[a] (inorganic and organic chemicals) or Industrial SAL[b] (radionuclides)
1,2-Dichlorobenzene	14300
1,3-Dichlorobenzene	37.4[j]
Diethylphthalate	547000
2,4-Dimethylphenol	13700
2,4-Dinitrotoluene	103
Ethylbenzene	385
Fluoranthene	24400
Fluorene	24400
Hexachlorobenzene	12.0
Indeno(1,2,3-cd)pyrene	23.4
Methylene chloride	1090
2-Methylnaphthalene	4100[e]
4-Methylphenol	3100[e]
Naphthalene	252
Phenanthrene	20500
Pyrene	18300
RDX	174
Tetryl	2740
Toluene	57900
TPH-DRO	1120[k]
1,1,1-Trichloroethane	77100
Trichloroethene	253
1,2,4-Trichlorobenzene	525
Trichlorofluoromethane	6760
2,4,6-Trinitrotoluene	469
Xylene (total)	3610
Radionuclides (pCi/g)	
Americium-241	180
Cesium-137	23
Sodium-22	6.5
Uranium-234	1500
Uranium-238	430

[a] SSLs from NMED 2009, 106420, unless otherwise noted.

[b] SALs from LANL 2005, 088493.

[c] na = Not available.

[d] SSL is for hexavalent chromium.

[e] SSL is from the EPA Regional Screening Table (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm).

[f] SSL is for elemental mercury.

[g] SSL is for pyrene, which is surrogate for acenaphthylene.

[h] SSL is for pyrene, which is surrogate for benzo(g,h,i)perylene.

[i] SSL is for di-n-butylphthalate, which is surrogate for di-n-octylphthalate.

[j] SSL from NMED 2006, 092513.

[k] SSL from NMED 2006, 094614.

Table 4.0-1
Summary of Proposed Samples and Analyses

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
TA-03																					
	AOC 03-001(e) and SWMU 03-010(a)	Quarterly groundwater sampling of remaining well 03-B-13.	Well 03-B-13	n/a[a]	water	X[b]	—[c]	—	—	X	X	X	—	—	—	—	—	X	—	—	—
	SWMU 03-001(k)	Collect 20 surface asphalt and/or concrete samples from 12 locations where electrical equipment and drums of vacuum oil were stored adjacent to the south side of the building on concrete and asphalt covering the site and from eight locations surrounding the former storage area.	20 locations, 20 samples	Concrete or asphalt	Surface concrete or asphalt	—	—	—	—	—	—	—	—	X	—	—	—	X	—	—	—
		Collect 40 samples from two depths beneath the concrete and/or asphalt from the same 12 locations where electrical equipment and drums of vacuum oil were stored adjacent to the south side of the building and from the same eight locations surrounding the former storage area.	20 locations, 40 samples	0–1, 2–3 beneath concrete or asphalt	Soil beneath concrete or asphalt	X	X	X	—	X	X	—	—	X	—	—	—	X	—	—	—
		Collect 16 samples from two depths from eight locations in the two drainages downgradient of the site. NOTE: Samples from the western drainage will also be used to characterize lateral extent for SWMU 03-055(a).	8 locations, 16 samples	0–1, top 1 ft of unweathered tuff	Soil, tuff, sediment	X	X	X	—	X	X	—	—	X	—	—	—	X	—	—	—
	SWMU 03-003(a) and AOC 03-042	Collect 10 samples from the asphalt and/or concrete and from two depths beneath the asphalt and/or concrete from 10 locations within the former storage area and concrete containment area.	10 locations, 10 samples	Surface concrete or asphalt	Concrete, asphalt	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—	—
		Collect 20 samples from the asphalt and/or concrete and from two depths beneath the asphalt and/or concrete from 10 locations within the former storage area and concrete containment area	10 locations, 20 samples	0–1, 2–3 beneath concrete or asphalt	Soil beneath concrete or asphalt	X	X	X	—	X	X	—	—	X	—	—	—	—	—	—	—
		Collect 14 samples (beneath any asphalt) from two depths from seven locations around the former storage area.	7 locations, 14 samples	0–1, 2–3 beneath concrete or asphalt	Soil beneath concrete or asphalt	X	X	X	—	X	X	—	—	X	—	—	—	—	—	—	—
	SWMU 03-003(b)	Collect 7 surface base course samples from seven locations within the former storage area.	7 locations, 7 samples	Surface base course	Base course	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—	—
		Collect 14 samples from two depths beneath base course from the same seven locations within the former storage area.	7 locations, 14 samples	0–1, 2–3 beneath base course	Soil beneath base course	X	X	X	—	X	X	—	—	X	—	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 03-003(b) (cont.)	Collect 10 samples from two depths (beneath any asphalt) from five locations around the former storage area.	5 locations, 10 samples	0–1, 2–3 beneath concrete or asphalt	Soil	X	X	X	—	X	X	—	—	X	—	—	—	—	—	—	—
	AOC 03-003(h)	No sampling currently proposed; sampling delayed until decontamination and decommissioning (D&D) of building 03-0039.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	AOC 03-003(j)	No sampling currently proposed; sampling delayed until D&D of building 03-0040.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	AOC 03-003(k)	Collect 16 samples from two depths beneath the asphalt from four locations around former transformer location and four downgradient locations.	8 locations, 16 samples	0–1, 2–3 beneath asphalt	Soil, tuff	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—	—
	AOC 03-003(l)	No sampling currently proposed; sampling delayed until D&D of building 03-0016.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	AOC 03-003(p)	Collect 42 samples from two depths from twelve locations within the former storage area (including three previous VCA confirmation sampling locations 03-09000, 03-09001, and 03-09002) and from nine locations around the former storage area.	21 locations, 42 samples	0–1, 2-3 beneath asphalt	Soil, tuff	X	X	—	—	X	X	—	—	X	—	—	—	—	—	—	—
	AOC 03-014(a2)	Collect six samples from two depths beneath the drainline from three locations between building 03-0316 and where the outlet drainline connects to the main sanitary sewer line north of building 03-0316.	3 locations, 6 samples	0–1, 2–3 (beneath drainline)	Soil, tuff	X	X	X	—	X	X	—	—	X[d]	—	—	—	—	—	—	—
	SWMU 03-014(t)	Collect 12 samples from two depths beneath and adjacent to the bottom of the lift station from two locations adjacent to the lift station and four locations along the drainline between the lift station and where it connects to the main sanitary sewer line.	6 locations, 12 samples	0–1, 2–3 (beneath and adjacent to bottom of lift station and drainline)	Soil, tuff	X	X	X	—	X	X	—	—	X[d]	—	—	—	—	—	—	—
	AOC 03-014(z)	No sampling currently proposed; sampling delayed until D&D of building 03-0040.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	AOC 03-022	Collect samples from three depths (0 to 1 ft, 3 to 4 ft, and 5 to 6 ft beneath clean fill or until no soil staining, odor, or elevated PID readings observed) from eight locations within sump footprint.	8 locations, 24 samples	0-1, 3–4, 5–6 (beneath clean fill)	Soil, tuff	X	X	—	—	X	X	—	—	X	X	—	—	—	—	—	—
		Collect 24 samples from three depths from eight locations around the former sump footprint.	8 locations, 24 samples	1–2, 3–4, 5–6	Soil, tuff, sediment	X	X	—	—	X	X	—	—	X	X	—	—	—	—	—	—
		Collect nine samples from three depths from three locations along the former location of the oil transfer line.	3 locations, 9 samples	1–2, 3–4, 5–6	Soil, tuff	X	X	—	—	X	X	—	—	X	X	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	AOC 03-022 (cont.)	Collect samples from two depths from nine locations in the two drainages downgradient of the site.	9 locations, 18 samples	0-1, top 1 ft of unweathered tuff	Soil, tuff, sediment	X	X	—	—	X	X	—	—	X	X	—	—	—	—	—	—
	SWMU 03-025(b)	No sampling currently proposed; sampling delayed until D&D of building 03-0102.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	AOC 03-025(c)	Collect six samples from two depths beneath the bottom of the sump from three locations around the structure (north, south, and east sides of the sump).	3 locations, 6 samples	0–1, 2–3 (beneath bottom of sump)	Soil	X	X	X	X	X	X	—	—	X[d]	X	X	X	—	X	X	—
	SWMU 03-026(d)	No sampling currently proposed; sampling delayed until D&D of building 03-0016.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	SWMU 03-033	Collect 28 samples from two depths beneath former structures from: • two locations within the steel containment excavation, • two locations within the concrete secondary containment excavation, • three locations around the concrete secondary containment structure, • three locations within the drainline excavation, and • four locations downgradient of these structures.	14 locations, 28 samples	0–1, 3–4 (beneath structures)	Soil	X	X	X	X	X	X	—	—	X[d]	—	—	—	—	—	—	—
	AOC 03-038(f)	Collect six samples from two depths beneath drainline from three locations along the drainline. Use radiological field screening to guide sampling.	3 locations, 6 samples	0–1, 2–3 (beneath drainline)	Soil, tuff	X	X	X	X	X	X	—	—	X[d]	—	X	X	X	X	—	—
	SWMU 03-043(c)	Collect 15 samples from three depths from one location in the center of the former manhole location and four step-out locations around the former manhole location.	5 locations, 15 samples	1–2, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	—	—	X[d]	—	X	X	X	X	—	—
		Collect six samples from two depths beneath the bottom of the former drainline from three locations along former drainline location. Use radiological field screening to guide sampling.	3 locations, 6 samples	0–1, 2–3 (beneath former drainline)	Soil, tuff	X	X	X	X	X	X	—	—	X[d]	—	X	X	X	X	—	—
03-050(a)-00	SWMU 03-050(a)	Collect 44 samples from two depths (beneath any asphalt or concrete) at twenty-two locations along the fence line around the CMR building (building 03-0029).	22 locations, 44 samples	0–1, 2–3 (beneath asphalt or concrete)	Soil	—	—	—	—	—	—	—	—	X[c]	—	X	X	X	X	X	X
	SWMU 03-050(d)	Collect 22 samples from two depths (beneath any asphalt or concrete) from eleven locations around building 03-0102.	11 locations, 22 samples	0–1, 2–3 (beneath asphalt or concrete)	Soil	—	—	—	—	—	—	—	—	X[d]	—	X	X	X	X	X	X
	SWMU 03-050(f)	Collect 26 samples from two depths (beneath any asphalt or concrete) from thirteen locations around building 03-0040.	13 locations, 26 samples	0–1, 2–3 (beneath asphalt or concrete)	Soil	X[e]	—	—	—	—	—	—	—	X[d]	—	X	X	X	X	X	X

