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Investigation Report for Lower Sandia Canyon Aggregate Area

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EXECUTIVE SUMMARY

This investigation report presents the investigation activities at 28 solid waste management units (SWMUs) and areas of concern (AOCs) in the Lower Sandia Canyon Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). The SWMUs and AOCs are located in Technical Area 53 (TA-53), TA-72, and former TA-20. Of the 28 sites, 6 are proposed for delayed characterization and investigation, 1 site is currently not subject to corrective action requirements and was not investigated, and the nature and extent of contamination at 1 other site was defined during previous investigation and remediation activities.

The objectives of this investigation are to define the nature and extent of contamination and, if defined, to determine whether the sites pose a potential unacceptable risk to human health or the environment as well as to assess whether additional sampling is required. This report presents the results of site characterization activities conducted during the 2010 investigation, as directed by the approved investigation work plan for the Lower Sandia Canyon Aggregate Area.

The 2010 investigation activities included collecting soil, sediment, and rock samples from the surface to a maximum depth of 21 ft below ground surface. Data from samples collected during the 2010 investigation were evaluated with data collected during previous investigations that meet current Laboratory data-quality requirements.

The sampling data presented in this report indicate the extent of contamination has been defined at three sites. Human health and ecological risk assessments were performed for two of the three sites. No chemicals of potential concern (COPCs) were identified for human health and ecological risk assessments at the third site.

The human health risk-screening assessment results indicate no potential unacceptable risks from COPCs for the industrial, construction worker, and residential scenarios at SWMU 53-001(b) and AOC 53-013. The total excess cancer risks were below the New Mexico Environment Department (NMED) target risk level of 1×10^{-5}, and the hazard indexes (HIs) were below or equivalent to the NMED target HI of 1.0. The ecological risk-screening assessment results indicate no potential unacceptable risks to any receptor at the evaluated sites. No COPCs were identified at AOC 53-014, and therefore no risk-screening assessments were performed. No potential unacceptable human health or ecological risk exists at this site. The Laboratory recommends corrective actions complete without controls for the three sites within the Lower Sandia Canyon Aggregate Area for which nature and extent have been defined.

The extent of contamination has not been defined at 17 sites. Additional sampling is needed to define the vertical and/or lateral extent at each of these sites. The Laboratory will provide a Phase II investigation work plan to address the additional sampling required to complete characterization at these sites. Once additional data are available and extent is defined, human health and ecological risk-screening assessments will be conducted to determine if the sites pose a potential unacceptable risk to human health and the environment.

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1.0 INTRODUCTION

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

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

This investigation report discusses the 2010 investigation of the Lower Sandia Canyon Aggregate Area at the Laboratory. These sites are potentially contaminated with both hazardous and radioactive components. Corrective actions at the Laboratory are subject to a Compliance Order on Consent (the Consent Order). The New Mexico Environment Department (NMED), pursuant to the New Mexico Hazardous Waste Act, regulates cleanup of hazardous wastes and hazardous constituents. DOE regulates cleanup of radioactive contamination, pursuant to DOE Order 5400.5, Radiation Protection of the Public and the Environment; DOE Order 435.1, Radioactive Waste Management; and DOE Order 458.1, Administrative Change 1, Radiation Protection of the Public and the Environment. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

1.1 General Site Information

The Lower Sandia Canyon Aggregate Area, located in former Technical Area 20 (TA-20), TA-53, and TA-72 at the Laboratory (Plate 1), consists of 82 SWMUs and AOCs. Fifty-four of the 82 sites have been approved for no further action (NFA) and are not addressed in this report. The remaining 28 SWMUs or AOCs were addressed in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). Historical details of previous investigations and data for all 82 sites are provided in the historical investigation report (HIR) for the Lower Sandia Canyon Aggregate Area (LANL 2009, 105078, pp. 275–276). This investigation report describes the investigation status and results from sampling activities conducted to date for the 28 sites. Table 1.1-1 lists the 28 sites and provides a brief description, summary of previous investigations, and investigation activities conducted in 2010 for each site.

1.2 Purpose of Investigation

Twenty-eight SWMUs and AOCs within the Lower Sandia Canyon Aggregate Area were addressed during the 2010 investigation because these sites are potentially contaminated with hazardous chemicals and/or radionuclides, and final assessments of site contamination, associated risks, and recommendations for additional corrective actions are incomplete. For each site, the objectives of the 2010 investigation were to (1) establish the nature and extent of contamination; (2) determine whether current site conditions pose a potential unacceptable risk to human health or the environment; and (3) assess whether any additional sampling and/or corrective actions are required.

Sampling was conducted during the 2010 investigation at 20 of the 28 SWMUs and AOCs not previously approved for NFA in accordance with the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). Six sites within the Lower Sandia Canyon Aggregate Area were not sampled in 2010 because the sites are active or are part of a structure and cannot be investigated safely at this time; investigation of these sites is delayed until after decontamination and decommissioning (D&D) of the active facilities or associated structures. One site was not sampled in 2010 because nature and extent was previously defined, and one other site was not sampled because it is not currently subject to corrective action requirements.

All analytical data collected during the 2010 investigation activities are presented and evaluated in this report in conjunction with decision-level data from previous investigations. If nature and extent were defined during a historical investigation but the data have not been previously presented and evaluated for risk, the evaluation is performed in this report.

1.3 Document Organization

This report is organized into 11 sections, including this introduction, with multiple supporting appendixes. Section 2 provides details of the site conditions (surface and subsurface) of the aggregate area. Section 3 provides an overview of the scope of the activities performed during the implementation of the work plan. Section 4 describes the regulatory criteria used to evaluate potential risk to ecological and human receptors. Section 5 describes the data review methods. Sections 6, 7, and 8 present an overview of the operational history of each site, historical releases, summaries of previous investigations, results of the field activities performed during the 2010 investigation, site contamination, evaluation of the nature and extent of contamination, and summaries of human health risk-screening and ecological risk-screening assessments for former TA-20, TA-53, and TA-72, respectively. Section 9 presents the conclusions of the nature and extent of contamination and risk assessments for each TA. Section 10 discusses recommendations based on applicable data and the risk-screening assessments. Section 11 includes a list of references cited and the map data sources used in all figures and plates.

Appendixes include acronyms, a metric conversion table, and definitions of the data qualifiers used in this report (Appendix A); field methods (Appendix B); x-ray fluorescence (XRF) and geophysical survey results (Appendix C); borehole logs (Appendix D); analytical program descriptions and summaries of data quality (Appendix E); analytical suites and results and analytical reports (Appendix F); investigation-derived waste (IDW) management (Appendix G); box plots and statistical comparisons (Appendix H); and risk-screening assessments (Appendix I).

2.0 AGGREGATE AREA SITE CONDITIONS

2.1 Surface Conditions

2.1.1 Soil

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).

The soil in the bottom of Sandia Canyon consists of the Totavi series, containing deep, well-drained soil that formed in alluvium in canyon bottoms. The surface soil is a brown gravelly loamy sand or sandy loam with 15% to 20% gravel. The permeability of this soil is high, the runoff is very slow, and the erosion hazard rating is low (Nyhan et al. 1978, 005702, p. 31).

The soil at mesa-top sites in the eastern part of the Lower Sandia Canyon Aggregate Area is classified as rock outcrop, mesic land type found on moderately sloping to steep mesa tops and edges and consists of about 65% tuff rock outcrop with small areas of very shallow undeveloped soil. Mesa-top sites in the western part of the Lower Sandia Canyon Aggregate Area consist of very shallow to shallow, well-drained soil of the Hackroy series; a Hackroy rock outcrop complex; moderately deep, well-drained soil of the Nyjack series; and deep well-drained soil of the fine-loamy Typic Eutroboralfs (LANL 1994, 034756, p. 3-23). The surface layer of the Hackroy soils is a brown sandy loam or loam that has medium runoff and moderate water erosion hazard. The Hackroy rock outcrop complex has moderate to severe water erosion hazard and medium to high runoff (Nyhan et al. 1978, 005702, p. 25). The surface layer of the Nyjack soil is a brown loam, very fine sandy loam, or sandy loam. This soil has moderate permeability, slow runoff, and slight water erosion hazard (Nyhan et al. 1978, 005702, p. 25). The surface layer of the fine-loamy Typic Eutroboralfs soil is a very dark grayish-brown loam, sandy loam, or very fine sandy loam. This soil exhibits slow runoff and moderate water erosion hazard (Nyhan et al. 1978, 005702, p. 32).

2.1.2 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.

Sandia Canyon has a relatively small drainage area (5.5 mi^2) that heads on the western Pajarito Plateau at TA-03 at an elevation of approximately 7450 ft above sea level (asl). The canyon extends east/southeast from TA-03 to the Rio Grande for a distance of approximately 10 mi. The canyon contains a stream that is continuous in the upper canyon from effluent discharges from the Laboratory sanitary wastewater treatment plant and from cooling tower discharges. The middle and lower parts of the canyon, including the Lower Sandia Canyon Aggregate Area, contain a stream that is ephemeral from natural runoff. The Sandia Canyon watershed has no named tributaries on Laboratory property (LANL 1999, 064617, p. 3-2).

During summer thunderstorms and spring snowmelt, runoff from Mesita de los Alamos flows into storm drains, down hillsides, and into Sandia Canyon. Surface-water runoff and erosion of contaminated surface soil from sites in TA-53 may lead to contamination of sediment and surface water in Sandia Canyon. Surface water may also access subsurface contaminants exposed by soil erosion.

2.1.3 Land Use

Currently, land use of the Lower Sandia Canyon Aggregate Area is industrial. TA-53, which comprises much of the mesa-top portion of the aggregate area, is highly developed with major experimental facilities and numerous office and laboratory buildings, utilities, parking lots, roads, and other paved areas. The eastern end of Mesita de los Alamos, east of the TA-53 facilities, is undeveloped.

The TA-72 firing range is the main developed area in the canyon-bottom portion of the aggregate area. The firing range contains various structures associated with the training activities conducted at that site. Other structures in the canyon bottom include two municipal supply well pump houses and a vehicle inspection station at the east end of TA-72. A portion of the east end of TA-72 is accessible to the public, but none of the publically accessible area contains any Lower Sandia Canyon Aggregate Area SWMUs or AOCs.

2.2 Subsurface Conditions

2.2.1 Stratigraphic Units of the Bandelier Tuff

The stratigraphy of the Lower Sandia Canyon Aggregate Area is summarized in this section. Additional information on the geologic setting of the area and information on the Pajarito Plateau can be found in the Laboratory’s hydrogeologic synthesis report (Collins et al. 2005, 092028).

The bedrock at or near the surface of the mesa top is the Bandelier Tuff (Qbt). There are approximately 1250 ft of volcanic and sedimentary materials between any potential contaminant-bearing units at the mesa-top surface and the regional aquifer. The stratigraphic units encountered during investigation of the Lower Sandia Canyon Aggregate Area are described briefly in the following sections. The descriptions begin with the oldest (deepest) and proceed to the youngest (topmost). The only stratigraphic unit encountered during the Lower Sandia Canyon Aggregate Area investigation was Qbt 3 of the Tshirege Member of the Bandelier Tuff (LANL 1999, 064617; LANL 2006, 093196, p. 13). Stratigraphic units comprising the Bandelier Tuff are shown in Figure 2.2-1

2.2.1.1 Otowi Member of the Bandelier Tuff

Griggs and Hem (1964, 092516); Smith and Bailey (1966, 021584); Bailey et al (1969, 021498); and Smith et al. (1970, 009752) described the Otowi Member. It consists of moderately consolidated (indurated), porous, and nonwelded vitric tuff (ignimbrite) that forms gentle colluvium covered slopes along the base of canyon walls. The Otowi ignimbrites contain light gray to orange pumice that is supported in a white to tan ash matrix (Broxton et al. 1995, 050121; Broxton et al. 1995, 050119; Goff 1995, 049682). The ash matrix consists of glass shards, broken pumice, and crystal fragments, and fragments of perlite.

2.2.1.2 Tephra and Volcaniclastic Sediment of the Cerro Toledo Interval

The Cerro Toledo interval is an informal name given to a sequence of volcaniclastic sediment and tephra of mixed provenance that separates the Otowi and Tshirege Members of the Bandelier Tuff (Broxton et al. 1995, 050121; Broxton and Reneau 1995, 049726; Goff 1995, 049682). Although it is located between the two members of the Bandelier Tuff, it is not considered part of that formation (Bailey et al. 1969, 021498). The unit contains primary volcanic deposits described by Smith et al. (1970, 009752) as well as reworked volcaniclastic sediment. The occurrence of the Cerro Toledo interval is widespread; however, its thickness is variable, ranging between several feet and more than 100 ft.

The predominant rock types in the Cerro Toledo interval are rhyolitic tuffaceous sediment and tephra (Heiken et al. 1986, 048638; Stix et al. 1988, 049680; Broxton et al. 1995, 050121; Goff 1995, 049682). The tuffaceous sediment is the reworked equivalent of Cerro Toledo rhyolite tephra. Oxidation and clay-rich horizons indicate at least two periods of soil development occurred within the Cerro Toledo deposits. Because the soil is rich in clay, it may act as a barrier to the movement of vadose zone moisture. Some of the deposits contain both crystal-poor and crystal-rich varieties of pumice. The pumice deposits tend to form porous and permeable horizons within the Cerro Toledo interval, and locally may provide important pathways for moisture transport in the vadose zone. A subordinate lithology within the Cerro Toledo interval includes clast-supported gravel, cobble, and boulder deposits derived from the Tschicoma Formation (Broxton et al. 1995, 050121; Goff 1995, 049682; Broxton and Reneau 1996, 055429).

2.2.1.3 Tshirege Member of the Bandelier Tuff

The Tshirege Member of the Bandelier Tuff and is upper member and is the most widely exposed bedrock unit of the Pajarito Plateau (Griggs and Hem 1964, 092516; Smith and Bailey 1966, 021584; Bailey et al. 1969, 021498; Smith et al. 1970, 009752). Emplacement of this unit occurred during eruptions of the Valles Caldera approximately 1.2 million years ago (Izett and Obradovich 1994, 048817; Spell et al. 1996, 055542). The Tshirege Member is a multiple-flow, ash-and-pumice sheet that forms the prominent cliffs in most of the canyons on the Pajarito Plateau. It is a cooling unit whose physical properties vary vertically and laterally. The consolidation in this member is largely from compaction and welding at high temperatures after the tuff was emplaced. Its light brown, orange-brown, purplish, and white cliffs have numerous, mostly vertical fractures that may extend from several feet up to several tens of feet. The Tshirege Member includes thin but distinctive layers of bedded, sand-sized particles called surge deposits that demark separate flow units within the tuff. The Tshirege Member is generally over 200 ft thick.

The Tshirege Member differs from the Otowi Member most notably in its generally greater degree of welding and compaction. Time breaks between the successive emplacement of flow units caused the tuff to cool as several distinct cooling units. For this reason, the Tshirege Member consists of at least four cooling subunits that display variable physical properties vertically and horizontally (Smith and Bailey 1966, 021584; Crowe et al. 1978, 005720; Broxton et al. 1995, 050121). The welding and crystallization variability in the Tshirege Member produce recognizable vertical variations in its properties, such as density, porosity, hardness, composition, color, and surface-weathering patterns. The subunits are mappable based on a combination of hydrologic properties and lithologic characteristics.

Broxton et al. (1995, 050121) provide extensive descriptions of the Tshirege Member cooling units. The following paragraphs describe, in ascending order, subunits of the Tshirege Member present at the Lower Sandia Canyon Aggregate Area.

The Tsankawi Pumice Bed forms the base of the Tshirege Member. Where exposed, it is commonly 20 to 30 in. thick. This pumice-fall deposit contains moderately well-sorted pumice lapilli (diameters reaching about 2.5 in.) in a crystal-rich matrix. Several thin ash beds are interbedded with the pumice-fall deposits.

Subunit Qbt 1g is the lowermost tuff subunit of the Tshirege Member. It consists of porous, nonwelded, and poorly sorted ash-flow tuff. This unit is poorly indurated but nonetheless forms steep cliffs because of a resistant bench near the top of the unit; the bench forms a harder protective cap over the softer underlying tuff. A thin (4 to 10 in.) pumice-poor surge deposit commonly occurs at the base of this unit.

Subunit Qbt 1v forms alternating clifflike and sloping outcrops composed of porous, nonwelded, crystallized tuff. The base of this unit is a thin horizontal zone of preferential weathering that marks the abrupt transition from glassy tuff below (in Qbt 1g) to the crystallized tuff above. This feature forms a widespread marker horizon (locally termed the vapor-phase notch) throughout the Pajarito Plateau. The lower part of Qbt 1v is orange-brown, resistant to weathering, and has distinctive columnar (vertical) joints; hence, the term “colonnade tuff” is appropriate for its description. A distinctive white band of alternating cliff- and slope-forming tuffs overlies the colonnade tuff. The tuff of Qbt 1v is commonly nonwelded (pumices and shards retain their initial equant shapes) and have an open, porous structure.

Qbt 2 forms a distinctive medium-brown vertical cliff that stands out in marked contrast to the slope-forming, lighter-colored tuff above and below. It displays the greatest degree of welding in the Tshirege Member. A series of surge beds commonly mark its base. It typically has low porosity and permeability relative to the other units of the Tshirege Member.

Qbt 3 is a nonwelded to partially welded, vapor-phase altered tuff that forms the upper cliffs. Its base consists of a purple-gray, unconsolidated, porous, and crystal-rich nonwelded tuff that forms a broad, gently sloping bench developed on top of Qbt 2. Abundant fractures extend through the upper units of the Bandelier Tuff, including the ignimbrite of Qbt 3 of the Tshirege. The origin of the fractures has not been fully determined, but the most probable cause is brittle failure of the tuff caused by cooling contraction soon after initial emplacement (Vaniman 1991, 009995.1; Wohletz 1995, 054404).

2.2.2 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 contain perennial groundwater in the canyon-bottom alluvium. Dry canyons have only occasional streamflow and may lack alluvial groundwater. Intermediate perched groundwater has been found at certain locations on the plateau at depths ranging between 100 and 700 ft below ground surface (bgs). The regional aquifer is found at depths of about 600 to 1200 ft bgs (Collins et al. 2005, 092028).

The hydrogeologic conceptual site model for the Laboratory (LANL 2010, 109830) 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.

2.2.2.1 Groundwater

In the Los Alamos 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 (Collins et al. 2005, 092028). Numerous wells have been installed at the Laboratory and in the surrounding area to investigate the presence of groundwater in these zones and to monitor groundwater quality.

The Laboratory formulated a comprehensive groundwater protection plan for an enhanced set of characterization and monitoring activities. The Laboratory's Interim Facility-Wide Groundwater Monitoring Plan (LANL 2010, 109830) details the implementation of extensive groundwater characterization across the Pajarito Plateau within an area potentially affected by past and present Laboratory operations.

The locations of the existing wells within the vicinity of the Lower Sandia Canyon Aggregate Area are shown in Plate 1.

Alluvial Groundwater

Intermittent and ephemeral streamflow in the canyons of the Pajarito Plateau have deposited alluvium that can be as thick as 100 ft. The alluvium in canyons of the Jemez Mountains is generally composed of sand, gravel, pebbles, cobbles, and boulders derived from the Tschicoma Formation and Bandelier Tuff. The alluvium in canyons of the Pajarito Plateau is finer grained, consisting of clay, silt, sand, and gravel derived from the Bandelier Tuff (Purtymun 1995, 045344).

In contrast to the underlying volcanic tuff and sediment, alluvium is relatively permeable. Ephemeral runoff in some canyons infiltrates the alluvium until downward movement is impeded by the less permeable tuff and sediment, which results in the buildup of a shallow alluvial groundwater body. Depletion by evapotranspiration and movement into the underlying rock limit the horizontal and vertical extent of the alluvial water (Purtymun et al. 1977, 011846). The limited saturated thickness and extent of the alluvial groundwater preclude its use as a viable source of water for municipal and industrial needs. Lateral flow of the alluvial perched groundwater is in an easterly, downcanyon direction (Purtymun et al. 1977, 011846).

In Sandia Canyon, the infiltration of water near the eastern limit of surface flow recharges alluvial groundwater that generally accumulates in the lower part of the alluvial deposits, most often perching on or within shallow bedrock units. The thickest, most persistent perched alluvial groundwater occurs in middle Sandia Canyon, between alluvial wells SCA-2 and SCA-5 (Plate 1). The region between these two alluvial wells is identified by water-level measurements as contributing to alluvial groundwater loss to bedrock units beneath the canyon floor. The western boundary of the main zone of bedrock infiltration is uncertain, but it possibly extends to the area near gaging station D123.8 (Plate 1) (LANL 2007, 098938, p. 5).

Perched Intermediate Water

Observations of perched intermediate water are rare on the Pajarito Plateau. Perched intermediate waters are thought to form mainly at horizons where medium properties change dramatically, such as at paleosol horizons containing clay or caliche. It is not known whether perched intermediate water bodies are isolated or connected and to what degree they may influence travel times and pathways for contaminants in the vadose zone. Perched intermediate water has been detected at a depth of approximately 600 ft bgs within the Lower Sandia Canyon Aggregate Area at intermediate well TA-53i (LANL 2009, 107661, p. 14).

Regional Groundwater

The regional aquifer is the only aquifer capable of large-scale municipal water supply in the Los Alamos area (Purtymun 1984, 006513). The surface of the regional aquifer rises westward from the Rio Grande within the Santa Fe Group into the lower part of the Puye Formation beneath the central and western part of the Pajarito Plateau. The depths to the regional aquifer below the mesa tops range between about 1200 ft bgs along the western margin of the plateau and about 600 ft bgs at the eastern margin. The location of wells and generalized water-level contours on top of the regional aquifer are described in the annual General Facility Information report (LANL 2010, 109084). The regional aquifer is typically separated from the alluvial groundwater and intermediate perched zone groundwater by 350 to 620 ft of tuff, basalt, and sediments (LANL 1993, 023249).

Groundwater in the regional aquifer flows east-southeast toward the Rio Grande. The velocity of groundwater flow ranges from about 20–250 ft/yr (LANL 1998, 058841, pp. 2-7). Details of depths to the regional aquifer, flow directions and rates, and well locations are presented in various Laboratory documents (Purtymun 1995, 045344; LANL 1997, 055622; LANL 2000, 066802; LANL 2010, 109830).

2.2.2.2 Vadose Zone

The unsaturated zone from the mesa surface to the top of the regional aquifer is referred to as the vadose zone. The source of moisture for the vadose zone is precipitation, but much of it runs off, evaporates, or is absorbed by plants. The subsurface vertical movement of water is influenced by properties and conditions of the materials that make up the vadose zone.

Although water moves slowly through the unsaturated tuff matrix, it can move rapidly through fractures if saturated conditions exist (Hollis et al. 1997, 063131). Fractures may provide conduits for fluid flow but probably only in discrete, disconnected intervals of the subsurface. Because they are open to the passage of both air and water, fractures can have both wetting and drying effects, depending on the relative abundance of water in the fractures and the tuff matrix.

The Bandelier Tuff is very dry and does not readily transmit moisture. Most of the pore spaces in the tuff are of capillary size and have a strong tendency to hold water against gravity by surface-tension forces. Vegetation is very effective at removing moisture near the surface. During the summer rainy season when rainfall is highest, near-surface moisture content is variable because of higher rates of evaporation and of transpiration by vegetation, which flourishes during this time.

The various units of the Bandelier Tuff tend to have relatively high porosities. Porosity ranges between 30% and 60% by volume, generally decreasing for more highly welded tuff. Permeability varies for each cooling unit of the Bandelier Tuff. The moisture content of native tuff is low, generally less than 5% by volume throughout the profile (Kearl et al. 1986, 015368; Purtymun and Stoker 1990, 007508).

3.0 SCOPE OF ACTIVITIES

This section presents an overview of field activities performed during the implementation of the Lower Sandia Canyon Aggregate Area approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). The scope of activities for the 2010 investigation included site access and premobilization activities; geodetic, geophysical, and radiological surveys; surface and shallow subsurface sampling; excavation and removal activities; health and safety monitoring; and waste management activities.

All activities were conducted in accordance with the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). The applicable field methods are summarized below and are detailed in Appendix B. Any deviations from the approved investigation work plan are noted in sections 6, 7, and 8 and are discussed in Appendix B.

3.1 Site Access and Pre-mobilization Activities

The area encompassing the Lower Sandia Canyon Aggregate Area is currently used for Laboratory operations, and some areas are used by Laboratory personnel for road and foot traffic. Before field mobilization, the issue of Laboratory worker access (e.g., traffic control plan, notifications) was reviewed as part of the management self-assessment process. All efforts were made to provide a secure and safe work area and to reduce impacts to Laboratory personnel, cultural resources, and the environment.

3.2 Field Activities

The following sections describe the field activities conducted during the 2010 investigation, including surface surveys, field screening, surface and shallow subsurface sampling, and abandonment. Details regarding the field methods and procedures used to perform these field activities are presented in Appendix B.

3.2.1 Geodetic Survey

Geodetic surveys were conducted during the Lower Sandia Canyon Aggregate Area investigation to locate surface and subsurface sampling locations. Initial geodetic surveys were performed to establish and mark the planned sampling locations in the field. Geodetic surveys were conducted in accordance with Standard Operating Procedure (SOP) 5028, Coordinating and Evaluating Geodetic Surveys, using a Trimble 5700 differential global positioning system. The surveyed coordinates for all sampling locations are presented in Table 3.2-1. All geodetic coordinates are expressed as State Plane Coordinate System 1983, New Mexico Central, U.S.

3.2.2 Geophysical Surveys

A geophysical survey was performed at the site of SWMU 20-001(c), a former landfill, and SWMU 53-005, a former waste disposal pit, to locate anomalies that could confirm the presence of these disposal areas. Multiple geophysical methods were used to optimize the survey, including high-sensitivity metal detector (EM61), terrain conductivity (EM31), and ground-penetrating radar (GPR). At SWMU 20-001(c), numerous anomalies were identified and attributed to buried metal objects. However, no features that appear to be landfill boundaries were identified. At SWMU 53-005, geophysical data indicated the presence of a former excavation and nonnative materials. Appendix C presents the geophysical survey report with individual profile results.

3.2.3 Field Screening

Environmental samples were field screened for headspace organic vapors with a MiniRAE 2000 photoionization detector (PID) equipped with an 11.7- electron volt. Calibration was performed in accordance with the manufacturer’s specifications and SOP-06.33, Headspace Vapor Screening with a Photoionization Detector, and recorded in the field logbook. After collection, the sample was placed in a sealed plastic bag for approximately 5 min. Screening measurements were recorded on the field sample collection logs (SCLs) and in the field logbook. The SCLs are provided on DVD in Appendix F. The organic vapor-screening results are presented in Table 3.2-2.

All samples collected were field screened for radioactivity before they were submitted to the Sample Management Office (SMO). A Laboratory radiation control technician (RCT) conducted radiological screening using an Eberline E-600 radiation meter with an SHP-380AB alpha/beta scintillation detector held within 1 in. of the sample. All field results for alpha and beta/gamma radioactivity were recorded in disintegrations per minute (dpm) on the field SCL/chain-of-custody (COC) forms. The SCLs and COC forms are provided on DVD in Appendix F. The screening results are presented in Table 3.2-2.

3.2.4 Surface and Shallow Subsurface Soil Investigation

Samples were collected according to the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). Table 3.2-1 shows the proposed sampling locations as listed in the approved investigation work plan, with the corresponding actual location identifiers as sampled. Surface samples were collected using the spade-and-scoop method in accordance with SOP-06.09, Spade and Scoop Method for Collection of Soil Samples, or with a hand auger in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler. The samples were collected in stainless-steel bowls and transferred to sample collection bottles with a stainless-steel spoon.

All surface and shallow subsurface samples were placed in appropriate sample containers and submitted to the analytical laboratory for the analyses specified by the approved investigation work plan. Standard quality assurance (QA)/quality control (QC) samples (field duplicates, field trip blanks, and rinsate blanks) were also collected in accordance with SOP-5059, Field Quality Control Samples.

All sample collection activities were coordinated with the SMO. After the samples were collected, they remained in the controlled custody of the field team at all times until they were delivered to the SMO. Sample custody was then relinquished to the SMO for delivery to a preapproved off-site analytical laboratory (SCLs and COC forms included in Appendix F [on DVD]).

3.2.5 Borehole Drilling and Subsurface Sampling

At all locations the required sample depths could be reached by hand augers, so a drill rig with a hollow-stem auger was not used to collect subsurface samples. Samples were collected in accordance with approved subcontractor procedures technically equivalent to SOP-06.10, Hand Auger and Thin-Wall Tube Sampler, or SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples.

3.2.6 Borehole Abandonment

No boreholes were drilled during the 2010 investigation. However, hand-auger sampling locations deeper than 15 ft bgs were abandoned in accordance with an approved subcontractor procedure that is technically equivalent to SOP-5034, Monitor Well and RFI Borehole Abandonment, by filling the boreholes with bentonite chips up to 2–3 ft from the ground surface. The chips were hydrated and clean soil was placed on top. All cuttings from those locations were managed as IDW as described in Appendix G.

3.2.7 Excavation

Based on results from an XRF field-screening survey (Appendix C), eight areas were excavated at AOC 53-013 during the 2010 investigation. Approximately 75 yd^3 of hazardous waste was generated and disposed of at an authorized off-site disposal facility. Management of waste generated from the excavation and removal of lead-contaminated soil associated IDW is described in Appendix G.

3.2.8 Equipment Decontamination

All field equipment with the potential to contact sample material (e.g., hand augers, sampling scoops, bowls, and core barrel sections) was decontaminated between sample collection and between sampling locations to prevent cross-contamination of samples and sampling equipment. Dry decontamination was performed in accordance with SOP-5061, Field Decontamination of Equipment. Rinsate blanks were collected on sampling equipment to check the effectiveness of decontamination. The decontamination methods used are described in Appendix B.

3.2.9 Sample Analyses

All samples were shipped by the SMO to contract analytical laboratories for the requested analyses. The analyses requested were as specified by the approved work plan (LANL 2009, 106660.14; NMED 2009, 106703). The samples were analyzed for all or a subset of the following: target analyte list (TAL) metals, total cyanide, nitrate, perchlorate, explosive compounds, pesticides, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH) diesel range organics (DRO), semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium.

Field duplicates of investigation samples were analyzed for the same analytical suites as the corresponding investigation samples. Equipment rinsate blanks were analyzed for the same inorganic chemical suites as the related investigation samples. Field trip blanks were analyzed only for VOCs.

Analytical methods and summaries of data quality are presented in Appendix E. Analytical results, analytical reports, and SCLs/COCs are included on DVD in Appendix F.

3.2.10 Health and Safety Measures

All 2010 investigation activities were conducted in accordance with an approved site-specific health and safety plan and integrated work document that detailed work steps, potential hazards, hazard controls, and required training to conduct work. These health and safety measures included the use of modified level-D personal protective equipment and field monitoring for VOCs and for gross-alpha and -beta radioactivity using portable air-monitoring systems.

3.2.11 IDW Storage and Disposal

All IDW generated during the investigation was managed in accordance with SOP-5238, Characterization and Management of Environmental Program Waste. This procedure incorporates the requirements of all applicable U.S. Environmental Protection Agency (EPA) and NMED regulations, DOE orders, and Laboratory implementation requirements, policies, and/or procedures. IDW was also managed in accordance with the approved waste characterization strategy form (WCSF). Details of IDW management are presented in Appendix G.

The waste streams associated with the investigation included drill cuttings from a motorized hand auger, contact waste, and excavation waste. Each waste stream was containerized and placed in an accumulation area appropriate for the regulatory classification of the waste, in accordance with the approved WCSF (Appendix G).

3.3 Deviations

Deviations occurred while conducting field activities as defined in the approved work plan (LANL 2009, 106660.14; NMED 2009, 106703). The deviations did not adversely affect the completion or results of the investigation. Specific deviations are described in Appendix B, section B-8.0.

4.0 REGULATORY CRITERIA

This section describes the criteria used for evaluating potential risk to ecological and human receptors. Regulatory criteria identified by medium in the Consent Order include cleanup standards, risk-based screening levels, and risk-based cleanup goals.

Human health risk-screening evaluations were conducted for the Lower Sandia Canyon Aggregate Area sites using NMED guidance (NMED 2009, 108070). Ecological risk-screening assessments were performed using Laboratory guidance (LANL 2004, 087630).

4.1 Current and Future Land Use

The specific screening levels used in the risk evaluation and corrective action decision process at a site depend on the current and reasonably foreseeable future land use. The current and reasonably foreseeable future land use for a site determines the receptors and exposure scenarios used to select screening and cleanup levels. The land use within and surrounding the Lower Sandia Canyon Aggregate Area is currently industrial and is expected to remain industrial for the reasonably foreseeable future. The construction worker scenario was evaluated because construction is a reasonable possibility in the foreseeable future. Although the residential scenario is not applicable given the current and forseeable future land use, this scenario was evaluated as required by the Consent Order.

4.2 Screening Levels

Human health risk-screening evaluations were conducted for the solid media at sites within the Lower Sandia Canyon Aggregate Area. The human health screening assessments (Appendix I) were performed for inorganic and organic chemicals of potential concern (COPCs) using NMED soil screening levels (SSLs) for the industrial, construction worker, and residential scenarios (NMED 2009, 108070). Radionuclides were assessed using the Laboratory screening action levels (SALs) (LANL 2009, 107655). When an NMED SSL was not available for a COPC, SSLs were obtained from EPA regional tables (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm) (adjusted to a risk level of 10^{-5} for carcinogens). Surrogate SSLs were used for some COPCs for which no SSLs were available, based on structural similarity or breakdown products.

4.3 Ecological Screening Levels

The ecological risk-screening assessments (Appendix I) were conducted using ecological screening levels (ESLs) obtained from the ECORISK Database, Version 2.5 (LANL 2010, 110846). The ESLs are based on similar species and are derived from experimentally determined no observed adverse effect levels, lowest observed adverse effect levels (LOAELs), or doses determined lethal to 50% of the test population. Information relevant to the calculation of ESLs, including concentration equations, dose equations, bioconcentration factors, transfer factors, and toxicity reference values, are presented in the ECORISK Database, Version 2.5 (LANL 2010, 110846).

4.4 Cleanup Standards

As specified in the Consent Order, screening levels are used as soil cleanup levels unless they are determined to be impracticable or values do not exist for current and reasonably foreseeable future land use. Screening assessments compare COPC concentrations for each site with industrial, residential, and construction worker SSLs and SALs.