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 03-050(g)	Collect 32 samples from two depths (beneath any asphalt or concrete) from sixteen locations around building 03-0016.	16 locations, 32 samples	0–1, 2-3 (beneath asphalt or concrete)	Soil	—	—	—	—	—	—	—	—	X[d]	—	—	—	X	—	—	—
	AOC 03-051(a)	Collect six samples from the asphalt paving at six locations around the compressor shed.	6 locations, 6 samples	Asphalt	Asphalt	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—	—
		Collect 12 samples from two depths beneath the asphalt paving at six locations around the compressor shed.	6 locations, 12 samples	0–1, 2–3 (beneath asphalt)	Soil	X	X	X	—	X	X	—	—	X	—	—	—	—	—	—	—
	AOC 03-051(b)	Collect 12 samples from two depths beneath concrete paving from six locations at and around the former compressor shed.	6 locations, 12 samples	0–1, 2–3 (beneath concrete)	Soil	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—	—
		Collect four samples from two depths from two locations downgradient of the former compressor shed location, directly south of the concrete pad and the facility fence line.	2 locations, 4 samples	0-1, 2–3	Soil	X	X	X	—	X	X	—	—	X	—	—	—	—	—	—	—
03-052(a)-00	Consolidated Unit 03-052(a)-00	Collect 21 samples from two depths from seven locations within outfall area on mesa top.	7 locations, 21 samples	0–1, 2–3, 4–5	Soil	X	X	X	—	X	X	—	—	X	—	—	—	—	—	—	—
		Collect 16 samples from two depths from eight locations in the drainage downgradient of the outfall area.	8 locations, 16 samples	0–1, top 1 ft of unweathered tuff	Soil, tuff, sediment	X	X	X	—	X	X	—	—	X	—	—	—	—	—	—	—
03-054(a)-00	Consolidated Unit 03-054(a)-00	Collect 10 samples from two depths beneath the drainlines from five locations along the drainlines between building 03-0016 and former buildings 03-0208, 03-0019 and the outfall.	5 locations, 10 samples	0–1, 2–3 (beneath drainlines)	Soil, tuff	X[f]	X	X	—	X	X	—	—	X	—	—	—	X	—	—	—
		Collect 10 samples from two depths from five mesa-top locations at and downgradient of the outfall.	5 locations, 10 samples	0–1, 2–3	Soil, sediment	X[f]	X	X	—	X	X	—	—	X	—	—	—	X	—	—	—
		Collect 10 samples from two depths at five locations in the drainage down gradient of the site.	5 locations, 10 samples	0–1, top 1 ft of unweathered tuff	Soil, tuff, sediment	X[f]	X	X	—	X	X	—	—	X	—	—	—	X	—	—	—
	SWMU 03-055(a)	Collect four samples from two depths beneath the drainline from two locations along the drainline between building 03-0016 and the outfall.	2 locations, 4 samples	0–1, 2–3	Soil, tuff	X	X	X	—	X	X	—	—	X[d]	—	—	—	X	—	—	—
		Collect eight samples from two depths from four locations at and down gradient of the outfall.	4 locations, 8 samples	0–1, top 1 ft of unweathered tuff	Soil, tuff, sediment	X	X	X	—	X	X	—	—	X[d]	—	—	—	X	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
TA-06																					
	SWMU 06-001(a)	Remove septic tank and collect nine samples from three depths beneath inlet and outlet to tank and beneath bottom of tank.	3 locations, 9 samples	0–1, 2–3, 5–6 (below drainlines and tank bottom)	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	X	—	—
		Collect 12 samples from two depths beneath inlet and outlet drainlines.	6 locations, 12 samples	0–1, 3–4 (below drainlines)	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	X	—	—
		Collect 18 samples from six locations at three depths at and downgradient of the outfall to define lateral extent.	6 locations, 18 samples	0–1, 2–3, 4–5 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	X	—	—
	SWMU 06-001(b)	Remove septic tank and collect nine samples from three depths beneath inlet and outlet to tank and beneath bottom of tank.	3 locations, 9 samples	0–1, 2–3, 5–6 (below drainlines and tank bottom)	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	X	—	—
		Collect six samples from three locations at two depths beneath inlet drainline.	3 locations, 6 samples	0–1, 3–4 (below drainline)	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	X	—	—
		Collect 12 samples from three depths in the filter trench area below the distribution box, below each perforated drainline, and below outlet drainline.	4 locations, 12 samples	0–1, 2–3, 4–5 (below distribution box and drainlines)	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	X	—	—
		Collect 18 samples at three depths from six locations at and downgradient of the outfall to define lateral extent. These samples will also define lateral extent for other upstream SWMUs and AOCs.	6 locations, 18 samples	0–1, 2–3, 4–5 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	X	—	—
06-002-00	SWMU 06-002	Collect nine samples at three depths from three 1995 RFI locations 06-08001, 06-08002, and 06-08003 at and around former septic tank at deeper depths and with expanded analytical suite.	3 locations, 9 samples	0–1, 4–5, 8–9	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect 18 samples at two depths beneath inlet drainlines from former buildings 06-0010 and 06-0020 and beneath outlet drainline.	9 locations, 18 samples	0–1, 3–4 (below drainlines)	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect six samples at three depths from 1998 RFI locations 06-08060 and 06-08061 at and below outfall at deeper depths and with expanded analytical suite.	2 locations, 6 samples	0–1, 4–5, 8–9 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 06-002 (cont.)	Collect six samples at three depths from two locations downgradient of 1998 RFI outfall sampling locations.	2 location, 6 samples	0–1, 4–5, 8–9 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
06-002-00	AOC C-06-005	Perform XRF survey within building footprint to identify areas of elevated lead contamination. Remove lead-contaminated soil and collected confirmation samples.	To be determined	0–1, 2–3 (below excavation)	Soil, tuff	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Collect nine samples at three depths from RFI locations 06-08010, 06-08011, and 06-08012 at deeper depths and with expanded analytical suite to define nature and extent.	3 locations, 9 samples	0–1, 4–5, 8–9	Soil, tuff	X	X	X	X	X	X	X	X	X[d]	—	—	—	—	—	—	—
		Collect 12 samples at three depths from four step-out locations around RFI locations.	4 locations, 12 samples	0–1, 4–5, 8–9	Soil, tuff	X	X	X	X	X	X	X	X	X[d]	—	—	—	—	—	—	—
06-003(a)-99	SWMU 06-003(a)	Sample sediment and water in bowl and filter pit to characterize for removal and disposal requirements.	To be determined	To be determined	Sediment, water	X	—	—	—	X	X	X	—	X	—	X	—	—	X	X	—
		Angle drill beneath pad and collect samples beneath bowl and filter pit.	1 location, 4 samples	Approximately 10 ft below bottom of shaft	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	X	—	X	X	X
		Collect nine samples at three depths from RFI locations 06-04004, 06-04005, and 06-04006 outside concrete bowl at deeper depths.	3 locations, 9 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	X	—	X	X	X
		Collect nine samples at three depths from three step-out locations outside concrete bowl.	3 locations, 9 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	—	X	X	—	X	X	X
		Collect nine samples at three depths from the outfall from filter pit drainline and two downgradient locations.	3 locations, 9 samples	0–1, 2–3, 4–5 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	X	—	X	X	X
	AOC 06-008	Collect three samples at three depths from one location of former tank.	1 location, 3 samples	0–1, 3–4, 6–7 (below backfill)	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	X	X	X	—	X	X	X
		Collect nine samples at three depths from 3 step-out locations on the north, south and east sides of the tank.	3 locations, 9 samples	4–5, 7–8, 10–11	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	X	X	X	—	X	X	X
	AOC C-06-019	Collect nine samples at three depths from one location in footprint of former structure and two locations adjacent to footprint at 3 depths.	3 locations, 9 samples	0–1, 4–5, 8–9	Soil, tuff	X	X	X	X	X	X	X	X	X[d]	X	X	X	—	X	X	X