The cleanup goals specified in the Consent Order are a target risk of 10^{-5} for carcinogens or a hazard index (HI) of 1 for noncarcinogens. For radionuclides, the target dose is 15 mrem/yr based on DOE guidance (DOE 2000, 067489). The SSLs and SALs used in the risk-screening assessments in Appendix I are based on these cleanup goals.

5.0 DATA REVIEW METHODOLOGY

The purpose of the data review is to identify COPCs for each SWMU and AOC in the Lower Sandia Canyon Aggregate Area, where the nature and extent of contamination have been defined.

Extent is determined for inorganic chemicals and radionuclides by spatial analysis of detections above background values (BVs) or fallout values (FVs) and by detection for organic chemicals. For inorganic chemicals and radionuclides, statistical comparisons are performed, as described in section 5.2, to determine if concentrations are comparable with background and to aid in defining extent. Across a site, extent is defined for inorganic chemicals whose concentrations are below BVs and radionuclides whose concentrations are below BVs/FVs or are not different from background. Extent is also defined when concentrations of inorganic chemicals, organic chemicals, or radionuclides decrease with depth (vertical extent) or with distance from the source of contamination or downgradient (lateral extent). In addition, concentrations of certain naturally occurring inorganic chemicals (e.g., nitrate) that do not have established BVs likely reflect naturally occurring concentrations and not a contaminant release.

Organic chemicals detected at or below the estimated quantitation limit (EQL) for the analytical method are considered present at “trace” concentrations, and extent is defined.

If the nature and extent of inorganic chemicals, organic chemicals, and/or radionuclides have been defined for a site, COPC identification is performed for that site. If nature and extent are not defined for all analytes, COPCs are not identified for that site and further investigation, including Phase II sampling, is recommended.

5.1 Identification of COPCs

Inorganic COPCs are identified by comparing site data with BVs (LANL 1998, 059730) or are based on detection status if no BVs are available. Organic chemicals are identified as COPCs based on detection status. Radionuclides are identified as COPCs based on comparisons with BVs or FVs or are based on detection status if no BVs or FVs are available.

For inorganic chemicals, data are evaluated by sample media to facilitate the comparison with media-specific background data. Background data are generally available for soil, sediment, and tuff (LANL 1998, 059730). However, some analytes (e.g., nitrate, perchlorate, and hexavalent chromium) have no BVs. A BV may be either a calculated value from the background data set (upper tolerance limit or the 95% upper confidence bound on the 95th quantile) or a detection limit (DL). When a BV is based on a DL, there is no corresponding background data set for that analyte/media combination.

To identify inorganic COPCs, the first step is to compare the sample result with the BV, if available. If sample results are above BVs and sufficient data are available (10 or more sample results), statistical tests are used to compare the site sample data with the background data set for the appropriate media. If statistical tests cannot be performed because of insufficient data (less than 10 samples) or a high percentage of nondetects, the sample results are compared with the BV and/or the maximum background concentration of the chemical in the appropriate media. If sample results are above the BV and/or maximum background concentration, the chemical is identified as a COPC. The same evaluation is performed using sample DLs when a constituent is not detected but has DLs above the BV. If no BV is available, detected inorganic chemicals are identified as COPCs.

Radionuclides are identified as COPCs based on comparisons with BVs for naturally occurring radionuclides or to FVs for fallout radionuclides. Isotopic thorium and isotopic uranium are naturally occurring radionuclides. Americium-241, cesium-137, plutonium-238, plutonium-239/240, strontium-90, and tritium are fallout radionuclides. FVs apply only to surface soil (0–1 ft bgs) and sediment (all depths). Fallout radionuclides detected at any concentration below 1 ft bgs in soil are identified as COPCs. Fallout radionuclides in tuff are also identified as COPCs based on detection status.

Sample media encountered during investigations at Lower Sandia Canyon Aggregate Area include soil (all soil horizons, designated by the media code ALLH or SOIL); fill material (media code FILL); alluvial sediment (media code SED), and Bandelier Tuff (media code QBT3—the only unit of Bandelier Tuff encountered during this investigation). Because no separate BVs are available for fill material, fill samples are evaluated by comparison with soil BVs (LANL 1998, 059730). The discussions of site contamination in soil include fill samples with soil samples in sample counts and comparisons with background.

5.2 Overview of Statistical Methods

A variety of statistical methods may be applied to each of the data sets but generally include distributional comparisons and box plots comparing site data with background data. In cases where no background data are available, fewer than 10 samples were analyzed for a specific constituent, or more than 80% of the site samples and background samples are nondetects, statistical tests are not valid. In such cases, COPC identification is based on detection status, direct comparison to the BV or FV (if one is available), and subsequent comparison with the maximum background concentration if it is greater than the BV or FV. If no BV or FV is available, the constituent is identified as a COPC if it was detected in any samples at the site.

Comparisons between site data sets and the Laboratory background data sets are performed using statistical methods. All comparisons begin with a simple comparison of site-specific data to media-specific BVs or FVs (LANL 1998, 059730). BV/FV comparisons are followed, when appropriate, by statistical tests that evaluate potential differences between the distributions. These tests are used for testing hypotheses about data from two potentially different distributions (e.g., a test of the hypothesis that site concentrations are different from background levels).

Tests most commonly performed include the Gehan test (a modification of the Wilcoxon rank sum test) and the quantile test (Gehan 1965, 055611; Gilbert and Simpson 1990, 055612). The Gehan test is best suited for assessing complete shifts in distributions, and accounts for nondetected concentrations at multiple DLs in a statistically robust manner. If the data have no nondetected concentrations, the Gehan test is equivalent to the Wilcoxon test. The quantile test is better suited for assessing shifts of a subset of the data. Most types of differences between distributions can be identified. Occasionally, if the differences between two distributions appear to occur far into the tails, the slippage test may be performed. This test evaluates the potential for some of the site data to be greater than the maximum concentration in the background data set if, in fact, the site data and background data came from the same distribution.

Observed significance levels (p-values) are obtained from the Gehan, quantile, or slippage tests. If a p-value is less than a specified probability (e.g., 0.05, a nominal significance level), then there is some reason to suspect that a difference exists between the distributions. If the p-value is greater than 0.05, no difference is indicated. The standard set of tests is run whenever the detection rate for both the site data set and the Laboratory background data set is greater than 50%. If there are fewer than 50% detections in either set, then the Gehan test is not applicable. If all sample data are nondetects, statistical tests are not performed.

Paired tests are used to determine whether site data are different from background. Specifically, the Gehan test is the preferred initial test. If the result of the Gehan test indicates that the site data are not different from background (i.e., $p > 0.05$), the quantile test is performed. Site data must pass (i.e., $p > 0.05$) both tests to eliminate an inorganic chemical as a COPC. If the p-value from either the Gehan or the quantile test is less than 0.05, the constituent is identified as a COPC for the specific medium tested.

If the Gehan test is not applicable because either the site or background data set includes more than 50% nondetects, the quantile test is performed first. If the p-value from the quantile test is >0.05, the slippage test is performed next. Again, the p-value from both tests must be >0.05 to eliminate an inorganic chemical as a COPC. If the p-value from the first test is <0.05, indicating the site data are different from background, the second test does not need to be performed, and the inorganic chemical is identified as a COPC. Results of statistical tests are presented in Appendix H.

Box plots provide a visual representation of the data and may identify the presence of outliers or other anomalous data that might affect statistical results and interpretations. The plots allow a visual comparison between site and background concentration distributions. The plots are generally used in conjunction with the statistical tests (distributional comparisons) described above. A box plot consists of a box, a line across the box, whiskers (lines extended beyond the box and terminated with a short perpendicular line), and points outside the whiskers. The box area of the plot is the region between the 25th percentile and the 75th percentile of the data, which is the interquartile range or middle half of the data. The horizontal line within the box represents the median (50th percentile) of the data. The whiskers give an interval of 1.5 times the interquartile range, outside of which data may be evaluated for their potential to be outliers. The concentrations of individual samples are plotted as points overlaying the box plot.

When a data set contains both detected and nondetected concentrations reported as DLs, the detected concentrations are plotted as Xs, and the nondetected concentrations are plotted as Os. The medium-specific BV is also illustrated by a dashed line in each box plot. All box plots are presented in Appendix H.

6.0 FORMER TA-20 BACKGROUND AND FIELD INVESTIGATION RESULTS

The Lower Sandia Canyon Aggregate Area contains 11 sites associated with former TA-20 that are addressed in this investigation report (Table 1.1-1). Each site is described separately in sections 6.2 through 6.8, including site description and operational history, relationship to other SWMUs and AOCs, historical and 2010 investigation activities, site contamination results based on qualified data (decision-level data from the current and previous investigations), and summaries of human health and ecological risk-screening assessments.

6.1 Background of Former TA-20

Former TA-20, a historical Laboratory TA, was located near the west end of Sandia Canyon and the SWMUs and AOCs associated with it are now contained within TA-53 and TA-72 (Plate 1). The former TA-20 site consisted of a series of firing areas spaced along a small road heading west from NM 4, the only access route (LANL 1994, 034756, pp. 2-1–2-5). Former TA-20 was used from 1945 to 1948 to test initiators (devices used to generate neutrons needed to initiate nuclear chain reactions) and to conduct implosion studies.

6.1.1 Operational History

Former TA-20 was established during the Manhattan Project, beginning in 1944, to test initiators using both implosion and impaction methods. Implosion testing involved placing test devices inside metal shapes that were then imploded using high explosives (HE). After implosion, the devices were recovered for study. Impaction tests were conducted by firing test devices from a smooth-bore Navy gun into an earth-filled recovery bin or by firing devices from a 20-mm gun into a target. Test measurements were taken as the devices impacted the recovery bin or targets. A number of buildings and gun-firing sites, a firing pit, and magazines for munitions storage were installed in support of the testing program (LANL 1996, 054466). Initiator tests were conducted until late 1945, when the work was transferred to TA-33. TA-20 was then briefly used to conduct other types of implosion tests (LANL 1994, 034756, pp. 2-1–2-4).

In 1946, an intensive radiation-monitoring and cleanup effort was performed at former TA-20 and included the removal and disposal of items such as soil and gloves. In 1948, all experimental operations at former TA-20 ceased, and the area was largely decommissioned to make way for a new road through the canyon (East Jemez Road). Decommissioning activities included dismantling and removing structures and a site cleanup that netted 60–70 lb of HE. Some of the structures deactivated in 1948 were not destroyed until 1960, when they were burned after they had been monitored for HE, radiation, and toxic materials. Periodic follow-up searches for HE continued until 1973, when the Laboratory Safety Group declared the area safe and removed fencing and warning signs. In 1985, a radiation survey of the remaining structures (mainly underground structures including manholes, pull boxes, and footings) was conducted, and most of the structures were removed at that time (LANL 1994, 034756, p. 2-4).

6.1.2 Summary of Releases

Potential contaminants at former TA-20 may have been released into the environment through landfill disposal, firing sites, leaks, drainages, or operational releases.

6.1.3 Current Site Usage and Status

Former TA-20 is located in Sandia Canyon within the current boundaries of TA-53 and TA-72. The former TA is not currently used for any Laboratory activities independent of the activities associated with either TA-53 or TA-72.

6.2 SWMU 20-001(a), Landfill

6.2.1 Site Description and Operation History

SWMU 20-001(a) is a former landfill used to bury scrap metal, some of which may have been contaminated from firing-site activities conducted at former TA-20. This SWMU is located next to East Jemez Road and south of the currently active small-arms firing range at TA-72 (Figure 6.2-1). The landfill was removed in 1948, before East Jemez Road was constructed. A 1948 memorandum describing cleanup efforts in Sandia Canyon notes three burial grounds were excavated and the ground “checked negative” after removal (Buckland 1948, 006001). The three burial grounds referred to in the 1948 memorandum correspond to SWMUs 20-001(a,b,c), the only landfills at former TA-20. Little is known about the actual dimensions of the landfill. However, a 1965 memorandum states the landfill was approximately 5 ft deep (Russo 1965, 005984).

6.2.2 Relationship to Other SWMUs and AOCs

SWMU 20-001(a) is located approximately 150 ft southwest of AOC 20-004, a septic system, and 170 ft south of AOC 72-001, a small-arms firing range. Neither of these sites is associated with SWMU 20-001(a).

6.2.3 Summary of Previous Investigations

In 1986, geophysical surveys were conducted in an attempt to find evidence of the landfill site. Its location was not positively established at that time. This area was included in a DOE Headquarters Environmental Survey in 1987 (DOE 1988, 008609, pp. 4-177–4-180). The DOE report notes that the landfill site was located across East Jemez Road from the present location of the TA-72 small-arms firing range and that an approximately 5-ft-deep depression was observed at the end of an unimproved road. This depression was not noted during the 1986 geophysical survey (LANL 1994, 034756, p. 5-5).

During the 1995 Phase I Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) conducted at SWMU 20-001(a), the former location of SWMU 20-001(a) and the surrounding area were gridded (200 ft × 300 ft), and a geophysical survey was conducted (LANL 1996, 054466). A backhoe was used to excavate portions (two trenches) of the site that showed anomalies in the geophysical survey. A field radiological survey was conducted before excavation, and no radiation levels above local background were detected (LANL 1996, 054466, p. 5-3). The north trench excavation exposed small pieces of wood debris, a 3-ft-long section of a pole, and a metal power-pole anchor. Excavation of the south trench produced no evidence of previous disturbance. Soil samples were collected from seven locations at the north trench and one location at the south trench (LANL 1996, 054466, p. 5-7). At each location, a sample was collected from a depth of 10–11 ft bgs and analyzed for gamma-emitting radionuclides, HE, isotopic uranium, TAL metals, strontium-90, and uranium.

Decision-level data from the 1995 RFI are presented and discussed in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site. The work plan proposed to collect 24 subsurface samples from the eight locations sampled during the 1995 RFI. Data from 2010 samples replaced all the 1995 RFI results. Table 6.2-1 presents the samples collected and analyses requested for SWMU 20-001(a).

6.2.4 Site Contamination

6.2.4.1 Soil and Rock Sampling

Based on previous investigation results, further characterization was required to assess potential contamination at SWMU 20-001(a) As a result, the following activities were completed as part of the 2010 investigation.

- Twenty-four samples were collected from eight locations at SWMU 20-001(a) in 2010 with depths ranging from 5–15 ft bgs. All 24 samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, explosive compounds, PCBs (9 of the 24 samples), SVOCs, VOCs, gamma-emitting radionuclides, isotopic uranium, and strontium-90.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at SWMU 20-001(a) are shown in Figure 6.2-1. Table 6.2-1 presents the samples collected and analyses requested for SWMU 20-001(a). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

6.2.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of samples. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

6.2.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 20-001(a) consist of results from 24 tuff samples collected in 2010 from eight locations.

Inorganic Chemicals

Twenty-four tuff samples were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 6.2-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.2-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Twenty-four tuff samples were analyzed for explosive compounds, PCBs (9 of the 24 samples), SVOCs, and VOCs. Table 6.2-3 presents the detected organic chemicals. Figure 6.2-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Twenty-four tuff samples were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90. Table 6.2-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.2-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

6.2.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was not detected above BV but had DLs (0.955 05 mg/kg to 1.05 mg/kg) above the tuff BV (0.5 mg/kg) in 24 samples. Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in 24 samples at eight locations. The maximum concentration (108 mg/kg) was detected at location 20-612562 from 5–6 ft bgs. Concentrations of barium increased slightly with depth at locations 20-612556 and 20-612561 but decreased with depth at the other six locations and decreased downgradient to the east. The lateral extent is defined, but the vertical extent of barium is not defined at locations 20-612556 and 20-612561.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in three samples at three locations. The maximum concentration (3120 mg/kg) was detected at location 20-612562 from 5–6 ft bgs. Calcium concentrations decreased with depth at all three locations and decreased downgradient. The lateral and vertical extent of calcium are defined.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in 16 samples at seven locations. The maximum concentration (7.75 mg/kg) was detected at location 20-612562 from 5–6 ft bgs. Concentrations of copper decreased with depth at all seven locations and decreased downgradient to the east. The lateral and vertical extent of copper are defined.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in six samples at three locations. The maximum concentration (12.1 mg/kg) was detected at location 20-612557 from 10–11 ft bgs. Concentrations of lead increased slightly with depth at location 20-612561, did not change with depth at location 20-612557, and decreased with depth at location 20-612558. All detected concentrations of lead were below the maximum Qbt 3 background concentration (15.5 mg/kg). The lateral and vertical extent of lead are defined.

Nickel was detected above the Qbt 3 BV (6.58 mg/kg) in one sample (6.66 mg/kg) at location 20-612558 from 5–6 ft bgs. Concentrations decreased with depth at this location, and the detected concentration of nickel was below the maximum Qbt 3 background concentration (7 mg/kg). The lateral and vertical extent of nickel are defined.

Nitrate was detected in seven samples at three locations. The detected concentrations of nitrate (maximum 1.02 mg/kg) likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in 22 samples at eight locations. The maximum concentration (0.00345 mg/kg) was detected at location 20-612558 from 14–15 ft bgs. Concentrations of perchlorate decreased with depth at locations 20-612556, 20-612557, 20-612559, and 20-612562 but increased slightly with depth at locations 20-612558, 20-612560, 20-612561, and 20-612563. The detected concentrations of perchlorate were at or below the EQL at locations 20-612560 and 20-612561. Concentrations decreased downgradient to the east. The lateral extent of perchlorate is defined, but the vertical extent is not defined at locations 20-612558 and 20-612563.

Selenium was not detected above BV but had DLs (0.957 mg/kg to 1.05 mg/kg) above the tuff BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Organic Chemicals

Acetone was detected in two samples at location 20-612556. Concentrations of acetone decreased with depth at this location and were slightly above the EQL. The lateral and vertical extent of acetone are defined.

Aroclor-1248 was detected in one sample at location 20-612558. Aroclor-1254 was detected in two subsurface samples at two locations. All detected concentrations of Aroclor-1248 and Aroclor-1254 were below the EQLs. The lateral and vertical extent of Aroclor-1248 and Aroclor-1254 are defined.

The polycyclic aromatic hydrocarbons (PAHs) anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene were each detected in two to six samples at one to three locations. Concentrations of PAHs decreased with depth or were below the EQLs at all three locations and decreased downgradient to the east. The lateral and vertical extent of PAHs are defined.

Isopropyltoluene[4-] was detected in two samples at location 20-612563. Detected concentrations were below the EQL and decreased with depth. The lateral and vertical extent of 4-isopropyltoluene are defined.

Methylene chloride was detected in nine samples at three locations. Detected concentrations were below the EQL. The lateral and vertical extent of methylene chloride are defined.

Radionuclides

Uranium-235/236 was detected above the Qbt 3 BV (0.09 pCi/g) in eight samples at four locations. The maximum concentration (0.123 pCi/g) was detected at location 20-612563 from 14–15 ft bgs. Concentrations of uranium-235/236 were slightly above the Qbt 3 BV and likely reflect natural variability in tuff. The lateral and vertical extent of uranium-235/236 are defined.

Summary of Nature and Extent

The vertical extent of barium and perchlorate is not defined at SWMU 20-001(a). The lateral and vertical extent of organic chemicals and radionuclides are defined at SWMU 20-001(a).

6.2.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 20-001(a) because extent is not defined for the site.

6.2.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 20-001(a) because extent is not defined for the site.

6.3 Consolidated Unit 20-001(b)-00

Consolidated Unit 20-001(b)-00 consists of SWMU 20-001(b), a former landfill; SWMU 20-002(c) a former firing point; and AOC 20-003(c), a former U.S. Navy gun site. The consolidated unit is located in the central portion of Sandia Canyon next to East Jemez Road near the western boundary of TA-72 (Figure 6.3-1).

6.3.1 SWMU 20-001(b), Landfill

6.3.1.1 Site Description and Operation History

SWMU 20-001(b) is a former landfill located in the central portion of Sandia Canyon next to East Jemez Road (Figure 6.3-1). The site is believed to have been excavated with a bulldozer in 1945 and used to dispose of a number of gun barrels (Russo 1965, 005984). The landfill was excavated and its contents removed in a 1948 cleanup effort (LANL 1994, 034756, pp. 5-1–5-3). A 1948 memorandum describing cleanup efforts in Sandia Canyon notes three burial grounds were excavated and the ground “checked negative” after removal (Buckland 1948, 006001). The three burial grounds referred to in the 1948 memorandum correspond to SWMUs 20-001(a,b,c), the only landfills at former TA-20.

6.3.1.2 Relationship to Other SWMUs and AOCs

The northern portion of SWMU 20-001(b) overlaps the footprint of structure 20-16, the former gun mount portion of AOC 20-003(c). SWMU 20-002(c) is located approximately 60 ft southwest of SWMU 20-001(b) on the south side of East Jemez Road.

6.3.1.3 Summary of Previous Investigations

In 1986, a geophysical survey of the site was conducted to find evidence of the former landfill. Several anomalies, possibly indicating past disposal activity, were noted (Weston 1989, 005439). In 1989, a radiological survey of the area found only background radiation levels (LANL 1994, 034756, pp. 5-1–5-3).

A Phase I RFI was conducted in 1995, at which time an area approximately 150 ft × 200 ft was gridded and a geophysical survey conducted (LANL 1996, 054466). Where geophysical anomalies were evident from the survey, three trenches were excavated. The east trench excavation exposed a 4-ft-long piece of electrical conduit and some rope. Excavation of the north trench exposed structural steel shapes and angles, the Navy gun foundation, and wood debris. The southern trench exposed inactive utility lines and a 6-ft-long pipe wrench. Soil samples were collected from seven locations in each trench (LANL 1996, 054466, pp. 5-8–5-12). At each location, a sample was collected from a depth of 10–11 ft bgs and analyzed for gamma-emitting radionuclides, HE, isotopic uranium, TAL metals, strontium-90, and uranium.

Decision-level data from the 1995 RFI are presented and discussed in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site. The work plan proposed to collect 16 to 24 (depending if the level of the landfill was less than 10 ft bgs) subsurface samples from the eight locations sampled during the 1995 RFI. Data from 2010 samples replaced all the 1995 RFI results. Table 6.3-1 presents the samples collected and analyses requested for SWMU 20-001(b).

6.3.1.4 Site Contamination

Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 20-001(b):

- Seventeen samples were collected from eight locations at SWMU 20-001(b) in 2010 with depths ranging from 6–15 ft bgs. All samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, explosive compounds, PCBs (15 of the 17 samples), SVOCs, VOCs, gamma-emitting radionuclides, and isotopic uranium.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at SWMU 20-001(b) are shown in Figure 6.3-1. Table 6.3-1 presents the samples collected and analyses requested for SWMU 20-001(b). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

Soil and Rock Sample Analytical Results

Decision-level data at SWMU 20-001(b) consist of results from 17 samples (6 soil and 11 tuff) collected in 2010 from eight locations.

Inorganic Chemicals

Seventeen samples (6 soil and 11 tuff) were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 6.3-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.3-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Seventeen samples (6 soil and 11 tuff) were analyzed for explosive compounds, PCBs (15 of the 17 samples), SVOCs, and VOCs. Table 6.3-3 presents the results of the detected organic chemicals. Figure 6.3-3 shows the spatial distribution of the detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Seventeen samples (6 soil and 11 tuff) were analyzed for gamma-emitting radionuclides and isotopic uranium. Table 6.3-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.3-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was not detected above BV but had DLs (0.88 mg/kg to 1.14 mg/kg) above the tuff BV (0.5 mg/kg) in 11 samples and DLs (0.951 mg/kg to 1.13 mg/kg) above the soil BV (0.83 mg/kg) in 6 samples. Because antimony was not detected above BV, the lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in seven samples at four locations. The maximum concentration (67.2 mg/kg) was detected at location 20-612570 from 10–11 ft bgs. Concentrations of barium increased slightly with depth at location 20-612569 but decreased with depth at the three other locations. The detected concentrations of barium at location 20-612569 were below the maximum Qbt 3 background concentration (51.6 mg/kg). Concentrations of barium increased downgradient of location 20-612569 to location 20-612567. The vertical extent of barium is defined, but the lateral extent is not defined.

Cadmium was not detected above BV but had DLs (0.476 mg/kg to 0.565 mg/kg) above the soil BV (0.5 mg/kg) in five samples. Because cadmium was not detected above the BV, the lateral and vertical extent of cadmium are defined.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in one sample (7.74 mg/kg) at location 20-612568 from 14–15 ft bgs. The detected concentration of chromium was below the maximum Qbt 3 background concentration (13 mg/kg). Concentrations of chromium decreased downgradient. The lateral and vertical extent of chromium are defined.

Nitrate was detected in 13 samples at six locations. The detected concentrations of nitrate (maximum 1.54 mg/kg) likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in seven samples at four locations. The maximum concentration (0.00225 mg/kg) was detected at location 20-612569 from 14–15 ft bgs. Concentrations of perchlorate increased with depth at location 20-612569 but decreased with depth at locations 20-612568 and 20-612571 and were below the EQL at location 20-612566. Concentrations of perchlorate decreased downgradient. The lateral extent of perchlorate is defined, but the vertical extent is not defined at location 20-612569.

Selenium was detected above the Qbt 3 BV (0.3 mg/kg) in three samples at two locations. The maximum concentration (1.05 mg/kg) was detected at location 20-612567 from 10–11 ft bgs. Concentrations of selenium decreased with depth at both locations but increased downgradient of location 20-612569 to location 20-612567. The lateral extent is not defined, but the vertical extent of selenium is defined.

Organic Chemicals

Bis(2-ethylhexyl)phthalate was detected in one subsurface soil sample at location 20-612564 from 14–15 ft bgs. The detected concentration of bis(2-ethylhexyl)phthalate was below the EQL. The lateral and vertical extent of bis(2-ethylhexyl)phthalate are defined.

Radionuclides

Uranium-234 was detected above the Qbt 3 BV (1.98 pCi/g) in two samples at location 20-612568. The maximum concentration (2.77 pCi/g) was detected at 14–15 ft bgs. Concentrations of uranium-234 increased with depth but decreased downgradient. The lateral extent of uranium-234 is defined, but the vertical extent is not defined at location 20-612568.

Uranium-235/236 was detected above the Qbt 3 BV (0.09 pCi/g) in seven samples at four locations. The maximum concentration (0.201 pCi/g) was detected at location 20-612568 from 14–15 ft bgs. Concentrations of uranium-235/236 increased with depth at locations 20-612568 and 20-612569 but decreased with depth at the other two locations and decreased downgradient. The lateral extent of uranium-235/236 is defined, but the vertical extent is not defined at locations 20-612568 and 20-612569.

Uranium-238 was detected above the Qbt 3 BV (1.93 pCi/g) in two samples at location 20-612568. The maximum concentration (3.01 pCi/g) was detected at 14–15 ft bgs. Concentrations of uranium-238 increased with depth, but decreased downgradient. The lateral extent of uranium-238 is defined, but the vertical extent is not defined at location 20-612568.

Summary of Nature and Extent

The vertical extent of perchlorate, uranium-234, uranium-235/236, and uranium-238 is not defined at SWMU 20-001(b). The lateral extent of barium and selenium is not defined at SWMU 20-001(b). The lateral and vertical extent of organic chemicals are defined at SWMU 20-001(b).

6.3.1.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 20-001(b) because extent is not defined for the site.

6.3.1.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 20-001(b) because extent is not defined for the site.

6.3.2 SWMU 20-002(c), Former Firing Point

6.3.2.1 Site Description and Operation History

SWMU 20-002(c) is a former firing point located near the southern edge of TA-53 close to the boundary of TA-72 (Figure 6.3-1). This firing point was used for tests with explosive charges of up to 50 lb. The firing point is depicted in engineering drawing ENG-C 1778, Revision 1, as a pad bordered on three sides by an earthen berm (LASL 1951, 024345). Engineering records show that the structure associated with this firing point (structure 20-9) was removed in April 1948. A memorandum dated April 20, 1948, describing cleanup efforts in Sandia Canyon notes seven “shot areas” were excavated and the “ground checked negative after removal” (Buckland 1948, 006001). It is likely that the SWMU 20-002(c) firing point is one of the seven shot areas. The north side of this site is currently covered by the road embankment for East Jemez Road.

6.3.2.2 Relationship to Other SWMUs and AOCs

SWMU 20-002(c) is located approximately 60 ft southwest of SWMU 20-001(b) and 170 ft southwest of AOC 20-003(c). SWMU 20-002(c) is separated from SWMU 20-001(b) and AOC 20-003(c) by East Jemez Road.

6.3.2.3 Summary of Previous Investigations

A Phase I RFI was conducted in 1995 (LANL 1996, 054466). During the RFI, a 200- ft × 200-ft-grid field radiological survey was conducted at this site. Surface radiation readings were measured and recorded at 20-ft intervals (LANL 1996, 054466, p. 5-3). The radiological survey showed little variation across the site, except for higher readings along the drainage that transects the site (LANL 1996, 054466, p. 5-30). Samples were collected from eight locations within an approximate 100-ft radius of the firing point. At each location, a surface sample (0.0–0.5 ft bgs) and two subsurface samples (2.5–3.0 ft and 4.5–5.0 ft bgs) were collected and analyzed for gamma-emitting radionuclides, HE, isotopic uranium, TAL metals, strontium-90, and uranium.

Decision-level data from the 1995 RFI are presented and discussed in the investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and extent of contamination were not defined at this site. The work plan proposed to collect 24 surface and subsurface samples from four new step-out locations and the four locations sampled during the 1995 RFI. The data from 2010 samples replaced all the 1995 RFI results. Table 6.3-5 presents the samples collected and analyses requested for SWMU 20-002(c).

6.3.2.4 Site Contamination

Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 20-002(c):

- Twenty-four samples were collected from eight locations at SWMU 20-002(c) in 2010 with depths ranging from 0–9 ft bgs. All samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, explosive compounds, PCBs (12 of the 24 samples), gamma-emitting radionuclides, isotopic uranium, and strontium-90.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at SWMU 20-002(c) are shown in Figure 6.3-1. Table 6.3-5 presents the samples collected and analyses requested for SWMU 20-002(c). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

Soil and Rock Sample Analytical Results

Decision-level data at SWMU 20-002(c) consist of results from 24 tuff samples collected in 2010 from eight locations.

Inorganic Chemicals

Twenty-four tuff samples were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 6.3-6 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.3-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Twenty-four tuff samples were analyzed for explosive compounds and PCBs (12 of the 24 samples). Table 6.3-7 presents the results of the detected organic chemicals. Figure 6.3-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Twenty-four tuff samples were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90. Table 6.3-8 presents the radionuclides detected or detected above BVs/FVs. Figure 6.3-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Aluminum was detected above Qbt 3 BV (7340 mg/kg) in five samples at five locations. The maximum concentration (8080 mg/kg) was detected at location 20-612600 from 0–1 ft bgs. Concentrations of aluminum decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of aluminum are defined.

Antimony was detected above Qbt 3 BV (0.5 mg/kg) in six samples at six locations. The maximum concentration (1.12 mg/kg) was detected at location 20-612599 from 0–1 ft bgs. Concentrations of antimony decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in seven samples at seven locations. The maximum concentration (88.6 mg/kg) was detected at location 20-612602 from 0–1 ft bgs. Concentrations of barium decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of barium are defined.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in one sample (2370 mg/kg) at location 20-612600 from 0–1 ft bgs. Concentrations of calcium decreased with depth and decreased downgradient. The lateral and vertical extent of calcium are defined.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in 10 samples at eight locations. The maximum concentration (60.7 mg/kg) was detected at location 20-612599 from 0–1 ft bgs. Concentrations of chromium decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of chromium are defined.

Copper was detected above Qbt 3 BV (4.66 mg/kg) in six surface samples at six locations. The maximum concentration (13.7 mg/kg) was detected at location 20-612602 from 0–1 ft bgs. Concentrations of copper decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of copper are defined.

Lead was detected above Qbt 3 BV (11.2 mg/kg) in six samples at six locations. The maximum concentration (24.6 mg/kg) was detected at location 20-612602 from 0–1 ft bgs. Concentrations of lead decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of lead are defined.

Nitrate was detected in 19 samples at eight locations. The detected concentrations of nitrate (maximum 3.84 mg/kg) likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in nine samples at six locations. The maximum concentration (0.00451 mg/kg) was detected at location 20-612598 from 0–1 ft bgs. Concentrations of perchlorate decreased with depth at six locations and were below the EQL at location 20-612601. Concentrations of perchlorate decreased downgradient. The lateral and vertical extent of perchlorate are defined.

Selenium was not detected above BV but had DLs (0.89 mg/kg to 1.15 mg/kg) above the tuff BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Silver was detected above Qbt 3 BV (1 mg/kg) in six surface samples at six locations. The maximum concentration (2.31 mg/kg) was detected at location 20-612602 from 0–1 ft bgs. Concentrations of silver decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of silver are defined.

Zinc was detected above Qbt 3 BV (63.5 mg/kg) in five surface samples at five locations. The maximum concentration (80 mg/kg) was detected at location 20-612602 from 0–1 ft bgs. The results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-1 and Table H-1). The lateral and vertical extent of zinc are defined.

Organic Chemicals

Aroclor-1254 was detected in four samples at four locations. The maximum concentration (0.0443 mg/kg) was detected at location 20-612599 from 0–1 ft bgs. Concentrations of Aroclor-1254 decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of Aroclor-1254 are defined.

Aroclor-1260 was detected in 11 samples at four locations. The maximum concentration (0.0648 mg/kg) was detected at location 20-612600 from 0–1 ft bgs. Concentrations of Aroclor-1260 decreased with depth at all four locations. Concentrations of Aroclor-1260 decreased downgradient of location 20-612600 along the south side of East Jemez Road. However, Aroclor-1260 was detected at location 20-612892, and samples at downgradient location 20-612603 were not analyzed for PCBs. The vertical extent of Aroclor-1260 is defined, but the lateral extent is not defined.

SWMU 20-002(c) was used solely as a firing point in the mid-1940s and is therefore not the source of low concentrations of Aroclor-1254 and Aroclor-1260 detected in investigation samples. As stated in the approved Sandia Canyon investigation report, the source of PCBs detected in Lower Sandia Canyon includes SWMUs and AOCs within TA-03, TA-53, TA-61, and runoff from developed areas within the Laboratory and Los Alamos County (LANL 2009, 107453). PCB contamination in Sandia Canyon is being addressed by separate canyons investigations (LANL 2009, 107453).

Radionuclides

Cesium-137 was detected in two samples at two locations. The maximum activity (0.136 pCi/g) was detected at location 20-612603 from 0–1 ft bgs. Cesium-137 was not detected in deeper samples at both locations. Concentrations of cesium-137 increased downgradient. The vertical extent of cesium-137 is defined, but the lateral extent is not defined.

Uranium-235/236 was detected above Qbt 3 BV (0.09 pCi/g) in one sample (0.119 pCi/g) at location 20-612600 from 4–5 ft bgs. Uranium-235/236 was not detected in the deepest sample collected at that location. Concentrations of uranium-235/236 decreased downgradient. The lateral and vertical extent of uranium-235/236 are defined.

Summary of Nature and Extent

The lateral extent of cesium-137 is not defined at SWMU 20-002(c). The lateral and vertical extent of inorganic and organic chemicals are defined at SWMU 20-002(c).

6.3.2.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 20-002(c) because extent is not defined for the site.

6.3.2.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 20-002(c) because extent is not defined for the site.

6.3.3 AOC 20-003(c), Former U.S. Navy Gun Site

6.3.3.1 Site Description and Operation History

AOC 20-003(c) is the site of a former U.S. Navy gun mount located approximately 90 ft north of East Jemez Road in Sandia Canyon (Figure 6.3-1). The former gun site was used between 1945 and 1948. A 10-ft × 10-ft concrete pad with a steel-plate surface (former structure 20-16) was used as a mount for the gun. Engineering drawing ENG-C 1778 shows a 30-ft-long earth-bermed timber-frame bin filled with tamped earth (former structure 20-10) located near the gun and on the slope at the toe of the canyon wall (LASL 1951, 024345). At the end nearest the gun, the timber frame was 12 ft wide and 10 ft high, and at the far end it was 20 ft wide and 5 ft high. The gun was fired into the earth-filled bin so the projectile could be recovered. Laboratory engineering records show that in April 1948 structures 20-10 and 20-16 were removed and that structure 20-28, a conduit manhole, was left in place. The disposition of the soil that filled the frame is not known (LANL 1994, 034756, pp. 5-16–5-17).

6.3.3.2 Relationship to Other SWMUs and AOCs

AOC 20-003(c) partially overlaps with the northern portion of SWMU 20-001(b) and is also located approximately 170 ft northeast of SWMU 20-002(c).

6.3.3.3 Summary of Previous Investigations

In 1985, the area around the gun mount pad (former structure 20-16) was investigated under the Los Alamos Characterization Program. Radiation surveys revealed no readings higher than background, and soil samples showed uranium levels within the normal background range (LANL 1994, 034756, p. 5-22).

In 1995, a Phase I RFI was conducted at AOC 20-003(c) (LANL 1996, 054466). The gun mount consisted of a soil-covered concrete pad with anchor bolts and included conduit and electrical wire debris. Samples were collected at eight locations. At each location, one surface sample (0.0–0.5 ft bgs) and two subsurface samples (2.5–3.0 ft and 4.5–5.0 ft bgs) were collected and analyzed for gamma-emitting radionuclides, HE, isotopic uranium, TAL metals, strontium-90, and uranium.

The locations of the 1995 samples were not provided in the RFI report (LANL 1996, 054466) and could not be verified from available records during the HIR data review. Therefore, the results for these samples are not decision-level data and were not presented in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703).

In 1995, a voluntary corrective action (VCA) was conducted at AOC 20-003(c) (LANL 1996, 053775). The top 4 ft of the 6-ft-thick concrete pad, conduits, manhole (former structure 20-28), and miscellaneous metal debris were removed. Approximately 21.5 yd^3 of concrete debris was disposed of at the Los Alamos County landfill. The remaining portion of the concrete pad that was not removed was covered with 5–6 ft of soil. No confirmation samples were collected during the VCA (LANL 1996, 053775, pp. 1–2).

No previous decision-level data exist for this site. The approved work plan proposed to collect 12 subsurface samples from four sampling locations at and around former structure 20-10.

6.3.3.4 Site Contamination

Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at AOC 20-003(c):

- Twelve samples were collected from four locations at AOC 20-003(c) with depths ranging from 0–11 ft bgs. All samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, explosive compounds, PCBs (6 of the 12 samples), gamma-emitting radionuclides, isotopic uranium, and strontium-90.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at AOC 20-003(c) are shown in Figure 6.3-1. Table 6.3-9 presents the samples collected and analyses requested for AOC 20-003(c). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

Soil and Rock Sample Analytical Results

Decision-level data at AOC 20-003(c) consist of results from 12 samples (4 fill and 8 tuff) collected in 2010 from four locations.

Inorganic Chemicals

Twelve samples (four fill and eight tuff) were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 6.3-10 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.3-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Twelve samples (four fill and eight tuff) were analyzed for explosive compounds and PCBs (6 of the 12 samples). Organic chemicals were not detected at AOC 20-003(c).

Radionuclides

Twelve samples (four fill and eight tuff) were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90. Table 6.3-11 presents the radionuclides detected or detected above BVs/FVs. Figure 6.3-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was not detected above BV but had DLs (1 mg/kg to 1.06 mg/kg) above the tuff BV (0.5 mg/kg) in eight samples and DLs (1.04 mg/kg to 1.07 mg/kg) above the soil BV (0.83 mg/kg) in four samples. Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in one subsurface sample (49.8 mg/kg) at location 20-612498 from 3.0–3.5 ft bgs. The concentration decreased with depth and was below the maximum Qbt 3 background concentration (51.6 mg/kg). The lateral and vertical extent of barium are defined.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in four subsurface samples at three locations. The maximum concentration (2660 mg/kg) was detected at location 20-612497 from 7.5–8.0 ft bgs. Concentrations of calcium decreased with depth at all three locations and decreased downgradient at SWMU 20-001(b), where calcium was not detected above BV (section 6.3.1.4). The lateral and vertical extent of calcium are defined.

Perchlorate was detected in five samples at three locations. The maximum concentration (0.01 mg/kg) was detected at location 20-612499 from 0–1 ft bgs. Concentrations of perchlorate decreased with depth at all three locations and decreased downgradient. The lateral and vertical extent of perchlorate are defined.

Selenium was not detected above BV but had DLs (0.974 mg/kg to 1.07 mg/kg) above the tuff BV (0.3 mg/kg) in eight samples. Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Thallium was not detected above BV but had a DL (1.07 mg/kg) above the soil BV (0.73 mg/kg) in one sample. Because thallium was not detected above the BV, the lateral and vertical extent of thallium are defined.

Zinc was detected above the soil BV (48.8 mg/kg) in one sample (53.2 mg/kg) at location 20-612497 from 0–1 ft bgs. Concentrations of zinc decreased with depth and decreased downgradient at SWMU 20-001(b), where zinc was not detected above BV (section 6.3.1.4). The lateral and vertical extent of zinc are defined.

Organic Chemicals

Organic chemicals were not detected at AOC 20-003(c).

Radionuclides

Cesium-137 was detected in one tuff sample (0.166 pCi/g) at location 20-612499 from 1–2 ft bgs. Concentrations of cesium-137 decreased with depth and decreased downgradient at SWMU 20-001(b), where cesium-137 was not detected (section 6.3.1.4). The lateral and vertical extent of cesium-137 are defined.

Uranium-234 was detected above the Qbt 3 BV (1.98 pCi/g) in seven samples at four locations. The maximum concentration (3.16 pCi/g) was detected at location 20-612496 from 4–5 ft bgs. Concentrations of uranium-234 increased with depth at all four locations but decreased downgradient at locations in SWMU 20-001(b) (section 6.3.1.4). No sampling depths were above 10 ft bgs at SWMU 20-001(b) because the site is believed to have been excavated (Russo 1965, 005984; LANL 1994, 034756). The lateral extent of uranium-234 is defined, but the vertical extent is not defined.

Uranium-235/236 was detected above the Qbt 3 BV (0.09 pCi/g) in eight samples at four locations. The maximum concentration (0.216 pCi/g) was detected at location 20-612496 from 4–5 ft bgs. Concentrations of uranium-235/236 increased with depth at all four locations but decreased downgradient at locations in SWMU 20-001(b) (section 6.3.1.4). No sampling depths were above 10 ft bgs at SWMU 20-001(b) because the site is believed to have been excavated (Russo 1965, 005984; LANL 1994, 034756). The lateral extent of uranium-235/236 is defined, but the vertical extent is not defined.

Uranium-238 was detected above the Qbt 3 BV (1.93 pCi/g) in seven samples at four locations. The maximum concentration (3.43 pCi/g) was detected at location 20-612498 from 5–6 ft bgs. Concentrations of uranium-238 increased with depth at all four locations but decreased downgradient at locations in SWMU 20-001(b) (section 6.3.1.4). No sampling depths were above 10 ft bgs at SWMU 20-001(b) because the site is believed to have been excavated (Russo 1965, 005984; LANL 1994, 034756). The lateral extent of uranium-238 is defined, but the vertical extent is not defined.

Summary of Nature and Extent

The vertical extent of uranium-234, uranium-235/236, and uranium-238 is not defined at AOC 20-003(c). The lateral and vertical extent of inorganic and organic chemicals are defined at AOC 20-003(c).

6.3.3.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC 20-003(c) because extent is not defined for the site.

6.3.3.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC 20-003(c) because extent is not defined for the site.

6.4 Consolidated Unit 20-001(c)-00

Consolidated Unit 20-001(c)-00 consists of SWMU 20-001(c), a former landfill; SWMU 20-002(a), a former firing pit; and SWMU 20-002(b), former steel tanks (firing site). The consolidated unit is located near the west end of former TA-20. SWMUs 20-001(c) and 20-002(b) are north, while SWMU 20-002(a) is south, of East Jemez Road (Figure 6.4-1).

6.4.1 SWMU 20-001(c), Landfill

6.4.1.1 Site Description and Operation History

SWMU 20-001(c) is a former landfill and, together with SWMUs 20-002(a) and 20-002(b), comprises Consolidated Unit 20-001(c)-00. This landfill was located near the west end of former TA-20, just north of East Jemez Road (Figure 6.4-1). This site is believed to have been used to dispose of a number of 3- to 5-in. bore guns cut into sections and buried in a trench (Russo 1965, 005984). The site was excavated and its contents removed in a 1948 cleanup effort (LANL 1994, 034756, pp. 5-1–5-3). A 1948 memorandum describing cleanup efforts in Sandia Canyon notes three burial grounds were excavated and the ground “checked negative” after removal (Buckland 1948, 006001). The three burial grounds referred to in the 1948 memorandum correspond to SWMUs 20-001(a,b,c), the only landfills at former TA-20.

6.4.1.2 Relationship to Other SWMUs and AOCs

The estimated boundary of SWMU 20-001(c) is approximately 10 ft southeast of SWMU 20-002(b) and 700 ft east of SWMU 02-002(a).

6.4.1.3 Summary of Previous Investigations

A Phase I RFI was conducted at SWMU 20-001(c) in 1995 (LANL 1996, 054466). During the RFI, samples were collected at 21 locations. Subsurface samples were collected from a depth of 10–11 ft bgs at each location, and a surface sample (0.0–0.5 ft) was collected at one location. All samples were analyzed for gamma-emitting radionuclides, HE, isotopic uranium, TAL metals, and strontium-90. The RFI report stated that the 1995 sampling for SWMU 20-001(c) was not conducted in the proper locations (LANL 1996, 054466, p. 5-15) but did not elaborate on the reasons.

The 1995 sampling locations for SWMU 20-001(c) are incorrect. Therefore, the 1995 RFI samples did not properly characterized potential contamination at the site. Because the locations associated with these sampling results were incorrect, these results are not decision-level data and were not presented in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703).

No previous decision-level data exist for this site. The work plan proposed conducting a geophysical survey and, if no anomalies were identified, collecting 30 subsurface samples from 10 sampling locations within the geophysical survey boundary.

6.4.1.4 Site Contamination

Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 20-001(c):

- A geophysical survey was conducted at SWMU 20-001(c), and numerous anomalies attributed to buried metal objects were identified. However, no features that appear to be landfill boundaries were identified (Appendix C).
- Thirty samples were collected from 10 locations at SWMU 20-001(c) with depths ranging from 5–15 ft bgs. All samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, explosive compounds, PCBs (12 of the 30 samples), SVOCs, VOCs, gamma-emitting radionuclides, isotopic uranium, and strontium-90.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at SWMU 20-001(c) are shown in Figure 6.4-1. Table 6.4-1 presents the samples collected and analyses requested for SWMU 20-001(c). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

Soil and Rock Sample Analytical Results

Decision-level data at SWMU 20-001(c) consist of results from 30 tuff samples collected from 10 locations.

Inorganic Chemicals

Thirty tuff samples were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 6.4-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.4-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Thirty tuff samples were analyzed for explosive compounds, PCBs (12 of the 30 samples), SVOCs, and VOCs. Table 6.4-3 presents the results of the detected organic chemicals. Figure 6.4-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Thirty tuff samples were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90. Table 6.4-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.4-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was not detected above BV but had DLs (0.882 mg/kg to 1.15 mg/kg) above the tuff BV (0.5 mg/kg). Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in one sample (82.4 mg/kg) at location 20-612581 from 5–6 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-2 and Table H-2). The lateral and vertical extent of barium are defined.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in two samples at location 20-612580. The maximum concentration (2320 mg/kg) was detected from 5–6 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-3 and Table H-2). The lateral and vertical extent of calcium are defined.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in two subsurface samples at two locations. The maximum concentration of 16.7 mg/kg was detected at location 20-612579 from 14–15 ft bgs. Concentrations of chromium increased with depth at location 20-612579 but decreased with depth at location 20-612581. Concentrations of chromium decreased laterally to the west, north, and east and increased to the south at location 20-612579. The lateral and vertical extent of chromium is not defined.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in one sample (5.18 mg/kg) at location 20-612581 from 5–6 ft bgs. Concentrations of copper decreased with depth and decreased downgradient. The lateral and vertical extent of copper are defined.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in one subsurface sample (11.3 mg/kg) at location 20-612581 from 5–6 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-4 and Table H-2). The lateral and vertical extent of lead are defined.

Nitrate was detected in 27 samples at 10 locations. The detected concentrations of nitrate (maximum 2.92 mg/kg) likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in nine subsurface samples at three locations. The maximum concentration (0.00482 mg/kg) was detected at location 20-612575 from 5–6 ft bgs. Concentrations of perchlorate decreased with depth at all three locations and decreased downgradient. The lateral and vertical extent of perchlorate are defined.

Selenium was not detected above BV but had DLs (0.48 mg/kg to 1.1 mg/kg) above the tuff BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Organic Chemicals

Aroclor-1254 was detected in one sample at location 20-612573 at a concentration below the EQL. The lateral and vertical extent of Aroclor-1254 are defined.

Isopropyltoluene[4-] was detected in one sample at location 20-612580 from 5–6 ft bgs. Concentrations of 4-isopropyltoluene decreased with depth and decreased downgradient. The lateral and vertical extent of 4-isopropyltoluene are defined.

Radionuclides

Uranium-234 was detected above the Qbt 3 BV (1.98 pCi/g) in three samples at location 20-612575. The maximum concentration (3.13 pCi/g) was detected at location 20-612575 from 14–15 ft bgs. Concentrations of uranium-234 increased with depth at this location but decreased downgradient. The lateral extent of uranium-234 is defined, but the vertical extent is not defined at location 20-612575.

Uranium-235/236 was detected above the Qbt 3 BV (0.09 pCi/g) in nine samples at six locations. The maximum concentration (0.177 pCi/g) was detected at location 20-612575 from 5–6 ft bgs. Concentrations of uranium-235/236 decreased with depth at all six locations and decreased downgradient to location 20-612579. The lateral and vertical extent of uranium-235/236 are defined.

Uranium-238 was detected above the Qbt 3 BV (1.93 pCi/g) in three samples at location 20-612575. The maximum concentration (3.17 pCi/g) was detected from 5–6 ft bgs. Concentrations of uranium-238 decreased with depth at this location and decreased downgradient to location 20-612579. The lateral and vertical extent of uranium-238 are defined.

Summary of Nature and Extent

The vertical extent of chromium and uranium-234 is not defined at SWMU 20-001(c). The lateral extent of chromium is not defined at SWMU 20-001(c). The lateral and vertical extent of organic chemicals are defined at SWMU 20-001(c).

6.4.1.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 20-001(c) because extent is not defined for the site.

6.4.1.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 20-001(c) because extent is not defined for the site.

6.4.2 SWMU 20-002(a), Former Firing Pit

6.4.2.1 Site Description and Operation History

SWMU 20-002(a) is the location of a former firing pit (former structure 20-6) used from 1945 to 1948 to conduct initiator tests. The firing pit was located on the far west end of former TA-20, south of East Jemez Road (Figure 6.4-1). The steel-lined pit was constructed following the failure of the Dumbo, a contained firing vessel [see description of SWMU 20-002(b) in section 6.4.3]. The firing pit had interior dimensions of 14 ft 8 in. × 14 ft 8 in. × 12 ft deep. The walls and floor of the pit consisted of 0.75-in.-thick steel plate backed by 12-in. × 12-in. timbers. The pit was covered by a steel framework overlain by a mat of 0.25-in.-diameter steel rods spaced 1 in. apart. According to a 1947 report, the framework and mat, presumably installed to contain shot debris, failed after the first few shots (LASL 1947, 005581).

Laboratory facility engineering records indicate the pit was removed in April 1948. A memorandum dated April 20, 1948, describing cleanup efforts in Sandia Canyon notes one “cage” was excavated and the “interior checked negative after clearing” (Buckland 1948, 006001). The SWMU 20-002(a) firing pit is presumed to be the “cage” referred to in the memorandum.

6.4.2.2 Relationship to Other SWMUs and AOCs

SWMU 20-002(a) is approximately 700 ft southeast of SWMU 20-002(b) and the estimated boundary of SWMU 20-001(c)

6.4.2.3 Summary of Previous Investigations

In 1985, environmental samples were collected from this site for the Los Alamos Site Characterization Program and analyzed for HE, uranium, beryllium, and gross-alpha and -beta radioactivity. Only one sample indicated the presence of uranium slightly above background levels (10.16 mg/kg versus 3 mg/kg to 7 mg/kg) (NUS Corporation 1990, 012571, pp. 4-1–4-6; LANL 1994, 034756, p. 5-20).

In 1995, a Phase I RFI was conducted at SWMU 20-002(a) (LANL 1996, 054466). The site was gridded and field surveyed for radiological contamination; the survey results were used to determine the sampling locations. Soil samples were collected at 11 locations within an approximate 100-ft radius of the firing pit. At each location, a surface sample (0.0–0.5 ft) and subsurface sample (2.5–3.0 ft) were collected and analyzed for gamma-emitting radionuclides, HE, isotopic uranium, TAL metals, strontium-90, and uranium.

Decision-level data from the 1995 RFI are presented and discussed in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site. The work plan proposed to collect 27 surface and subsurface samples from the 9 locations, including 5 of the 11 locations sampled during the 1995 RFI. Data from 2010 samples replaced all the 1995 RFI results. Table 6.4-5 presents the samples collected and analyses requested for SWMU 20-002(a).

6.4.2.4 Site Contamination

Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 20-002(a):

- Twenty-seven samples were collected from nine locations at SWMU 20-002(a) with depths ranging from 0–5 ft bgs. All samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, explosive compounds, PCBs (9 of the 27 samples), and isotopic uranium.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at SWMU 20-002(a) are shown in Figure 6.4-1. Table 6.4-5 presents the samples collected and analyses requested for SWMU 20-002(a). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

Soil and Rock Sample Analytical Results

Decision-level data at SWMU 20-002(a) consist of results from 27 tuff samples collected from nine locations.

Inorganic Chemicals

Twenty-seven tuff samples were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 6.4-6 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.4-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Twenty-seven tuff samples were analyzed for explosive compounds and PCBs (9 of the 27 samples). Organic chemicals were not detected at SWMU 20-002(a).

Radionuclides

Twenty-seven tuff samples were analyzed for isotopic uranium. Table 6.4-7 presents the radionuclides detected or detected above BVs/FVs. Figure 6.4-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Aluminum was detected above the Qbt 3 BV (7340 mg/kg) in three samples at two locations. The maximum concentration (10,200 mg/kg) was detected at location 20-612590 from 4–5 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-5 and Table H-3). The lateral and vertical extent of aluminum are defined.

Antimony was not detected above BV but had DLs (0.889–1.27 mg/kg) above the tuff BV (0.5 mg/kg). Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined

Barium was detected above the Qbt 3 BV (46 mg/kg) in six samples at three locations. The maximum concentration (146 mg/kg) was detected at location 20-612590 from 4–5 ft bgs. Concentrations of barium increased with depth at location 20-612590 but decreased with depth at the two other locations and decreased downgradient. The lateral extent of barium is defined, but the vertical extent is not defined at location 20-612590.

Beryllium was detected above the Qbt 3 BV (1.21 mg/kg) in two samples at location 20-612588. The maximum concentration (3.89 mg/kg) was detected from 2–3 ft bgs. Concentrations of beryllium decreased with depth at this location. Location 20-612588 is the most downgradient sampling location to the east. The vertical extent of beryllium is defined, but the lateral extent is not defined downgradient of location 20-612588.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in one sample (2850 mg/kg) at location 20-612590 from 4–5 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-6 and Table H-3). The lateral and vertical extent of calcium are defined.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in four samples at two locations. The maximum concentration (21.7 mg/kg) was detected at location 20-612588 from 4–5 ft bgs. Concentrations of chromium increased slightly with depth at both locations. However, the concentrations of chromium in samples collected at location 20-612590 were below the maximum Qbt 3 background concentration (13 mg/kg). Location 20-612588 is the most downgradient sampling location to the east. The lateral and vertical extent of chromium are not defined.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in 11 samples at six locations. The maximum concentration (18.1 mg/kg) was detected at location 20-612584 from 0–1 ft bgs. Concentrations of copper decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of copper are defined.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in four surface and three subsurface samples at five locations. The maximum concentration (14.9 mg/kg) was detected at location 20-612589 from 2–3 ft bgs. Concentrations of lead did not change with depth at location 20-612588 but decreased with depth at the four other locations. All detected concentrations of lead were below the maximum Qbt 3 background concentration (15.5 mg/kg). The lateral and vertical extent of lead are defined.

Nitrate was detected in 20 samples at nine locations. The maximum concentration (29.6 mg/kg) was detected at location 20-612589 from 4–5 ft bgs. Concentrations of nitrate increased with depth at location 20-612589. Concentrations of nitrate at the other locations likely reflect naturally occurring levels. The lateral extent of nitrate is defined, but the vertical extent is not defined at location 20-612589.

Perchlorate was detected in nine samples at six locations. The maximum concentration (0.00151 mg/kg) was detected at location 20-612589 from 2–3 ft bgs. All detected concentrations of perchlorate were below the EQL. The lateral and vertical extent of perchlorate are defined.

Selenium was detected above Qbt 3 BV (0.3 mg/kg) in one sample (1.76 mg/kg) at location 20-612588 from 2–3 ft bgs. Concentrations of selenium decreased with depth at this location. Location 20-612588 is the most downgradient sampling location to the east. The vertical extent of selenium is defined, but the lateral extent is not defined downgradient of location 20-612588.

Thallium was not detected above BV but had a DL (1.29 mg/kg) above the tuff BV (1.1 mg/kg). Because thallium was not detected above the BV, the lateral and vertical extent of thallium are defined.

Vanadium was detected above the Qbt 3 BV (17 mg/kg) in two samples at location 20-612590. The maximum concentration (18.7 mg/kg) was detected from 2–3 ft bgs. Detected concentrations of vanadium were below the maximum Qbt 3 background concentration (21 mg/kg). The lateral and vertical extent of vanadium are defined.

Zinc was detected above the Qbt 3 BV (63.5 mg/kg) in one surface sample (72.3 mg/kg) at location 20-612588 from 0–1 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-7 and Table H-3). The lateral and vertical extent of zinc are defined.

Organic Chemicals

Organic chemicals were not detected at SWMU 20-002(a).

Radionuclides

Uranium-235/236 was detected above the Qbt 3 BV (0.09 pCi/g) in three samples at three locations. The maximum concentration (0.0983 pCi/g) was detected at location 20-612589 from 4–5 ft bgs. Concentrations of uranium-235/236 increased with depth at location 20-612589 but decreased with depth at the two other locations. Concentrations of uranium-235/236 decreased downgradient. The lateral extent of uranium-235/236 is defined, but the vertical extent is not defined at location 20-612589.

Uranium-238 was detected above the Qbt 3 BV (1.93 pCi/g) in one sample (2.08 pCi/g) at location 20-612589 from 4–5 ft bgs. Concentrations of uranium-238 increased with depth. Concentrations of uranium-238 decreased downgradient. The lateral extent of uranium-238 is defined, but the vertical extent is not defined at location 20-612589.

Summary of Nature and Extent

The vertical extent of barium, chromium, nitrate, uranium-235/236, and uranium-238 is not defined at SWMU 20-002(a). The lateral extent of beryllium, chromium, and selenium is not defined at SWMU 20-002(a). The lateral and vertical extent of organic chemicals are defined at SWMU 20-002(a).

6.4.2.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 20-002(a) because extent is not defined for the site.

6.4.2.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 20-002(a) because extent is not defined for the site.

6.4.3 SWMU 20-002(b), Former Steel Tanks (Firing Site)

6.4.3.1 Site Description and Operation History

SWMU 20-002(b) is the site of two former 5-ft-diameter cylindrical steel containment vessels known as Dumbos (Figure 6.4-1). The Dumbos were designed to contain explosive tests to recover explosive fragments. The Dumbo containment units were mounted on a firing pad at each end of a concrete platform (structure 20-7) near the west end of former TA-20. Other structures associated with this site are a manhole (structure 20-4) and a platform and hoist (structure 20-8). One Dumbo unit was used only once because of the difficulty of opening the containment vessel after the shot was fired within the vessel, and the second Dumbo unit was never used. The two Dumbos were constructed in 1945 and 1946 and were removed in 1948. Laboratory facility engineering records document that the firing pads and the platform were removed in April 1948 (LANL 1994, 034756, pp. 5-13–5-15).

6.4.3.2 Relationship to Other SWMUs and AOCs

SWMU 20-002(b) is approximately 10 ft northwest of the estimated boundary of SWMU 20-001(c) and 700 ft northeast of SWMU 20-002(a).

6.4.3.3 Summary of Previous Investigations

A 1946 Laboratory memorandum (Littlejohn 1946, 005997) states the two Dumbos were surveyed for radioactivity. The used Dumbo showed activity of 3000–5000 counts per minute (cpm) on the rim and greater than 20,000 cpm on the interior; no contamination was found on the unused Dumbo.

In 1985, radiation surveys and soil sampling were performed at this site as part of the Los Alamos Site Characterization Program. The surveys showed background radiation levels and the soil samples showed no uranium concentrations above background levels (NUS Corporation 1990, 012571, pp. 4-1–4-8; LANL 1994, 034756, p. 5-20).

In 1995, a Phase I RFI was conducted at SWMU 20-002(b) (LANL 1996, 054466). The site was gridded and field surveyed for radiological contamination; the survey results were used to determine the soil sampling locations. Soil samples were collected at 11 locations within an approximate 100-ft radius of the firing pad. At each location, a surface sample (0.0–0.5 ft bgs) and subsurface sample (2.5–3.0 ft) were collected and analyzed for gamma-emitting radionuclides, HE, isotopic uranium, TAL metals, strontium-90, and uranium.

Decision-level data from the 1995 RFI are presented and discussed in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site. The work plan proposed to collect 21 surface and subsurface samples from 7 locations, including 5 of the 11 locations sampled during the 1995 RFI. Data from 2010 samples replaced all the 1995 RFI results. Table 6.4-8 presents the samples collected and analyses requested for SWMU 20-002(b).

6.4.3.4 Site Contamination

Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 20-002(b):

- Twenty-one samples were collected from seven locations at SWMU 20-002(b) with depths ranging from 0–5 ft bgs. All samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, explosive compounds, PCBs (6 of the 21 samples), gamma-emitting radionuclides, and isotopic uranium.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at SWMU 20-002(b) are shown in Figure 6.4-1. Table 6.4-8 presents the samples collected and analyses requested for SWMU 20-002(b). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

Soil and Rock Sample Analytical Results

Decision-level data at SWMU 20-002(b) consist of results from 21 tuff samples collected in 2010 from seven locations.

Inorganic Chemicals

Twenty-one tuff samples were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 6.4-9 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.4-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Twenty-one tuff samples were analyzed for explosive compounds and PCBs (6 of the 21 samples). Organic chemicals were not detected at SWMU 20-002(b)

Radionuclides

Twenty-one tuff samples were analyzed for gamma-emitting radionuclides and isotopic uranium. Table 6.4-10 presents the radionuclides detected or detected above BVs/FVs. Figure 6.4-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was not detected above BV but had DLs (0.901 mg/kg to 1.11 mg/kg) above the tuff BV (0.5 mg/kg). Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Barium was detected above Qbt 3 BV (46 mg/kg) in six samples at four locations. The maximum concentration (86.7 mg/kg) was detected at location 20-612596 from 4–5 ft bgs. Concentrations of barium increased with depth at locations 20-612594 and 20-612596 but decreased with depth at the other two locations and decreased downgradient. The lateral extent of barium is defined, but the vertical extent is not defined at locations 20-612594 and 20-612596.

Beryllium was detected above Qbt 3 BV (1.21 mg/kg) in two samples at location 20-612596. The maximum concentration (1.37 mg/kg) was detected from 4–5 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-8 and Table H-4). The lateral and vertical extent of beryllium are defined.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in three samples at three locations. The maximum concentration (2950 mg/kg) was detected at location 20-612596 from 4–5 ft bgs. Concentrations of calcium increased with depth at all three locations but decreased downgradient. The lateral extent of calcium is defined, but the vertical extent is not defined at locations 20-612594, 20-612596, and 20-612597.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in three samples at location 20-612596. The maximum concentration (5.64 mg/kg) was detected from 0–1 ft bgs. Concentrations of copper decreased with depth and decreased downgradient. Detected concentrations were also below the maximum Qbt 3 background concentration (6.2 mg/kg). The lateral and vertical extent of copper are defined.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in two surface samples at two locations. The maximum concentration (13.9 mg/kg) was detected at location 20-612596 from 0–1 ft bgs. Concentrations of lead decreased with depth at both locations and decreased downgradient. Detected concentrations were also below the maximum Qbt 3 background concentration (15.5 mg/kg). The lateral and vertical extent of lead are defined.

Manganese was detected above the Qbt 3 BV (482 mg/kg) in two subsurface samples at location 20-612596. The maximum concentration (521 mg/kg) was detected from 4–5 ft bgs. Concentrations of manganese increased with depth but decreased downgradient. Detected concentrations were below the maximum Qbt 3 background concentration (752 mg/kg). The lateral and vertical extent of manganese are defined.

Nitrate was detected in 20 samples at seven locations. Nitrate concentrations likely reflect naturally occurring levels (maximum 7.15 mg/kg). The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in three surface and seven subsurface samples at six locations. Concentrations increased with depth at four locations (20-612591, 20-612592, 20-612596, and 20-612597) but were below the EQLs except at location 20-612592. At the other two locations, perchlorate was not detected or concentrations decreased with depth. Concentrations of perchlorate decreased downgradient. The lateral extent of perchlorate is defined, but the vertical extent is not defined at location 20-612592.

Selenium was not detected above BV but had DLs (0.9 mg/kg to 1.1 mg/kg) above the tuff BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Organic Chemicals

Organic chemicals were not detected at SWMU 20-002(b).

Radionuclides

Cesium-137 was detected in six samples at six locations. The maximum concentration (0.475 pCi/g) was detected at location 20-612596 from 0–1 ft bgs. Concentrations of cesium-137 decreased with depth at all six locations and decreased downgradient. The lateral and vertical extent of cesium-137 are defined.

Uranium-235/236 was detected above Qbt 3 BV (0.09 pCi/g) in four samples at three locations. The maximum concentration (0.108 pCi/g) was detected at location 20-612596 from 2–3 ft bgs. Concentrations of uranium-235/236 decreased with depth at all three locations and decreased downgradient. The lateral and vertical extent of uranium-235/236 are defined.

Uranium-238 was detected above Qbt 3 BV (1.93 pCi/g) in two samples at location 20-612594. The maximum concentration (2.06 pCi/g) was detected at location 20-612594 from 0–1 ft bgs. Concentrations of uranium-238 decreased with depth and decreased downgradient. The lateral and vertical extent of uranium-238 are defined.

Summary of Nature and Extent

The vertical extent of barium, calcium, and perchlorate is not defined at SWMU 20-002(b). The lateral and vertical extent of organic chemicals and radionuclides are defined at SWMU 20-002(b).

6.4.3.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 20-002(b) because extent is not defined for the site.

6.4.3.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 20-002(b) because extent is not defined for the site.

6.5 SWMU 20-002(d), Former Firing Site

6.5.1 Site Description and Operation History

SWMU 20-002(d) is a former firing point located near a manhole (structure 20-3) in the central part of former TA-20 (Figure 6.5-1). Fewer than 10 implosion shots were fired near structure 20-3 (LANL 1994, 034756, p. 5-15). One of these shots, containing 500 lb of Composition B, did not detonate completely. A 1962 Laboratory memorandum describes two cleanup efforts related to this incident: one conducted immediately after the incident and a second that was part of the 1948 Sandia Canyon cleanup conducted before the construction of East Jemez Road (Courtright 1962, 005971). Other historical documents indicate small pieces of HE were found and removed from this site at various times, including in July 1966, July 1967, and June 1969 (Drake and Courtright 1966, 005985; Drake and Courtright 1967, 005986; Drake and Courtright 1969, 005987). No HE was found during inspections in April 1971, May 1973, and June 1975.

6.5.2 Relationship to Other SWMUs and AOCs

SWMU 20-002(d), a former firing point, is located approximately 625 ft west of SWMU 20-002(c) and 600 ft southeast of SWMU 20-001(c). No SWMUs or AOCs are associated with SWMU 20-002(d).

6.5.3 Summary of Previous Investigations

In 1985, environmental samples were collected from this site for the Los Alamos Site Characterization Program. Two soil samples indicated the presence of uranium above established background levels (52.48 mg/kg and 33.25 mg/kg versus 3 mg/kg to 7 mg/kg) (LANL 1994, 034756, p. 5-22).

In 1995, a Phase I RFI was conducted at SWMU 20-002(d) (LANL 1996, 054466). Samples were collected from eight locations within a 50-ft radius of the former firing point. At each location, a surface sample (0.0–0.5 ft) and two subsurface samples (2.5–3.0 ft and 4.5–5.0 ft bgs) were collected and analyzed for gamma-emitting radionuclides, HE, isotopic uranium, TAL metals, strontium-90, and uranium.