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
		Collect three samples at three depths from one step-out location to define lateral extent. Samples from SWMU 06-003(a) and AOC 06-008 will also be used for lateral extent.	1 locations, 3 samples	0–1, 4-5, 8-9	Soil, tuff	X	X	X	X	X	X	X	X	X[d]	X	X	X	—	X	X	X
	SWMU 06-003(d)	Collect 15 samples at three depths from one location within footprint of former building and at four step-out locations.	5 locations, 15 samples	0–1, 3-4, 6-7	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
	SWMU 06-003(e)	Collect 18 samples at three depths from two locations within footprint of former building and at four step-out locations to define nature and extent.	6 locations, 18 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
	SWMU 06-003(f)	Collect 18 samples at three from RFI locations 06-04022, 06-04023, 06-04024, 06-04025, 06-04026, and 06-04027 at deeper depths to define lateral and vertical extent.	6 locations, 18 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	X	—	X
	SWMU 06-003(h)	Collect 21 samples at three depths from three locations within footprint of former firing site and at four step-out locations to define nature and extent. Sample locations within footprint to be based on XRF and HE field-screening results.	7 locations, 21 samples	0–1, 4–5, 8–9	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
	SWMU 06-006	Collect 24 samples at three depths from eight locations below former storage pad.	8 locations, 24 samples	0–1, 2–3, 4–5 (below pad)	Soil, tuff	X	X	X	X	X	X	X	—	X	—	X	—	—	X	—	—
		Collect eight samples from storage pad material from eight locations to characterize PCB contamination.	8 location, 8 samples	0–0.5	Asphalt, concrete	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—	—
		Collect 18 samples at three locations from six step-out locations around former storage pad.	6 locations, 18 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X	—	X	—	—	X	—	—
06-007(a)-99	SWMU 06-005	Collect four samples at two depths from two locations within footprint of backfilled pit.	2 locations, 4 samples	0–1, 3–4 (below backfill)	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
		Collect 12 samples at three depths from four step-out locations.	4 locations, 12 samples	0–1, 4–5, 9–10	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
	SWMU 06-007(a)	Perform geophysical surveys to locate pits and excavate test pits to confirm locations. Install boreholes around boundary of disposal pits and sample to define nature and extent.	To be determined	0–1, 3–4, 6–7 (below bottom of pit)	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
	SWMU 06-007(b)	Perform geophysical surveys to locate pit and shafts and excavate test pit to confirm location. Install boreholes around boundary of disposal pit and sample to define nature and extent.	To be determined	0–1, 3–4, 6–7 (below bottom of pit)	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 06-007(c)	Perform geophysical surveys to locate pit and excavate test pit to confirm location. Install boreholes around boundary of disposal pit and sample to define nature and extent.	To be determined	0–1, 3–4, 6–7 (below bottom of pit)	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
	SWMU 06-007(d)	Perform geophysical surveys to locate pit and excavate test pit to confirm location. Install boreholes around boundary of disposal pit and sample to define nature and extent.	To be determined	0–1, 3–4, 6–7 (below bottom of pit)	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
	SWMU 06-007(e)	Perform geophysical surveys to locate pit and excavate test pit to confirm location. Install boreholes around boundary of disposal pit and sample to define nature and extent.	To be determined	0–1, 3–4, 6–7 (below bottom of pit)	Soil, tuff	X	X	X	X	—	X	X	—	X[c]	—	X	—	—	X	—	X
	SWMU 06-007(f)	Collect nine samples at three depths from VCA locations 06-09911, 06-09912, and 06-09913 at deeper depth to determine vertical extent.	3 locations, 9 samples	0–1, 2–3, 4–5 into undisturbed soil/tuff	Soil, tuff	X	X	X	X	X	X	X	X	X[d]	—	X	—	—	X	—	X
		Collect 12 samples at three depths from four step-out locations around site.	4 locations, 12 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	X	X[d]	—	X	—	—	X	—	X
	SWMU 06-007(g)	Collect nine samples at three depths from RFI locations 06-05004, 06-05005, and 06-05006 at deeper depth.	3 locations, 9 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	X	—	X
		Collect nine samples at three depths from four step-out locations around site to define lateral extent.	4 locations, 12 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	X	—	X
	AOC C-06-001	Collect nine samples at three depths from RFI locations 06-08004, 06-08005, and 06-08006 at deeper depth and with expanded analytical suite.	3 locations, 9 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	—	—	—
		Collect six samples at three depths from two step-out locations around site to define lateral extent.	2 locations, 6 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	—	—	—	—	—
TA-07																					
07-001(a)-99	SWMU 07-001(a)	Conduct UXO survey around site to locate unexploded detonators or scrap. Collect 18 samples at three depths from RFI locations 07-04041, 07-04042, 07-04043, 07-04044, 07-04045, and 07-04046 at deeper depths and with expanded analytical suite to determine nature and vertical extent.	6 locations, 18 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 07-001(b)	Conduct UXO survey around site to locate unexploded detonators or scrap. Collect 18 samples at three depths from RFI locations 07-04047, 07-04048, 07-04049, 07-04050, 07-04051, and 07-04052 at deeper depths and with expanded analytical suite to determine nature and vertical extent.	6 locations, 18 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
	SWMU 07-001(c)	Collect nine samples at three depths from RFI locations 07-04053, 07-04054, and 07-04055 at deeper depths and with expanded analytical suite to determine nature and vertical extent.	3 locations, 9 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
		Collect nine samples at three depths from three locations downgradient of site to determine lateral extent.	3 locations, 9 samples	0–1, 2–3, 4–5 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
	SWMU 07-001(d)	Collected 18 samples at three depths from RFI locations 07-04062, 07-04063, 07-04064, 07-04065, 07-04066, and 07-04067 at deeper depths and with expanded analytical suite to determine nature and vertical extent.	6 locations, 18 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
		Collect three samples at one downgradient step-out location to determine lateral extent.	1 location, 3 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	—	X	X	—	X[d]	—	X	—	—	X	—	X
TA-22																					
	SWMU 22-010(a)	Collect 12 samples at two depths from six locations: • one location beneath the drainline where it exits building 22-0034; • one location beneath the drainline at the midpoint between the building and septic tank; • two locations, one beneath the inlet and one beneath the outlet to the septic tank; • one location beneath the septic tank; and • one location beneath manhole riser.	6 locations, 12 samples	0–1, 3–4 below drainlines, septic tank and manhole riser	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect eight samples at two depths from four locations in the drain field area. One location beneath each perforated drainline in the drain field area (three total locations) and one location beneath the point of discharge from the drain field area.	4 locations, 8 samples	0–1, 3–4 below drainfield drainlines	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
		Collect 3 samples at three depths from one location at the outfall from the drain field.	1 location, 3 samples	0–1, 2–3, 4–5 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
	SWMU 22-014(a)	Collect 18 samples at two depths from nine locations: • two locations, beneath the drainline one at each point where the drainline exits building 22-0093; • two locations adjacent to the sump; • two locations, one adjacent and below each, the sump inlet and outlet; • two locations beneath the sump drainline between the sump and seepage pit; and, • one location beneath the seepage pit inlet.	9 locations, 18 samples	0–1, 3–4 below drainlines, adjacent and below level of sump	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect five samples from advancing one borehole adjacent and downgradient of the seepage pit.	1 location, 7 samples	10 ft intervals to 30 ft below bottom of pit	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect nine samples at three depths from three locations downgradient of the seepage pit.	3 locations, 9 samples	0–1, 2–3, and 4-5 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect 18 samples at three depths from six locations in the drainage area from 1996 RFI location IDs 40-03056, 40-0357, 40-03058, 40-03059, 40-03060, and 40-03061.	6 locations, 18 samples	0–1, 2–3, 5–6	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
	SWMU 22-014(b)	Collect 12 samples at two depths from six locations: • one location beneath the drainline at building 22-0034; • one location beneath the sump; • two locations, one location beneath each, the sump inlet and outlet; and, • two locations beneath the sump drainline between the sump and outfall.	6 locations, 12 samples	0–1, 3–4 ft below sump and drainlines	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect 18 samples at three depths from six locations: one location at the outfall and five locations downgradient of the outfall to the toe of the hillslope.	6 locations, 18 samples	0–1, 2–3, 4–5 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
		Collect nine samples at three depths from three locations in the drainage downgradient of the outfall.	3 locations, 9 samples	0–1, 2–3 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
	SWMU 22-015(a)	Collect 10 samples at two depths from five locations: • two locations, one at each point where the drainline exits building 22-0091 beneath the drainline; • one location at the drainline junction; • one location along the drainline; and, • one location beneath seepage pit inlet.	5 locations, 10 samples	0–1, 3–4 beneath drainlines	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect four samples at two depths from two locations beneath the drainline connecting the seepage pits. One location at the outlet of seepage pit A and one location at the inlet of seepage pit B.	2 locations, 4 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect 18 samples at three depths from six locations downgradient of the seepage pits.	6 locations, 18 samples	0–1, 2–3, 4–5 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Advance two boreholes, one next to and downgradient of each seepage pit.	2 locations, 11 samples	10 ft intervals to 30 ft below bottom of pit	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
	SWMU 22-015(b)	Collect 10 samples at two depths from five locations: • one location beneath the drainline where it exits building 22-0025; • one location beneath the sump; • two locations, one beneath each, the sump inlet and outlet; and • one location along the drainline at the midpoint between the sump and the outfall.	8 locations, 16 samples	0–1, 3–4 below sump and drainlines	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect three samples at three depths from one location at 1997 RFI sample ID 22-03024.	1 location, 3 samples	0–1, 3–4, 8–9	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect 24 samples at three depths from eight locations downgradient of the outfall to the toe of the slope. Two sample locations will be collected at 1997 RFI sample location ID 22-06066 (at the outfall) and 22-06068 (downgradient of the outfall).	8 locations, 24 samples	0–1, 2–3, 4–5 or from the top 1 ft of unweathered tuff, whichever is shallower.	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
TA-40																					
	SWMU 40-001(b)	Collect 10 samples at two depths from five locations: • one location where drainline exits building 40-0023; • two locations, one location where each of two drainlines exits building 40-0001; • one location at the junction where the drainline from former building 40-0019 joins the drainline from building 40-001; and • one location east of Twomile Mesa Road.	5 locations, 10 samples	0–1, 3–4 below the drainlines, septic tank, and distribution box.	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect 12 samples at two depths from six locations: • two locations, one adjacent and below the inlet and outlet of the cleanout; • one location adjacent and below the septic tank; • two locations, one adjacent and below the septic tank inlet and outlet; and, • one location beneath the distribution box.	6 locations, 12 samples	0–1, 3–4 below the cleanout and septic tank drainlines, septic tank, and distribution box.	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect eight samples at two depths from four locations: one at the inlet and outlet of both seepage pits.	4 locations, 8 samples	0–1, 3–4 below drainlines	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Advance two boreholes, one adjacent and downgradient of each seepage pit. Borehole samples will be collected at ten-foot intervals to a depth of 30 ft below the bottom of each seepage pit. Note: Depths of pits is unknown.	2 locations	10 ft intervals to 30 ft below each pit	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect six samples at two depths from three locations, one beneath each perforated drainline in the drain field.	3 locations, 6 samples	0–1, 3–4 below the perforated drainlines	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect 12 samples at three depths from four locations downgradient of the drain field.	4 locations, 12 samples	0–1, 2–3, 4–5 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
	SWMU 40-005	Collect nine samples from three depths below the drainlines: one location where the drainline exits building 40-0041; and, two locations, one below the sump inlet and one below the sump outlet.	3 locations, 9 samples	0–1, 4–5, 8–9 ft below the drainlines	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect 12 samples at three depths from four RFI locations (sample IDs 40-3048, 40-3049, 40-3050) surrounding the sump.	4 locations, 12 samples	0–1, 4–5, 8–9 bgs	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
		Sample along drainline. Sampling will define extent in area.	1 location, 2 samples	0–1, 3–4 ft below drainline	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect 12 samples at two depths from six locations in the outfall area and downgradient. One sample location will be at the outfall and five sample locations downgradient to the toe of the slope.	6 locations, 12 samples	0–1, 2–3 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
	AOC 40-007(e)	Collect eight samples at two depths from four locations, one location on each side of building 40-0041, 8 ft from the building; the sample collected on the east side of the building will be beneath the asphalt.	4 locations, 8 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
TA-50																					
	AOC C-50-001	Collect 16 samples from the asphalt and from two depths beneath the asphalt from eight locations around the transformer pad.	8 locations, 16 samples	0–1, 2–3 (beneath asphalt)	Soil	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—	—
TA-59																					
	AOC 59-004	Collect 12 samples at two depths from six locations. One sample location at the outfall and five locations downgradient of the outfall to the toe of the slope.	6 locations, 12 samples	0–1, the top 1 ft of unweathered tuff	Soil, tuff	X	X	X	X	X	X	X	—	X[d]	—	X	X	X	X	X	X
	AOC C-59-001	Delay – no sampling.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	TPH (EPA SW-846 8440)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
TA-69																					
	SWMU 69-001	Collect four concrete chip samples from four locations on concrete slab foundation of former building 69-0003.	4 locations, 4 samples	Surface	Concrete chips	X	X	X	X	X	X	X	—	X[d]	—	—	—	—	—	—	—
		Collect six samples at three depths from two locations between the east side of the concrete foundation of former building 69-0003 and the west side of Jumbino Road.	2 locations, 6 samples	0–1, 3–4, 4–5 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff	X	X	—	—	X	X	—	—	X	—	—	—	—	—	—	—
		Collect 26 samples at two depths from 13 locations on the east side of Jumbino Road. Five sampling locations in the drainage of VCA excavated area; six sample locations, three along east and three along the west side of VCA excavation area; and, two sample locations in the drainage downgradient of the VCA excavation area.	13 locations, 26 samples	0–1, 2–3 or from the top 1 ft of unweathered tuff, whichever is shallower	Soil, tuff, sediment	X	X	—	—	X	X	—	—	X	—	—	—	—	—	—	—
		Collect eight samples from four sediment pockets on canyon slope downgradient of the VCA area to the toe of the slope.	4 locations, 8 samples	0–1, top 1 ft of unweathered tuff	Soil, tuff, sediment	X	X	—	—	X	X	—	—	X	—	—	—	—	—	—	—

[a] n/a = Not applicable.

[b] X = Analysis proposed.

[c] — = Analysis will not be performed.

[d] 20% of samples collected will be analyzed for PCBs.

[e] Samples analyzed for beryllium only.

[f] Samples analyzed for hexavalent chromium.

Table 4.1-1
Summary of Samples Collected and Analyses Requested at TA-03 Sites

Sample ID	Location ID	Depth (ft)	Media	Metals	VOCs	SVOCs	TPH-DRO
Consolidated Unit 03-052(a)-00							
RE03-02-45102	03-02-19564	0.0–0.17	Soil	734S[a]	—[b]	734S	734S
RE03-02-45093	03-02-19564	0.58–0.75	Soil	734S	—	734S	734S
RE03-02-45103	03-02-19565	0.0–0.17	Soil	734S	—	734S	734S
RE03-02-45094	03-02-19565	0.42–0.58	Soil	734S	—	734S	734S
RE03-02-45104	03-02-19566	0.0–0.17	Soil	734S	—	734S	734S
RE03-02-45095	03-02-19566	0.83–1.08	Soil	734S	734S	734S	734S
RE03-02-45105	03-02-19567	0.0–0.17	Soil	734S	—	734S	734S
RE03-02-45096	03-02-19567	1.0–1.17	Soil	734S	—	734S	734S
RE03-02-45106	03-02-19568	0.0–0.17	Soil	734S	—	734S	734S
RE03-02-45097	03-02-19568	0.83–1.0	Soil	734S	—	734S	734S
RE03-02-45107	03-02-19569	0.0–0.17	Soil	734S	—	734S	734S
RE03-02-45098	03-02-19569	0.67–0.83	Soil	734S	734S	734S	734S
RE03-02-45108	03-02-19570	0.0–0.17	Soil	734S	—	734S	734S
RE03-02-45099	03-02-19570	0.17–0.33	Soil	734S	—	734S	734S
RE03-02-45109	03-02-19571	0.0–0.17	Soil	734S	—	734S	734S
RE03-02-45100	03-02-19571	1.5–1.7	Soil	734S	—	734S	734S
RE03-02-45110	03-02-19572	0.0–0.17	Soil	734S	—	734S	734S
RE03-02-45101	03-02-19572	0.67–0.83	Soil	734S	734S	734S	734S

[a] Request numbers.

[b] — = Analysis not requested.