Decision-level data from the 1995 RFI are presented and discussed in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site. The work plan proposed to collect 24 subsurface samples from 8 locations, including 4 of the 8 locations sampled during the 1995 RFI. Data from the 2010 samples replaced all the 1995 RFI results. Table 6.5-1 presents the samples collected and analyses requested for SWMU 20-002(d).

6.5.4 Site Contamination

6.5.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 20-002(d):

- Twenty-four samples were from eight locations at SWMU 20-002(d) with depths ranging from 0–9 ft bgs. All samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, explosive compounds, PCBs (9 of the 24 samples), gamma-emitting radionuclides, isotopic uranium, and strontium-90.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at SWMU 20-002(d) are shown in Figure 6.5-1. Table 6.5-1 presents the samples collected and analyses requested for SWMU 20-002(d). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

6.5.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

6.5.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 20-002(d) consist of results from 24 tuff samples collected from eight locations.

Inorganic Chemicals

Twenty-four tuff samples were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 6.5-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.5-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Twenty-four tuff samples were analyzed for explosive compounds and PCBs (9 of the 24 samples). Table 6.5-3 presents the results of the detected organic chemicals. Figure 6.5-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Twenty-four tuff samples were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90. Table 6.5-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.5-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

6.5.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Aluminum was detected above the Qbt 3 BV (7340 mg/kg) in three samples at location 20-612611. The maximum concentration (12,500 mg/kg) was detected from 8–9 ft bgs. Concentrations of aluminum increased with depth at this location but decreased downgradient. The lateral extent of aluminum is defined, but the vertical extent is not defined at location 20-612611.

Antimony was not detected above BV but had DLs (0.973 mg/kg to 1.15 mg/kg) above the tuff BV (0.5 mg/kg). Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in 13 samples at six locations. The maximum concentration (126 mg/kg) was detected at location 20-612611 from 8–9 ft bgs. Concentrations of barium increased with depth at locations 20-612611 and 20-612613 but decreased with depth at the other four locations and decreased downgradient. The lateral extent of barium is defined, but the vertical extent is not defined at locations 20-612611 and 20-612613.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in five samples at four locations. The maximum concentration (19.1 mg/kg) was detected at location 20-612608 from 0–1 ft bgs. Concentrations of chromium increased with depth at location 20-612611 but decreased with depth at the other three locations. The detected concentrations at location 20-612611 were below the maximum Qbt 3 background concentration (13 mg/kg). Concentrations of chromium increased downgradient at location 20-612608. The vertical extent of chromium is defined, but the lateral extent is not defined.

Cobalt was detected above the Qbt 3 BV (3.14 mg/kg) in two samples at location 20-612611. The maximum concentration (3.65 mg/kg) was detected at location 20-612611 from 4–5 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-9 and Table H-5). The lateral and vertical extent of cobalt are defined.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in seven samples at five locations. The maximum concentration (28.7 mg/kg) was detected at location 20-612612 from 0–1 ft bgs. Concentrations of copper decreased with depth at all five locations and decreased downgradient. The lateral and vertical extent of copper are defined.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in five samples at three locations. The maximum concentration (13.2 mg/kg) was detected at location 20-612610 from 0–1 ft bgs. Concentrations of lead increased slightly with depth at location 20-612612 but decreased with depth at the two other locations. All detected concentrations of lead were below the maximum Qbt 3 background concentration (15.5 mg/kg). The lateral and vertical extent of lead are defined.

Magnesium was detected above the Qbt 3 BV (1690 mg/kg) in one sample (1770 mg/kg) at location 20-612611 from 4–5 ft bgs. The concentration of magnesium decreased with depth and downgradient and was below the maximum Qbt 3 background (2820 mg/kg). The lateral and vertical extent of magnesium are defined.

Manganese was detected above the Qbt 3 BV (482 mg/kg) in one sample (494 mg/kg) at location 20-612611 from 4–5 ft bgs. The concentration of manganese decreased with depth and downgradient and was below the maximum Qbt 3 background (752 mg/kg). The lateral and vertical extent of manganese are defined.

Nitrate was detected in 8 surface and 11 subsurface samples at eight locations. The detected concentrations of nitrate (maximum 10.9 mg/kg) likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in eight samples at six locations. The maximum concentration (0.00254 mg/kg) was detected at location 20-612609 from 4–5 ft bgs. Concentrations of perchlorate decreased with depth at all locations except 20-612606. The detected concentration of perchlorate at location 20-612606 was below the EQL. Concentrations of perchlorate decreased downgradient. The lateral and vertical extent of perchlorate are defined.

Selenium was not detected above BV but had DLs (0.955–1.14 mg/kg) above the tuff BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Organic Chemicals

Aroclor-1242 was detected in one sample (0.0457 mg/kg) at location 20-612606 from 4–5 ft bgs. Concentrations of Aroclor-1242 decreased with depth and decreased downgradient. Aroclor-1242 was not detected in the deepest sample at location 20-612606. The lateral and vertical extent of Aroclor-1242 are defined.

Aroclor-1254 was detected in four samples at three locations. The maximum concentration (0.06 mg/kg) was detected at location 20-612606 from 4–5 ft bgs. Concentrations of Aroclor-1254 decreased with depth at all three locations but increased downgradient. The vertical extent of Aroclor-1254 is defined, but the lateral extent is not defined.

Aroclor-1260 was detected in six samples at three locations. The maximum concentration (0.0263 mg/kg) was detected at location 20-612608 from 0–1 ft bgs. Concentrations of Aroclor-1260 decreased with depth at all three locations. Concentrations of Aroclor-1260 increased downgradient. The vertical extent of Aroclor-1260 is defined, but the lateral extent is not defined.

SWMU 20-002(d) was used solely as a firing point in the mid-1940s and is therefore not the source of low concentrations of Aroclor-1254 and Aroclor-1260 detected in investigation samples. As stated in the approved Sandia Canyon investigation report (LANL 2009, 107453; NMED 2010, 108683), the source of PCBs detected in Lower Sandia Canyon includes SWMUs and AOCs within TA-03, TA-53, and TA-61and runoff from developed areas within the Laboratory and Los Alamos County (LANL 2009, 107453). PCB contamination in Sandia Canyon is being addressed by separate canyons investigations (LANL 2009, 107453).

Radionuclides

Cesium-137 was detected in three samples at three locations. The maximum concentration (0.281 pCi/g) was detected at location 20-612613 from 0–1 ft bgs. Concentrations of cesium-137 decreased with depth at all three locations and decreased downgradient. The lateral and vertical extent of cesium-137 are defined.

Uranium-234 was detected above the Qbt 3 BV (1.98 pCi/g) in two samples at two locations. The maximum concentration (15 pCi/g) was detected at location 20-612612 from 0–1 ft bgs. Concentrations of uranium-234 decreased with depth at both locations and decreased downgradient. The lateral and vertical extent of uranium-234 are defined.

Uranium-235/236 was detected above the Qbt 3 BV (0.09 pCi/g) in 10 samples at six locations. The maximum concentration (0.775 pCi/g) was detected at location 20-612612 from 0–1 ft bgs. Concentrations of uranium-235/236 increased with depth at locations 20-612611 and 20-612613 but decreased with depth at the four other locations and decreased downgradient. The lateral extent of uranium-235/236 is defined, but the vertical extent is not defined at locations 20-612611 and 20-612613.

Uranium-238 was detected above the Qbt 3 BV (1.93 pCi/g) in two samples at two locations. The maximum concentration (15.4 pCi/g) was detected at location 20-612612 from 0–1 ft bgs. Concentrations of uranium-238 decreased with depth at both locations and decreased downgradient. The lateral and vertical extent of uranium-238 are defined.

Summary of Nature and Extent

The vertical extent of aluminum, barium, and uranium-235/236 is not defined at SWMU 20-002(d). The lateral extent of chromium is not defined at SWMU 20-002(d). The lateral and vertical extent of organic chemicals are defined at SWMU 20-002(d).

6.5.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 20-002(d) because extent is not defined for the site.

6.5.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 20-002(d) because extent is not defined for the site.

6.6 AOC 20-003(b), Former 20-mm Gun-Firing Site

6.6.1 Site Description and Operation History

AOC 20-003(b) is a former 20-mm gun-firing site that consisted of two former buildings constructed in 1945 and located near the canyon wall (Figure 6.6-1). Former building 20-44 was a 16-ft × 16-ft × 8-ft-high wood-frame building equipped with concrete gun mounts. Adjacent former control building 20-13 had approximately the same dimensions. The site was used to conduct initiator timing tests, which consisted of firing projectiles from a 20-mm gun into steel plates set against the canyon walls. In 1948, the 20-mm gun was relocated to TA-04. A site visit in 1993 confirmed all surface structures and the steel plates had been removed and some concrete foundations remained (LANL 1994, 034756, p. 5-16).

6.6.2 Relationship to Other SWMUs and AOCs

AOC 20-003(b) is located approximately 560 ft east of AOC 53-010 and 320 ft southwest of AOC 53-008. No SWMUs or AOCs are associated with AOC 20-003(b).

6.6.3 Summary of Previous Investigations

In 1985, the area around the gun site was investigated as part of the Los Alamos Site Characterization Program. A radiation survey and soil sampling were conducted. The radiation survey showed no readings above background. Soil samples showed uranium levels within background. The survey and sampling, however, were performed near the gun-mount building rather than at the projectile-impact areas (LANL 1994, 034756, p. 5-22).

In 1995, a Phase I RFI was conducted at AOC 20-003(b) (LANL 1996, 054466). An 80-ft × 140-ft grid was established at the site, and surface radiation readings were measured to help determine sampling locations. Radiological readings were consistent across the site, with no areas exhibiting elevated readings. A total of nine soil and tuff samples were collected from six locations in the drainage channel downgradient of the projectile impact area. Surface samples (0–1 ft) were collected at each of three locations and one subsurface sample (2–3.0 ft or 5.0–5.5 ft) was collected at all six locations for a total of three surface and six subsurface samples. All samples were analyzed for gamma-emitting radionuclides, TAL metals, and strontium-90.

Decision-level data from the 1995 RFI are presented and discussed in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site. The work plan proposed to collect 12 subsurface samples from six locations downgradient of the locations sampled during the 1995 RFI. The original RFI sampling locations were not proposed to be resampled because these locations had eroded since the 1995 RFI. Therefore, the 1995 RFI data were not used to define extent of contamination at AOC 20-003(b), and only the 2010 sample data are presented in this report. Table 6.6-1 presents the samples collected and analyses requested for AOC 20-003(b).

6.6.4 Site Contamination

6.6.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at AOC 20-003(b):

- Fourteen samples were collected from six locations at AOC 20-003(b) with depths ranging from 2–21 ft bgs. All samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, PCBs, and isotopic uranium.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at AOC 20-003(b) are shown in Figure 6.6-1. Table 6.6-1 presents the samples collected and analyses requested for AOC 20-003(b). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

6.6.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

6.6.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 20-003(b) consist of results from 14 samples (13 sediment and 1 tuff) collected from six locations.

Inorganic Chemicals

Fourteen samples (13 sediment and 1 tuff) were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 6.6-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.6-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Fourteen samples (13 sediment and 1 tuff) were analyzed for PCBs. Organic chemicals were not detected at AOC 20-003(b).

Radionuclides

Fourteen samples (13 sediment and 1 tuff) were analyzed for isotopic uranium. Table 6.6-3 presents the radionuclides detected or detected above BVs/FVs. Figure 6.6-3 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

6.6.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was not detected above BV but had DLs (0.949 mg/kg to 1.14 mg/kg) above the sediment BV (0.83 mg/kg) and a DL (0.955 mg/kg) above the tuff BV (0.5 mg/kg). Because antimony was not detected above BV, the lateral and vertical extent of antimony are defined.

Cadmium was not detected above BV but had DLs (0.474 mg/kg to 0.572 mg/kg) above the sediment BV (0.4 mg/kg). Because cadmium was not detected above the BV, the lateral and vertical extent of cadmium are defined.

Nitrate was detected in three samples at two locations. The detected concentrations of nitrate (maximum 1.26 mg/kg) likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in six subsurface samples at four locations. The maximum concentration (0.0071 mg/kg) was detected at location 20-612495 from 2–3 ft bgs. Concentrations of perchlorate decreased with depth at all locations, except at 20-612492. The detected concentrations of perchlorate at location 20-612492 were below the EQL. Concentrations of perchlorate increased downgradient at location 20-612495. The vertical extent of perchlorate is defined but the lateral extent is not defined.

Selenium was not detected above BV but had DLs (0.936 mg/kg to 1.11 mg/kg) above the sediment BV (0.3 mg/kg) and a DL (0.978 mg/kg) above the tuff BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Organic Chemicals

Organic chemicals were not detected at AOC 20-003(b).

Radionuclides

Uranium-235/236 was detected above the Qbt 3 BV (0.09 pCi/g) in one sample (0.103 pCi/g) at location 20-612491 from 11–12 ft bgs, and above the sediment BV (0.2 pCi/g) in one sample (0.223 pCi/g) at location 20-612493 from 8–9 ft bgs. Concentrations of uranium-235/236 increased with depth at both locations but decreased downgradient. The lateral extent of uranium-235/236 is defined but the vertical extent is not defined at locations 20-612491 and 20-612493.

Summary of Nature and Extent

The vertical extent of uranium-235/236 and the lateral extent of perchlorate are not defined at AOC 20-003(b). The lateral and vertical extent of organic chemicals are defined at AOC 20-003(b).

6.6.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC 20-003(b) because extent is not defined for the site.

6.6.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC 20-003(b) because extent is not defined for the site.

6.7 AOC 20-004, Septic System

6.7.1 Site Description and Operation History

AOC 20-004 is a former septic system located next to the current TA-72 small-arms firing range (Figure 6.7-1). This septic system was constructed in 1952 to serve the guardhouse (structure 20-47, now designated as structure 72-8) at former TA-20. The 540-gal.-capacity tank (former structure 20-49) was a single-tank chamber made of 6-in. reinforced concrete, with inside dimensions of 6 ft × 6 ft × 5 ft (LASL 1951, 026066). The inlet drainline to the septic tank consisted of 6-in.-diameter vitrified clay pipe and was approximately 100 ft long. It is not clear from engineering drawings whether the system discharged to daylight. The tank ceased to be used after 1957, when the guard shack was abandoned but was returned to service in 1966 when the TA-72 firing range opened. In 1989, the tank was collapsed and filled in. Interviews with site personnel state that the tank and associated drainlines were removed during a construction project in the early 1990s. This tank was registered with the New Mexico Environmental Improvement Division (NMEID) as an Unpermitted Individual Liquid Waste System (Registration Number LA-10). The NMEID registration states no leach bed was associated with the tank (LANL 1994, 034756, pp. 5-62–5-64).

6.7.2 Relationship to Other SWMUs and AOCs

AOC 20-004 was located approximately 100 ft southeast of AOC 72-001 and 150 ft northeast of SWMU 20-001(a). No SWMUs or AOCs are associated with AOC 20-004.

6.7.3 Summary of Previous Investigations

In 1995, a Phase I RFI was conducted at AOC 20-004 (LANL 1996, 054466). A geophysical survey was conducted to help locate the tank. Survey data showed no subsurface anomalies, indicating the tank had been removed. Three surface (0.0–0.5 ft) and six subsurface (1.0–1.3 ft or 2.5–3.0 ft) samples were collected from nine locations at the former location of the septic tank and analyzed for TAL metals, VOCs, and SVOCs (LANL 1996, 054466, p. 5-60). No inorganic chemicals were detected above BVs. Antimony, cadmium, and mercury were not detected above soil BVs but had DLs above BVs. Benzoic acid and butylbenzylphthalate were each detected in one sample.

Based on a review of engineering drawing ENG-C45621 (LANL 1989, 104234), the AOC 20-004 septic tank was actually located approximately 50 ft south-southeast of the location sampled during the 1995 RFI. Therefore, the 1995 RFI samples were not collected near the location of the former septic tank, as intended, but were collected near the active sanitary wastewater drainline associated with TA-72. Because these samples were not collected at the correct location, they are not decision-level data and are not presented in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703) or in this report.

6.7.4 Site Contamination

6.7.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at AOC 20-004:

- Fourteen samples were collected from seven locations at AOC 20-004 with depths ranging from 3.0–11.0 ft bgs. All samples were analyzed for TAL metals, nitrate, total cyanide, PCBs (6 of the 14 samples), SVOCs, VOCs, and gamma-emitting radionuclides.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at AOC 20-004 are shown in Figure 6.7-1. Table 6.7-1 presents the samples collected and analyses requested for AOC 20-004. The geodetic coordinates of sampling locations are presented in Table 3.2-1.

6.7.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

6.7.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 20-004 consist of results from 14 samples (9 fill and 5 tuff) collected from seven locations.

Inorganic Chemicals

Fourteen samples (9 fill and 5 tuff) were analyzed for TAL metals, nitrate, and total cyanide. Table 6.7-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.7-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Fourteen samples (9 fill and 5 tuff) were analyzed for PCBs (6 of the 14 samples), SVOCs, and VOCs. Organic chemicals were not detected at AOC 20-004.

Radionuclides

Fourteen samples (9 fill and 5 tuff) were analyzed for gamma-emitting radionuclides. Radionuclides were not detected at AOC 20-004.

6.7.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Aluminum was detected above the Qbt 3 BV (7340 mg/kg) in one sample (10,200 mg/kg) at location 20-612505 from 10–11 ft bgs. Concentrations of aluminum increased with depth at location 20-612505 and increased downgradient. The lateral and vertical extent of aluminum are not defined.

Antimony was not detected above BV but had DLs (0.968 mg/kg to 5.35 mg/kg) above the soil BV (0.83 mg/kg) and DLs (0.957 mg/kg to 5.01 mg/kg) above the tuff BV (0.5 mg/kg). Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in five samples at five locations. The maximum concentration (141 mg/kg) was detected at location 20-612505 from 10–11 ft bgs. Concentrations of barium increased with depth at four locations but decreased with depth at location 20-612503. At location 20-612503, barium was below the soil BV in the shallow sample while the concentrations were above BV in the deeper samples because of differences in the media-specific BVs (i.e., the soil BV is higher than the tuff BV). Concentrations of barium increased downgradient at location 20-612505. The lateral and vertical extent of barium are not defined.

Cadmium was not detected above BV but had DLs (0.484 mg/kg to 0.537 mg/kg) above the soil BV (0.4 mg/kg). Because cadmium was not detected above the BV, the lateral and vertical extent of cadmium are defined.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in three samples at three locations. The maximum concentration (2840 mg/kg) was detected at location 20-612501 from 10–11 ft bgs. Concentrations of calcium increased with depth at all three locations but decreased downgradient. The lateral extent of calcium is defined, but the vertical extent is not defined.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in three samples at three locations. The maximum concentration (11.4 mg/kg) was detected at location 20-612502 from 6–7 ft bgs. Concentrations of chromium were below the maximum Qbt 3 background concentration (13 mg/kg). The lateral and vertical extent of chromium are defined.

Cobalt was detected above the Qbt 3 BV (3.14 mg/kg) in five samples at five locations. The maximum concentration (6.62 mg/kg) was detected at location 20-612501 from 10–11 ft bgs. Concentrations of cobalt increased with depth at all five locations but decreased downgradient. The lateral extent of cobalt is defined, but the vertical extent is not defined.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in two samples at two locations. The maximum concentration (6.55 mg/kg) was detected at location 20-612505 from 10–11 ft bgs. Concentrations of copper increased with depth at both locations and increased downgradient at location 20-612505. The detected concentration of copper at location 20-612501 was below the maximum Qbt 3 background concentration (6.2 mg/kg). The lateral and vertical extent of copper are not defined.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in three samples at three locations. The maximum concentration (13.4 mg/kg) was detected at location 20-612505 from 10–11 ft bgs. Concentrations of lead were below the maximum Qbt 3 background concentration (15.5 mg/kg). The lateral and vertical extent of lead are defined.

Magnesium was detected above the Qbt 3 BV (1690 mg/kg) in one sample (1950 mg/kg) at location 20-612505 from 10–11 ft bgs. The concentration of magnesium was below the maximum Qbt 3 background (2820 mg/kg). The lateral and vertical extent of magnesium are defined.

Nickel was detected above the Qbt 3 BV (6.58 mg/kg) in two samples at two locations. The maximum concentration (7.78 mg/kg) was detected at location 20-612505 from 10–11 ft bgs. Concentrations of nickel increased with depth at both locations and increased downgradient at location 20-612505. The lateral and vertical extent of nickel are not defined.

Nitrate was detected in six samples at four locations. The maximum concentration (38.1 mg/kg) was detected at location 20-612504 from 6–7 ft bgs. Concentrations of nitrate increased with depth at location 20-612504 and decreased downgradient. The detected concentrations of nitrate at the other locations likely reflect naturally occurring levels. The lateral extent of nitrate is defined, but the vertical extent is not defined at location 20-612504.

Selenium was detected above the sediment BV (1.52 mg/kg) in one sample (1.75 mg/kg) at location 20-612501 from 7–8 ft bgs and above the Qbt 3 BV (0.3 mg/kg) in one sample (1.72 mg/kg) at location 20-612502 from 6–7 ft bgs. Concentrations of selenium increased with depth at location 20-612502 but decreased with depth at location 20-612501 and decreased downgradient. The lateral extent of selenium is defined, but the vertical extent is not defined at location 20-612502.

Vanadium was detected above the Qbt 3 BV (17 mg/kg) in two samples at two locations. The maximum concentration (22.6 mg/kg) was detected at location 20-612505 from 10–11 ft bgs. Concentrations of vanadium increased with depth at both locations and increased downgradient at location 20-612505. The lateral and vertical extent of vanadium are not defined.

Organic Chemicals

Organic chemicals were not detected at AOC 20-004.

Radionuclides

Radionuclides were not detected at AOC 20-004.

Summary of Nature and Extent

The vertical extent of aluminum, barium, calcium, cobalt, copper, nickel, nitrate, selenium, and vanadium is not defined at AOC 20-004. The lateral extent of aluminum, barium, copper, nickel, and vanadium is not defined at AOC 20-004. The lateral and vertical extent of organic chemicals and radionuclides are defined at AOC 20-004.

6.7.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC 20-004 because extent is not defined for the site.

6.7.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC 20-004 because extent is not defined for the site.

6.8 SWMU 20-005, Septic System

6.8.1 Site Description and Operation History

SWMU 20-005 is a former septic system (septic tank and drainlines) located south of East Jemez Road in the central portion of the aggregate area (Figure 6.8-1). The system served a toilet, restroom sink, and darkroom sink in former building 20-1. The system was constructed in 1945, and its use was discontinued in 1948. Engineering drawings show the tank (structure 20-27) as having 6-in.-thick concrete walls with interior dimensions of 3 ft × 6 ft × 5 ft high and a capacity of 540 gal. (LASL 1951, 024343). The discharge point of the tank is not known. The septic system could not be located during a 1985 program conducted by the Laboratory to remove existing structures from Sandia Canyon. Although the tank could not be located, a pit-like depression was noted in the tuff in the area where the tank was believed to have been located. According to the 1985 report, excavation surrounding the area of the “pit” turned up no evidence of the tank or associated drainlines (LANL 1994, 034756, pp. 5-64–5-65).

6.8.2 Relationship to Other SWMUs and AOCs

SWMU 20-005 is located approximately 625 ft southeast of SWMU 20-001(b). No SWMUs or AOCs are associated with AOC 20-003(b).

6.8.3 Summary of Previous Investigations

In 1985, a soil sample was collected from the pit-like depression, where the tank is believed to have been located. No radioactivity was detected in this sample (LANL 1994, 034756, pp. 5-64–5-65).

A Phase I RFI of SWMU 20-005 was conducted during 1995 (LANL 1996, 054466). As part of the RFI, a geophysical survey was conducted to help locate the tank. Survey data indicated no subsurface anomalies, confirming that the tank had been removed. Nine subsurface samples (4.5–5.0 ft bgs) were collected from nine locations in the drainage downgradient of the former location of the septic tank and analyzed for TAL metals and cyanide (LANL 1996, 054466, pp. 5-63–5-64).

Decision-level data from the 1995 RFI are presented and discussed in the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site. The work plan proposed to collect 12 samples from the six locations, including five locations sampled during the 1995 RFI. Data from 2010 samples replaced all the 1995 RFI results. Table 6.8-1 presents the samples collected and analyses requested for SWMU 20-005.

6.8.4 Site Contamination

6.8.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 20-005:

- Twelve samples were collected from six locations at SWMU 20-005 with depths ranging from 0–10 ft bgs. All samples were analyzed for TAL metals, nitrate, total cyanide, PCBs (6 of the 12 samples), SVOCs, VOCs, and gamma-emitting radionuclides.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at SWMU 20-005 are shown in Figure 6.8-1. Table 6.8-1 presents the samples collected and analyses requested for SWMU 20-005. The geodetic coordinates of sampling locations are presented in Table 3.2-1.

6.8.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

6.8.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 20-005 consist of results from 12 samples collected from six locations.

Inorganic Chemicals

Twelve samples were analyzed for TAL metals, nitrate, and total cyanide. Table 6.8-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 6.8-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Twelve samples were analyzed for PCBs (6 of the 12 samples), SVOCs, and VOCs. Table 6.8-3 presents the results of the detected organic chemicals. Figure 6.8-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Twelve samples were analyzed for gamma-emitting radionuclides. Radionuclides were not detected at SWMU 20-005.

6.8.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was not detected above BV but had DLs (0.987 mg/kg to 1.13 mg/kg) above the soil BV (0.83 mg/kg). Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Cadmium was detected above the soil BV (0.4 mg/kg) in one sample (0.641 mg/kg) at location 20-612615 from 9–10 ft bgs. The concentration of cadmium was below the maximum soil background concentration (2.6 mg/kg). The lateral and vertical extent of cadmium are defined.

Nitrate was detected in four samples at two locations. The detected concentrations of nitrate (maximum 4.66 mg/kg) likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Silver was detected above the soil BV (1 mg/kg) in one sample (1.55 mg/kg) at location 20-612615 from 9–10 ft bgs. The concentrations of silver increased with depth but decreased downgradient. The lateral extent of silver is defined, but the vertical extent is not defined at location 20-612615.

Organic Chemicals

Aroclor-1254 was detected in two samples at location 20-612616. The maximum concentration (0.0034 mg/kg) was detected from 4–5 ft bgs. Concentrations of Aroclor-1254 were below the EQL. The lateral and vertical extent of Aroclor-1254 are defined.

Aroclor-1260 was detected in two samples at location 20-612616. The maximum concentration (0.0071 mg/kg) was detected from 4–5 ft bgs. Concentrations of Aroclor-1260 decreased with depth but increased downgradient. The vertical extent of Aroclor-1260 is defined, but the lateral extent is not defined.

Methylene chloride was detected in two subsurface samples at two locations. The maximum concentration (0.0031 mg/kg) was detected at location 20-612614 from 9–10 ft bgs. The detected concentrations of methylene chloride were below the EQL. The lateral and vertical extent of methylene chloride are defined.

SWMU 20-005 consists solely of a septic system used in the mid-1940s and is therefore not the source of low concentrations of Aroclor-1254 and Aroclor-1260 detected in investigation samples. As stated in the approved Sandia Canyon investigation report (LANL 2009, 107453; NMED 2010, 108683), the source of PCBs detected in Lower Sandia Canyon includes SWMUs and AOCs within TA-03, TA-53, andTA-61 and runoff from developed areas within the Laboratory and Los Alamos County (LANL 2009, 107453). PCB contamination in Sandia Canyon is being addressed by separate canyons investigations (LANL 2009, 107453).

Radionuclides

Radionuclides were not detected at SWMU 20-005.

Summary of Nature and Extent

The vertical extent of silver is not defined at SWMU 20-005. The lateral and vertical extent of organic chemicals and radionuclides are defined at SWMU 20-005.

6.8.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 20-005 because extent is not defined for the site.

6.8.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 20-005 because extent is not defined for the site.

7.0 TA-53 BACKGROUND AND FIELD INVESTIGATION RESULTS

The Lower Sandia Canyon Aggregate Area contains 16 sites associated with TA-53 that are addressed in this investigation report (Table 1.1-1). Each site is described separately in sections 7.2 through 7.15, including site description and operational history, relationship to other SWMUs and AOCs, historical and 2010 investigation activities, site contamination results based on qualified data (decision-level data from the current and previous investigations), and summaries of human health and ecological risk-screening assessments.

7.1 Background of TA-53

TA-53 is located in the northeast portion of the Laboratory on Mesita de los Alamos, which is the mesa bounded by Los Alamos Canyon to the north and Sandia Canyon to the south (Plate 1). TA-53 is the location of the Los Alamos Neutron Science Center (LANSCE). The primary component of LANSCE is a 0.5-mi-long linear proton accelerator that produces subatomic particles for experimental physics activities and isotope production. TA-53 also contains office buildings, laboratories, and other facilities associated with the operation of the accelerator.

7.1.1 Operational History

TA-53 was originally developed as the Los Alamos Meson Physics Facility (LAMPF). Construction of LAMPF began in 1967, and the facility became fully operational in 1974. The facility was renamed LANSCE to reflect the programs currently carried out at TA-53. LANSCE programs and activities are housed in a large complex (approximately 400 buildings), including the building housing the linear accelerator itself, experimental areas and laboratories, and experimental support operations and advanced technology programs (LANL 1996, 054466).

7.1.2 Summary of Releases

Potential contaminants at former TA-53 may have been released into the environment through landfill disposal, leaks, spills, outfall, drainages, or operational releases.

7.1.3 Current Site Usage and Status

Currently, TA-53 is occupied by LANSCE facilities. LANSCE is presently used for research in condensed-matter science and engineering, accelerator science, fundamental nuclear physics, and radiography.

7.2 SWMU 53-001(a), Storage Area

7.2.1 Site Description and Operation History

SWMU 53-001(a) is an outdoor storage area located on the north side of the TA-53 equipment test laboratory (building 53-2) (Figure 7.2-1). This storage area consists of a covered concrete pad currently serving as a drum storage area for building 53-2. This area was also formerly used as a satellite accumulation area. Non-PCB dielectric oil is currently stored on the concrete pad. The pad is surrounded by a concrete curb to provide secondary containment. A drain valve located in the northwest corner of the curbed area was previously used to release accumulated rainwater but is now plugged. The storage area is believed to have been first used in 1968 when operations at building 53-2 began. A 1989 photograph of the area shows the site to look much as it does today (LANL 1989, 020502). In 1992, the site was no longer used as a satellite accumulation area. A Laboratory listing of waste-accumulation areas dated April 1993 notes the satellite accumulation area on the north side of building 53-2 was removed (LANL 1993, 029415). The site was inspected during preparation of the RFI work plan in 1993, and no evidence of staining or releases was noted (LANL 1994, 034756, p. 5-38).

7.2.2 Relationship to Other SWMUs and AOCs

SWMU 53-001(a) is located approximately 210 ft east-northeast of AOC 53-012(e), 200 ft northeast of SWMU 53-001(b), and 250 ft north of SWMU 53-005. No SWMUs or AOCs are associated with SWMU 53-001(a).

7.2.3 Summary of Previous Investigations

Previous investigations at SWMU 53-001(a) include a Phase I RFI conducted in 1995 and 1997 (LANL 1996, 054466; LANL 1996, 054467). In 1995, two surface soil samples (0.0–0.5 ft) were collected at each of four locations along the northern side of the storage pad to determine if releases had occurred (LANL 1996, 054466, p. 5-43). One sample from each location was analyzed for TAL metals, pesticides/PCBs, TPH, and VOCs, and the other sample was analyzed for SVOCs (LANL 1996, 054466, p. 5-45). In 1997, one surface (0.0–0.5 ft bgs) and two subsurface (0.5–1.0 ft and 1.0–1.5 ft bgs) samples were collected at one of the 1995 sampling locations and analyzed for pesticides/PCBs. Five surface (0.0–0.5 ft bgs) and one subsurface (1.0–1.5 ft bgs) samples were collected at six additional locations in a drainage downgradient of the site and analyzed for PCBs (LANL 1997, 056505).

Based on the results of the Phase I RFI, a VCA was conducted during 1997 to remove PCB-contaminated soil. Approximately 10 yd^3 of soil was excavated. Following soil removal, 22 confirmation samples were collected from 16 locations. Ten of these sampling locations were immediately outside the boundary of the excavation, and six were at the bottom of the excavation (LANL 1997, 056505, p. 11).

The sampling depth intervals were 0.0–0.5 ft, 0.5–0.8 ft, 0.7–1.2 ft, 0.8–1.2 ft, 2.5–3.0 ft, and 5.5–6.0 ft bgs. All confirmation samples were analyzed for PCBs. The RFI samples collected in 1995 and 1997 and the analyses requested are presented in Table 7.2-1. During the VCA, soil at the locations of four RFI samples (53-01054, 53-01518, 53-01519, and 53-01520) was excavated. Based on the results of the VCA confirmation samples, additional soil was removed at location 53-01526, including removal of location 0253-97-0080. Following this additional soil removal, a new confirmation sample (0253-97-0111) was collected at location 53-01526. The samples collected and the analyses requested during the 1995 RFI and 1997 VCA are presented in Table 7.2-1.

All decision-level data collected during previous investigations are presented and evaluated in section 7.2.4. Table 7.2-1 presents the samples collected and analyses requested at SWMU 53-001(a).

7.2.4 Site Contamination

7.2.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 53-001(a):

- Twenty-five samples were collected from 12 locations at SWMU 53-001(a) with depths ranging from 0–5 ft bgs. All samples were analyzed for TAL metals, PCBs, SVOCs, and VOCs. Samples from location 53-612469 were also analyzed for pesticides.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The sampling locations at SWMU 53-001(a) are shown in Figure 7.2-1. Table 7.2-1 presents the samples collected and analyses requested for SWMU 53-001(a). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

7.2.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

7.2.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 53-001(a) consist of results from three soil samples collected from three locations during the 1995 RFI, 24 samples (15 soil and 9 tuff) collected from 19 locations during the 1997 VCA, and 25 samples (23 tuff and 2 soil) collected from 12 locations during the 2010 investigation.

Inorganic Chemicals

Twenty-eight samples (5 soil and 23 tuff) were analyzed for TAL metals. Table 7.2-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 7.2-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Fifty-two samples (32 tuff and 20 soil) were analyzed for PCBs. Five samples (2 tuff and 3 soil) were analyzed for pesticides. Twenty-five (23 tuff and 2 soil) samples were analyzed for SVOCs. Twenty-eight samples (23 tuff and 5 soil) were analyzed for VOCs. Three soil samples were analyzed for TPH.

Table 7.2-3 presents the results of the detected organic chemicals. Figure 7.2-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Radionuclides were not analyzed at SWMU 53-001(a).

7.2.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was not detected above BV but had DLs (0.96 mg/kg to 1.15 mg/kg) above the tuff BV (0.5 mg/kg). Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in 11 samples at seven locations. The maximum concentration (93.1 mg/kg) was detected at location 53-612471 from 1–2 ft bgs. Concentrations of chromium increased with depth at locations 53-612469, 53-602470, and 53-612474 and decreased with depth at the other four locations. The detected concentrations of chromium were below the maximum Qbt 3 background concentration (13 mg/kg) at locations 53-612469, 53-602470, and 53-612474. Location 53-612471 is a central sampling location in a flat area, and concentrations of chromium decreased laterally to surrounding locations. The lateral and vertical extent of chromium are defined.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in 13 samples at nine locations. The maximum concentration (12.8 mg/kg) was detected at location 53-612469 from 4–5 ft bgs. Concentrations of copper increased with depth at locations 53-612469, 53-612473, and 53-612480 and decreased with depth at the other four locations. The detected concentrations of copper were below the maximum Qbt 3 background concentration (6.2 mg/kg) at locations 53-612470 and 53-612475. Location 53-612469 is a central sampling location in a flat area, and concentrations of copper decreased laterally to surrounding locations. The lateral extent of copper is defined, but the vertical extent is not defined at locations 53-612469, 53-612473, and 53-612480.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in two samples at two locations. The maximum concentration (84.2 mg/kg) was detected at location 53-612473 from 1–2 ft bgs. Concentrations of lead decreased with depth at both locations. Concentrations of lead decreased laterally from location 20-612473 downgradient. The lateral and vertical extent of lead are defined.

Mercury was detected above the soil BV (0.1 mg/kg) in one sample (0.16 mg/kg) at location 53-01052 from 0–0.5 ft bgs. Location 53-01052 was sampled from only one depth. However, mercury was not detected above the BV in samples collected at the surface and in deeper samples at adjacent sampling locations. The lateral and vertical extent of mercury are defined.

Selenium was detected above the Qbt 3 BV (0.3 mg/kg) in one sample (0.574 mg/kg) at location 53-612480 from 2–3 ft bgs. Concentrations of selenium decreased with depth. The single detected concentration of selenium at location 53-612480 was less than the DLs for the other samples. The lateral and vertical extent of selenium are defined.

Silver was not detected above BV but had DLs (1.5 mg/kg) above the soil BV (1 mg/kg). Because silver was not detected above the BV, the lateral and vertical extent of silver are defined.

Thallium was not detected above BV but had DLs (1.5 mg/kg) above the soil BV (0.73 mg/kg). Because thallium was not detected above the BV, the lateral and vertical extent of thallium are defined.

Organic Chemicals

Acetone was detected in eight tuff samples at five locations. The maximum concentration (0.0226 mg/kg) was detected at location 53-612469 from 2–3 ft bgs. Concentrations of acetone did not change with depth at location 53-612477 and decreased with depth at the other four locations. Location 53-612469 is in a flat area and concentrations of acetone decreased laterally to adjacent sampling locations. The lateral and vertical extent of acetone are defined.

Aroclor-1254 was detected in 15 samples (13 tuff and 2 soil) at nine locations. The maximum concentration (3.74 mg/kg) was detected at location 53-612474 from 1–2 ft bgs. Concentrations of Aroclor-1254 increased with depth at locations 53-612470 and 53-612477, but decreased with depth at the other seven locations. Location 53-612474 is a central sampling location in a flat area, and concentrations of Aroclor-1254 decreased laterally to adjacent sampling locations. The lateral extent of Aroclor-1254 is defined, but the vertical extent is not defined at locations 53-612470 and 53-612477.

Aroclor-1260 was detected in 21 tuff samples at 14 locations and in seven soil samples at seven locations. The maximum concentration (3.84 mg/kg) was detected at location 53-612472 from 1–2 ft bgs. Concentrations of Aroclor-1260 increased with depth at locations 53-612470 and 53-612475 but decreased with depth at the other locations or decreased in deeper samples collected near sampling locations where only one depth was sampled. Location 53-612472 is in a flat area, and concentrations of Aroclor-1260 decreased laterally to adjacent sampling locations. The lateral extent of Aroclor-1260 is defined, but the vertical extent is not defined at locations 53-612470 and 53-612475.

Benzo(a)pyrene, benzo(b)fluoranthene, and benzo(g,h,i)perylene were each detected in one soil sample at location 53-612476 from 1–2 ft bgs. The PAHs fluoranthene and pyrene were each detected in one tuff sample at location 53-612479. Concentrations decreased with depth and laterally. The lateral and vertical extent of PAHs are defined.

Isopropylbenzene was detected in one tuff subsurface sample (0.00289 mg/kg) at location 53-612472 from 1–2 ft bgs. Concentrations of isopropylbenzene decreased with depth and decreased laterally. The lateral and vertical extent of isopropylbenzene are defined.

Trimethylbenzene[1,2,4-] was detected in four tuff samples at three locations. The maximum concentration (0.00143 mg/kg) was detected at location 53-612480 from 0–1 ft bgs. Concentrations of 1,2,4-trimethylbenzene decreased with depth at all three locations but increased downgradient at location 53-612480. The vertical extent of 1,2,4-trimethylbenzene is defined, but the lateral extent is not defined.

TPH was detected in three soil samples from three locations collected during the 1995 RFI. Because there are potential sources for TPH contamination other than the wastes stored at SWMU 53-001(a) (e.g., parking lot runoff), the approved investigation work plan did not propose analysis of samples for TPH (LANL 2009, 106660.14; NMED 2009, 106703). The 2010 analytical suites (TAL metals, PCBs, SVOCs, and VOCs) were deemed to be better indicators of contaminant releases from SWMU 53-001(a). Because the approved investigation work plan did not propose analysis of any samples for TPH, the extent of TPH was not evaluated.

Radionuclides

Radionuclides were not analyzed at SWMU 53-001(a).

Summary of Nature and Extent

The vertical extent of copper, Aroclor-1254, and Aroclor-1260 is not defined at SWMU 53-001(a). The lateral extent of 1,2,4-trimethylbenzene is not defined at SWMU 53-001(a). The lateral and vertical extent of radionuclides were not evaluated at SWMU 53-001(a).

7.2.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 53-001(a) because extent is not defined for the site.

7.2.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 53-001(a) because extent is not defined for the site.

7.3 SWMU 53-001(b), Storage Area

7.3.1 Site Description and Operation History

SWMU 53-001(b) is an outdoor storage area located on a concrete pad that rests on the asphalt parking lot on the south side of the TA-53 equipment test laboratory (building 53-2) (Figure 7.3-1). Before 1990, this area consisted of drum racks used to store drums of products and wastes associated with maintenance activities conducted in building 53-2. Wastes included spent trichloroethene (TCE), Freon, other solvents, and acidic waste. Engineering drawings show the storage area was constructed in 1971 (LASL 1971, 023260). A photograph taken in 1989 shows the storage area contained drums, some of which were product and some of which were marked with hazardous waste labels. In addition, the photograph identifies no staining, indicating no spills or leakage occurred (LANL 1989, 020516).

In 1990, the drum racks were removed and replaced with four lockable flammable-material storage cabinets. The site was inspected during preparation of the RFI work plan in 1993, and again no evidence of staining or releases was noted (LANL 1994, 034756, p. 5-40). The Laboratory’s current waste-site database indicates this storage location also contained a less-than-90-d storage area that was removed (i.e., taken out of service) in 1998. The site currently contains flammable-material storage cabinets, which are used for product storage but not for waste storage.

7.3.2 Relationship to Other SWMUs and AOCs

SWMU 53-001(b) is located approximately 200 ft southwest of SWMU 53-001(a), 100 ft southeast of AOC 53-012(e), and 150 ft northwest of SWMU 53-005. No SWMUs or AOCs are associated with SWMU 53-001(b).

7.3.3 Summary of Previous Investigations

A Phase I RFI was conducted at SWMU 53-001(b) in 1995 to determine whether contaminants were present in the drainage channel downgradient of this site (LANL 1996, 054466). This drainage channel collects surface runoff from the parking lot upon which the storage area is located. Five surface samples (0.0–0.3 ft, 0.0–0.7 ft, and 0.0–1.0 ft) and two subsurface samples (0.3–0.7 ft and 1.0–1.5 ft) were collected from two locations in the drainage channel (LANL 1996, 054466, p. 5-49). One surface sample from each location and one subsurface sample were analyzed for TAL metals, PCBs, TPH, and VOCs.

Two surface samples from one location and one surface sample and one subsurface sample from the other location were analyzed for SVOCs. Only three samples are decision-level data, and the other samples are screening level data. The samples collected and the analyses requested during the 1995 RFI for the three samples are presented in Table 7.3-1.

Inorganic chemicals detected above BVs were cadmium, copper, lead, and zinc. Cadmium was detected above soil BVs but less than the maximum background concentration for soil (2.6 mg/kg) at two locations. Copper and lead were each detected above soil BVs and the maximum background concentrations for soil (16 mg/kg and 28 mg/kg, respectively) at one location. Zinc was detected above the soil BV at two locations and above the maximum background concentration for soil (75.5 mg/kg) at one location. Antimony and mercury were not detected above BVs but had DLs above BVs for three samples. SVOCs, VOCs, and PCBs were not detected. TPH was detected in three samples.

All decision-level data collected during previous investigations are presented and evaluated in section 7.3.4. Table 7.3-1 presents the samples collected and analyses requested for SWMU 53-001(b).

7.3.4 Site Contamination

7.3.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 53-001(b):

- Four samples were collected from two locations at SWMU 53-001(b) with depths ranging from 0–3 ft bgs. All samples were analyzed for TAL metals and PCBs.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The sampling locations at SWMU 53-001(b) are shown in Figure 7.3-1. Table 7.3-1 presents the samples collected and analyses requested for SWMU 53-001(b). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

7.3.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

7.3.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 53-001(b) consist of results from three soil samples collected from two locations during the 1995 RFI and four tuff samples collected from two locations during the 2010 investigation.

Inorganic Chemicals

Seven samples (three soil and four tuff) were analyzed for TAL metals. Table 7.3-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 7.3-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Seven samples (three soil and four tuff) were analyzed for PCBs and three samples were analyzed for VOCs and TPH. Table 7.3-3 presents the results of the detected organic chemicals. Figure 7.3-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Radionuclides were not analyzed at SWMU 53-001(b).

7.3.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was detected above the Qbt 3 BV (0.5 mg/kg) in one sample (4.19 mg/kg) at location 53-612482 from 0–1 ft bgs. Concentrations of antimony decreased with depth and decreased downgradient. The lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in one sample (47.4 mg/kg) at location 53-612482 from 0–1 ft bgs. Concentrations of barium decreased with depth at this location and the detected concentration was below the maximum Qbt 3 background concentration (51.6 mg/kg). The lateral and vertical extent of barium are defined.

Cadmium was detected above the soil BV (0.4 mg/kg) in two samples at two locations and above the Qbt 3 BV (1.63 mg/kg) in one sample at location 53-612482. The maximum concentration (1.67 mg/kg) was detected at location 53-612482 from 0–1 ft bgs. The detected concentrations of cadmium at locations 53-01055 and 53-01056 were below the maximum background soil concentration (2.6 mg/kg). Concentrations of cadmium decreased with depth at locations 53-612482 and 53-01055 and decreased downgradient. The lateral and vertical extent of cadmium are defined.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in two samples at two locations. The maximum concentration (17.2 mg/kg) was detected at location 53-612482 from 0–1 ft bgs. Concentrations of chromium decreased with depth at both locations and decreased downgradient. The lateral and vertical extent of chromium are defined.

Copper was detected above the soil BV (14.7 mg/kg) in one sample at location 53-01055 and above the Qbt 3 BV (4.66 mg/kg) in two samples at two locations. The maximum concentration (41 mg/kg) was detected at location 53-612482 from 0–1 ft bgs. Concentrations of copper decreased with depth at all three locations and decreased downgradient. The lateral and vertical extent of copper are defined.

Lead was detected above the soil BV (22.3 mg/kg) in one sample at location 53-01055 and above the Qbt 3 BV (11.2 mg/kg) in two samples at two locations. The maximum concentration (71.1 mg/kg) was detected at location 53-612482 from 0–1 ft bgs. Concentrations of lead decreased with depth at all three locations and decreased downgradient. The lateral and vertical extent of lead are defined.

Mercury was not detected above BV but had DLs (0.23 mg/kg to 0.25 mg/kg) above the soil BV (0.1 mg/kg). Because mercury was not detected above the BV, the lateral and vertical extent of mercury are defined.

Selenium was not detected above BV but had DLs (0.959 mg/kg to 1.34 mg/kg) above the tuff BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Silver was detected above the Qbt 3 BV (1.0 mg/kg) in one sample (1.7 mg/kg) at location 53-612482 from 0–1 ft bgs. The concentration of silver decreased with depth and decreased downgradient, and the detected concentration of silver was below the maximum Qbt 3 background concentration (1.9 mg/kg). The lateral and vertical extent of silver are defined.

Zinc was detected above the soil BV (48.8 mg/kg) in two samples at two locations and above the Qbt 3 BV (63.5 mg/kg) in one sample at location 53-612482. The maximum concentration (148 mg/kg) was detected at location 53-612482 from 0–1 ft bgs. Concentrations of zinc decreased with depth at locations 53-01055 and 53-612482, and the detected concentration was below the maximum soil background concentration (75.5 mg/kg) at location 53-01056. Concentrations of zinc decreased downgradient. The lateral and vertical extent of zinc are defined.

Organic Chemicals

Aroclor-1254 and Aroclor-1260 were each detected in four tuff samples at locations 53-612481 and 53-612482. Concentrations of Aroclor-1254 and Aroclor-1260 decreased with depth at both locations and decreased downgradient. The lateral and vertical extent of Aroclor-1254 and Aroclor-1260 are defined.

TPH was detected in three soil samples from three locations collected during the 1995 RFI. Because there are potential sources for TPH contamination other than the wastes stored at SWMU 53-001(b) (e.g., parking lot runoff), the approved investigation work plan did not propose analysis of samples for TPH (LANL 2009, 106660.14; NMED 2009, 106703). The 2010 analytical suites (TAL metals and PCBs) were deemed to be better indicators of contaminant releases from SWMU 53-001(b). Because the approved investigation work plan did not propose analysis of any samples for TPH, the extent of TPH was not evaluated.

Radionuclides

Radionuclides were not analyzed at SWMU 53-001(b).

Summary of Nature and Extent

The lateral and vertical extent of all COPCs are defined at SWMU 53-001(b).

7.3.5 Summary of Human Health Risk Screening

Details of the human health risk-screening assessment for SWMU 53-001(b) are discussed in Appendix I.

The total excess cancer risk for the industrial scenario is 3×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 0.1, which is below the NMED target HI of 1 (NMED 2009, 108070).

The total excess cancer risk for the construction worker scenario is 1×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 0.3, which is below the NMED target HI of 1 (NMED 2009, 108070).

The total excess cancer risk for the residential scenario is approximately 5×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is approximately 1, which is equivalent to the NMED target HI of 1 (NMED 2009, 108070).

Based on the risk-screening assessment results, no potential unacceptable risks from COPCs exist for the industrial, construction worker, and residential scenarios.

7.3.6 Summary of Ecological Risk Screening

Details of the ecological risk-screening assessment are presented in Appendix I. No potential unacceptable ecological risk was found for any receptor following evaluations based on minimum ESL, HI analyses, comparison with background concentrations, potential effects to populations (individuals for threatened and endangered [T&E] species), and LOAEL analyses.

7.4 SWMU 53-005, Former Waste Disposal Pit

7.4.1 Site Description and Operation History

SWMU 53-005 is an inactive disposal pit located southeast of the TA-53 equipment test laboratory (building 53-2) (Figure 7.4-1). This pit measured approximately 8 ft × 8 ft × 6 ft deep and was excavated directly into the tuff. The pit was constructed in approximately 1970 and used until 1986. Historical engineering drawings indicate that solvent wastes (TCE and Freon) and acidic wastes were piped from the building 53-2 equipment test laboratory to the pit (LASL 1971, 023260). Other wastes may also have been dumped into the pit.

The 1986 working draft of the Comprehensive Environmental Assessment and Response Program report describes the pit as being full of a thick brownish liquid and notes the presence of a metal grate over the pit (DOE 1986, 008657, p. TA53-3). The 1990 SWMU report states that the pit contents were removed in 1986 and the sides of the pit scraped clean. The contents of the pit were sampled during the 1986 removal, but sampling data were not reported and could not be located. The 1990 SWMU report also notes that the liquid in the pit contained 4–5 ppm PCBs (LANL 1990, 007514). Equipment maintained in building 53-2 and the wastes discharged to the pit may also have contained radioactive activation products. The reported location of the disposal pit is currently vegetated and undeveloped.

7.4.2 Relationship to Other SWMUs and AOCs

SWMU 53-005 is located approximately 250 ft southeast of AOC 53-012(e), 150 ft southeast of SWMU 53-001(b), and 250 ft south of SWMU 53-001(a). No SWMUs or AOCs are associated with SWMU 53-005.

7.4.3 Summary of Previous Investigations

A Phase I RFI was conducted at the disposal pit during 1995 (LANL 1996, 054466). A reconnaissance-type geophysical survey was conducted at the general location of the pit to identify sampling locations. The location of the pit was not found. Additional historical research was conducted to better identify the location of the pit. The RFI report notes an expanded geophysical survey was conducted, and the location of the pit was identified (LANL 1996, 054466, p. 5-57). The location of the pit was not documented in the RFI report, however, and associated documentation cannot be located.

No previous decision-level data exist for this site.

7.4.4 Site Contamination

7.4.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 53-005:

- A geophysical survey was conducted at SWMU 53-005 during the 2010 investigation and indicated the presence of a former excavation and nonnative materials (Appendix C).
- Ten samples were collected from four locations at SWMU 53-005 with depths ranging from 2–16 ft bgs. All samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, PCBs, SVOCs, VOCs, and gamma-emitting radionuclides.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at SWMU 53-005 are shown in Figure 7.4-1. Table 7.4-1 presents the samples collected and analyses requested for SWMU 53-005. The geodetic coordinates of sampling locations are presented in Table 3.2-1.

7.4.4.2 Soil and Rock Sample Field-Screening Results

Organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores (maximum 25.1 ppm). No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results. This was a deviation from the approved work plan, which stated that field screening for VOCs would be used to guide the depth of boreholes (see deviations in Appendix B).

7.4.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 53-005 consist of results from 10 tuff samples collected from four locations.

Inorganic Chemicals

Ten tuff samples were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 7.4-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 7.4-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Ten tuff samples were analyzed for PCBs, SVOCs, and VOCs. Table 7.4-3 presents the results of the detected organic chemicals. Figure 7.4-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Ten tuff samples were analyzed for gamma-emitting radionuclides. Table 7.4-4 presents the radionuclides detected or detected above BVs/FVs. Figure 7.4-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

7.4.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was detected above the Qbt 3 BV (0.5 mg/kg) in three samples at location 53-612484. The maximum concentration (1.73 mg/kg) was detected from 14–15 ft bgs. Concentrations of antimony increased with depth at this location and increased downgradient. The lateral and vertical extent of antimony are not defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in two samples at location 53-612486. The maximum concentration (53.8 mg/kg) was detected from 0–1 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-10 and Table H-6). The lateral and vertical extent of barium are defined.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in eight samples at four locations. The maximum concentration (86.5 mg/kg) was detected at location 53-612484 from 14–15 ft bgs. Concentrations of chromium increased with depth at all four locations and increased downgradient at location 53-612484. The detected concentration of chromium at location 53-612486 was below the maximum Qbt 3 background concentration (13 mg/kg). The lateral extent of chromium is not defined. The vertical extent of chromium is not defined at locations 53-612483, 53-612484, and 53-612485.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in nine samples at four locations. The maximum concentration (23.8 mg/kg) was detected at location 53-612486 from 0–1 ft bgs. Concentrations of copper decreased with depth at all four locations and decreased downgradient. The lateral and vertical extent of copper are defined.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in two samples at two locations. The maximum concentration (13.8 mg/kg) was detected at location 53-612484 from 0–1 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-11 and Table H-6). The lateral and vertical extent of lead are defined.

Nickel was detected above the Qbt 3 BV (6.58 mg/kg) in four samples at two locations. The maximum concentration (9.56 mg/kg) was detected at location 53-612484 from 5–6 ft bgs. Concentrations of nickel decreased with depth at both locations but increased downgradient at location 53-612484. The vertical extent of nickel is defined, but the lateral extent is not defined.

Nitrate was detected in four samples at three locations. The detected concentrations of nitrate (maximum 1.58 mg/kg) likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in two samples at location 53-612485. Concentrations of perchlorate decreased with depth, and the detected concentrations of perchlorate were below the EQL. The lateral and vertical extent of perchlorate are defined.

Selenium was not detected above BV but had DLs (0.927 mg/kg to 1.15 mg/kg) above the tuff BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Organic Chemicals

Acetone was detected in four samples at three locations. The maximum concentration (0.0709 mg/kg) was detected at location 53-612484 from 14–15 ft bgs. Concentrations of acetone increased with depth at location 53-612484 and decreased with depth at location 53-612483. The detected concentration of acetone at location 53-612485 was below the EQL. Concentrations of acetone increased downgradient. The lateral and vertical extent of acetone are not defined.

Aroclor-1254 was detected in two samples at location 53-612484. The maximum concentration (0.0713 mg/kg) was detected from 14–15 ft bgs. Concentrations of Aroclor-1254 increased with depth at this location and increased downgradient. The lateral and vertical extent of Aroclor-1254 are not defined.

Aroclor-1260 was detected in two samples at location 53-612485. Detected concentrations of Aroclor-1260 were below the EQL. The lateral and vertical extent of Aroclor-1260 are defined.

Benzoic acid and bis(2-ethylhexyl)phthalate were each detected in two samples at location 53-612484. The detected concentrations of benzoic acid and bis(2-ethylhexyl)phthalate were below the EQLs. The lateral and vertical extent of benzoic acid and bis(2-ethylhexyl)phthalate are defined.

Butanone[2-] was detected in three samples at two locations. The maximum concentration (0.0199 mg/kg) was detected at location 53-612484 from 14–15 ft bgs. Concentrations of 2-butanone increased with depth at location 53-612484 but decreased with depth at location 53-612483. Concentrations of 2-butanone increased downgradient. The lateral and vertical extent of 2-butanone are not defined.

Butylbenzene[sec-] was detected in one sample (0.0061 mg/kg) at location 53-612484 from 14–15 ft bgs. Concentrations of sec-butylbenzene increased with depth and downgradient. The lateral and vertical extent of sec-butylbenzene are not defined.

Dichloroethene[1,1-] was detected in one sample (0.00324 mg/kg) at location 53-612484 from 2–3 ft bgs. Concentrations of 1,1-dichloroethane decreased with depth at this location and increased downgradient. The vertical extent of dichloroethane[1,1-] is defined, but the lateral extent is not defined.

Isopropylbenzene was detected in one sample (0.01 mg/kg) at location 53-612484 from 2–3 ft bgs. Concentrations of isopropylbenzene decreased with depth at this location and increased downgradient. The vertical extent of isopropylbenzene is defined, but the lateral extent is not defined.

Isopropyltoluene[4-] was detected in two samples at location 53-612484. The maximum concentration (0.0315 mg/kg) was detected at location 53-612484 from 14–15 ft bgs. Concentrations of 4-isopropyltoluene increased with depth at this location and increased downgradient. The lateral and vertical extent of 4-isopropyltoluene are not defined.

Methylene chloride was detected in one sample (0.0024 mg/kg) at location 53-612486 from 0–1 ft bgs. The detected concentration of methylene chloride was below the EQL. The lateral and vertical extent of methylene chloride are defined.

Tetrachloroethene was detected in two samples at location 53-612484. The maximum concentration (0.00115 mg/kg) was detected from 14–15 ft bgs. The detected concentrations of tetrachloroethene were below the EQL. The lateral and vertical extent of tetrachloroethene are defined.

Toluene was detected in one sample (0.00109 mg/kg) at location 53-612484 from 2–3 ft bgs. The detected concentration decreased with depth and was below the EQL. The lateral and vertical extent of toluene are defined.

Trichloroethane[1,1,1-] was detected in two samples at two locations. Concentrations of 1,1,1-trichloroethane decreased with depth at both locations but increased downgradient at location 53-612484. The detected concentration of 1,1,1-trichloroethane at location 53-612486 was below the EQL. The vertical extent of 1,1,1-trichloroethane is defined, but the lateral extent is not defined.

Trichloroethene was detected in three samples at two locations. The maximum concentration (0.0825 mg/kg) was detected at location 53-612484 from 2–3 ft bgs. Concentrations of trichloroethene decreased with depth at both locations but increased downgradient at location 53-612484. The vertical extent of trichloroethene is defined, but the lateral extent is not defined.

Trimethylbenzene[1,2,4-] was detected in four samples at three locations. The maximum concentration (0.0218 mg/kg) was detected at location 53-612484 from 2–3 ft bgs. Concentrations of 1,2,4-trimethylbenzene decreased with depth at locations 53-612484 and 53-612486. The detected concentration of 1,2,4-trimethylbenzene at location 53-612483 was below the EQL. Concentrations of 1,2,4-trimethylbenzene increased downgradient at location 53-612484. The vertical extent of 1,2,4-trimethylbenzene is defined, but the lateral extent is not defined.

Trimethylbenzene[1,3,5-] was detected in one sample (0.128 mg/kg) at location 53-612484 from 14–15 ft bgs. The concentration of 1,3,5-trimethylbenzene increased with depth and increased downgradient. The lateral and vertical extent of 1,3,5-trimethylbenzene are not defined.

Xylene[1,2-] was detected in one sample (0.00286 mg/kg) at location 53-612484 from 14–15 ft bgs. The concentration of 1,2-xylene increased with depth and increased downgradient. The lateral and vertical extent of 1,2-xylene are not defined.

Radionuclides

Cesium-137 was detected in two samples at two locations. The maximum concentration (0.114 pCi/g) was detected at location 53-612483 from 15–16 ft bgs. Concentrations of cesium-137 increased with depth at location 53-612483 but decreased with depth at location 53-612484 and decreased downgradient. The lateral extent of cesium-137 is defined, but the vertical extent is not defined at location 53-612483.

Summary of Nature and Extent

The vertical extent of antimony, chromium, acetone, Aroclor-1254, 2-butanone, sec-butylbenzene, 4-isopropyltoluene, 1,3,5-trimethylbenzene, 1,2-xylene, and cesium-137 is not defined at SWMU 53-005. The lateral extent of antimony, chromium, nickel, acetone, Aroclor-1254, 2-butanone, sec-butylbenzene, 1,1-dichloroethane, isopropylbenzene, 4-isopropyltoluene,1,1,1-trichloroethane, trichloroethene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and 1,2-xylene is not defined at SWMU 53-005.

7.4.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 53-005 because extent is not defined for the site.

7.4.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 53-005 because extent is not defined for the site.

7.5 Consolidated Unit 53-006(b)-99

Consolidated Unit 53-006(b)-99 consists of SWMUs 53-006(b) and 53-006(c), two identical steel underground tanks installed next to each other. The consolidated unit is located west of building 53-3, Sector M, at TA-53 (Figure 7.5-1).

7.5.1 SWMU 53-006(b), Underground Storage Tank

7.5.1.1 Site Description and Operation History

SWMUs 53-006(b) and 53-006(c) are two identical steel underground tanks (structures 53-68 and 53-69, respectively), located west of building 53-3, Sector M (Figure 7.5-1). Each tank is approximately 6 ft in diameter × 12 ft long, with a capacity of approximately 2500 gal. The tanks were installed next to each other and are approximately 18 ft below grade. The tanks were formerly used to store radioactive liquid waste (RLW) generated in building 53-3 during operation of the LANSCE accelerator.

Most of the RLW consisted of tritiated deionized water collected in floor drains along the length of the accelerator tunnel. The tanks received the wastewater from the floor drains and from a sink, shower, and clothes washer in building 53-502 (LANL 1994, 034756, p. 6-12). Waste flowed into the tanks through a buried 4-in.-diameter drainline. Structures 53-68 and 53-69 functioned primarily as holding tanks to allow short-lived activation products to decay before discharging the RLW to the TA-53 surface impoundments [Consolidated Unit 53-002(a)-99]. The tanks were installed in 1973 and operated until 1999 when the new TA-53 RLW system became operational.

In 2000, both tanks were emptied, high-pressure washed, and double-rinsed. The drainlines to the tanks were cut and capped, isolating the tanks. A video camera and light source were placed in the tanks to observe conditions inside the tanks. No cracks, fractures, holes, or other integrity issues were observed (LANL 2001, 070268).

The location of the two tanks is currently within the locked, fenced nuclear facility boundary associated with structure 53-59 [AOC 53-006(a)], an underground tank formerly used to store spent ion-exchange resin. AOC 53-006(a) was approved for NFA by the EPA (2005, 088464) and is regulated by DOE as a Category 2 nuclear facility and nuclear environmental site.

7.5.1.2 Relationship to Other SWMUs and AOCs

SWMU 53-006(b) is located next to SWMU 53-006(c). No other SWMUs or AOCs are associated with SWMU 53-006(b).

7.5.1.3 Summary of Previous Investigations

In March 1999, samples were collected beneath the waste lines connected to the tanks when the lines were exposed, cut, and capped to bypass the tanks and route the RLW lines to the new TA-53 RLW system. Samples were collected at two depths at each of three locations beneath the waste lines and analyzed for VOCs, SVOCs, TAL metals, cyanide, isotopic uranium, isotopic plutonium, strontium-90, tritium, and gamma-emitting radionuclides. The samples collected and analyses requested are presented in the approved work plan (LANL 2009, 106660.14; NMED 2009, 106703).

7.5.1.4 Delayed Investigation Rationale

Delayed investigation of SWMU 53-006(b) is proposed because it is located within the locked, fenced nuclear facility boundary associated with structure 53-59 [AOC 53-006(a)] and is next to an operating facility (structure 53-7). The inspection of the interior of the tank conducted when it was taken out of service indicates previous leakage from the tank was unlikely. The approved investigation work plan proposed delaying site characterization and investigation until the nearby facility is deactivated and the AOC 53-006(a) tank removed (LANL 2009, 106660.14; NMED 2009, 106703). At that time, the site will be investigated to characterize potential contamination beneath the tank, the drainlines connecting the tank to the buildings, and the drainlines connecting the tank to the impoundments.

7.5.2 SWMU 53-006(c), Underground Storage Tank

7.5.2.1 Site Description and Operation History

SWMUs 53-006(b) and 53-006(c) are two identical steel underground tanks (structures 53-68 and 53-69, respectively), located west of building 53-3, Sector M (Figure 7.5-1). The tanks are described together in section 7.5.1.1.

7.5.2.2 Relationship to Other SWMUs and AOCs

SWMU 53-006(c) is located next to SWMU 53-006(b). No other SWMUs or AOCs are associated with SWMU 53-006(c).

7.5.2.3 Summary of Previous Investigations

Previous investigations for SWMUs 53-006(b) and 53-006(c) are discussed in section 7.5.1.3.

7.5.2.4 Delayed Investigation Rationale

Delayed investigation of SWMU 53-006(c) is proposed because it is located within the locked, fenced nuclear facility boundary associated with structure 53-59 [AOC 53-006(a)] and is next to an operating facility [structure 53-7]. The inspection of the interior of the tank conducted when it was taken out of service indicates previous leakage from the tank was unlikely. The approved investigation work plan proposed delaying site characterization and investigation until the nearby facility is deactivated and the AOC 53-006(a) tank removed (LANL 2009, 106660.14; NMED 2009, 106703). At that time, the site will be investigated to characterize potential contamination beneath the tank, the drainlines connecting the tank to the buildings, and the drainlines connecting the tank to the impoundments.

7.6 Consolidated Unit 53-006(d)-99

Consolidated Unit 53-006(b)-99 consists of SWMU 53-006(d) and SWMU 53-006(e), the two compartments of an inactive underground tank. The consolidated unit is located directly south of building 53-622 at TA-53 (Figure 7.6-1).

7.6.1 SWMU 53-006(d), Underground Storage Tank

7.6.1.1 Site Description and Operation History

SWMUs 53-006(d) and 53-006(e) (structures 53-144 and 53-145, respectively) make up the two compartments of an inactive underground tank associated with the RLW system at TA-53 (Figure 7.6-1). This tank, located directly south of building 53-622, measures approximately 20 ft long × 12 ft wide × 10 ft high. The tank is approximately 10 ft below grade and constructed of 1-ft-thick reinforced concrete with a 1-ft-thick reinforced concrete divider wall between the two compartments.

SWMUs 53-006(d) and 53-006(e) were used to store RLW generated in the Weapons Neutron Research facility. Wastes received by these tank compartments included drainage from floor drains in the beam line, target, and experimental areas in building 53-7; drainage from beneath a contaminated deionized water pump stand in building 53-8; drainage from contaminated floor drains and sink drains in building 53-30; drainage from the deionized water system in building 53-30; and discharges from an equipment room floor drain in building 53-368 (LANL 1994, 034756, p. 6-12). A buried 4-in.-diameter waste line conveyed RLW to the tank. The tank compartments were used primarily as holding areas to allow short-lived activation products to decay before RLW was discharged to the TA-53 surface impoundments [Consolidated Unit 53-002(a)-99]. The tank was installed in 1977 and operated until 1999 when the new TA-53 RLW system became operational.

In 2000, both tank compartments were emptied, high-pressure washed, and double-rinsed. The drainlines to the tank were cut and capped, isolating the tank. A video camera and light source were placed in the tank to observe conditions inside the tank. No cracks, fractures, holes, or other integrity issues were observed (LANL 2001, 070268). Facility staff reported that the tanks were backfilled with sand following decontamination. The pumps and piping formerly at the surface have been removed, and the tank is currently located beneath a recent addition to building 53-30 housing experimental equipment and is inaccessible.

7.6.1.2 Relationship to Other SWMUs and AOCs

SWMU 53-006(d) is located next to SWMU 53-006(e). No other SWMUs or AOCs are associated with SWMU 53-006(d).

7.6.1.3 Summary of Previous Investigations

In March 1999, the waste lines connected to the tanks were exposed, cut, and capped to bypass the tanks and reroute the lines to the new TA-53 RLW system. During these activities, samples were collected at two depths at each of two locations beneath the waste lines. Samples were analyzed for VOCs, SVOCs, TAL metals, cyanide, isotopic uranium, isotopic plutonium, strontium-90, tritium, and gamma-emitting radionuclides. The samples collected and analyses requested are presented in the approved work plan (LANL 2009, 106660.14; NMED 2009, 106703).