Table 4.1-2
Inorganic Chemicals above BVs at TA-03

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt
Soil BV[a]				**0.83**	**8.17**	**1.83**	**0.4**	**19.3**	**8.64**
Consolidated Unit 03-052(a)-00									
RE03-02-45102	03-02-19564	0.0–0.17	Soil	—[b]	—	—	—	27.7 (J)	—
RE03-02-45093	03-02-19564	0.58–0.75	Soil	1.2	—	—	0.49	19.6 (J)	—
RE03-02-45103	03-02-19565	0.0–0.17	Soil	0.98	—	—	0.72	—	—
RE03-02-45094	03-02-19565	0.42–0.58	Soil	—	—	—	0.69	—	—
RE03-02-45104	03-02-19566	0.0–0.17	Soil	—	—	—	0.51	23.8 (J)	9.4
RE03-02-45095	03-02-19566	0.83–1.08	Soil	0.88	—	—	—	39.6 (J)	—
RE03-02-45105	03-02-19567	0.0–0.17	Soil	—	—	—	0.5	—	—
RE03-02-45096	03-02-19567	1.0–1.17	Soil	—	—	—	0.73	20.5 (J)	—
RE03-02-45106	03-02-19568	0.0–0.17	Soil	—	—	—	—	—	—
RE03-02-45097	03-02-19568	0.83–1.0	Soil	—	—	—	—	20.2 (J)	—
RE03-02-45107	03-02-19569	0.0–0.17	Soil	—	—	—	0.59	—	—
RE03-02-45098	03-02-19569	0.67–0.83	Soil	—	—	—	—	—	—
RE03-02-45108	03-02-19570	0.0–0.17	Soil	0.92	—	—	1.1	32.3 (J)	—
RE03-02-45099	03-02-19570	0.17–0.33	Soil	1.0	—	—	1.0	28.3 (J)	—
RE03-02-45109	03-02-19571	0.0–0.17	Soil	1.1	8.6	—	1.3	—	—
RE03-02-45100	03-02-19571	1.5–1.7	Soil	1.0	—	—	0.59	34.2 (J)	—
RE03-02-45110	03-02-19572	0.0–0.17	Soil	—	—	—	1.2	29.9 (J)	—
RE03-02-45101	03-02-19572	0.67–0.83	Soil	—	—	3.1 (J)	1.6	60.5 (J)	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Copper	Lead	Mercury	Nickel	Silver	Zinc
Soil BV				**14.7**	**22.3**	**0.1**	**15.4**	**1**	**48.8**
Consolidated Unit 03-052(a)-00									
RE03-02-45102	03-02-19564	0.0–0.17	Soil	120	23.6 (J-)	—	44.2 (J)	—	198
RE03-02-45093	03-02-19564	0.58–0.75	Soil	121	62.3 (J-)	—	—	—	246
RE03-02-45103	03-02-19565	0.0–0.17	Soil	67.1	39.7 (J-)	—	—	—	476
RE03-02-45094	03-02-19565	0.47–0.58	Soil	65.1	57.5 (J-)	—	—	3.6	391
RE03-02-45104	03-02-19566	0.0–0.17	Soil	211	80.8 (J-)	—	17.8 (J)	—	307
RE03-02-45095	03-02-19566	0.83–1.08	Soil	108	99.9 (J-)	—	27.6 (J)	—	125
RE03-02-45105	03-02-19567	0.0–0.17	Soil	27.4	27.2 (J-)	—	—	—	330
RE03-02-45096	03-02-19567	1.0–1.17	Soil	71.1	47.2 (J-)	—	—	—	360
RE03-02-45106	03-02-19568	0.0–0.17	Soil	17.8	22.6 (J-)	—	—	—	138
RE03-02-45097	03-02-19568	0.83–1.0	Soil	197	40.6 (J-)	—	—	—	130
RE03-02-45107	03-02-19569	0.0–0.17	Soil	30.3	52.2 (J-)	—	—	—	218
RE03-02-45098	03-02-19569	0.67–0.83	Soil	—	27.7 (J-)	—	—	—	63.2
RE03-02-45108	03-02-19570	0.0–0.17	Soil	67.4	91.8 (J-)	—	16.4 (J)	1.3	400
RE03-02-45099	03-02-19570	0.17–0.33	Soil	60.4	89.5 (J-)	—	15.8 (J)	1.4	284
RE03-02-45109	03-02-19571	0.0–0.17	Soil	135	52.1 (J-)	—	—	1.1	825
RE03-02-45100	03-02-19571	1.5–1.7	Soil	254	97.9 (J-)	—	—	—	265
RE03-02-45110	03-02-19572	0.0–0.17	Soil	71.4	84.1 (J-)	0.11	—	1.7	431
RE03-02-45101	03-02-19572	0.67–0.83	Soil	106	168 (J-)	0.18	20.7 (J)	1.9	497

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

[a] BVs from LANL 1998, 059730.

[b] — = Result was not detected or was below the BV.

Table 4.1-3
Organic Chemicals Detected at TA-03

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Anthracene	Aroclor 1260	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Butylbenzylphthalate	Chrysene	Di-n-octylphthalate	Dibenz(a,h)anthracene
Consolidated Unit 03-052(a)-00																		
RE03-02-45102	03-02-19564	0.0–0.17	Soil	17	0.72 (J)	17	NA[a]	38	42 (J)	51 (J)	8.3 (J)	40 (J)	—[b]	1.1 (J)	—	46	—	3.9
RE03-02-45093	03-02-19564	0.58–0.75	Soil	49	1.5 (J)	61	NA	110	110	74	29	56	—	—	—	120	—	17
RE03-02-45103	03-02-19565	0.0–0.17	Soil	30	1.4 (J)	37	NA	100	110	110	25 (J)	100	—	2.4 (J)	—	130	10 (J)	15
RE03-02-45094	03-02-19565	0.42–0.58	Soil	45	3 (J)	52	NA	170	190	160	39 (J)	150	0.98 (J)	4.7	—	220	—	21
RE03-02-45104	03-02-19566	0.0–0.17	Soil	79	4.3	81	NA	220	260	240	57 (J)	190	1.3 (J)	—	—	280	—	31
RE03-02-45095	03-02-19566	0.83–1.08	Soil	24	—	31	NA	50	49	52	23	26	—	—	—	57	—	12
RE03-02-45105	03-02-19567	0.0–0.17	Soil	23	1.3 (J)	23	NA	57	65 (J)	66	14 (J)	54	—	—	—	79	7.8 (J)	6
RE03-02-45096	03-02-19567	1.0–1.17	Soil	52	3 (J)	60	NA	190	200	170	41 (J)	140	1.2 (J)	—	5.8	240	—	24
RE03-02-45106	03-02-19568	0.0–0.17	Soil	13	0.88 (J)	15	NA	45	52 (J)	63	11 (J)	50 (J)	—	—	—	56	—	3.2 (J)
RE03-02-45097	03-02-19568	0.83–1.0	Soil	3.5 (J)	—	4.1	NA	12	14 (J)	15 (J)	3.7 (J)	15 (J)	—	—	—	15	—	1.5 (J)
RE03-02-45107	03-02-19569	0.0–0.17	Soil	4.5	—	5.6	NA	14	17	19	2.7 (J)	20	—	—	—	18	—	1.1 (J)
RE03-02-45098	03-02-19569	0.67–0.83	Soil	—	—	—	NA	1.7 (J)	2.1 (J)	2.1 (J)	—	2.3 (J)	—	—	—	2.3 (J)	—	—
RE03-02-45108	03-02-19570	0.0–0.17	Soil	19	1.1 (J)	23	NA	58	70	63	15 (J)	59	—	—	—	79	—	6.4
RE03-02-45099	03-02-19570	0.17–0.33	Soil	6.1	—	8.8	NA	26	30 (J)	31 (J)	7.9 (J)	30 (J)	—	—	—	31	—	4.2
RE03-02-45109	03-02-19571	0.0–0.17	Soil	6.1	—	6.4	NA	18	22	25	5.2	19	—	—	—	24	—	1.9 (J)
RE03-02-45100	03-02-19571	1.5–1.7	Soil	24	—	30	NA	52	55 (J)	61 (J)	14 (J)	47 (J)	—	—	0.97 (J)	61	—	7.9
RE03-02-45110	03-02-19572	0.0–0.17	Soil	10	—	13	NA	35	42	58	6.4	36	—	—	—	48	—	—
RE03-02-45101	03-02-19572	0.67–0.83	Soil	14	—	18	NA	42	49 (J)	64 (J)	10 (J)	48 (J)	—	1.2 (J)	—	53	—	5.8

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Dibenzofuran	Dimethylphenol[2,4-]	Ethylbenzene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Methylnaphthalene[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Pyrene	TPH-DRD	Trichloroethane[1,1,1-]	Trichloroethene	Xylene (Total)
Consolidated Unit 03-052(a)-00																		
RE03-02-45102	03-02-19564	0.0–0.17	Soil	8.5	—	NA	120	15	12 (J)	6	—	18	110	98	580	NA	NA	NA
RE03-02-45093	03-02-19564	0.58–0.75	Soil	24	1 (J)	NA	300	42	38	17	1.9 (J)	50	300	250	2800	NA	NA	NA
RE03-02-45103	03-02-19565	0.0–0.17	Soil	11	—	NA	250	21	34 (J)	4.5 (J)	—	8.3	190	190	1800	NA	NA	NA
RE03-02-45094	03-02-19565	0.42–0.58	Soil	15	—	NA	430	32	54 (J)	11	—	23	330	390	5600	NA	NA	NA
RE03-02-45104	03-02-19566	0.0–0.17	Soil	24	1.1 (J)	NA	560	49	130	20	1.3 (J)	46	420	470	3500	NA	NA	NA
RE03-02-45095	03-02-19566	0.83–1.08	Soil	13	—	—	150	22	29	7.3	—	21	150	110	2300	0.0048 (J)	0.00077 (J)	—
RE03-02-45105	03-02-19567	0.0–0.17	Soil	10	—	NA	150	19	18 (J)	6.3	—	13	130	130	2000	NA	NA	NA
RE03-02-45096	03-02-19567	1.0–1.17	Soil	17	—	NA	440	35	56 (J)	12	—	24	340	400	2300	NA	NA	NA
RE03-02-45106	03-02-19568	0.0–0.17	Soil	4.5	—	NA	110	9.7	14 (J)	3.1 (J)	—	7.4	79	90	340	NA	NA	NA
RE03-02-45097	03-02-19568	0.83–1.0	Soil	1.1 (J)	—	NA	35	2.4 (J)	4.8 (J)	0.92 (J)	—	2.2 (J)	22	27	460	NA	NA	NA
RE03-02-45107	03-02-19569	0.0–0.17	Soil	1.6 (J)	—	NA	38	3.3 (J)	4 (J)	0.89 (J)	—	2.2 (J)	27	27	—	NA	NA	NA
RE03-02-45098	03-02-19569	0.67–0.83	Soil	—	—	0.00096 (J)	5.2	—	—	—	—	—	2.9 (J)	4	—	—	—	0.002 (J)
RE03-02-45108	03-02-19570	0.0–0.17	Soil	7.5	—	NA	160	15	20 (J)	3.5 (J)	—	7.4	120	120	810	NA	NA	NA
RE03-02-45099	03-02-19570	0.17–0.33	Soil	2.1 (J)	—	NA	62	4.7	11 (J)	1 (J)	—	2.4 (J)	43	60	620	NA	NA	NA
RE03-02-45109	03-02-19571	0.0–0.17	Soil	2.2 (J)	—	NA	46	4.4	7.4	1.5 (J)	—	3.9	34	35	—	NA	NA	NA
RE03-02-45100	03-02-19571	1.5–1.7	Soil	12	—	NA	140	20	19 (J)	7.4	—	23	140	110	1600	NA	NA	NA
RE03-02-45110	03-02-19572	0.0–0.17	Soil	3.8 (J)	—	NA	89	7.6	9.7	2.4 (J)	—	6.2	69	83	740	NA	NA	NA
RE03-02-45101	03-02-19572	0.67–0.83	Soil	5.5	—	—	120	11	14 (J)	2.9 (J)	—	7.6	98	100	2000	—	—	—

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

[a] NA = Not analyzed.

[b] — = Result was not detected.