The nature and vertical extent of contamination have not been defined at this site. However, no investigation activities were proposed at SWMUs 53-006(d) and 53-006(e) in the approved work plan because the site is inaccessible, and it is difficult to conduct intrusive activities in close proximity to an operating facility. Sampling will be delayed until the nearby facilities are deactivated and the tank removed.

7.6.1.4 Delayed Investigation Rationale

Delayed investigation of SWMUs 53-006(d) and 53-006(e) is proposed because they are located next to an operating facility. The inspection of the interior of the tank conducted when it was taken out of service indicates previous leakage from the tank was unlikely. The approved investigation work plan proposed that site characterization and investigation be delayed until the nearby facility is deactivated (LANL 2009, 106660.14; NMED 2009, 106703). At that time, the site will be investigated to characterize potential contamination beneath the tank, the drainlines connecting the tank to the buildings, and the drainlines connecting the tank to the impoundments.

7.6.2 SWMU 53-006(e), Underground Storage Tank

7.6.2.1 Site Description and Operation History

SWMUs 53-006(d) and 53-006(e) (structures 53-144 and 53-145, respectively) make up the two compartments of an inactive underground tank associated with the RLW system at TA-53. The SWMUs are described in section 7.6.1.1.

7.6.2.2 Relationship to Other SWMUs and AOCs

SWMU 53-006(e) is located next to SWMU 53-006(d). No other SWMUs or AOCs are associated with SWMU 53-006(e).

7.6.2.3 Summary of Previous Investigations

Previous investigations at SWMUs 53-006(d) and 53-006(e) are described together in section 7.6.1.3.

7.6.2.4 Delayed investigation Rationale

Delayed investigation of SWMUs 53-006(d) and 53-006(e) is proposed because they are located next to an operating facility. The inspection of the interior of the tank conducted when it was taken out of service indicates previous leakage from the tank was unlikely. The approved investigation work plan proposed that site characterization and investigation be delayed until the nearby facility is deactivated (LANL 2009, 106660.14; NMED 2009, 106703). At that time, the site will be investigated to characterize potential contamination beneath the tank, the drainlines connecting the tank to the buildings, and the drainlines connecting the tank to the impoundments.

7.7 SWMU 53-006(f), Underground Storage Tank

7.7.1 Site Description and Operation History

SWMU 53-006(f) is an inactive 3000-gal. storage tank located beneath the D Wing basement floor of building 53-1, an office and laboratory (Figure 7.7-1). This tank was used from 1972 to 1996 to store neutralized RLW generated in building 53-1 radiochemistry laboratories. The storage tank received treated waste from the wall-mounted neutralization treatment tank [SWMU 53-007(a) discussed in section 7.8.1]. When sufficient wastes accumulated in the storage tank, the contents were removed for further treatment or disposed of by pumping them to a tank truck located on a transfer pad outside the southwest corner of building 53-1. The transfer pad had a spill-collection sump that drained back into the storage tank. The sump drain could be plugged to prevent rain water from entering the RLW system (Santa Fe Engineering Ltd. 1993, 031756; LANL 1994, 034756).

Although the storage tank was intended only to manage radioactive waste, an unintended mercury spill in one of the radiochemistry laboratories in building 53-1 entered the neutralization tank, which drained into this storage tank. As a result, the contents of the storage tank were sampled and found to contain hazardous wastes (LANL 1999, 063459). The contents were subsequently removed, and the storage tank was decontaminated by steam cleaning. The tank was taken out of service in August 1996. The storage tank is currently empty, and all piping into and out of the tank has been cut and capped. The tank is locked and inaccessible, and a spill-containment berm has been placed on the basement floor around the tank entrance to prevent any spills inside the building from entering the tank.

7.7.2 Relationship to Other SWMUs and AOCs

SWMU 53-006(f) is located next to a wall-mounted neutralization treatment tank SWMU 53-007(a). No other SWMUs or AOCs are associated with SWMU 53-006(f).

7.7.3 Summary of Previous Investigations

No previous investigations have been conducted at SWMU 53-006(f).

7.7.4 Site Contamination

7.7.4.1 Soil and Rock Sampling

No investigation activities were proposed at the location of the underground storage tank in the work plan because of limited access to the tank for sampling and the difficulty of conducting intrusive activities within an operating facility. Sampling will be delayed until building 53-1 is reactivated and the tank removed. However, the work plan proposed to collect nine surface and subsurface samples from three sampling locations around the waste transfer pad outside building 53-1.

As part of the 2010 investigation, the following characterization activities were conducted at SWMU 53-006(f):

- Nine samples were collected from three locations around the waste transfer pad at SWMU 53-006(f) with depths ranging from 0–9 ft bgs. All samples were analyzed for TAL metals, nitrate, perchlorate, total cyanide, PCBs, SVOCs, VOCs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at SWMU 53-006(f) are shown in Figure 7.7-1. Table 7.7-1 presents the samples collected and analyses requested for SWMU 53-006(f). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

7.7.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

7.7.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 53-006(f) consist of results from nine tuff samples collected from three locations around the waste transfer pad.

Inorganic Chemicals

Nine tuff samples were analyzed for TAL metals, nitrate, perchlorate, and total cyanide. Table 7.7-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 7.7-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

No investigation activities were conducted at the location of the underground storage tank because of limited access and the difficulty of conducting intrusive activities within an operating facility. Sampling will be delayed until building 53-1 is deactivated and the tank removed. Therefore, the extent of contamination is not defined for the site and inorganic COPCs have not been identified.

Organic Chemicals

Nine tuff samples were analyzed for PCBs, SVOCs, and VOCs. Table 7.7-3 presents the results of the detected organic chemicals. Figure 7.7-3 shows the spatial distribution of detected organic chemicals.

No investigation activities were conducted at the location of the underground storage tank because of limited access and the difficulty of conducting intrusive activities within an operating facility. Sampling will be delayed until building 53-1 is deactivated and the tank is removed. Therefore, the extent of contamination is not defined for the site, and organic COPCs have not been identified.

Radionuclides

Nine tuff samples were analyzed for gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium. Table 7.7-4 presents the radionuclides detected or detected above BVs/FVs. Figure 7.7-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

No investigation activities were conducted at the location of the underground storage tank because of limited access and the difficulty of conducting intrusive activities within an operating facility. Sampling will be delayed building 53-1 is deactivated and the tank removed. Therefore, the extent of contamination is not defined for the site, and radionuclide COPCs have not been identified.

7.7.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Aluminum was detected above the Qbt 3 BV (7340 mg/kg) in three samples at two locations. The maximum concentration (10,400 mg/kg) was detected at location 53-612489 from 8–9 ft bgs.

Concentrations of aluminum increased with depth at both locations and decreased downgradient at locations 53-612487 and 53-612488. The lateral extent of aluminum is defined, but the vertical extent is not defined.

Antimony was not detected above BV but had DLs (1.01 mg/kg to 1.18 mg/kg) above the tuff BV (0.5 mg/kg). Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in seven samples at three locations. The maximum concentration (186 mg/kg) was detected at location 53-612488 from 8–9 ft bgs. Concentrations of barium increased with depth at locations 53-612488 and 53-612489 but decreased with depth at location 53-612487. Concentrations of barium increased downgradient at location 53-612488. The lateral and vertical extent of barium are not defined.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in five samples at three locations. The maximum concentration (6520 mg/kg) was detected at location 53-612488 from 0–1 ft bgs. Concentrations of calcium increased with depth at location 53-612489 but decreased with depth at the two other locations. Concentrations of calcium decreased downgradient in the deeper samples at locations 53-612487 and 53-612488. The lateral extent of calcium is defined, but the vertical extent is not defined.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in four samples at two locations. The maximum concentration (10.8 mg/kg) was detected at location 53-612488 from 8–9 ft bgs. Concentrations of chromium were below the maximum Qbt 3 background concentration (13 mg/kg). The lateral and vertical extent of chromium are defined.

Cobalt was detected above the Qbt 3 BV (3.14 mg/kg) in three samples at two locations. The maximum concentration (8.06 mg/kg) was detected at location 53-612488 from 8–9 ft bgs. Concentrations of cobalt increased with depth at both locations and increased downgradient at location 53-612488. The lateral and vertical extent of cobalt are not defined.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in six samples at three locations. The maximum concentration (8.66 mg/kg) was detected at location 53-612489 from 8–9 ft bgs. Concentrations of copper increased with depth at locations 53-612488 and 53-612489 and decreased downgradient at locations 53-612487 and 53-612488. The detected concentration of copper at location 53-612487 was below the maximum Qbt 3 background concentration (6.2 mg/kg). The lateral extent of copper is defined, but the vertical extent is not defined.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in four samples at three locations. The maximum concentration (14 mg/kg) was detected at location 53-612488 from 8–9 ft bgs. Concentrations of lead were below the maximum Qbt 3 background concentration (15.5 mg/kg). The lateral and vertical extent of lead are defined.

Magnesium was detected above the Qbt 3 BV (1690 mg/kg) in four samples at two locations. The maximum concentration (2360 mg/kg) was detected at location 53-612489 from 8–9 ft bgs. Concentrations of magnesium were below the maximum Qbt 3 background concentration (2820 mg/kg). The lateral and vertical extent of magnesium are defined.

Manganese was detected above the Qbt 3 BV (482 mg/kg) in one sample (548 mg/kg) at location 53-612488 from 8–9 ft bgs. The concentration of manganese was below the maximum Qbt 3 background concentration (752 mg/kg). The lateral and vertical extent of manganese are defined.

Nickel was detected above the Qbt 3 BV (6.58 mg/kg) in three samples at three locations. The maximum concentration (8.46 mg/kg) was detected at location 53-612488 from 8–9 ft bgs. Concentrations of nickel increased with depth at all three locations and increased downgradient at location 53-612488. The lateral and vertical extent of nickel are not defined.

Nitrate was detected in seven samples at three locations. The detected concentrations of nitrate (maximum 13 mg/kg) likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in one sample (0.000769 mg/kg) at location 53-612487 from 8–9 ft bgs. The detected concentration of perchlorate was below the EQL. The lateral and vertical extent of perchlorate are defined.

Selenium was not detected above BV but had DLs (1.02 mg/kg to 1.17 mg/kg) above the tuff BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Vanadium was detected above the Qbt 3 BV (17 mg/kg) in three samples at two locations. The maximum concentration (29.6 mg/kg) was detected at location 53-612488 from 8–9 ft bgs. Concentrations of vanadium increased with depth at both locations and increased downgradient at location 53-612488. The lateral and vertical extent of vanadium are not defined.

Organic Chemicals

Aroclor-1254 was detected in four samples at three locations. The maximum concentration (0.0735 mg/kg) was detected at location 53-612489 from 0–1 ft bgs. Concentrations of Aroclor-1254 decreased with depth at all three locations and decreased downgradient. The lateral and vertical extent of Aroclor-1254 are defined.

Aroclor-1260 was detected in five samples at three locations. The maximum concentration (0.0663 mg/kg) was detected at location 53-612489 from 0–1 ft bgs. Concentrations of Aroclor-1260 decreased with depth at all three locations and decreased downgradient. The lateral and vertical extent of Aroclor-1260 are defined.

Diethylphthalate was detected in one sample (0.103 mg/kg) at location 53-612489 from 2–3 ft bgs. The detected concentration decreased with depth and was below the EQL. The lateral and vertical extent of diethylphthalate are defined.

Radionuclides

Tritium was detected in five samples at three locations. The maximum concentration (0.0581442 pCi/g) was detected at location 53-612488 from 8–9 ft bgs. The concentration of tritium increased with depth at all three locations and decreased or did not change downgradient. The lateral extent of tritium is defined, but the vertical extent is not defined.

Summary of Nature and Extent

The vertical extent of aluminum, barium, calcium, cobalt, copper, nickel, vanadium, and tritium is not defined around the waste transfer pad at SWMU 53-006(f). The lateral extent of barium, cobalt, nickel, and vanadium is not defined around the waste transfer pad at SWMU 53-006(f). The lateral and vertical extent of organic chemicals are defined around the waste transfer pad at SWMU 53-006(f).

7.7.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 53-006(f) because extent is not defined for the site.

7.7.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 53-006(f) because extent is not defined for the site.

7.7.7 Delayed Site Investigation Rationale

Delayed investigation is proposed for SWMU 53-006(f). Removing the inactive tank and collecting confirmation samples are not feasible because the tank is located beneath the D Wing basement floor of building 53-1, an active office and laboratory. The inspection of the interior of the tank conducted when it was taken out of service indicates previous leakage from the tank was unlikely. The approved investigation work plan proposed that remaining site characterization and investigation be delayed until deactivation of building 53-1 (LANL 2009, 106660.14; NMED 2009, 106703).

Although extent of contamination around the waste transfer pad at SWMU 53-006(f) was not defined during the 2010 investigation, collection of additional samples will be delayed until after D&D of building 53-1 and the waste transfer pad. All concentrations detected around the waste transfer pad were significantly below the residential SSLs for inorganic chemicals and the residential SAL for tritium. Based on the 2010 investigation results, no additional characterization sampling is required around the waste transfer pad until it is removed.

7.8 SWMU 53-007(a), Aboveground Treatment Tank

7.8.1 Site Description and Operation History

SWMU 53-007(a) is an inactive 50-gal. aboveground tank mounted on a wall in the D Wing basement of building 53-1 at TA-53 (Figure 7.8-1). This tank was used from 1972 to 1996 to neutralize RLW generated in the radiochemistry laboratories in building 53-1. The sources of these wastes were cup drains, an emergency eye wash/shower drain, and a floor sink drain. The wastes were collected in the tank, where they were neutralized with sodium hydroxide. After neutralization, the treated wastes were drained to an underground tank located beneath the basement floor [SWMU 53-006(f)]. The neutralization tank was intended only to manage radioactive waste.

However, a 1990 RCRA inspection by NMED identified the potential for SWMU 53-007(a) to have received mercury from an unintentional spill in one of the radiochemistry laboratories in building 53-1. As a result, the contents of the neutralization tank were sampled and found to contain hazardous wastes (LANL 1999, 063459). The contents were subsequently removed, and the tank was decontaminated by steam-cleaning. The neutralization tank is currently empty and all piping in and out of the tank has been cut and capped.

7.8.2 Relationship to Other SWMUs and AOCs

SWMU 53-007(a) is located next to the storage tank, SWMU 53-006(f).

7.8.3 Summary of Previous Investigations

No previous investigations have been conducted at SWMU 53-007(a), and no analytical results are available for this site.

7.8.4 Delayed Investigation Rationale

Delayed investigation is proposed for SWMU 53-007(a). Removing the inactive tank and collecting confirmation samples are not feasible because the tank is located in the basement of building 53-1, an active office and laboratory. The approved investigation work plan proposed that remaining site characterization and investigation be delayed until deactivation of building 53-1 (LANL 2009, 106660.14; NMED 2009, 106703). At that time, the site will be investigated to characterize potential contamination resulting from releases from the tank and the drainlines connecting the tank to the radiochemistry laboratories and the storage tank.

7.9 AOC 53-008, Storage Area

7.9.1 Site Description and Operation History

AOC 53-008 is an unpaved open area (referred to as a “boneyard”) used to store used materials and equipment associated with experiments conducted at TA-53. This storage area, approximately 3 to 4 acres in size, is irregularly shaped, and located east and south of the former TA-53 surface impoundments [Consolidated Unit 53-002(a)-99] (Figure 7.9-1). Most of the storage area is vegetated with grasses, shrubs, and juniper trees, and several dirt trails also run through it. Materials shown to be present at the site in 1989 photographs include vacuum pumps, metal ducting, concrete shielding blocks, empty overpack drums, and drums containing steel bearings (LANL 1989, 020616; LANL 1989, 020615; LANL 1989, 020614).

This site was inspected in September 1993 during preparation of the RFI work plan and was found to contain shielding blocks (magnetite concrete and steel), concrete, steel, other metallic debris, and other miscellaneous items. No hazardous materials or chemicals were observed, with the exception of lead stored in a shed (structure 53-621) at the south end of the site (LANL 1994, 034756, p. 5-44).

This area has been used for storage from approximately 1972 to the present. Currently, much of the material previously stored at the site has been removed.

7.9.2 Relationship to Other SWMUs and AOCs

AOC 53-008 overlaps SWMU 53-015, a wastewater treatment facility, within the north section of the AOC boundary. No other SWMUs or AOCs are associated with AOC 53-008.

7.9.3 Summary of Previous Investigations

A Phase I RFI was conducted at AOC 53-008 during 1995 to determine whether contaminants were present at the site (LANL 1996, 054466). The Phase I RFI included conducting a radiation survey of the site and collecting 11 surface samples (0.0–0.5 ft) at locations determined by the results of the radiation survey (LANL 1997, 056384). All samples were submitted for laboratory analysis of TAL metals and gamma-emitting radionuclides. In 1998, three additional surface samples (0.0–0.2 ft) were collected within the boundary of AOC 53-008 at the location of the proposed new TA-53 Radioactive Liquid Waste Treatment Facility (RLWTF) and analyzed for TAL metals, gross-alpha and -beta radioactivity, and gamma-emitting radionuclides.

Decision-level data from the 1995 RFI are presented and discussed in the approved work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site. The work plan proposed to collect 34 samples from 17 locations, including the 10 locations sampled during the 1995 RFI. The data from 2010 samples replaced all the RFI results. Table 7.9-1 presents the samples collected and analyses requested for AOC 53-008.

7.9.4 Site Contamination

7.9.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at AOC 53-008:

- Thirty-four samples were collected from 17 locations at AOC 53-008 with depths ranging from 0–3 ft bgs. All samples were analyzed for TAL metals, total cyanide, PCBs, SVOCs, VOCs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and tritum.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at AOC 53-008 are shown in Figure 7.9-1. Table 7.9-1 presents the samples collected and analyses requested for AOC 53-008. The geodetic coordinates of sampling locations are presented in Table 3.2-1.

7.9.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

7.9.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 53-008 consist of results from 34 tuff samples collected from 17 locations.

Inorganic Chemicals

Thirty-four tuff samples were analyzed for TAL metals and total cyanide. Table 7.9-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 7.9-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Thirty-four tuff samples were analyzed for PCBs, SVOCs, and VOCs. Table 7.9-3 presents the results of the detected organic chemicals. Figure 7.9-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Thirty-four tuff samples were analyzed for gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and tritium. Table 7.9-4 presents the radionuclides detected or detected above BVs/FVs. Figure 7.9-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

7.9.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Aluminum was detected above the Qbt 3 BV (7340 mg/kg) in one sample (9160 mg/kg) at location 53-612508 from 2–3 ft bgs. Concentrations of aluminum increased with depth but decreased downgradient. The lateral extent of aluminum is defined, but the vertical extent is not defined at location 53-612508.

Antimony was detected above the Qbt 3 BV (0.5 mg/kg) in one sample (3.08 mg/kg) at location 53-612513 from 2–3 ft bgs. Concentrations of antimony increased with depth but decreased downgradient. The lateral extent of antimony is defined, but the vertical extent is not defined at location 53-612513.

Arsenic was detected above the Qbt 3 BV (2.79 mg/kg) in one sample (5.6 mg/kg) at location 53-612523 from 2–3 ft bgs. Concentrations of arsenic increased with depth. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of arsenic is defined, but the vertical extent is not defined at location 53-612523.

Barium was detected above the Qbt 3 BV (46 mg/kg) in 20 samples at 16 locations. The maximum concentration (184 mg/kg) was detected at location 53-612523 from 2–3 ft bgs. Concentrations of barium increased with depth at six locations and did not change substantially with depth at location 53-612508. Concentrations of barium decreased with depth at the other nine locations. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of barium is defined, but the vertical extent is not defined at six locations.

Beryllium was detected above the Qbt 3 BV (1.21 mg/kg) in one sample (1.35 mg/kg) at location 53-612523 from 2–3 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-12 and Table H-7). The lateral and vertical extent of beryllium are defined.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in 17 samples at 12 locations. The maximum concentration (24,800 mg/kg) was detected at location 53-612523 from 2–3 ft bgs. Concentrations of calcium increased with depth at nine locations but decreased with depth at the other three locations. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of calcium is defined, but the vertical extent is not defined at nine locations.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in 12 samples at 11 locations. The maximum concentration (150 mg/kg) was detected at location 53-612513 from 2–3 ft bgs. Concentrations of chromium increased with depth at eight locations but decreased with depth at the other three locations. The detected concentrations of chromium at locations 53-612508, 53-612510, 53-612511, 53-612512, and 53-612523 were below the maximum Qbt 3 background concentration (13 mg/kg). Concentrations of chromium decreased downgradient. The lateral extent of chromium is defined, but the vertical extent is not defined at locations 53-612509, 53-612513, 53-612516, and 53-612517.

Cobalt was detected above the Qbt 3 BV (3.14 mg/kg) in four samples at four locations. The maximum concentration (3.61 mg/kg) was detected at location 53-612519 from 0–1 ft bgs. Concentrations of cobalt increased with depth at location 53-612523. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of cobalt is defined, but the vertical extent is not defined at location 53-612523.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in 13 samples at 11 locations. The maximum concentration (6.52 mg/kg) was detected at location 53-612523 from 2–3 ft bgs. Concentrations of copper increased with depth at three locations but decreased with depth at the other eight locations. At locations 53-612515 and 53-612516, the detected concentrations of copper were below the maximum Qbt 3 background concentration (6.2 mg/kg). The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of copper is defined, but the vertical extent is not defined at location 53-612523.

Total cyanide was detected above the Qbt 3 BV (0.5 mg/kg) in three samples at three locations. The maximum concentration of 14.9 mg/kg was detected at location 53-612519 from 2–3 ft bgs. The concentration of total cyanide increased with depth at location 53-612516 but decreased with depth at the other two locations. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of total cyanide is defined, but the vertical extent is not defined at location 53-612516.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in 11 samples at 11 locations. The maximum concentration of 26.2 mg/kg was detected at location 53-612523 from 2–3 ft bgs. The concentration of lead increased with depth at two locations but decreased with depth at the other nine locations. Detected concentrations of lead were below the maximum Qbt 3 background concentration (15.5 mg/kg), except at location 53-612523. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of lead is defined, but the vertical extent is not defined at location 53-612523.

Magnesium was detected above the Qbt 3 BV (1690 mg/kg) in two samples at two locations. The maximum concentration of 3720 mg/kg was detected at location 53-612523 from 2–3 ft bgs. The concentration of magnesium increased with depth at both locations. The detected concentration of magnesium was below the maximum Qbt 3 background concentration (2820 mg/kg) at location 53-612508. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of magnesium is defined, but the vertical extent is not defined at location 53-612523.

Mercury was detected at the Qbt 3 BV (0.1 mg/kg) in one sample (0.11 mg/kg) at location 53-612523 from 2–3 ft bgs. The detected concentration is similar to the BV. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral and vertical extent of mercury are defined.

Nickel was detected above the Qbt 3 BV (6.58 mg/kg) in eight samples at eight locations. The maximum concentration of 18 mg/kg was detected at location 53-612516 from 2–3 ft bgs. The concentration of nickel increased with depth at five locations but decreased with depth at the three other locations. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of nickel is defined, but the vertical extent is not defined at locations 53-612509, 53-612513, 53-612516, 53-612517, and 53-612523.

Selenium was detected above the Qbt 3 (0.3 mg/kg) in two subsurface samples at two locations. The maximum concentration of 1.03 mg/kg was detected at location 53-612523 from 2–3 ft bgs. The concentration of selenium increased with depth at both locations. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of selenium is defined, but the vertical extent is not defined at locations 53-612516 and 53-612523.

Organic Chemicals

Aroclor-1248 was detected in one sample (0.0195 mg/kg) at location 53-612517 from 2–3 ft bgs. Concentrations of Aroclor-1248 increased with depth at this location. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of Aroclor-1248 is defined, but the vertical extent is not defined at location 53-612517.

Aroclor-1254 was detected in one sample (0.0276 mg/kg) at location 53-612517 from 2–3 ft bgs. Concentrations of Aroclor-1254 increased with depth at this location. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of Aroclor-1254 is defined, but the vertical extent is not defined at location 53-612517.

Aroclor-1260 was detected in five samples at four locations. The maximum concentration (0.0917 mg/kg) was detected at location 53-612519 from 0–1 ft bgs. Concentrations of Aroclor-1260 did not change with depth at location 53-612517, and the concentrations were below the EQL. Concentrations decreased with depth at the other three locations. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral and vertical extent of Aroclor-1260 are defined.

Benzoic acid was detected in one sample (0.477 mg/kg) at location 53-612510 from 0–1 ft bgs. The detected concentration of benzoic acid decreased with depth at this location and was below the EQL. The lateral and vertical extent of benzoic acid are defined.

Ethylbenzene was detected in two samples at two locations. The maximum concentration (0.0035 mg/kg) was detected at location 53-612521 from 2–3 ft bgs. Concentrations of ethlybenzene increased with depth at location 53-612521 but decreased with depth at location 53-612523. Ethylbenzene was not detected in samples collected downgradient at AOC 20-003(b) (section 6.6.4.3). The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of ethylbenzene is defined, but the vertical extent is not defined at location 53-612521.

Methylene chloride was detected in six samples at five locations. The maximum concentration (0.00353 mg/kg) was detected at location 53-612507 from 0–1 ft bgs. Detected concentrations of methylene chloride were below the EQL. The lateral and vertical extent of methylene chloride are defined.

Toluene was detected in three samples at three locations. The maximum concentration (0.000623 mg/kg) was detected at location 53-612511 from 0–1 ft bgs. Detected concentrations of toluene were below the EQL. The lateral and vertical extent of toluene are defined.

Xylene[1,3-]+xylene[1,4-] was detected in one surface sample (0.000528 mg/kg) at location 53-612511 from 0–1 ft bgs. Concentrations of 1,3-xylene+1,4-xylene decreased with depth and were below the EQL. The lateral and vertical extent of 1,3-xylene+1,4-xylene are defined.

Radionuclides

Cesium-137 was detected in 13 samples at 13 locations. The maximum concentration (0.607 pCi/g) was detected at location 53-612508 from 0–1 ft bgs. Concentrations of cesium-137 decreased with depth at all locations. Concentrations of cesium-137 decreased downgradient of location 53-612508. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral and vertical extent of cesium-137 are defined.

Cobalt-60 was detected in four samples at four locations. The maximum concentration (0.71 pCi/g) was detected at location 53-612516 from 0–1 ft bgs. The concentration of cobalt-60 increased with depth at location 53-612515 but decreased with depth at the three other locations. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of cobalt-60 is defined, but the vertical extent is not defined at location 53-612515.

Plutonium-239/240 was detected in nine samples at nine locations. The maximum concentration (0.388 pCi/g) was detected at location 53-612514 from 2–3 ft bgs. Concentrations of plutonium-239/240 increased with depth at locations 53-612509 and 53-612514 but decreased with depth at the other seven locations. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of plutonium-239/240 is defined, but the vertical extent is not defined at locations 53-612509 and 53-612514.

Tritium was detected in 20 samples at 13 locations. The maximum concentration (0.715034 pCi/g) was detected at location 53-612517 from 2–3 ft bgs. Concentrations of tritium increased with depth at eight locations and did not change substantially with depth at locations 53-612508 and 53-612522. Concentrations of tritium decreased with depth at the other three locations. The nature and extent of contamination down the main drainage from the site have been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The lateral extent of tritium is defined, but the vertical extent is not defined at 10 locations.

Uranium-235/236 was detected above the Qbt 3 BV (0.09 pCi/g) in two samples at two locations. The concentration was essentially the same at location 53-612520 from 0–1 ft and location 53-612522 from 2–3 ft bgs. The concentrations of uranium-235/236 at both locations are comparable with the Qbt 3 BV. The extent of uranium-235/236 down the main drainage from location 53-612522 has been defined by the sampling performed during cleanup of the adjacent surface impoundments (LANL 2004, 085221, p. 19). The extent of uranium-235/236 downgradient of location 53-612520 is defined by samples collected at AOC 20-003(b) (section 6.6.4.3). The lateral and vertical extent of uranium-235/236 are defined.

Summary of Nature and Extent

The vertical extent of aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, total cyanide, lead, magnesium, nickel, selenium, Aroclor-1248, Aroclor-1254, ethylbenzene, cobalt-60, plutonium-239/240, and tritium is not defined at AOC 53-008.

7.9.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC 53-008 because extent is not defined for the site.

7.9.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC 53-008 because extent is not defined for the site.

7.10 AOC 53-009, Former Storage Area

7.10.1 Site Description and Operation History

AOC 53-009 is an unpaved area where liquid scintillation oil used in experiments conducted at TA-53 was previously stored. This area is located north of the inactive TA-53 surface impoundments [Consolidated Unit 53-002(a)-99] (Figure 7.10-1). The date of operation of the storage area is not known. The 1990 SWMU report describes this storage area as an earth-bermed area containing three aboveground storage tanks (LANL 1990, 007514). The three tanks and an earthen containment berm, which appears to be approximately 2 ft high, are shown in a 1989 photograph (LANL 1989, 020608). This photograph also shows twenty-five 55-gal. drums within the containment berm. Another photograph taken on the same day shows soil staining near one of the tanks (LANL 1989, 020609).

The earthen-bermed area was later replaced with two steel containment structures (former structures 53-1071 and 53-1072), each of which measured 30 ft × 60 ft × 3 ft high. Both containment structures were lined with 0.125-in.-thick butyl rubber to prevent the release of spills. This storage area was inspected in 1993 during preparation of the RFI work plan (LANL 1994, 034756, p. 6-33). At that time, three aboveground tanks, each containing 30,000 gal. liquid scintillation oil, were present in the western containment structure (53-1071). The scintillation liquid was mineral-oil based and contained a small fraction of pseudocumene (1,2,4-trimethylbenzene). In addition, thirty 55-gal. drums were present. The drums also contained liquid scintillation oil. These drums were covered with a canvas tarp. Four empty tanks and one hundred forty-one 55-gal. drums of liquid scintillation oil were present in the eastern containment structure (53-1072). These drums were also covered with a canvas tarp. At the time this area was inspected, no staining was observed. Laboratory facility engineering records state that structure 53-1072 was removed in November 1998, and structure 53-1071 was removed in March 2003 (LANL 2009, 106660.14, p. 38).

7.10.2 Relationship to Other SWMUs and AOCs

AOC 53-009 is located approximately 60 ft west of AOC 53-008. No SWMUs or AOCs are associated with AOC 53-009.

7.10.3 Summary of Previous Investigations

In September 2006, two subsurface samples were collected at the location of structure 53-1071 as part of closeout activities for removal of this structure. Samples were submitted for analysis of VOCs, SVOCs, and TPH–diesel range organics (DRO). TPH-DRO was detected in one sample. No other organic chemicals were detected.

All decision-level data collected during previous investigations are presented and evaluated in section 7.10.4. Table 7.10-1 presents the samples collected and analyses requested for AOC 53-009.

7.10.4 Site Contamination

7.10.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at AOC 53-009:

- Eighteen samples were collected from nine locations at AOC 53-009 with depths ranging from 0–3 ft bgs. All samples were analyzed for TAL metals, PCBs, SVOCs, and VOCs.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The sampling locations at AOC 53-009 are shown in Figure 7.10-1. Table 7.10-1 presents the samples collected and analyses requested for AOC 53-009. The geodetic coordinates of sampling locations are presented in Table 3.2-1.

7.10.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

7.10.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 53-009 consist of results from two fill samples collected from two locations during the 2006 sampling event and 18 tuff samples collected from nine locations during the 2010 investigation.

Inorganic Chemicals

Eighteen tuff samples were analyzed for TAL metals. Table 7.10-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 7.10-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Twenty samples (2 fill and 18 tuff) were analyzed for SVOCs and VOCs. Eighteen tuff samples were analyzed for PCBs. Two fill samples were analyzed for TPH-DRO. Table 7.10-3 presents the results of the detected organic chemicals. Figure 7.10-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Radionuclides were not analyzed at AOC 53-009.

7.10.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was detected above the Qbt 3 BV (0.5 mg/kg) in one sample (0.788 mg/kg) at location 53-612532 from 0–1 ft bgs. Concentrations of antimony decreased with depth and decreased downgradient to location 53-612515 in AOC 53-008 (section 7.9.4.4), where antimony was not detected. The lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in seven samples at six locations. The maximum concentration (250 mg/kg) was detected at location 53-612531 from 0–1 ft bgs. Concentrations of barium increased with depth at location 53-612532 but decreased with depth at the other five locations and decreased downgradient. The lateral extent of barium is defined, but the vertical extent is not defined at location 53-612532.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in nine samples at eight locations. The maximum concentration (20,000 mg/kg) was detected at location 53-612532 from 0–1 ft bgs. Concentrations of calcium decreased with depth at all eight locations and decreased downgradient to location 53-612515 in AOC 53-008 (section 7.9.4.4). The lateral and vertical extent of calcium are defined.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in five samples at four locations. The maximum concentration (14.9 mg/kg) was detected at location 53-612532 from 0–1 ft bgs. Concentrations of chromium decreased with depth at all four locations and decreased downgradient to location 53-612515 in AOC 53-008 (section 7.9.4.4), where chromium not detected above BV. The lateral and vertical extent of chromium are defined.

Cobalt was detected above the Qbt 3 BV (3.14 mg/kg) in five samples at five locations. The maximum concentration (4.24 mg/kg) was detected at location 53-612531 from 0–1 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-13 and Table H-8). The lateral and vertical extent of cobalt are defined.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in five samples at five locations. The maximum concentration (11.8 mg/kg) was detected at location 53-612528 from 0–1 ft bgs. Concentrations of copper decreased with depth at all five locations and decreased downgradient. The lateral and vertical extent of copper are defined.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in four samples at three locations. The maximum concentration (201 mg/kg) was detected at location 53-612532 from 0–1 ft bgs. Concentrations of lead increased with depth at location 53-612527 but decreased with depth at location 53-612532. The detected concentration of lead was below the maximum Qbt 3 background concentration (15.5 mg/kg) at location 53-612526. Concentrations of lead decreased downgradient to location 53-612515 in AOC 53-008 (section 7.9.4.4). The lateral extent of lead is defined, but the vertical extent is not defined at location 53-612527.

Magnesium was detected above the Qbt 3 BV (1690 mg/kg) in four samples at four locations. The maximum concentration (1910 mg/kg) was detected at location 53-612531 from 0–1 ft bgs. Concentrations of magnesium decreased with depth at all four locations and decreased downgradient. The lateral and vertical extent of magnesium are defined.

Nickel was detected above the Qbt 3 BV (6.58 mg/kg) in two samples at two locations. The maximum concentration (9.5 mg/kg) was detected at location 53-612532 from 0–1 ft bgs. Concentrations of nickel decreased with depth at both locations and decreased downgradient to location 53-612515 in AOC 53-008 (section 7.9.4.4), where nickel was not detected above BV. The lateral and vertical extent of nickel are defined.

Selenium was not detected above BV but had DLs (0.959 mg/kg to 1.08 mg/kg) above the tuff BV (0.3 mg/kg). Because it was not detected above BV, the lateral and vertical extent of selenium are defined.

Vanadium was detected above the Qbt 3 BV (17 mg/kg) in seven samples at seven locations. The maximum concentration (36 mg/kg) was detected at location 53-612531 from 0–1 ft bgs. Concentrations of vanadium decreased with depth at all seven locations and decreased downgradient. The lateral and vertical extent of vanadium are defined.

Organic Chemicals

Aroclor-1242 was detected in two subsurface samples at two locations. The maximum concentration (0.0053 mg/kg) was detected at location 53-612529 from 2–3 ft bgs. Concentrations of Aroclor-1242 increased with depth at location 53-612529 and were below the EQL at location 53-612532. Concentrations of Aroclor-1242 decreased downgradient. The lateral extent of Aroclor-1242 is defined, but the vertical extent is not defined at location 53-612529.

Aroclor-1254 was detected in seven samples at six locations. The maximum concentration (0.0292 mg/kg) was detected at location 53-612525 from 0–1 ft bgs. Concentrations of Aroclor-1254 increased with depth at location 53-612529 but decreased with depth at three other locations and decreased downgradient. The detected concentrations of Aroclor-1254 at locations 53-612527 and 53-612531 were below the EQL. The lateral extent of Aroclor-1254 is defined, but the vertical extent is not defined at location 53-612529.

Aroclor-1260 was detected in four samples at four locations. The maximum concentration (0.0109 mg/kg) was detected at location 53-612529 from 2–3 ft bgs. Concentrations of Aroclor-1260 increased with depth at location 53-612527 and 53-612529 but decreased with depth at the other two locations and decreased downgradient. The lateral extent of Aroclor-1260 is defined, but the vertical extent is not defined at locations 53-612527 and 53-612529.

TPH-DRO was detected in one sample (4.35 mg/kg) at location 53-27008 from 1.5–2 ft bgs. TPH-DRO was not detected in adjacent sampling location 53-27007, which was sampled from 2.0–2.5 ft bgs. The lateral and vertical extent of TPH-DRO are defined.

Radionuclides

Radionuclides were not analyzed at AOC 53-009.

Summary of Nature and Extent

The vertical extent of barium, lead, Aroclor-1242, Aroclor-1254, and Aroclor-1260 is not defined at AOC 53-009. The lateral and vertical extent of radionuclides were not evaluated at AOC 53-009.

7.10.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC 53-009 because extent is not defined for the site.

7.10.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC 53-009 because extent is not defined for the site.

7.11 AOC 53-010, Former Storage Area

7.11.1 Site Description and Operation History

AOC 53-010 is a former unpaved storage area used to store scintillation liquid in tanks and drums. This former storage area was located approximately 150 ft southeast of building 53-1031 (Figure 7.11-1). The storage area measured 30 ft × 35 ft and was surrounded by 2-ft-high soil berms. The bottom and sidewalls of the storage area were lined with a reinforced, welded geomembrane that was covered with soil. The 1990 SWMU report notes this site was used in 1989 and 1990 to store scintillation liquid in two 3000-gal. tanks and eighteen 55-gal. drums (LANL 1990, 007514). The scintillation liquid was mineral-oil based and contained a small fraction of pseudocumene (1,2,4-trimethylbenzene). A 1989 photograph shows two tanks labeled “mineral oil” and approximately 12 drums (LANL 1989, 020636).

The tanks and drums were removed in 1990 when the site was closed (LANL 1994, 034756, p. 5-48). Two small areas of stained soil were also removed at that time. The storage area was inspected in 1993 during preparation of the RFI work plan. The cover soil at the top of the berms had been eroded in some places, exposing the membrane liner and causing deterioration. Several circular indentations caused by drum storage were noted in the soil (LANL 1994, 034756, p. 5-48). However, no evidence of staining was noted during the inspection. At present, the site is partially vegetated.

7.11.2 Relationship to Other SWMUs and AOCs

No SWMUs or AOCs are associated with AOC 53-010.

7.11.3 Summary of Previous Investigations

A Phase I RFI was conducted at AOC 53-010 during 1995 (LANL 1996, 054466). The Phase I RFI included collecting six surface samples (0.0–0.2 ft and 0.0–0.3 ft) from above the liner within the bermed area. These samples were submitted for laboratory analysis of SVOCs and TPH (ICF Kaiser Engineers 1995, 056781, p. 1). TPH was detected in all six samples at concentrations ranging from 7.93 mg/kg to 5100 mg/kg. No SVOCs were detected.

Based on the results of the Phase I RFI sampling, a VCA was conducted in 1995 (LANL 1996, 053776) to remove the cover soil from above the membrane liner, remove the membrane liner, inspect the soil beneath the liner for evidence of staining (none was found), collect six confirmation samples of soil from beneath the liner (0.0–0.08 ft and 0.0–0.5 ft), remove the soil berms, and regrade and reseed the site. During the VCA, the 1995 RFI sampling locations, which were all above the membrane liner, were excavated. These results, therefore, are no longer representative of site conditions and are not shown in a figure. No organic chemicals were detected in the VCA confirmation samples (LANL 1996, 053776, pp. 5–6).

Decision-level data from the 1995 RFI and VCA are presented and discussed in the approved work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site. The approved work plan proposed to collect 12 subsurface samples from the six VCA sampling locations. Data from 2010 samples replaced all the VCA confirmation sample results. Table 7.11-1 presents the samples collected and analyses requested for AOC 53-010.

7.11.4 Site Contamination

7.11.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at AOC 53-010:

- Twelve samples were collected six locations at AOC 53-010 with depths ranging from 0–4 ft bgs. All samples were analyzed for TAL metals, PCBs, SVOCs, and VOCs.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at AOC 53-010 are shown in Figure 7.11-1. Table 7.11-1 presents the samples collected and analyses requested for AOC 53-010. The geodetic coordinates of sampling locations are presented in Table 3.2-1.

7.11.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

7.11.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 53-010 consist of results from 12 samples collected from six locations.

Inorganic Chemicals

Twelve samples were analyzed for TAL metals. Table 7.11-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 7.11-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Twelve samples were analyzed for PCBs, SVOCs, and VOCs. Table 7.11-3 presents the results of the detected organic chemicals. Figure 7.11-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Radionuclides were not analyzed at AOC 53-010.

7.11.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was not detected above BV but had DLs (0.935 mg/kg to 1.15 mg/kg) above the tuff BV (0.5 mg/kg). Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 3 BV (46 mg/kg) in nine samples at six locations. The maximum concentration (83.9 mg/kg) was detected at location 53-612535 from 3–4 ft bgs. Concentrations of barium increased with depth at location 53-612535 but decreased with depth at the other five locations. The former storage area was located in a relatively flat area, and concentrations of barium decreased laterally outward from the interior of the former storage area. The lateral extent of barium is defined, but the vertical extent is not defined at location 53-612535.

Calcium was detected above the Qbt 3 BV (2200 mg/kg) in eight samples at four locations. The maximum concentration (45,800 mg/kg) was detected at location 53-612535 from 3–4 ft bgs. Concentrations of calcium increased with depth at all four locations. Concentrations of calcium decreased laterally outward from the interior of the former storage area. The lateral extent of calcium is defined, but the vertical extent is not defined at four locations.

Chromium was detected above the Qbt 3 BV (7.14 mg/kg) in two samples at two locations. The maximum concentration (16.2 mg/kg) was detected at location 53-612535 from 3–4 ft bgs. Concentrations of chromium increased with depth at location 53-612535 but decreased with depth at location 53-612533. Concentrations of chromium decreased laterally outward from the interior of the former storage area. The lateral extent of chromium is defined, but the vertical extent is not defined at location 53-612535.

Cobalt was detected above the Qbt 3 BV (3.14 mg/kg) in five samples at five locations. The maximum concentration (3.89 mg/kg) was detected at location 53-612533 from 3–4 ft bgs. Results of the Wilcoxon and quantile tests indicated site concentrations are not different from background (Figure H-14 and Table H-9). The lateral and vertical extent of cobalt are defined.

Copper was detected above the Qbt 3 BV (4.66 mg/kg) in five samples at five locations. The maximum concentration (5.97 mg/kg) was detected at location 53-612533 from 0–1 ft bgs. Concentrations of copper decreased with depth at all locations and decreased laterally outward from the interior of the former storage area. Detected concentrations were below the maximum Qbt 3 background concentration (6.2 mg/kg). The lateral and vertical extent of copper are defined.

Selenium was not detected above BV but had DLs (0.941–1.15 mg/kg) above the tuff BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Vanadium was detected above the Qbt 3 BV (17 mg/kg) in two surface samples at two locations. The maximum concentration (18.3 mg/kg) was detected at location 53-612533 from 0–1 ft bgs. Concentrations of vanadium decreased with depth at both locations and decreased laterally outward from the interior of the former storage area. Detected concentrations were below the maximum Qbt 3 background concentration (21 mg/kg). The lateral and vertical extent of vanadium are defined.

Organic Chemicals

Aroclor-1254 and Aroclor-1260 were both detected in one sample at location 53-612536. The detected concentrations of Aroclor-1254 (0.0031 mg/kg) and Aroclor-1260 (0.0031 mg/kg) were below the EQLs. The lateral and vertical extent of Aroclor-1254 and Aroclor-1260 are defined.

Benzo(b)fluoranthene was detected in one sample (0.0185 mg/kg) at location 53-612537 from 0–1 ft bgs. The detected concentration of benzo(b)fluoranthene decreased with depth and was below the EQL. The lateral and vertical extent of benzo(b)fluoranthene are defined.

Diethylphthalate was detected in one sample (1.92 mg/kg) at location 53-612535 from 3–4 ft bgs. The concentration of diethylphthalate increased with depth. The former storage area was located in a relatively flat area, and concentrations of diethylphthalate decreased laterally outward from the interior of the former storage area. The lateral extent of diethylphthalate is defined, but the vertical extent is not defined at location 53-612535.

Radionuclides

Radionuclides were not analyzed at AOC 53-010.

Summary of Nature and Extent

The vertical extent of barium, calcium, chromium, and diethylphthalate is not defined at AOC 53-010. The lateral and vertical extent of radionuclides were not evaluated at AOC 53-010.

7.11.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC 53-010 because extent is not defined for the site.

7.11.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC 53-010 because extent is not defined for the site.

7.12 AOC 53-012(e), Drainline and Outfall

7.12.1 Site Description and Operation History

AOC 53-012(e) is a drainline and former outfall associated with the TA-53 equipment test laboratory (building 53-2). The drainline runs southwest under an asphalt parking lot approximately 110 ft from the southwest corner of building 53-2 and then changes direction, running northwest approximately 100 ft to the associated outfall near the edge of Sandia Canyon (Figure 7.12-1). The drainline received discharges from 12 trench drains, 2 sink drains, and a floor drain in building 53-2. The primary source of wastewater was blowdown from the building 53-2 cooling tower, which was discharged to one of the trench drains.

Historically, chemicals added to the cooling water included sodium molybdate and hydroxyethylidene diphosphonic acid as corrosion inhibitors; 1-bromo-3-chloro-5,5-dimethylhydantoin as a microbicide; and sodium bisulfite as an oxygen scavenger. The trench drains also received equipment-flushing and floor-washing wastewater (LANL 1994, 034756, pp. 5-74–5-76). Discharges to this outfall began in approximately 1968, when building 53-2 went into service. This outfall was included in the Laboratory's National Pollutant Discharge Elimination System (NPDES) permit as Outfall 03A114. Discharges to this outfall ceased, and the outfall was removed from the NPDES permit on July 11, 1995. The drainline is still in place, but the outfall has been plugged.

7.12.2 Relationship to Other SWMUs and AOCs

No SWMUs or AOCs are associated with AOC 53-012(e).

7.12.3 Summary of Previous Investigations

A Phase I RFI was conducted at AOC 53-012(e) during 1995 (LANL 1996, 054466). The Phase I RFI included a geomorphic survey conducted downstream of the outfall to identify sediment catchment areas. Surface samples (0.0–0.33 ft or 0.0–0.67 ft) were collected at each of three locations in the sediment catchment areas (LANL 1996, 054466, p. 5-66). Samples were submitted for analysis of TAL metals, VOCs, pesticides/PCBs, and TPH (LANL 1996, 054466, p. 5-67).

All decision-level data collected during previous investigations are presented and evaluated in section 7.12.4. Table 7.12-1 presents the samples collected and analyses requested for AOC 53-012(e).

7.12.4 Site Contamination

7.12.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at AOC 53-012(e):

- Twelve samples were collected from six locations at AOC 53-012(e) with depths ranging from 0–4 ft bgs. All samples were analyzed for TAL metals, total cyanide, PCBs, pesticides, SVOCs, VOCs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and strontium-90.
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The sampling locations at AOC 53-012(e) are shown in Figure 7.12-1. Table 7.12-1 presents the samples collected and analyses requested for AOC 53-012(e). The geodetic coordinates of sampling locations are presented in Table 3.2-1.

7.12.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

7.12.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 53-012(e) consist of results from 3 soil samples collected from three locations during the 1995 RFI and 12 samples (6 soil and 6 tuff) collected from six locations during the 2010 investigation.

Inorganic Chemicals

Fifteen samples (9 soil and 6 tuff) were analyzed for TAL metals and 12 samples (6 soil and 6 tuff) were analyzed for total cyanide. Table 7.12-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 7.12-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. Because the extent of contamination is not defined for the site, inorganic COPCs have not been identified.

Organic Chemicals

Fifteen samples (nine soil and six tuff) were analyzed for VOCs. Twelve samples (six soil and six tuff) were analyzed for PCBs, pesticides, and SVOCs. Three soil samples were analyzed for pesticides/PCBs and TPH. Table 7.12-3 presents the results of the detected organic chemicals. Figure 7.12-3 shows the spatial distribution of detected organic chemicals. Because the extent of contamination is not defined for the site, organic COPCs have not been identified.

Radionuclides

Twelve samples (six soil and six tuff) were analyzed for gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and strontium-90. Table 7.12-4 presents the radionuclides detected or detected above BVs/FVs. Figure 7.12-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs. Because the extent of contamination is not defined for the site, radionuclide COPCs have not been identified.

7.12.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was detected above the soil BV (0.83 mg/kg) in five samples at five locations and above the Qbt 3 BV (0.5 mg/kg) in one sample at location 53-612542. The maximum concentration (2.3 mg/kg) was detected at location 53-01086 from 0.0–0.33 ft bgs. Concentrations of antimony decreased with depth at locations 53-612541 and 53-612542 and decreased downgradient. Locations 53-01086, 53-01087, and 53-01088 were sampled at only one depth, but the concentrations of antimony decreased in deeper samples collected at adjacent locations 53-612540, 53-612544, and 53-612543. The lateral and vertical extent of antimony are defined.

Cadmium was detected above the soil BV (0.4 mg/kg) in four samples at four locations. The maximum concentration (1.2 mg/kg) was detected at locations 53-01086 and 53-01088 from 0.0–0.33 ft bgs. Detected concentrations of cadmium were below the maximum background soil concentration (2.6 mg/kg). The lateral and vertical extent of cadmium are defined.

Chromium was detected above the soil BV (19.3 mg/kg) in one sample (23.5 mg/kg) at location 53-01086 from 0.0–0.33 ft bgs. Location 53-01086 was sampled from only one depth, but chromium was not detected above BV in any other samples collected at AOC 53-012(e), including adjacent location 53-612540. The lateral and vertical extent of chromium are defined.

Copper was detected above the soil BV (14.7 mg/kg) in six samples at six locations and above the Qbt 3 BV (4.66 mg/k) in three subsurface samples at three locations. The maximum concentration (267 mg/kg) was detected at location 53-01086 from 0.0–0.33 ft bgs. Concentrations of copper decreased with depth at all locations. Locations 53-01086, 53-01087, and 53-01088 were sampled at only one depth, but concentrations of copper decreased in deeper samples collected at adjacent locations 53-612540, 53-612544, and 53-612543. Concentrations of copper decreased downgradient. The lateral and vertical extent of copper are defined.

Total cyanide was detected above the soil BV (0.5 mg/kg) in one sample (2.96 mg/kg) at location 53-612544 from 1–2 ft bgs. Concentrations of total cyanide decreased with depth and decreased downgradient. The lateral and vertical extent of total cyanide are defined.

Lead was detected above the soil BV (22.3 mg/kg) in three samples at three locations and above the Qbt 3 BV (11.2 mg/kg) in one sample at location 53-612543. The maximum concentration (38.6 mg/kg) was detected at location 53-01086 from 0.0–0.33 ft bgs. The concentration of lead at location 53-612543 was below the maximum Qbt 3 background concentration (15.5 mg/kg). Concentrations of lead decreased with depth at location 53-612542. Locations 53-01086 and 53-01088 were sampled at only one depth, but lead concentrations decreased in deeper samples collected at adjacent locations 53-612540 and 53-612543. Concentrations of lead decreased downgradient. The lateral and vertical extent of lead are defined.

Mercury was detected above the soil BV (0.1 mg/kg) in one sample (0.27 mg/kg) at location 53-01086 from 0.0–0.33 ft bgs. Location 53-01086 was sampled at only one depth, but concentrations of mercury decreased in the deeper sample collected at adjacent location 53-612540 and decreased downgradient. The lateral and vertical extent of mercury are defined.

Nickel was detected above the soil BV (15.4 mg/kg) in one sample (27 mg/kg) at location 53-01086 from 0.0–0.33 ft bgs. Location 53-01086 was sampled at only one depth, but concentrations of nickel decreased in the deeper sample collected at adjacent location 53-612540 and decreased downgradient. The lateral and vertical extent of nickel are defined.

Selenium was not detected above BV but had DLs (1.02–1.16 mg/kg) above the Qbt 3 BV (0.3 mg/kg). Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Silver was detected above the soil BV (1 mg/kg) in one sample (2.3 mg/kg) at location 53-01086 from 0.0–0.33 ft bgs. Location 53-01086 was sampled at only one depth, but the concentration of silver decreased in the deeper sample collected at adjacent location 53-612540 and decreased downgradient. The lateral and vertical extent of silver are defined.

Thallium was not detected above BV but had DLs (1.5–1.7 mg/kg) above the soil BV (0.73 mg/kg). Because thallium was not detected above the BV, the lateral and vertical extent of thallium are defined.

Zinc was detected above the soil BV (48.8 mg/kg) in five surface samples at five locations. The maximum concentration (218 mg/kg) was detected at location 53-01086 from 0.0–0.33 ft bgs. Concentrations of zinc decreased with depth at locations 53-612542 and 53-612541. Locations 53-01086, 53-01087, and 53-01088 were sampled at only one depth, but zinc was not detected above BV in deeper samples collected at adjacent locations 53-612540, 53-612544, and 53-612543. Concentrations of zinc decreased downgradient. The lateral and vertical extent of zinc are defined.

Organic Chemicals

Aroclor-1248 was detected in three soil samples at three locations. The maximum concentration (0.76 mg/kg) was detected at location 53-01086 from 0.0–0.33 ft bgs. Locations 53-01086, 53-01087, and 53-01088 were sampled at only one depth, but Aroclor-1248 was not detected in deeper samples collected at adjacent locations 53-612540, 53-612544, and 53-612543. Concentrations of Aroclor-1248 decreased downgradient. The lateral and vertical extent of Aroclor-1248 are defined.

Aroclor-1254 was detected in four soil samples and two tuff samples at four locations. The maximum concentration (0.351 mg/kg) was detected at location 53-01086 from 0.0–0.33 ft bgs. Location 53-01086 was sampled at only one depth, but Aroclor-1254 decreased with depth in deeper samples collected at adjacent location 53-612540. Concentrations of Aroclor-1254 decreased with depth at the other three locations and decreased downgradient. The lateral and vertical extent of Aroclor-1254 are defined.

Aroclor-1260 was detected in eight soil samples and four tuff samples at eight locations. The maximum concentration (0.335 mg/kg) was detected at location 53-01088 from 0.0–0.33 ft bgs. Locations 53-01087 and 53-01088 were sampled at only one depth, but concentrations decreased with depth in deeper samples collected at adjacent locations 53-612544 and 53-612543. Concentrations of Aroclor-1260 decreased with depth at the other six locations and decreased downgradient. The lateral and vertical extent of Aroclor-1260 are defined.

Bis(2-ethylhexyl)phthalate was detected in one soil sample (0.223 mg/kg) at location 53-612540 from 0.0–1 ft bgs. Concentrations of bis(2-ethylhexyl)phthalate decreased with depth and decreased downgradient. The lateral and vertical extent of bis(2-ethylhexyl)phthalate are defined.

Chlordane[alpha-] was detected in one soil sample (0.00804 mg/kg) at location 53-01086 from 0.0–0.33 ft bgs. Location 53-01086 was sampled at only one depth, but concentrations of alpha-chlordane decreased in the deeper sample collected at adjacent location 53-612540 and decreased downgradient. The lateral and vertical extent of alpha-chlordane are defined.

Chlordane[gamma-] was detected in one soil sample (0.00376 mg/kg) at location 53-01086 from 0.0–0.33 ft bgs. Location 53-01086 was sampled at only one depth, but concentrations of gamma-chlordane decreased in the deeper sample collected at adjacent location 53-612540 and decreased downgradient. The lateral and vertical extent of gamma-chlordane are defined.

Dieldrin was detected in two soil samples at two locations. The maximum concentration (0.0156 mg/kg) was detected at location 53-01086 from 0.0–0.33 ft bgs. Location 53-01086 was sampled at only one depth, but dieldrin decreased with depth in deeper samples collected at adjacent location 53-612540 and decreased downgradient. The lateral and vertical extent of dieldrin are defined.

Endosulfan II was detected in three soil samples at three locations. The maximum concentration (0.00993 mg/kg) was detected at location 53-01087 from 0.0–0.67 ft bgs. Locations 53-01086, 53-01087, and 53-01088 were sampled at only one depth, but endosulfan II was not detected in deeper samples collected at adjacent locations 53-612540, 53-612544, and 53-612543. Concentrations of endosulfan II decreased downgradient. The lateral and vertical extent of endosulfan II are defined.

Endrin aldehyde was detected in two soil samples at two locations. The maximum concentration (0.00599 mg/kg) was detected at location 53-01088 from 0.0–0.33 ft bgs. Locations 53-01087 and 53-01088 were sampled at only one depth, but endrin aldehyde was not detected in deeper samples collected at adjacent locations 53-612544 and 53-612543. Concentrations of endrin aldehyde decreased downgradient. The lateral and vertical extent of endrin aldehyde are defined.

Ethylbenzene was detected in one sample (0.0014 mg/kg) at location 53-612541 from 3–4 ft bgs. The concentration of ethylbenzene was slightly above the EQL. The lateral and vertical extent of ethylbenzene are defined.

TPH was detected in three soil samples from three locations collected during the 1995 RFI. Because there are potential sources for TPH contamination other than the outfall discharges from AOC 53-012(e) (e.g., parking lot runoff), the approved investigation work plan did not propose to analyze samples for

TPH (LANL 2009, 106660.14; NMED 2009, 106703). The 2010 analytical suites, which include TAL metals, PCBs, SVOCs, VOCs, and radionuclides, were deemed to be better indicators of contaminant releases from AOC 53-012(e). Because the approved investigation work plan did not propose analysis of any samples for TPH, the extent of TPH was not evaluated.

Radionuclides

Cesium-137 was detected above the soil FV (1.65 pCi/g) in one sample at location 53-612543 and was detected in one tuff sample at location 53-612542. The maximum concentration (0.159 pCi/g) was detected at location 53-612543 from 1–2 ft bgs. Concentrations of cesium-137 increased with depth at location 53-612542 but decreased with depth at location 53-612543 and decreased downgradient. The lateral extent of cesium-137 is defined, but the vertical extent is not defined at location 53-612542.

Plutonium-238 was detected above the soil FV (0.023 pCi/g) in one sample (0.027 pCi/g) at location 53-612541 from 0–1 ft bgs. The concentration of plutonium-238 decreased with depth. The lateral and vertical extent of plutonium-238 are defined.

Plutonium-239/240 was detected above the soil FV (0.054 pCi/g) in one sample (0.122 pCi/g) at location 53-612542 from 0–1 ft bgs. Concentrations of plutonium-239/240 decreased with depth and decreased downgradient. The lateral and vertical extent of plutonium-239/240 are defined.

Uranium-235/236 was detected above the Qbt 3 BV (0.09 pCi/g) in two samples at two locations. The maximum activity (0.112 pCi/g) was detected at location 53-612543 from 3–4 ft bgs. Concentrations of uranium-235/236 increased with depth at location 53-61543 but decreased with depth at location 53-612542. At location 53-612542, uranium-235/236 was below BV in the shallow sample, while concentrations were above BV in the deeper samples because of differences in the media-specific BVs (i.e., soil BV is higher than tuff BV). Concentrations of uranium-235/236 decreased downgradient. The lateral extent of uranium-235/236 is defined, but the vertical extent is not defined at location 53-612543.

Uranium-238 was detected above the soil BV (1.93 pCi/g) in one sample (2.31 pCi/g) at location 53-612542 from 0–1 ft bgs. Concentrations of uranium-238 decreased with depth and decreased downgradient. The lateral and vertical extent of uranium-238 are defined.

Summary of Nature and Extent

The vertical extent of cesium-137 and uranium-235/236 is not defined at AOC 53-012(e). The lateral and vertical extent of inorganic and organic chemicals are defined at AOC 53-012(e).

7.12.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC 53-012(e) because extent is not defined for the site.

7.12.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC 53-012(e) because extent is not defined for the site.

7.13 AOC 53-013, Lead Spill Site

7.13.1 Site Description and Operation History

AOC 53-013 is a lead spill site located near the east end of TA-53, northeast of buildings 53-10 and 53-315, which are part of the LANSCE accelerator facility (Figure 7.13-1). Lead shot was present within two fenced areas, approximately 50 ft × 80 ft and 60 ft × 180 ft, used for storage and as staging areas for equipment used in beam experiments. The lead shot was used as radiation shielding for experiments conducted in building 53-10. The shot ranged from 1.5 to 4 mm in diameter and was mixed into the sandy soil present at the site. Previously, some of the shot was visible on the ground surface.

The shot was spilled at the site during assembly of components containing the shot and was also released from defective containers (ICF Kaiser Engineers 1995, 058172, p. 2). The dates the shot was spilled onto the ground surface are not known, but the release could date as far back as the late 1960s or the early 1970s, when accelerator operations began. This site was not originally identified in the 1990 SWMU report (LANL 1990, 007514) but was discovered after the RFI work plan had been prepared (LANL 1994, 034756). Both areas are presently used for storage and staging, are fenced and locked, and the westernmost area is posted as a radiological control area.

7.13.2 Relationship to Other SWMUs and AOCs

No SWMUs or AOCs are associated with AOC 53-013.

7.13.3 Summary of Previous Investigations

In July 1995, a sample of soil containing visible lead shot was collected to characterize the concentrations of lead present. The sample was analyzed for total lead and toxicity characteristic leaching procedure (TCLP) lead using an on-site laboratory. A portion of the sample was sieved to determine the amount of lead in different size fractions. The concentration of lead was 110,000 mg/kg for the total (unsieved) sample; 72,400 mg/kg for the fraction less than 1.7 mm; and 210,200 mg/kg for the fraction between 1.7 mm and 4 mm. The TCLP results were 129 mg/L in the total sample, 168 mg/L for the size fraction less than 1.7 mm, and 155 mg/L for the size fraction between 1.7 mm and 4 mm (ICF Kaiser Engineers 1995, 058172, p. 2).

Soil outside the areas of visible lead contamination was also sampled in 1995 as part of planning activities for a VCA. Ten soil samples for screening were collected inside and outside the storage areas (ICF Kaiser Engineers 1995, 058172, p. 3). These samples were screened for lead using XRF, and lead was detected in one sample collected near the entrance to the southern storage area. No other investigations have been conducted at this site and, although a VCA plan was prepared (ICF Kaiser Engineers 1995, 058172), the VCA was not implemented.

No previous decision-level data exist for this site.

7.13.4 Site Contamination

7.13.4.1 Soil and Rock Sampling

As part of the 2010 investigation, the following characterization activities were conducted at AOC 53-013:

- An XRF survey was conducted at AOC 53-013 during the 2010 investigation and elevated concentrations of lead were identified at eight locations. Soil was excavated to a depth of 0.5 ft at those eight locations (Appendix C). Confirmation samples were collected at depths of 0–1 ft and 2–3 ft bgs after excavation.

- Forty samples were collected from 20 locations at AOC 53-013 from depths of 0–1 ft and 2–3 ft bgs. Samples were analyzed for TAL metals (all 40 samples) and PCBs (12 of the 40 samples).
- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs (Appendix F) and are presented in Table 3.2-2.

The 2010 sampling locations at AOC 53-013 are shown in Figure 7.13-1. Table 7.13-1 presents the samples collected and analyses requested for AOC 53-013. The geodetic coordinates of sampling locations are presented in Table 3.2-1.

7.13.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient air during PID screening of subsurface cores. No radiological-screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the field-screening results.

7.13.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 53-013 consist of results from 40 tuff samples collected from 20 locations.

Inorganic Chemicals

Forty tuff samples were analyzed for TAL metals. Table 7.13-2 presents the results of the inorganic chemicals above BVs and the detected inorganic chemicals that have no BVs. Figure 7.13-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs. The nature and extent of contamination are defined at AOC 53-013; inorganic COPCs are identified below.

Antimony was not detected above BV but had DLs (0.526 mg/kg to 1.1 mg/kg) above the tuff BV (0.5 mg/kg) in 31 samples. The maximum DL (1.1 mg/kg) is above the maximum tuff background concentration (0.4 mg/kg). Antimony is identified as a COPC in tuff.

Arsenic was detected above the Qbt 3 BV (2.7 mg/kg) in one sample (3.1 mg/kg) at location 53-612551 from 0–1 ft bgs. The detected concentration of arsenic was below the maximum Qbt 3 background concentration (5 mg/kg), and results of the quantile test indicated that site concentrations of arsenic are different from background (Figure H-15 and Table H-10). Arsenic is not identified as a COPC in tuff.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in seven samples at six locations. The maximum concentration (35.4 mg/kg) was detected at location 53-612551 from 0–1 ft bgs. Results of the quantile test indicated site concentrations are different from background (Figure H-16 and Table H-10). Lead is identified as a COPC in tuff.

Selenium was not detected above BV but had DLs (0.979–1.11 mg/kg) above the tuff BV (0.3 mg/kg) in 40 samples. The maximum DL (1.11 mg/kg) is above the maximum tuff background concentration (0.105 mg/kg). Selenium is identified as a COPC in tuff.

Organic Chemicals

Twelve tuff samples were analyzed for PCBs. Table 7.13-3 presents the results of the detected organic chemicals. Figure 7.13-3 shows the spatial distribution of detected organic chemicals.

The nature and extent of contamination are defined at AOC 53-013. Organic COPCs are identified below.

Organic chemicals detected in soil and/or tuff at AOC 53-013 are Aroclor-1254 and Aroclor-1260. These organic chemicals are identified as COPCs.

Radionuclides

Radionuclides were not analyzed at AOC 53-013.

7.13.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Antimony was not detected above BV but had DLs (0.526 mg/kg to 1.1 mg/kg) above the tuff BV (0.5 mg/kg) in 31 samples. Because antimony was not detected above the BV, the lateral and vertical extent of antimony are defined.

Arsenic was detected above the Qbt 3 BV (2.7 mg/kg) in one sample (3.1 mg/kg) at location 53-612551 from 0–1 ft bgs. Concentrations of arsenic decreased with depth, and the detected concentration of arsenic was below the maximum Qbt 3 background concentration (5 mg/kg). The lateral and vertical extent of arsenic are defined.

Lead was detected above the Qbt 3 BV (11.2 mg/kg) in seven samples at six locations. The maximum concentration (35.4 mg/kg) was detected at location 53-612551 from 0–1 ft bgs. The concentration of lead at location 53-613168 was below the maximum Qbt 3 background concentration (15.5 mg/kg). Concentrations of lead decreased with depth at the other five locations and decreased downgradient. The lateral and vertical extent of lead are defined.

Selenium was not detected above BV but had DLs (0.979 mg/kg to 1.11 mg/kg) above the tuff BV (0.3 mg/kg) in 40 samples. Because selenium was not detected above the BV, the lateral and vertical extent of selenium are defined.

Organic Chemicals

Aroclor-1254 was detected in three samples at locations 53-612553 and 53-613171. The maximum concentration (0.0624 mg/kg) was detected at location 53-613171 from 0–1 ft bgs. Concentrations decreased with depth and decreased downgradient. The lateral and vertical extent of Aroclor-1254 are defined.

Aroclor-1260 was detected in two samples at location 53-613171. The maximum concentration (0.0074 mg/kg) was detected from 0–1 ft bgs. Concentrations decreased with depth and decreased downgradient. The lateral and vertical extent of Aroclor-1260 are defined.

Radionuclides

Radionuclides were not analyzed at AOC 53-013.

Summary of Nature and Extent

The lateral and vertical extent of all inorganic and organic COPCs are defined at AOC 53-013. The lateral and vertical extent of radionuclides were not evaluated at AOC 53-013.

7.13.5 Summary of Human Health Risk Screening

Details of the human health risk-screening assessment for AOC 53-013 are discussed in Appendix I.

The total excess cancer risk for the industrial scenario is 9×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 0.02, which is below the NMED target HI of 1 (NMED 2009, 108070).

The total excess cancer risk for the construction worker scenario is 1×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 0.03, which is below the NMED target HI of 1 (NMED 2009, 108070).

The total excess cancer risk for the residential scenario is approximately 3×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 0.1, which is below the NMED target HI of 1 (NMED 2009, 108070).

Based on the risk screening assessment results, no potential unacceptable risks from COPCs exist for the industrial, construction worker, and residential scenarios.

7.13.6 Summary of Ecological Risk Screening

Details of the ecological risk-screening assessment are presented in Appendix I. No potential unacceptable ecological risk was found for any receptor following evaluations based on minimum ESL, HI analyses, comparison with background concentrations, potential effects to populations (individuals for T&E species), and LOAEL analyses.