Table 4.2-1
Summary of Samples Collected and Analyses Requested at TA-06

Sample ID	Location ID	Depth (ft)	Media	Metals	VOCs	High Explosives	Gamma Spectroscopy	Isotopic Uranium	Tritium	Strontium-90
SWMU 06-002										
0506-95-1200	06-08001	0.0–0.5	Soil	317[a]	—[b]	315	—	—	316	—
0506-95-1202	06-08001	2.83–3.17	Soil	317	314	315	—	—	—	—
0506-95-1203	06-08002	0.0–0.5	Soil	317	—	315	—	—	—	—
0506-95-1204	06-08002	2.58–3.17	Soil	317	314	315	—	—	—	—
0506-95-1205	06-08003	0.0–0.5	Soil	317	—	315	—	—	—	—
0506-95-1206	06-08003	3.0–3.33	Soil	317	314	315	—	—	—	—
RE06-98-0001	06-08003	5.17–5.67	Soil	4363R	—	4362R[c]	—	—	—	—
RE06-98-0002	06-08003	7.5–8.0	Qbt 3	4363R[d]	—	4362R[c]	—	—	—	—
RE06-98-0003	06-08060	0.0–0.5	Soil	4363R	—	4362R	—	—	—	—
RE06-98-0004	06-08060	4.25–4.5	Soil	4363R	4361R	4362R	—	—	—	—
RE06-98-0006	06-08061	0.0–0.5	Soil	4363R	—	4362R	—	—	—	—
RE06-98-0007	06-08061	4.25–4.5	Soil	4363R	4361R	4362R	—	—	—	—
SWMU 06-003(a)										
0506-97-0001	06-04001	0.0–0.33	Soil	3044R	—	3043R	3045R	3045R	—	3045R
AOC C-06-001										
0506-95-1207	06-08004	0.0–0.5	Soil	317	—	315	—	—	—	—
0506-95-1208	06-08004	2.33–2.5	Soil	317	—	315	—	—	—	—
0506-95-1209	06-08005	0.0–0.5	Soil	317	—	315	—	—	—	—
RE06-98-0032	06-08005	0.0–0.5	Soil	4341R	—	4342R	—	—	—	—
0506-95-1210	06-08005	3.83–4.33	Soil	317	—	315	—	—	—	—
RE06-98-0033	06-08005	4.17–4.83	Soil	4341R	—	—	—	—	—	—

Table 4.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Metals	VOCs	High Explosives	Gamma Spectroscopy	Isotopic Uranium	Tritium	Strontium-90
0506-95-1211	06-08006	0.0–0.5	Soil	317	—	315	—	—	—	—
RE06-98-0035	06-08006	0.0–0.5	Soil	4341R	—	4342R	—	—	—	—
0506-95-1212	06-08006	0.83–1.25	Soil	317	—	315	—	—	—	—
RE06-98-0036	06-08006	2.17–2.83	Soil	4341R	—	—	—	—	—	—
AOC C-06-005										
0506-95-1219	06-08010	0.0–0.5	Soil	317	—	315	—	—	316	—
RE06-98-0017	06-08010	0.0–0.5	Soil	4365R[e]	—	—	—	—	—	—
0506-95-1220	06-08010	3.0–3.33	Soil	317	314	315	—	—	—	—
RE06-98-0018	06-08010	10.08–12.58	Soil	4365R[e]	—	—	—	—	—	—
0506-95-1221	06-08011	0.0–0.5	Soil	317	—	315	—	—	—	—
0506-95-1222	06-08011	3.0–3.33	Soil	317	314	315	—	—	—	—
0506-95-1223	06-08012	0.0–0.5	Soil	317	—	315	—	—	—	—
0506-95-1225	06-08012	2.67–3.17	Soil	317	314	315	—	—	—	—

[a] Request numbers.

[b] — = Analysis not requested.

[c] Sample analyzed for PETN only.

[d] Sample analyzed for antimony only.

[e] Sample analyzed for antimony, cadmium, and silver only.

Table 4.2-2
Inorganic Chemicals Detected above BVs at TA-06

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Sodium	Thallium	Vandadium	Zinc
Soil/Fill BV[a]				**29200**	**0.83**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**21500**	**22.3**	**671**	**0.1**	**15.4**	**1**	**915**	**0.73**	**39.6**	**48.8**
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**14500**	**11.2**	**482**	**0.1**	**6.58**	**1**	**2770**	**1.1**	**17**	**63.5**
SWMU 06-002																						
0506-95-1200	06-08001	0.0–0.5	Soil	—[b]	—	—	—	1.2	—	—	23.3	—	—	—	4030	—	—	—	—	—	—	—
0506-95-1202	06-08001	2.83–3.17	Soil	—	—	—	—	1.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0506-95-1203	06-08002	0.0–0.5	Soil	—	—	—	—	0.5 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0506-95-1204	06-08002	2.58–3.17	Soil	—	—	—	—	1.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0506-95-1205	06-08003	0.0–0.5	Soil	—	—	—	—	0.81	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0506-95-1206	06-08003	3.0–3.33	Soil	—	—	511	—	1.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE06-98-0001	06-08003	5.17–5.67	Soil	—	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	0.8 (J)	—	—
RE06-98-0004	06-08060	4.25–4.5	Soil	—	—	—	—	—	—	—	—	—	—	—	718	—	—	—	—	1.1	—	—
RE06-98-0007	06-08061	4.25–4.5	Soil	—	—	318	—	—	—	—	—	—	—	—	—	—	—	—	—	1.3	—	—
SWMU 06-003(a)																						
0506-97-0001	06-04001	0.0–0.33	Soil	—	28.4 (U)	—	2.27 (U)	2.84 (U)	21400	—	—	43.3	—	44.8	—	0.24 (U)	—	2.84 (U)	1570 (J)	1.14 (U)	40.8	112
AOC C-06-001																						
0506-95-1207	06-08004	0.0–0.5	Soil	—	—	—	—	0.87	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0506-95-1209	06-08005	0.0–0.5	Soil	—	—	—	—	1.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE06-98-0032	06-08005	0.0–0.5	Soil	NA	—	NA	NA	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0506-95-1210	06-08005	3.83–4.33	Soil	—	—	—	—	0.45 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0506-95-1211	06-08006	0.0–0.5	Soil	—	—	—	—	1.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0506-95-1212	06-08006	0.83–1.25	Soil	—	—	—	—	0.66	—	—	—	—	—	—	—	—	—	—	—	—	—	—
AOC C-06-005																						
0506-95-1219	06-08010	0.0–0.5	Soil	—	—	—	—	0.9	—	—	9.2	—	—	23.8 (J+)	—	—	—	—	—	—	—	—
0506-95-1220	06-08010	3.0–3.33	Soil	—	—	—	—	1.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0506-95-1221	06-08011	0.0–0.5	Soil	—	—	349	—	1.1	—	50.8	—	206	—	786 (J+)	—	—	17.8	—	—	—	—	1260
0506-95-1222	06-08011	3.0–3.33	Soil	43000	—	498	—	1.7	—	—	16	—	24400	39.4 (J+)	1080	—	19.6	—	—	—	—	—
0506-95-1223	06-08012	0.0–0.5	Soil	—	—	—	—	1.1	—	20.9	—	16.8	—	84.7 (J+)	—	—	—	—	—	—	—	191
0506-95-1225	06-08012	2.67–3.17	Soil	41800	—	469	—	—	—	—	—	—	—	—	—	—	15.5	—	—	—	—	—

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

[a] BVs from LANL 1998, 059730.

[b] — = Result was not detected or was below the BV.

Table 4.2-3
Organic Chemicals Detected at TA-06

Sample ID	Location ID	Depth (ft)	Media	Acetone	RDX	Toluene	Trinitrotoluene[2,4,6-]
SWMU 06-002							
0506-95-1202	06-08001	2.83–3.17	Soil	0.005 (J)	—[a]	0.006 (J)	—
0506-95-1206	06-08003	3.0-3.33	Soil	—	—	0.004 (J)	—
SWMU 06-003(a)							
0506-97-0001	06-04001	0.0–0.33	Soil	NA[b]	0.485	NA	0.498
AOC C-06-005							
0506-95-1220	06-08010	3.0–3.33	Soil	—	—	0.005 (J)	—

Notes: Units are mg/kg. Data qualifiers are defined in Appendix A.
[a] — = Not detected.
[b] NA = Not analyzed.

Table 4.2-4
Radionuclides Detected or Detected above BVs/FVs at TA-06

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-137	Sodium-22	Uranium-234	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**na[b]**	**2.59**	**2.29**
SWMU 06-003(a)								
0506-97-0001	06-04001	0.0–0.33	Soil	0.14	7.33	0.126	3.67	4.22

Note: Units are pCi/g.
[a] BVs/FVs from LANL 1998, 059730.
[b] na = Not available.

Table 4.3-1
Summary of Samples Collected and Analyses Requested at Former TA-07

Sample ID	Location ID	Depth (ft)	Media	SVOCs	High Explosives
SWMU 07-001(a)					
0507-96-0029	07-04041	0.0–0.5	Soil	1906*	1907
0507-96-0030	07-04041	2.75–3.0	Soil	1906	1907
0507-96-0031	07-04042	0.0–0.50	Soil	1906	1907
0507-96-0032	07-04042	2.33–3.0	Soil	1906	1907
0507-96-0033	07-04043	0.0–0.5	Soil	1906	1907
0507-96-0034	07-04043	2.33–3.0	Soil	1906	1907
0507-96-0035	07-04044	0.0–0.5	Soil	1906	1907
0507-96-0036	07-04044	2.5–3.17	Soil	1906	1907
0507-96-0037	07-04045	0.0–0.5	Soil	1906	1907
0507-96-0038	07-04045	2.5–3.17	Soil	1906	1907
0507-96-0039	07-04046	0.0–0.5	Soil	1906	1907
0507-96-0041	07-04046	2.5–3.17	Soil	1906	1907
SWMU 07-001(b)					
0507-96-0042	07-04047	0.0–0.5	Soil	1906	1907
0507-96-0043	07-04047	2.5–3.17	Soil	1906	1907
0507-96-0044	07-04048	0.0–0.5	Soil	1906	1907
0507-96-0045	07-04048	2.5–3.17	Soil	1906	1907
0507-96-0046	07-04049	0.0–0.5	Soil	1906	1907
0507-96-0047	07-04049	2.5–3.17	Soil	1906	1907
0507-96-0048	07-04050	0.0–0.5	Soil	1906	1907
0507-96-0049	07-04050	2.5–3.17	Soil	1906	1907
0507-96-0050	07-04051	0.0–0.5	Soil	1906	1907
0507-96-0051	07-04051	2.58–3.25	Soil	1906	1907
0507-96-0052	07-04052	0.0–0.5	Fill	1906	1907
0507-96-0053	07-04052	2.58–3.25	Fill	1906	1907

* Request number.

Table 4.3-2
Organic Chemicals Detected at Former TA-07

Sample ID	Location ID	Depth (ft)	Media	Benzo(a)anthracene	Benzo(k)fluoranthene	Benzoic Acid	Chloronaphthalene[2-]	Di-n-octylphthalate	Dichlorobenzene[1,2-]	Dichlorobenzene[1,3-]
SWMU 07-001(a)										
0507-96-0033	07-04043	0.0–0.5	Soil	—*	—	0.187 (J)	—	—	—	—
SWMU 07-001(b)										
0507-96-0042	07-04047	0.0–0.5	Soil	0.055 (J)	0.08 (J)	—	0.267 (J)	0.12 (J)	0.32 (J)	0.312 (J)
0507-96-0043	07-04047	2.5–3.17	Soil	—	—	—	—	—	—	—
0507-96-0044	07-04048	0.0–0.5	Soil	—	—	—	—	—	—	—
0507-96-0045	07-04048	2.5–3.17	Soil	—	—	—	—	—	—	—
0507-96-0046	07-04049	0.0–0.5	Soil	—	—	—	—	—	—	—
0507-96-0048	07-04050	0.0–0.5	Soil	—	—	—	—	—	—	—
0507-96-0052	07-04052	0.0–0.5	Fill	—	—	—	—	—	—	—

Table 4.3-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Diethylphthalate	Hexachlorobenzene	Phenanthrene	Pyrene	RDX	Tetryl	Trichlorobenzene[1,2,4-]
SWMU 07-001(a)										
0507-96-0033	07-04043	0.0–0.5	Soil	—	—	—	—	—	—	—
SWMU 07-001(b)										
0507-96-0042	07-04047	0.0–0.5	Soil	—	0.268 (J)	0.14 (J)	0.188 (J)	—	—	0.368 (J)
0507-96-0043	07-04047	2.5–3.17	Soil	—	—	—	—	—	1.5	—
0507-96-0044	07-04048	0.0–0.5	Soil	—	—	—	—	1.0	—	—
0507-96-0045	07-04048	2.5–3.17	Soil	—	—	—	—	1.0	—	—
0507-96-0046	07-04049	0.0–0.5	Soil	—	—	—	—	1.0	—	—
0507-96-0048	07-04050	0.0–0.5	Soil	—	—	—	—	1.0	—	—
0507-96-0052	07-04052	0.0–0.5	Fill	0.041 (J)	—	—	—	1.0	—	—

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

* — = Result was not detected.

Table 4.4-1
Summary of Samples Collected and Analyses Requested at TA-22

Sample ID	Location ID	Depth (ft)	Media	Metals	Cyanide	VOCs	SVOCs	High Explosives
SWMU 22-010(a)								
0522-97-0001	22-06061	4.33–5.0	Soil	3050R[a]	—[b]	3049R	3049R	3051R
0522-97-0002	22-06061	7.33–8.0	Soil	3050R	—	3049R	3049R	3051R
0522-97-0003	22-06062	3.0–3.67	Soil	3050R	—	3049R	3049R	3051R
0522-97-0004	22-06062	6.0–6.67	Soil	3050R	—	3049R	3049R	3051R
0522-97-0005	22-06063	4.83–5.5	Soil	3050R	—	3049R	3049R	3051R
0522-97-0006	22-06063	7.0–7.67	Soil	3050R	—	3049R	3049R	3051R
SWMU 22-015(a)								
0522-97-0010	22-06064	27.67–28.5	Soil	3074R	3074R	3073R	—	3075R
0522-97-0011	22-06064	29.0–30.0	Sed	3074R	3074R	3073R	—	3075R
0522-97-0014	22-06065	20.5–21.5	Sed	3074R	3074R	3073R	—	3075R
0522-97-0015	22-06065	23.0–24.0	Sed	3074R	3074R	3073R	—	3075R
SWMU 22-015(b)								
0522-97-0021	22-03024	0.0–0.5	Soil	—	—	3081R	—	3082R
0522-97-0022	22-03024	3.0–3.5	Soil	—	—	3081R	—	3082R
0522-97-0023	22-03024	3.5–4.0	Soil	—	—	3081R	—	3082R
0522-97-0018	22-03027	0.0–0.5	Soil	—	—	3081R	—	3082R
0522-97-0019	22-03027	3.5–4.5	Soil	—	—	3081R	—	3082R
0522-97-0020	22-03027	7.0–7.5	Qbt 4	—	—	3081R	—	3082R
0522-97-0024	22-06066	0.0–0.5	Sed	—	—	3081R	—	3082R
0522-97-0025	22-06066	1.33–2.0	Soil	—	—	3081R	—	3082R
0522-97-0026	22-06067	0.0–0.5	Sed	—	—	3081R	—	3082R
0522-97-0027	22-06067	2.0–2.67	Soil	—	—	3081R	—	3082R
0522-97-0028	22-06068	0.0–0.5	Sed	—	—	3081R	—	3082R
0522-97-0029	22-06068	0.67–1.33	Qbt 4	—	—	3081R	—	3082R

[a] Request numbers.

[b] — = Analysis not requested.

Table 4.4-2
Inorganic Chemicals above BVs at TA-22

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Cadmium	Cobalt	Copper	Manganese	Selenium	Silver
Soil BV[a]				**0.83**	**295**	**0.4**	**8.64**	**14.7**	**671**	**1.52**	**1**
Sediment BV[a]				**0.83**	**127**	**0.4**	**4.73**	**11.2**	**543**	**0.3**	**1**
SWMU 22-010(a)											
0522-97-0001	22-06061	4.33–5.0	Soil	5.8 (U)	—[b]	0.58 (U)	—	—	—	—	—
0522-97-0002	22-06061	7.33–8.0	Soil	6.49 (U)	—	0.649 (U)	—	—	—	—	—
0522-97-0003	22-06062	3.0–3.67	Soil	6 (U)	—	0.6 (U)	—	—	—	—	—
0522-97-0004	22-06062	6.0–6.67	Soil	5.61 (U)	—	0.561 (U)	26.9	—	1320 (J+)	—	—
0522-97-0005	22-06063	4.83–5.5	Soil	6.92 (U)	374	0.692 (U)	12.4	—	1360 (J+)	—	—
0522-97-0006	22-06063	7.0–7.67	Soil	6.51 (U)	—	0.651 (U)	—	—	—	—	—
SWMU 22-015(a)											
0522-97-0010	22-06064	27.67–28.5	Soil	4.9 (U)	—	0.83 (U)	—	122	—	—	—
0522-97-0011	22-06064	29.0–30.0	Sed	4.9 (U)	—	0.83 (U)	—	—	—	0.88 (U)	1.6 (J)
0522-97-0014	22-06065	20.5–21.5	Sed	5 (U)	—	0.91 (J)	—	126	—	0.89 (U)	—
0522-97-0015	22-06065	23.0–24.0	Sed	4.9 (U)	—	0.82 (U)	—	127	—	0.87 (U)	—

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

[a] BVs from LANL 1998, 059730.

[b] — = Result was not detected or was below the BV.

Table 4.4-3
Organic Chemicals Detected at TA-22

Sample ID	Location ID	Depth (ft)	Media	Acetone	Di-n-butylphthalate	Dinitrotoluene[2,4-]	Methylene Chloride	Tetryl	Toluene	Trichlorofluoromethane
SWMU 22-010(a)										
0522-97-0001	22-06061	4.33–5.0	Soil	—[a]	—	—	0.003 (J)	—	—	0.003 (J)
0522-97-0002	22-06061	7.33–8.0	Soil	—	—	—	0.003 (J)	—	—	0.002 (J)
0522-97-0003	22-06062	3.0–3.67	Soil	—	0.47	—	0.003 (J)	—	—	0.002 (J)
0522-97-0004	22-06062	6.0–6.67	Soil	—	0.76	—	0.003 (J)	—	—	0.002 (J)
0522-97-0005	22-06063	4.83–5.5	Soil	—	—	—	0.006	—	—	0.008
0522-97-0006	22-06063	7.0–7.67	Soil	—	—	—	0.005	—	—	0.006
SWMU 22-015(a)										
0522-97-0011	22-06064	29.0–30.0	Sed	0.026	NA[b]	—	—	—	—	—
0522-97-0014	22-06065	20.5–21.5	Sed	0.008 (J)	NA	—	—	—	—	—
SWMU 22-015(b)										
0522-97-0023	22-03024	3.5–4.0	Soil	—	NA	—	—	—	0.0068 (J)	—
0522-97-0028	22-06068	0.0–0.5	Sed	—	NA	—	—	0.428	—	—
0522-97-0029	22-06068	0.67–1.33	Qbt 4	—	NA	5.83	—	—	—	—

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

[a] — = Not detected.

[b] NA = Not analyzed.

Table 4.5-1
Summary of Samples Collected and Analyses Requested at TA-40

Sample ID	Location ID	Depth (ft)	Media	VOCs	High Explosives
SWMU 40-005					
0540-96-0001	40-03048	0.0–0.5	Soil	1915[a]	1917
0540-96-0002	40-03048	4.58–5.25	Soil	1915	1917
0540-96-0003	40-03048	7.5–8.17	Soil	1915	1917
0540-96-0004	40-03049	0.0–0.5	Soil	1915	1917
0540-96-0005	40-03049	4.67–5.17	Soil	1915	1917
0540-96-0006	40-03049	7.5–8.0	Soil	1915	1917
0540-96-0007	40-03050	0.0–0.5	Soil	1915	1917
0540-96-0008	40-03050	4.67–5.33	Soil	1915	1917
0540-96-0009	40-03050	7.0–7.5	Soil	1915	1917
0540-96-0010	40-03051	0.0–0.5	Soil	1915	1917
0540-96-0011	40-03051	4.67–5.33	Soil	1915	1917
0540-96-0012	40-03051	7.33–8.0	Soil	1915	1917
0540-96-0013	40-03052	0.0–0.5	Soil	1915	1917
0540-96-0014	40-03052	4.5–5.0	Soil	1915	1917
0540-96-0015	40-03052	7.5–8.0	Soil	1915	1917
0540-96-0017	40-03053	0.0–0.5	Soil	—	1917
0540-96-0018	40-03054	0.0–0.5	Soil	—	1917
0540-96-0019	40-03055	0.0–0.5	Soil	—	1917
0540-96-0021	40-03056	0.0–0.5	Sed	1915	1917
0540-96-0022	40-03057	0.0–0.5	Sed	1915	1917
0540-96-0023	40-03058	0.0–0.5	Sed	1915	1917
0540-96-0024	40-03059	0.0–0.5	Sed	1915	1917
0540-96-0025	40-03060	0.0–0.5	Sed	1915	1917
0540-96-0026	40-03061	0.0–0.5	Sed	1915	1917

[a] Request number.

[b] — = analysis not requested.

Table 4.5-2
Organic Chemicals Detected at TA-40

Sample ID	Location ID	Depth (ft)	Media	Acetone	Methylene Chloride
SWMU 40-005					
0540-96-0001	40-03048	0.0–0.5	Soil	0.006 (J-)	—*
0540-96-0002	40-03048	4.58–5.25	Soil	0.014 (J+)	—
0540-96-0003	40-03048	7.5–8.17	Soil	0.006 (J)	—
0540-96-0004	40-03049	0.0–0.5	Soil	0.01 (J)	—
0540-96-0005	40-03049	4.67–5.17	Soil	0.004 (J)	—
0540-96-0006	40-03049	7.5–8.0	Soil	0.004 (J-)	—
0540-96-0007	40-03050	0.0–0.5	Soil	0.021 (J)	0.004 (J)
0540-96-0008	40-03050	4.67–5.33	Soil	0.055	—

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

* — = Not detected.

Table 5.0-1
Summary of Investigation Methods

Method	Summary
Locating Utilities	Excavation/Soil Disturbance Permits will be obtained from the Industrial Hygiene and Safety–Operational Support Division. Underground utilities will be located, and the excavation permits secured before the readiness and planning review and before any field activities at the Twomile Canyon Aggregate Area are undertaken.
Spade-and-Scoop Collection of Soil Samples	This method will be used to collect surface (i.e., 0–1 ft) soil or fill samples. A hole will be dug to the desired depth, as prescribed in the work plan, and a discrete grab sample collected. The sample will be homogenized in a decontaminated stainless-steel bowl before it is transferred to the appropriate sample containers.
Hand Auger Collection of Soil Samples	This method will typically be 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 [I.D.]), creating a vertical hole which can be advanced to the desired sample depth. When the desired depth is reached, the auger is decontaminated before advancing the hole through the sample depth. The sample material is transferred from the auger bucket to a stainless-steel sampling bowl before filling the various required sample containers.
Split-Spoon Core-Barrel Sampling	The split-spoon core barrel is a cylindrical barrel split lengthwise so that the two halves can be separated to expose the core sample. The stainless-steel core barrel (3-in.-inner-diameter and 5 ft long) is pushed directly into the subsurface media with a hollow-stem auger drilling rig. A continuous length of core is extracted with the core barrel. Once it is extracted, the section of core will be screened for radioactivity and organic vapors, photographed, and described in a lithologic log. If it is located within a targeted sample interval, a portion of the core will be collected for fixed laboratory analysis.

Table 5.0-1 (continued)

Method	Summary
Field Logging, Handling, and Documentation of Borehole Materials	Upon reaching the surface, core barrels will be immediately opened for field-screening, logging, and sampling. Logging of borehole materials includes run number, core recovery in feet, depth interval (in 5-ft increments), field-screening results, lithological and structural description, and a photograph. Once the core material is logged, selected samples will be taken from discrete intervals of the core. All borehole material not sampled will be managed as IDW.
Borehole Abandonment	Shallow boreholes, with a total depth of 20 ft or less, will be abandoned by filling the borehole with bentonite chips and then hydrating the chips in 1- to 2-ft lifts. The borehole will be visually inspected while the bentonite chips are being added to ensure bridging does not occur. Boreholes greater than 20 ft in depth 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 presented in the investigation report.
Geophysical Surveys	Geophysical surveys will be performed at selected sites to identify anomalies that would indicate the location of former waste disposal sites. Geophysical methods employed will include terrain conductivity (EM-31 or equivalent), high-sensitivity metal detection (EM-61 or equivalent), and GPR. The area to be surveyed will be gridded as specified in the work plan and data will be digitally recorded. Geodetic coordinates will be recorded at 1-second intervals using an integrated GPS.
Headspace Vapor Screening	All soil and tuff samples will be field screened for VOCs by placing a portion of the sample in a glass jar. The jar will be sealed with foil and gently shaken and allowed to equilibrate for approximately 5 min. The sample will then be screened by inserting a PID probe equipped with an 11.7-eV lamp into the container. The results will be recorded in units of ppm.
XRF Screening	Soil samples will be screened in the field using XRF to delineate areas of inorganic chemical contamination. The XRF used will have a diction limit equal to approximately 10 to 20% of the soil screening level for major site contaminants. Samples will be collected and analyzed in accordance with the XRF manufacturer's instructions, including analysis of standards and other QA/QC samples.
HE Field Screening	EnSys™ RDX and TNT test kits will be used to field screen soil samples quantitatively for RDX, TNT, and related compounds. Soil samples will be extracted with solvent and the extract will be analyzed colorimetrically to determine the concentration of explosive in the sample.
UXO Surveys	Visual UXO surveys will be performed by trained UXO technicians to identify unexploded detonators or associated debris. Surveys will be accomplished by walking survey lines with several trained personnel positioned approximately arms-length apart. Hand-held metal detectors may be used to identify metallic debris in areas overgrown with brush that cannot be visually inspected.
Handling, Packaging, and Shipping of Samples	Samples will be sealed and labeled before being packed in ice. Sample and transport containers will be examined to ensure they are free of external contamination. Samples will be packaged to minimize the possibility of breakage during transport. After environmental samples are collected, packaged, and preserved, they will be transported to the SMO. A split of each sample will be sent to an SMO-approved radiation-screening laboratory under chain of custody (COC). Once radiation-screening results are received, the SMO will send the corresponding analytical samples to fixed laboratories for full analysis.

Table 5.0-1 (continued)

Method	Summary
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 will be printed in the sample collection logs (SCLs) provided by the SMO (size and type of container, preservatives, etc.). All samples will be preserved by placing them in insulated containers with ice to maintain a temperature of 4°C.
Sample Control and Field Documentation	The collection, screening, and transport of samples will be documented on standard forms generated by the SMO. These forms include SCLs, COC forms, and sample container labels. Collection logs will be completed at the time the samples are collected and signed by the sampler and a reviewer who verifies that the logs are complete and accurate. Corresponding labels will be initialed and applied to each sample container, and custody seals will be placed around container lids or openings. The COC forms will be completed and assigned to verify that the samples are not left unattended.
Coordinating and Evaluating Geodetic Surveys	Geodetic surveys will focus on obtaining survey data of acceptable quality to use during project investigations. Geodetic surveys will be conducted with a Trimble 5700 DGPS. The survey data will conform to Laboratory Information Architecture project standards IA-CB02, "GIS Horizontal Spatial Reference System," and IA-D802, "Geospatial Positioning Accuracy Standard for A/E/C/ and Facility Management." All coordinates will be expressed as State Plane Coordinate System, North American Datum 83, New Mexico Central Zone, U.S. survey ft. All elevation data will be reported relative to the National Geodetic Vertical Datum of 1983.
Management, Characterization, and Storage of IDW	The IDW will be 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 will comply with on-site or off-site waste acceptance criteria, as appropriate. All stored IDW will be marked with appropriate signs and labels. Each waste generated container will be individually labeled with waste classification, item ID, and radioactivity (if applicable) immediately following containerization. All waste will be segregated by classification and compatibility to prevent cross-contamination.
Field Quality Control Samples	Field QC samples will be collected as follows. Field duplicate samples and equipment blanks will be collected at a frequency of 10%. Field duplicates and equipment blanks will be collected at the same time as a regular sample and submitted for the same analyses. Trip blanks will be collected whenever samples were collected for VOC analysis. Trip blanks will be collected at a frequency of one sample per day when VOC samples are collected. Trip-blank containers will consist of certified clean sand that are opened and kept with the other sample containers during the sampling process.
Field Decontamination of Equipment	Dry decontamination will be the preferred method at the Twomile Canyon Aggregate Area to minimize generating liquid waste. Dry decontamination will include using a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by applying a commercial cleaning agent (i.e., Fantastik) and paper wipes.

Table 6.2-1
Twomile Canyon Aggregate Area Sites with Stormwater Monitoring

Site	MSGP SMAs	IP SMAs
SWMU 03-001(k)	—*	2M-SMA-1.8
SWMU 03-003(a)	—	2M-SMA-1.9
AOC 03-003(k)	—	2M-SMA-2.2
SWMU 03-010(a)	2M-SMA-1	2M-SMA-1
SWMU 03-050(d)	—	2M-SMA-2
SWMU 03-054(b)	2M-SMA-2	2M-SMA-2
SWMU 03-055(a)	2M-SMA-1.7	2M-SMA-1.7
SWMU 06-001(a)	—	2M-SMA-1.42
SWMU 06-001(b)	—	2M-SMA-1.44
SWMU 06-003(h)	—	2M-SMA-1.67
SWMU 06-006	—	2M-SMA-1.45
SWMU 06-007(g)	2M-SMA-1.6	—
SWMU 07-001(a)	—	2M-SMA-3
SWMU 07-001(b)	2M-SMA-3	2M-SMA-3
SWMU 07-001(c)	2M-SMA-3	2M-SMA-3
SWMU 07-001(d)	2M-SMA-3	2M-SMA-3
SWMU 22-014(a)	—	2M-SMA-1.43
SWMU 22-014(b)	2M-SMA-1.5	2M-SMA-1.5
SWMU 22-015(a)	—	2M-SMA-1.43
SWMU 40-005	—	2M-SMA-1.65

* — = Site not included in SMA.

Appendix A

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

A-1.0 ACRONYMS AND ABBREVIATIONS

AK	acceptable knowledge
AOC	area of concern
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BH	borehole
BTEX	benzene, toluene, ethylbenzene, and xylene
BV	background value
CEARP	Comprehensive Environmental Assessment and Response Program
CFR	Code of Federal Regulations
CMR	Chemical and Metallurgical Research (building)
COPC	chemical of potential concern
DCA	dichloroethane
DCE	dichloroethene
DDE	dichlorophenyltrichloroethylene
DOE	Department of Energy (U.S.)
DRO	diesel range organic
EM	electromagnetic
EP	Environmental Programs Directorate
EPA	Environmental Protection Agency (U.S.)
FFCA	Federal Facility Compliance Act
FV	fallout value
GPR	ground-penetrating radar
GPS	global-positioning system
HE	high explosives
HEPA	high-efficiency particulate air
HIR	historical investigation report
HSWA	Hazardous and Solid Waste Amendments
HWFP	Hazardous Waste Facility Permit
IDW	investigation-derived waste
IP	individual permit
LANL	Los Alamos National Laboratory
LLW	low level waste
MDA	material disposal area

MLLW	mixed low-level waste
MSGP	Multi-Sector General Permit
NFA	no further action
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PBX	plastic-bonded explosive
PCB	polychlorinated biphenyl
PETN	pentaerythritol tetranitrate
PID	photoionization detector
PPE	personal protective equipment
ppm	part per million
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RFI	RCRA facility investigation
RLW	radioactive liquid waste
RLWTF	Radioactive Liquid Waste Treatment Facility
SAA	satellite accumulation area
SAL	screening action level
SCL	sample collection log
SDPPP	Site Drainage Pollution Prevention Program
SMA	site-monitoring areas
SOP	standard operating procedure
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
SWSC	Sanitary Wastewater Systems Consolidated Plant
TA	technical area
TAL	target analyte list
TCA	trichloroethane

TCE	trichloroethene
TNT	2,4,6-trinitrotoluene
TPH	total petroleum hydrocarbons
UXO	unexploded ordnance
VCA	voluntary corrective action
VOC	volatile organic compound
WAC	waste acceptance criteria
WCSF	waste characterization strategy form
WWTP	wastewater treatment plant
XRF	x-ray fluorescence

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 Twomile Canyon Aggregate Area investigation will be managed by Los Alamos National Laboratory (the Laboratory). IDW may include, but is not limited to, drill cuttings, excavated media, excavated man-made debris, contact waste, decontamination fluids, and all other waste that has potentially come into contact with contamination.

B-2.0 IDW

All IDW generated during investigation activities will be managed in accordance with the current version of Standard Operating Procedure (SOP) 5238, Characterization and Management of Environmental Program Waste. This SOP incorporates the requirements of applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy (DOE) orders, and Laboratory requirements.

The most recent version of the Laboratory's Hazardous Waste Minimization Report will be implemented during the investigation to minimize waste generation. The Hazardous Waste Minimization Report is updated annually as a requirement of Module VIII 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 investigation data and/or documentation or by direct sampling. 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 for approval to NMED. Moderate amounts of material may potentially be excavated during the remediation of portions of Solid Waste Management Units (SWMUs) 06-001(a), 06-001(b), 22-010(a), 22-014(a), 22-014(b), 22-015(a), 22-015(b), and 40-001(b). To facilitate the staging and segregation of these materials, the Laboratory may submit area of contamination designation requests for these sites to NMED for approval. The need for area of contamination designations for these sites will be evaluated based on the results of preliminary field-screening activities and waste characterization results from samples collected at each site before excavation activities begin. The request will specify the boundaries of the proposed areas of contamination and describe the activities to be conducted within the boundaries.

Wastes will be containerized and placed in clearly marked and appropriately constructed waste accumulation areas. If IDW is generated within the boundary of an area of contamination, it will be managed as nonhazardous within those boundaries in designated, properly constructed waste management areas. If hazardous, the IDW will be managed in accordance with hazardous waste requirements once it is removed from the area of contamination. If IDW is generated outside area of contamination boundaries, the initial management of the waste will rely on the data from previous investigations and/or process knowledge. If new analytical data changes the expected waste category, the waste will be managed in accumulation areas appropriate to the final waste determination. 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 will be detailed in the WCSF and approved before the waste is generated. Table B-2.0-1 summarizes how waste is expected to be managed. The waste streams anticipated to be generated during work plan implementation are described below.

B-2.1 Drill Cuttings

This waste stream consists of soil and rock chips generated by the drilling of boreholes with the intent to sample. Drill cuttings include excess core sample not submitted for analysis and any returned samples sent for analysis. Drill cuttings will be containerized in 20 yd^3 rolloff containers, 55-gal. drums, B-12 containers, or other appropriate containers at the point of generation.

Cuttings will be land applied if they meet the criteria in the NMED-approved Notice of Intent (NOI) Decision Tree for Land Application of Investigation Derived Waste Solids from Construction of Wells and Boreholes. This waste stream will be characterized based either on direct sampling of the waste or on the results from core samples collected during drilling. If directly sampled, the following analyses will be performed: volatile organic compounds (VOCs); semivolatile organic compounds (SVOCs); cyanide, nitrate, explosive compounds and perchlorate (if screening and/or process knowledge indicates the presence of explosives); radionuclides as identified for each site in the work plan; total metals; and, if needed, toxicity characteristic metals. If process knowledge, odors, or staining indicates the cuttings may be contaminated with petroleum products, the materials will also be analyzed for total petroleum hydrocarbons (TPH) and polychlorinated biphenyls (PCBs). Other constituents may be analyzed as necessary to meet the waste acceptance criteria (WAC) for a receiving facility. The Laboratory expects most cuttings will be land applied or disposed of as a low-level waste (LLW); however, the waste may also be classified as hazardous, mixed low-level waste (MLLW), or PCB waste. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.2 Excavated Environmental Media

Layback and overburden spoils (including environmental media mixed with buried debris) will consist of soil and rock removed from within or next to (e.g., from benching to stabilize a trench) areas within the SWMUs that are to be excavated. This material will be field screened for high explosives (HE), radioactivity and/or VOCs during the excavation process. If contamination is not detected during screening, the spoils will be stored either in rolloff bins other suitable containers, or on the ground surface with appropriate best management practices. If field screening indicates the potential for contamination, the layback and overburden spoils will be placed in rolloff bins or other suitable containers. The spoils will remain within the area of contamination boundary of the SWMU from which they were excavated, awaiting analytical results. Incremental samples of the spoils will be collected as the spoils are excavated or the media may be sampled in piles or containers. A minimum of one sample will be collected for every 100 yd^3. The samples will be analyzed for VOCs; target analyte list (TAL) metals; nitrate, cyanide, explosive compounds, and perchlorate if screening and/or process knowledge indicates the presence of explosives; radionuclides, as identified for each site in the work plan; and toxicity characteristic metals, as needed. Other constituents may be analyzed as necessary to meet the WAC for a receiving facility. If odors or staining is present, the spoils may be contaminated with petroleum products; if so, the materials will also be analyzed for TPH and PCBs. If the spoils are determined to be suitable for reuse (i.e., meets residential cleanup standards as determined using NMED's and DOE's soil screening guidance), the Laboratory may use the soil to backfill the bottom of the excavations. If the spoils are not suitable for reuse, they will be treated/disposed of at an authorized facility appropriate for the waste regulatory classification. Based on existing data, the Laboratory expects the spoils that cannot be reused to be designated as industrial waste or LLW; however, the waste may also be classified as hazardous, MLLW, or PCB waste. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.3 Excavated and/or Removed Man-made Debris

Excavated man-made debris will be generated from the removal of three septic tanks, two sumps, and the surface infrastructure associated with inactive seepage pits at three sites. The debris will be segregated as it is excavated and/or removed, to the extent practical, based on factors such as the type and size of debris, the type of alternative treatment technology that would be used to treat the debris, field screening, process knowledge, and/or staining or odors. Where practicable, this waste stream will be characterized by direct sampling of the waste (e.g., concrete). Direct samples will be analyzed for VOCs, SVOCs, explosive compounds, and perchlorate (if field screening or process knowledge indicates the presence of explosives), radionuclides (as identified for each site in the work plan), total metals, and, if needed, toxicity characteristic metals. Other constituents may be analyzed as necessary to meet the WAC for a receiving facility or if the work plan or visual observations indicate other contaminants may be present (e.g., PCBs or asbestos). For debris that is difficult to characterize; acceptable knowledge (AK) will be used whenever possible, supplemented by sampling as needed. Sampling methods will often have to be identified on a case-by-case basis by qualified sampling personnel, and these sampling decisions will be documented in the field activity notebook.

Waste minimization will be implemented, where practicable, through segregation of waste materials. Nonhazardous and non-radioactive materials will be recycled, if practicable.

The types of debris expected to be excavated from each SWMU are identified in sections.B-2.3.1 through B-2.3.3.

B-2.3.1 Excavated Waste from SWMUs 06-001(a) and 06-001(b)

This waste stream will consist of debris from two abandoned concrete septic tanks (e.g., piping, metal, concrete reinforced with steel rebar and wood) and possibly contaminated soil. The septic tanks [SWMUs 06-001(a), and 06-001(b)] were abandoned in place, and sludge was found to be present in both tanks during the 1994 Phase I Resource Conservation and Recovery Act facility investigation (RFIs). Any waste remaining in the tanks will be sampled and analyzed before it is removed. The waste will then be containerized (e.g., in 55-gal. drums) and managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. The interiors of both tanks will be pressure-washed and chip-sampled for waste characterization purposes before the tanks are removed; wastes generated from steam cleaning are discussed in section B-2.5. Other components will be characterized based on the chip or sludge samples. To the extent practicable, soil will be brushed off or otherwise removed from the debris. Soil at locations with elevated HE, VOCs, and/or metals based on field screening within the septic tank excavations will be excavated.

The excavated debris will be placed in containers (e.g., rolloff bins) at the site and will be managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. Any soil generated will be managed as described in section B-2.2. The Laboratory expects most of this waste to be designated as industrial waste or hazardous waste. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.3.2 Excavated Waste from SWMU 22-010(a)

This waste stream will consist of debris from one abandoned septic tank (e.g., piping, metal, concrete reinforced with steel rebar and wood) and possibly contaminated soil. The septic tank [SWMU 22-010(a)] was abandoned in place, and sludge was found to be present in the tank during the 1994 Phase I RFI.

Any waste remaining in the tank will be sampled and analyzed before it is removed. The waste will be containerized (e.g., in 55-gal. drums) and managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. The interior of the tank will be pressure-washed and chip-sampled for waste characterization purposes before the tank is removed; wastes generated from steam cleaning are discussed in section B-2.5. Components that cannot be chip-sampled will be characterized using the concrete or sludge sampling. To the extent practicable, soil will be brushed off or otherwise removed from the debris. Soil at locations with elevated HE, VOCs, radioactivity, and/or metals based on field screening within the septic tank excavation will be excavated.

The excavated materials will be placed in containers (e.g., rolloff bins) at the site. The debris will be managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. Any soil generated will be managed as described in section B-2.2. The Laboratory expects most of this waste to be designated as industrial waste, LLW, or hazardous waste; however, the waste may also be classified as MLLW. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.3.3 Removed Debris from SWMUs 22-014(a) and 22-015(a)

This waste stream will consist of the surface infrastructure (including the metal manhole covers, metal and/or concrete subsurface vault, metal filter basket, and associated metal vent piping) associated with inactive seepage pits at SWMUs 22-014(a) and 22-015(b). The removed infrastructure components will be placed in containers (e.g., rolloff bins) at the site and managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. This debris will be field-screened for HE, VOCs, and radioactivity and swipe samples will be collected as necessary. Since most of this waste can be decontaminated, the Laboratory expects most of this waste to be designated as industrial waste that could be recycled. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.3.4 Excavated Waste from SWMUs 22-014(b) and 22-015(b)

This waste stream will consist of debris from two abandoned sumps (e.g., piping, metal, and concrete reinforced with steel rebar) and possibly contaminated soil. The sumps [SWMUs 22-014(b) and 22-015(a)] were abandoned in place and found to be empty during the 1994 Phase I RFIs; however, any waste remaining in the tanks will be sampled and analyzed before it is removed. The waste will then be containerized (e.g., in 55-gal. drums) and managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. The interior of both sumps will be pressure-washed and chip-sampled for waste characterization purposes before the sumps are removed; wastes generated from steam cleaning are discussed in section B-2.5. The other components will be characterized based on the chip or sludge samples. To the extent practicable, soil will be brushed off or otherwise removed from the debris. Soil at locations with elevated HE, VOCs, radioactivity, and/or metals based on field screening within the sump excavations will be excavated.

The excavated materials will be placed in containers (e.g., rolloff bins) at the sites. The debris will be managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. Any soil generated will be managed as described in section B-2.2. The Laboratory expects most of this waste to be designated as industrial waste or hazardous waste; however, the waste may also be classified as MLLW. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.3.5 Excavated Waste from SWMU 40-001(b)

This waste stream will consist of debris from a distribution box and surface infrastructure (including the manhole cover, subsurface vault, filter basket and associated vent piping) associated with an inactive seepage pit and possibly contaminated soil. The distribution box and seepage pit surface infrastructure [SWMU 40-001(b)] were abandoned in place and found to be empty during the 1994 Phase I RFI; however, any waste remaining in the distribution box will be sampled and analyzed before it is removed. The waste will then be containerized (e.g., in 55-gal. drums) and managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. The interior of the distribution box will be pressure-washed and chip-sampled for waste characterization purposes before it is removed; wastes generated from steam cleaning are discussed in section B-2.5. The other components will be characterized based on the results of the chip or sludge samples. To the extent practicable, soil will be brushed off or otherwise removed from the debris. Soil at locations with elevated HE, VOCs, radioactivity, and/or metals based on field screening within the sump excavations will be excavated.

The excavated debris will be placed in containers (e.g., rolloff bins) at the site and managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. Any soil generated will be managed as described in Section B-2.2. The Laboratory expects most of this waste to be designated as industrial waste or hazardous waste; however, the waste may also be classified as MLLW. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.4 Contact Waste

The contact waste stream consists of potentially contaminated materials that “contacted” waste during sampling and excavation. This waste stream consists primarily of, but is not limited, to personal protective equipment (PPE) such as gloves; decontamination wastes such as paper wipes; and disposable sampling supplies. Characterization of this waste stream will use AK of the waste materials; the methods of generation, the extent of contamination, and analysis of the material contacted (e.g., drill cuttings and soil). The waste will be containerized (e.g., in 55-gal. drums) and managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. The Laboratory expects most of the contact waste to be designated industrial waste or LLW; however, the waste may also be classified as hazardous, MLLW, or PCB waste. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.5 Decontamination Fluids

This waste stream will consist of liquid wastes from decontamination activities [i.e., decontamination solutions and rinse waters including water generated from the high pressure washing of the interior of the septic tanks at SWMUs 06-001(a), 06-001(b), and 22-010(a); the interior of the sumps at SWMUs 22-014(b) and 22-015(b); the interior of the distribution box at SWMU 40-001(b); and waste generated from the decontamination of surface infrastructure components associated with inactive seepage pits at SWMUs 22-014(a) and 22-015(b)]. Consistent with waste minimization practices, the Laboratory uses dry equipment decontamination methods to the extent possible. If dry decontamination cannot be performed, liquid decontamination wastes will be collected in containers at the point of generation. The fluids from decontaminating drilling or sampling equipment will be characterized through AK of the waste materials, the levels of contamination measured in the environmental media (e.g., the results of the associated drill cuttings), and, if necessary, direct sampling of the containerized waste. The fluids from decontaminating the septic tanks at SWMUs 06-001(a), 06-001(b), and 22-010(a) will be directly sampled. If directly

sampled, the following analyses will be performed: VOCs, SVOCs, radionuclides (as identified for each site in the work plan), total metals, and, if needed, toxicity characteristic metals and other analytes required by the receiving facility (i.e., total suspended solids, MICROTOX, chemical oxygen demand, oil and grease, pH, nitrates). The Laboratory expects most of these wastes to be nonhazardous liquid waste or radioactive liquid waste that will be sent to one of the Laboratory's wastewater treatment facilities where the WAC allows the waste to be received.

B-2.6 Unexploded and Spent Detonators

This waste stream is associated with the unexploded ordnance (UXO) surveys that will be conducted at SWMUs 07-001(a) and 07-001(b) where excess detonators were formerly disposed of by open detonation. Unexploded detonators will be detonated on-site in a permitted treatment facility or transported to an off-site permitted treatment facility for destruction. Spent detonators and associated metallic debris will be certified as nondetonable by a qualified UXO quality/safety officer or supervisor before they are transported off-site. This debris will be characterized by AK and swipe sampling for radionuclides. The Laboratory expects such debris to be designated industrial waste or LLW. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

Table B-2.0-1
Summary of Estimated IDW Generation and Management

Waste Stream	Expected Waste Type	Expected Disposition
Drill Cuttings	Industrial Hazardous PCB LLW MLLW	Land application or treatment/disposal at an authorized on-site or off-site facility
Excavated Environmental Media	Industrial Hazardous PCB LLW MLLW	Reused as fill at the excavation location or treated/disposed of at an authorized on- or off- facility
Excavated and/or Removed Man-made Debris	Industrial Hazardous PCB LLW MLLW	Treatment or disposal at an authorized on-site or off-site facility, recycled, or reused
Contact Waste	Industrial Hazardous PCB LLW MLLW	Disposal at an approved on- or off-site facility
Decontamination Fluids	Industrial LLW	Treatment at an on-site wastewater treatment facility
Unexploded and Spent Detonators	Industrial LLW	Treatment at an on-site or off-site permitted hazardous waste treatment facility