7.14 AOC 53-014, Lead Spill Site

7.14.1 Site Description and Operation History

AOC 53-014, a lead spill site, is located at a paved storage area in TA-53 west of building 53-18 (Figure 7.14-1). Lead shot was spilled on the paved surface, and stormwater washed the lead into an asphalt-lined channel that joins a drainage below an NPDES-permitted outfall (03A113). The lead shot was observed at a number of locations in the channel but was not seen below a large catchment approximately 50 ft below the canyon rim (ICF Kaiser Engineers 1995, 058172, pp. 4–5). This site was not originally identified in the 1990 SWMU report (LANL 1990, 007514) but was discovered only after the RFI work plan for Operable Unit 1100 (LANL 1994, 034756) had been prepared.

7.14.2 Relationship to Other SWMUs and AOCs

No SWMUs or AOCs are associated with AOC 53-014.

7.14.3 Summary of Previous Investigations

In August 1995, sediment in the channel was sampled as part of planning activities for a VCA. Fifteen sediment samples were collected in the drainage below the extent of visible lead contamination (ICF Kaiser Engineers 1995, 058172, p. 5) and screened for lead using XRF.

In 1997, a VCA was conducted at AOC 53-014. The VCA included removing all lead shot from the paved area, the asphalt channel, and the drainage below NPDES Outfall 03A113 (LANL 1997, 062913). To minimize impacts to the drainage, visible lead was picked up by hand, and sediment was sieved to remove lead. After the lead was removed, five surface sediment samples (0.0–0.5 ft) were collected from the drainage as confirmatory samples. These samples were submitted for analysis of lead. Lead was detected slightly above the BV for sediment but less than the maximum background concentration for sediment (25.6 mg/kg) (LANL 1998, 059730) in two samples. The samples collected in 1999 and analyses requested are presented in Table 7.14-1.

All decision-level data collected during previous investigations are presented and evaluated in section 7.14.4. Table 7.14-1 presents the samples collected and analyses requested for AOC 53-014.

7.14.4 Site Contamination

7.14.4.1 Soil and Rock Sampling

No sampling was proposed in the approved work plan because the nature and extent of lead contamination at the site were defined by the VCA confirmation sampling, which showed all results less than BV or the maximum background concentration. No investigation activities were conducted as part of the 2010 investigation at AOC 53-014. The 1997 VCA sampling locations at AOC 53-014 are shown in Figure 7.14-1. Table 7.14-1 presents the samples collected and analyses requested for AOC 53-014. The geodetic coordinates of sampling locations are presented in Table 3.2-1.

7.14.4.2 Soil and Rock Sample Field-Screening Results

No investigation activities were conducted as part of the 2010 investigation at AOC 53-014. Therefore, no field-screening results at AOC 53-013.

7.14.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 53-014 consist of results from five sediment samples collected from five locations during the 1997 VCA.

Inorganic Chemicals

Five sediment samples were analyzed for TAL metals. Table 7.14-2 presents the results of the inorganic chemicals above BVs. Figure 7.14-2 shows the spatial distribution of inorganic chemicals detected above BVs.

Lead was detected above the sediment BV (19.7 mg/kg) in two samples at two locations. Lead concentrations of 20 mg/kg were detected at locations 53-01506 and 53-01507 from 0.0–0.5 ft bgs. The detected concentrations were below the maximum sediment background concentration (25.6 mg/kg). Lead is not identified as a COPC in sediment.

7.14.4.4 Nature and Extent of Soil and Rock Contamination

Because no COPCs were identified at AOC 53-014, the nature and extent of contamination were not evaluated.

7.14.5 Summary of Human Health Risk Screening

No COPCs were identified at AOC 53-014. Therefore, no human health risk screening was performed for the site.

7.14.6 Summary of Ecological Risk Screening

No COPCs were identified at AOC 53-014. Therefore, no ecological risk screening was performed for the site.

7.15 SWMU 53-015, Wastewater Treatment Facility

7.15.1 Site Description and Operation History

SWMU 53-015 is the current RLW management system for TA-53. This system was constructed just east of the former wastewater impoundments [Consolidated Unit 53-002(a)-99] (Figure 7.15-1) to replace the former TA-53 RLW system, which included underground tanks [SWMUs 53-006(b–e)] and a surface impoundment [SWMU 53-002(b)]. This system consists of two lift stations, three 30,000-gal. double-walled tanks in an underground vault, two evaporation basins, and underground double-walled piping. SWMU 53-015 also includes some of the existing underground piping from the former RLW system. The SWMU 53-015 RLW system began operation in October 1999 and therefore was not originally identified in the 1990 SWMU report (LANL 1990, 007514) or in the 1994 RFI work plan (LANL 1994, 034756).

In October 1999, the Laboratory and DOE agreed to notify NMED of the existence of this system as a new SWMU, with the understanding it would not be subject to a compliance schedule for corrective actions in Module VIII of the Laboratory's Hazardous Waste Facility Permit. SWMU 53-015 is listed in Module VIII for tracking purposes only. The Laboratory and DOE agreed with NMED that when this system ceases to operate, it will be evaluated to determine whether releases have occurred (DOE 1999, 098985).

7.15.2 Relationship to Other SWMUs and AOCs

SWMU 53-015 overlaps with the northern section of AOC 53-008. No other SWMUs or AOCs are associated with SWMU 53-015.

7.15.3 Summary of Previous Investigations

No previous investigation has been conducted at SWMU 53-015.

7.15.4 Delayed Investigation Rationale

SWMU 53-015 is listed in Module VIII for tracking purposes only and is not currently subject to corrective actions requirements. The Laboratory and DOE agreed with NMED that when this system ceases to operate, it will be evaluated to determine whether releases have occurred (DOE 1999, 098985; LANL 2009, 106660.14; NMED 2009, 106703).

8.0 TA-72 BACKGROUND AND FIELD INVESTIGATION RESULTS

The Lower Sandia Canyon Aggregate Area contains one site associated with TA-72 that is addressed in this investigation report (Table 1.1-1).

8.1 Background of TA-72

The portion of TA-72 within the Lower Sandia Canyon Aggregate Area consists of the eastern portion of Sandia Canyon within the Laboratory boundary. TA-72 is in the eastern portion of the Laboratory and is bounded by TA-05 and San Ildefonso Pueblo to the south, TA-74 to the north, TA-53 to the west, and Bandelier National Monument to the east (Figure 1.0-1). The majority of TA-72 is vacant land that serves as a safety and security buffer. The primary active operations at TA-72 occur within lower Sandia Canyon and consist of a small-arms firing range used by the Laboratory's security force for training purposes since 1966. In addition, two water supply wells (Pajarito Wells 1 and 3 [PM-1 and PM-3], respectively]), each with associated facilities (chlorinator and pump station), are located within TA-72. The portion of TA-72 within lower Sandia Canyon also encompasses much of the location of former TA-20.

8.1.1 Operational History

TA-72 is an active small-arms firing and training range used by the Laboratory's security force. The firing range is located in Sandia Canyon at the west end of TA-72 and has been operational since 1966. It includes a 175-ft × 250-ft firing range surrounded by earthen berms, an adjacent skeet-shooting range, a tactical training range, and administrative buildings. The drainage channel and flood plain of Sandia Canyon run through the middle of the firing range. Structures at this site include an office building (former guard station 72-8), range house (72-9), scoring area (72-10), firing station (72-11), weapons-cleaning area (72-12), storage buildings (72-13 and 72-14), and canopies 3 and 4 (72-15 and 72-16) (LANL 1990, 007514). Lead is present within the firing range because bullets are scattered at the base of the berms and cliffs, and lead shot from skeet shooting is visible on the ground (LANL 1994, 034756, pp. 2-9, 5-22).

In 1995, as part of a VCA conducted at SWMU 00-016 (an inactive small-arms firing range), NMED concurred with the Laboratory's request to move lead-contaminated soil (in the form of lead bullet casings) to the active AOC 72-001 small-arms firing range (DOE 1995, 046257). During the second phase of the VCA implemented at SWMU 00-016 in 1996 and 1997, lead was removed from soil stockpiled from berms at the former firing range using dry sieving. Approximately 4660 yd^3 of fine soil from SWMU 00-016 was transported to TA-72 and placed on the berms located along the north side of the AOC 72-001 firing range and along the berm that was located between and north of canopies 3 and 4 (LANL 1997, 056737).

8.1.2 Summary of Releases

Potential contaminants at former TA-72 may have been released into the environment through operational releases from a small arms firing range.

8.1.3 Current Site Usage and Status

TA-72 currently is the site of a live firing range used by the Laboratory's security force.

8.2 AOC 72-001, Small Arms Firing Range

8.2.1 Site Description and Operation History

AOC 72-001 consists of an active small arms firing and training range used by the Laboratory's security force (Figure 8.2-1). The firing range is located in Sandia Canyon at the west end of TA-72 and has been operational since 1966. It includes a 175-ft × 250-ft firing range surrounded by earthen berms, an adjacent skeet-shooting range, and administrative buildings. The drainage channel and flood plain of Sandia Canyon run through the middle of the firing range. Structures at this site include an office building (building 72-8, a former guard station), range house (building 72-9), scoring area (building 72-10), firing station (building 72-11), weapons-cleaning area (building 72-12), storage buildings (72-13 and 72-14), and canopies 3 and 4 (buildings 72-15 and 72-16) (LANL 1990, 007514). Lead is present within the firing range because bullets are scattered at the base of the berms and cliffs, and lead shot from skeet shooting is visible on the ground (LANL 1994, 034756. pp. 2-9, 5-22).

In 1995, as part of a VCA conducted at SWMU 00-016 (an inactive small-arms firing range), NMED concurred with the Laboratory's request to move lead-contaminated soil from the inactive range to the active AOC 72-001 firing range (DOE 1995, 046257). During the second phase of the VCA implemented at SWMU 00-016 in 1996 and 1997, lead was removed from soil stockpiled from berms at the former firing range using dry sieving. Approximately 4660 yd^3 of soil from SWMU 00-016 was transported to TA-72 and placed on the berms located along the north side of the AOC 72-001 firing range and along the berm located between, and north of, canopies 3 and 4 (LANL 1997, 056737).

8.2.2 Relationship to Other SWMUs and AOCs

AOC 72-001 is located approximately 100 ft northwest of AOC 20-004. No SWMUs or AOCs are associated with AOC 72-001.

8.2.3 Summary of Previous Investigations

A Phase I RFI was conducted at AOC 72-001 in 1995 (LANL 1996, 054466). After a geomorphic survey was performed to locate sediment catchment areas downstream of the small-arms firing range, seven surface sediment samples (0–1 ft) were collected from seven locations (LANL 1996, 054466, pp. 5-40–5-41). Surface radiological screening was performed before the start of intrusive activities; screening results showed no radioactivity above local background. HE spot tests and gross-radiation screening were performed on each sediment sample to be submitted for laboratory analysis. No HE and no radiation levels above local background were detected. Samples were analyzed for TAL metals. Selenium was detected above the sediment BV in one sample. Mercury, silver, and thallium were not detected above sediment BVs but had DLs above BVs for all seven samples. Lead was not detected above the sediment BV in any samples.

Decision-level data from the 1999 RFI are presented and discussed in the approved work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site.

8.2.4 Delayed Investigation Rationale

Delayed investigation is proposed for AOC 72-001 because this site is an active small-arms firing range. The approved investigation work plan proposed that full characterization of this active firing range be delayed until operations cease. At that time, the nature and extent of contamination at AOC 72-001 will be determined and any necessary corrective actions identified and implemented (LANL 2009, 106660.14; NMED 2009, 106703).

9.0 CONCLUSIONS

9.1 Nature and Extent of Contamination

The nature and extent of contamination have been defined for three sites previously investigated or investigated during the 2010 investigation. The nature and extent of contamination have not been defined for 17 sites. A total of seven sites are proposed for delayed characterization and investigation pending D&D of certain building and structures within the aggregate area. One site is currently not subject to corrective action requirements and was not investigated in 2010. Summaries of the nature and extent of contamination and remaining characterization requirements for the sites at former TA-20, TA-53, and TA-72 are presented below.

9.1.1 Former TA-20

The extent of contamination has not been defined for 11 sites in former TA-20. Additional sampling is needed to define the extent of contamination for one or more inorganic chemicals, organic chemicals, or radionuclides at the following sites:

- SWMU 20-001(a)—the vertical extent of barium and perchlorate
- SWMU 20-001(b)—the vertical extent of perchlorate, uranium-234, uranium-235/236, and uranium-238; the lateral extent of barium and selenium
- SWMU 20-001(c)—the vertical extent of chromium and uranium-234; the lateral extent of chromium
- SWMU 20-002(a)—the vertical extent of barium, chromium, nitrate, uranium-235/236, and uranium-238; the lateral extent of beryllium, chromium, and selenium
- SWMU 20-002(b)—the vertical extent of barium, calcium, and perchlorate
- SWMU 20-002(c)—the lateral extent of cesium-137
- SWMU 20-002(d)—the vertical extent of aluminum, barium, uranium-235/236; the lateral extent of chromium
- AOC 20-003(b)—the vertical extent of uranium-235/236; the lateral extent of perchlorate
- AOC 20-003(c)—the vertical extent of uranium-234, uranium-235/236, and uranium-238
- AOC 20-004—the vertical extent of aluminum, barium, calcium, cobalt, copper, nickel, nitrate, selenium, and vanadium; the lateral extent of aluminum, barium, copper, nickel, and vanadium
- SWMU 20-005—the vertical extent of silver

Although Aroclor-1254 and Aroclor-1260 were detected at low concentrations in multiple samples at SWMUs 20-002(c), 20-002(d), and 20-005, there is no indication that PCBs were used at those sites. It is likely that the detected concentrations reflect widespread but very low concentration contamination from multiple potential sources upgradient of this site, including sites at TA-03, TA-61, and TA-53 and developed areas on Laboratory and Los Alamos County or private property (LANL 2009, 107453, p. 5–8). Furthermore, PCB and other contamination in the main drainage of Sandia Canyon have been addressed as part of separate canyons investigations (LANL 2009, 107453). Therefore, additional sampling to define the extent of PCBs at SWMUs 20-002(c), 20-002(d), and 20-005 is not recommended, and PCBs should not be considered COPCs for these sites.

9.1.2 TA-53

The nature and extent of contamination are defined for the following three sites in TA-53:

- SWMU 53-001(b), Storage area
- AOC 53-013, Lead spill site
- AOC 53-014, Lead spill site

The extent of contamination has not been defined for six sites in TA-53. Additional sampling is needed to define the extent of contamination for one or more inorganic chemicals, organic chemicals, or radionuclides at the following sites:

- SWMU 53-001(a)—the vertical extent of copper, Aroclor-1254, and Aroclor-1260; the lateral extent of 1,2,4-trimethylbenzene
- SWMU 53-005—the vertical extent of antimony, chromium, acetone, Aroclor-1254, 2-butanone, sec-butylbenzene, 4-isopropyltoluene, 1,3,5-trimethylbenzene, 1,2-xylene, and cesium-137; the lateral extent of antimony, chromium, nickel, acetone, Aroclor-1254, 2-butanone, sec-butylbenzene, 1,1-dichloroethane, isopropylbenzene, 4-isopropyltoluene, 1,1,1-trichloroethane, trichloroethene, 1,2,4-trimethylbenzene 1,3,5-trimethylbenzene, and 1,2-xylene
- AOC 53-008—the vertical extent of aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, total cyanide, lead, magnesium, nickel, selenium, Aroclor-1248, Aroclor-1254, ethylbenzene, cobalt-60, plutonium-239/240, and tritium
- AOC 53-009—the vertical extent of barium, lead, Aroclor-1242, Aroclor-1254, and Aroclor-1260.
- AOC 53-010—the vertical extent of barium, calcium, chromium, and diethylphthalate
- AOC 53-012(e)—the vertical extent of cesium-137, and uranium-235/236

Delayed investigations are proposed for the following seven sites in TA-53:

- SWMU 53-006(b), Underground storage tank
- SWMU 53-006(c), Underground storage tank
- SWMU 53-006(d), Underground storage tank
- SWMU 53-006(e), Underground storage tank
- SWMU 53-006(f), Underground storage tank
- SWMU 53-007(a), Aboveground storage tank
- SWMU 53-015, Wastewater treatment facility

9.1.3 TA-72

The nature and extent of contamination are not defined for AOC 72-001. No sampling was proposed in the approved work plan because it is an active small-arms firing range. Delayed investigations are proposed for this site.

9.2 Summary of Risk Screening Assessments

9.2.1 Human Health Risk Screening Assessments

The human health risk-screening assessments are presented in Appendix I, section I-4.

The risk-screening assessment results indicated no potential unacceptable risks from COPCs exist for the industrial, construction worker, and residential scenarios at SWMU 53-001(b) and AOC 53-013. The total excess cancer risks were below the NMED target risk level of 1×10^{-5}, and the HIs were below or equivalent to the NMED target HI of 1.

At AOC 53-014, no COPCs were identified, so no potential unacceptable risks to human health exist at the site.

9.2.2 Ecological Risk Screening Assessments

The ecological risk-screening assessments are presented in Appendix I, section I-5.

No potential ecological risk was found for any receptor following evaluations based on minimum ESL, HI analyses, comparison to background concentrations, potential effects to populations (individuals for T&E species), and LOAEL analyses for SWMU 53-001(b) and AOC 53-013.

At AOC 53-014, no COPCs were identified, so no potential unacceptable ecological risks exist at the site.

10.0 RECOMMENDATIONS

The determination of site status is based on the results of the risk-screening assessments and the nature and extent evaluation. Depending upon the decision scenario used, the sites are recommended as corrective actions complete either with or without controls or for additional action. The residential scenario is the only scenario under which corrective action complete without controls is applicable; that is, no additional corrective actions or conditions are necessary. The other decision scenarios (industrial and construction worker) result in corrective action complete with controls; that is, some type of institutional controls must be in place to ensure that the land use remains consistent with site cleanup levels. The current and reasonably foreseeable future land use for sites in the Lower Sandia Canyon Aggregate Area is industrial.

10.1 Additional Corrective Action Activities

The extent of contamination has not been defined for 17 sites investigated in the Lower Sandia Canyon Aggregate Area (Table 10.1-1). Additional sampling is needed to define the extent of contamination for one or more inorganic chemicals, organic chemicals, or radionuclides at the following sites:

- SWMUs 20-001(a), 20-001(b), 20-001(c), 20-002(a), 20-002(b), 20-002(c), 20-002(d), 20-005, 53-001(a), and 53-005 and AOCs 20-003(b), 20-003(c), 20-004, 53-008, 53-009, 53-010, and 53-012(e)

At SWMU 53-001(a), excavation of locations 53-612472 and 53-612474 is recommended to remove concentrations of Aroclor-1254 and Aroclor-1260 above the 1 mg/kg cleanup level.

A Phase II investigation work plan will be developed specifying sampling locations, numbers of samples, and analytical suites required to define the extent of contamination for those sites. Upon completion of the proposed Phase II sampling, the data will be used to confirm the extent of contamination has been defined and to complete human health and ecological risk-screening assessments. The results will be presented in a Phase II investigation report for the Lower Sandia Canyon Aggregate Area.

10.2 Recommendations for Corrective Actions Complete

SWMU 53-001(b) does not pose potential unacceptable risks under the industrial, construction worker, and residential scenarios. The Laboratory recommends that no further investigation or remediation activities are warranted for this site. The site is appropriate for corrective action complete without controls.

AOC 53-013 does not pose potential unacceptable risks under the industrial, construction worker, and residential scenarios. The Laboratory recommends that no further investigation or remediation activities are warranted for this site. The site is appropriate for corrective actions complete without controls.

At AOC 53-014, the nature and extent of contamination was defined during previous investigations and remediation activities, and no COPCs were identified. The Laboratory recommends that no further investigation or remediation activities are warranted for this site. The site is appropriate for corrective actions complete without controls.

10.3 Recommendations for Delayed Characterization

Eight sites are recommended for delayed characterization and investigation pending D&D of building and structures within the Lower Sandia Canyon Aggregate Area. These sites are SWMUs 53-006(b), 53-006(c), 53-006(d), 53-006(e), 53-006(f), 53-007(a), and 53-015 and AOC 72-001.

10.4 Schedule for Recommended Activities

A Phase II investigation work plan will be developed and submitted to NMED 6 months after this investigation report is approved. The Phase II work plan will provide details and a schedule for implementing sampling activities and submitting a Phase II investigation report.

11.0 REFERENCES AND MAP DATA SOURCES

11.1 References

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

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

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11.2 Data Map Sources

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

SWMU or AOC: er_prs_all_reg, Potential Release Sites; Los Alamos National Laboratory, ESH&Q Waste & Environmental Services Division, Environmental Data and Analysis Group, EP2010-1C; 1:2,500 Scale Data; 02 December 2010.

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

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

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

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

Paved Parking, ksl_paved_prking_arc; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 12 August 2002; as published 28 May 2009.

Road Centerlines for the County of Los Alamos, lac_centerlin_arc; County of Los Alamos, Information Services; as published 04 March 2009.

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

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

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

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

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

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

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

Primary Industrial Waste Lines, wfm_indstrl_waste_arc; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

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

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

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

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

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

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

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Drainage: wqh_drainage_arc: WQH Drainage_arc; Los Alamos National Laboratory, ENV Water Quality and Hydrology Group; 1:24,000 Scale Data; 03 June 2003.

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

Canyon Reaches: er_reaches_ply: Canyon Reaches; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program, ER2002-0592; 1:24,000 Scale Data; Unknown publication date.

Springs: er_springs_pnt: Locations of Springs; Los Alamos National Laboratory, Waste and Environmental Services Division in cooperation with the New Mexico Environment Department, Department of Energy Oversight Bureau, EP2008-0138; 1:2,500 Scale Data; 17 March 2008.

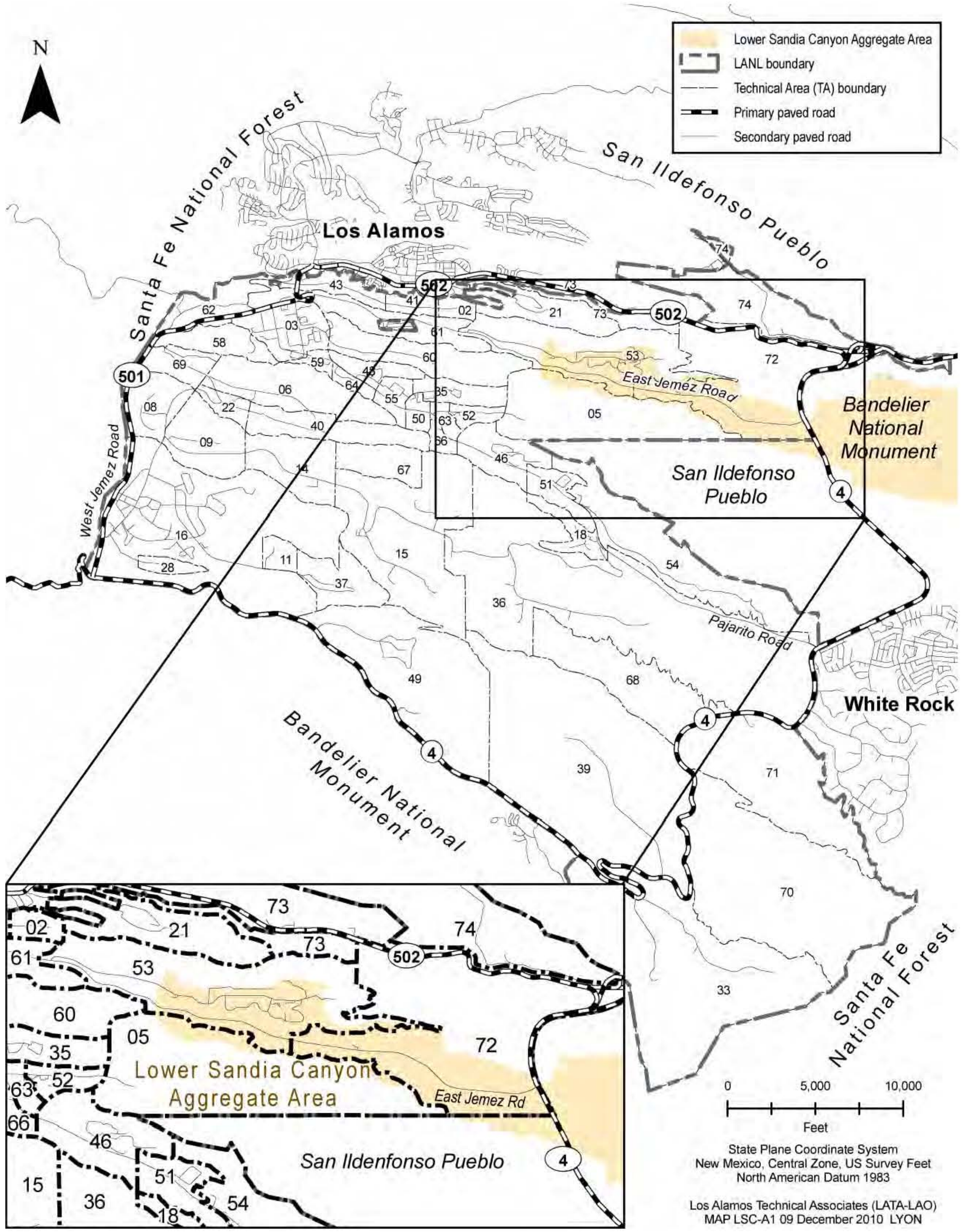


Figure 1.0-1 Location of Lower Sandia Canyon Aggregate Area with respect to Laboratory technical areas

Bandelier Tuff	Tshirege Member (Qbt)	Qbt 4	Ash-Flow Units
		Qbt 3	
		Qbt 2	
		Qbt 1v	
		Qbt 1g	
		Tsankawi Pumice Bed	
Cerro Toledo Interval (Qct)		Volcaniclastic Sediments and Ash-Falls	
Bandelier Tuff	Otowi Member (Qbo)	Ash-Flow Units	
		Guaje Pumice Bed (Qbog)	
Puye Formation (Tp)	Fanglomerate	Fanglomerate Facies includes sand, gravel, conglomerate, and tuffaceous sediments	
	Basalt and Andesite	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	
	Fanglomerate	Fanglomerate Facies includes sand, gravel, conglomerate, and tuffaceous sediments; includes “Old Alluvium”	
	Axial facies deposits of the ancestral Rio Grande	Totavi Lentil	
Santa Fe Group	Coarse Sediments	Coarse-Grained Upper Facies (formerly called the “Chaquehui Formation” by Purtymun 1995, 045344)	
	Basalt		
	Coarse Sediments		
	Basalt		
	Coarse Sediments		
	Basalt		
	Coarse Sediments		
	Arkosic clastic sedimentary deposits	Undivided Santa Fe Group (includes Chamita[?] and Tesuque Formations)	

Adapted from (LANL 1999, 064617).

Figure 2.2-1 Generalized stratigraphy of bedrock geologic units of the Pajarito Plateau

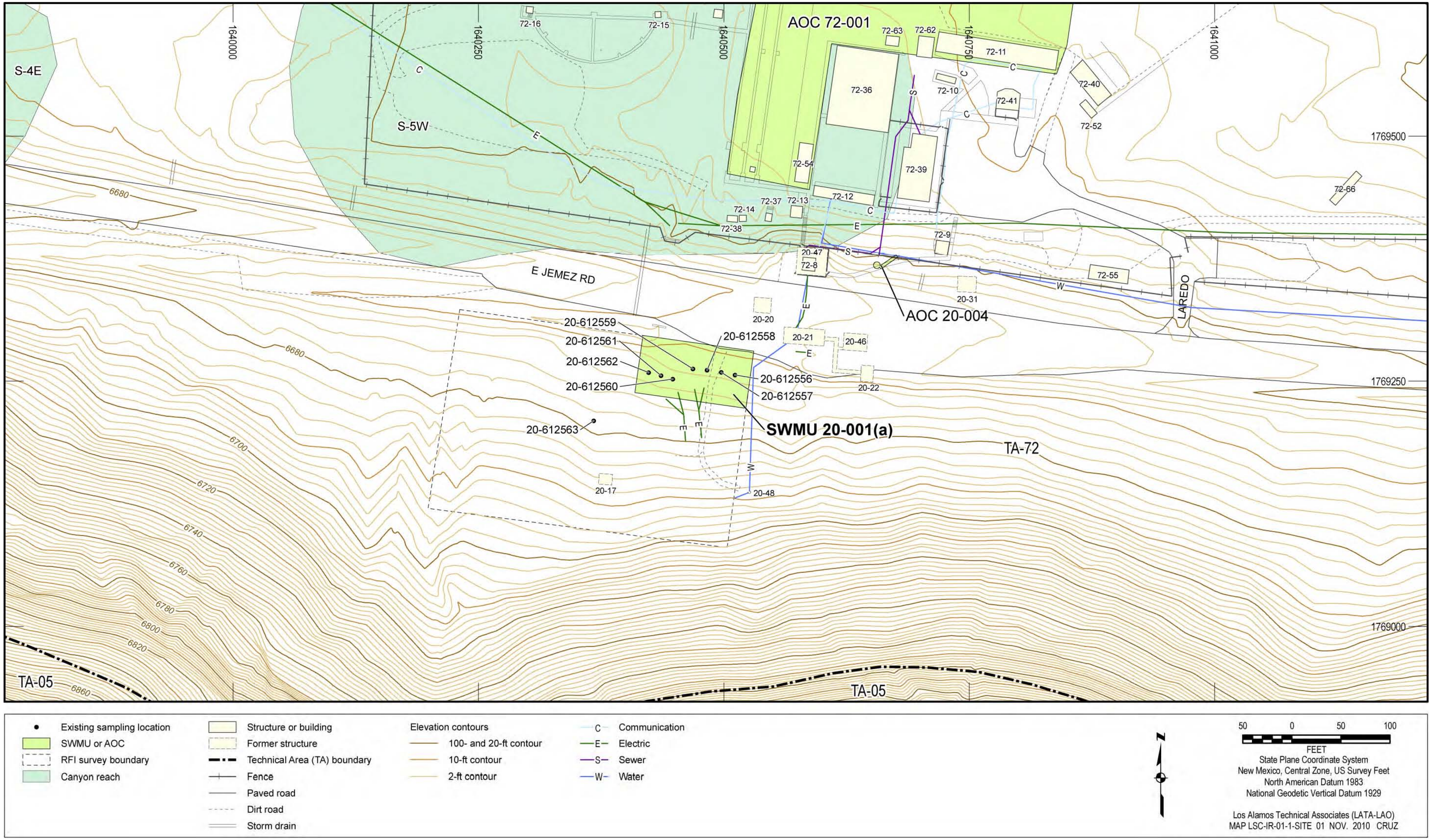


Figure 6.2-1 Site map of SWMU 20-001(a)

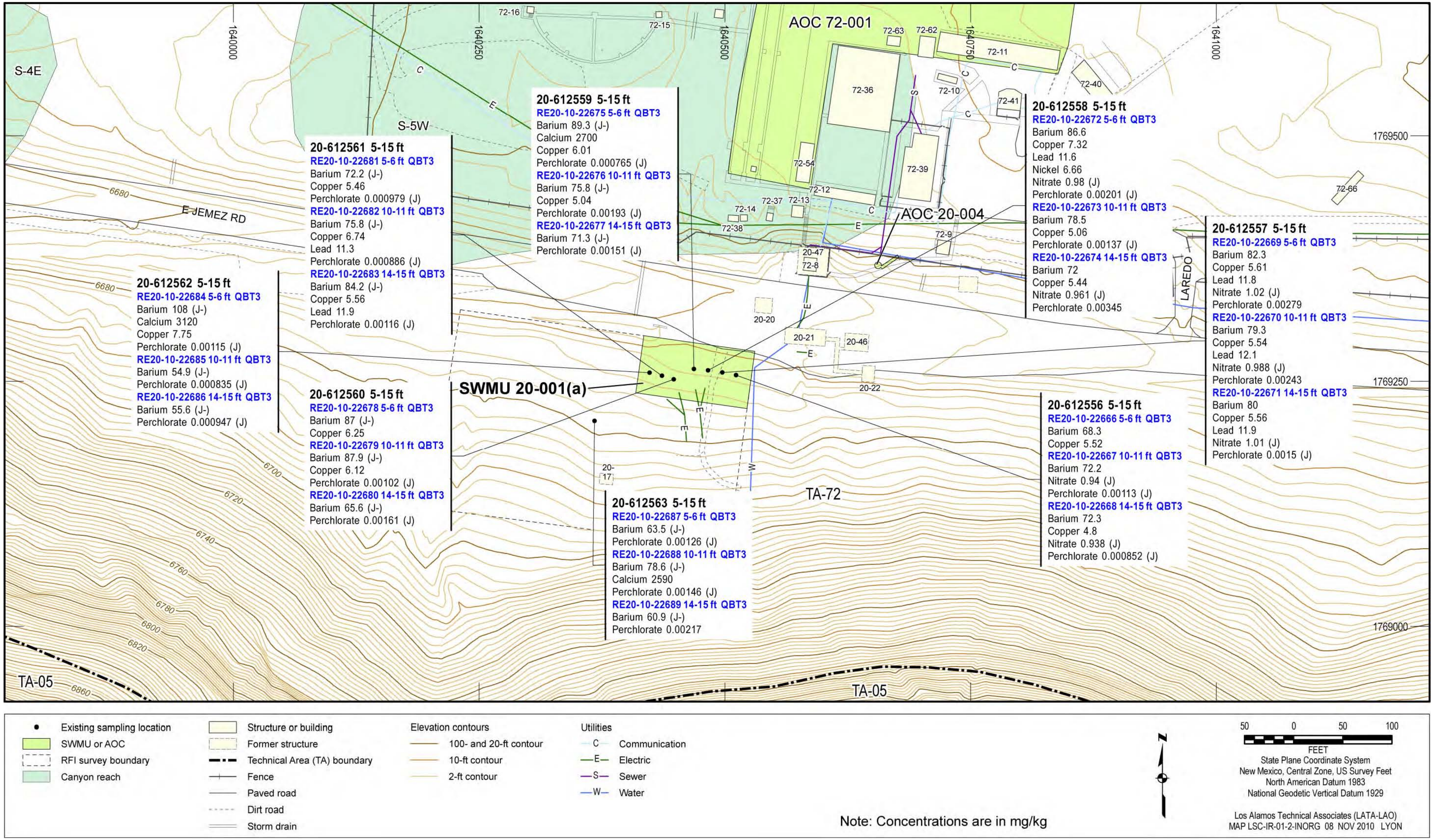


Figure 6.2-2 Inorganic chemicals detected or detected above BVs at SWMU 20-001(a)

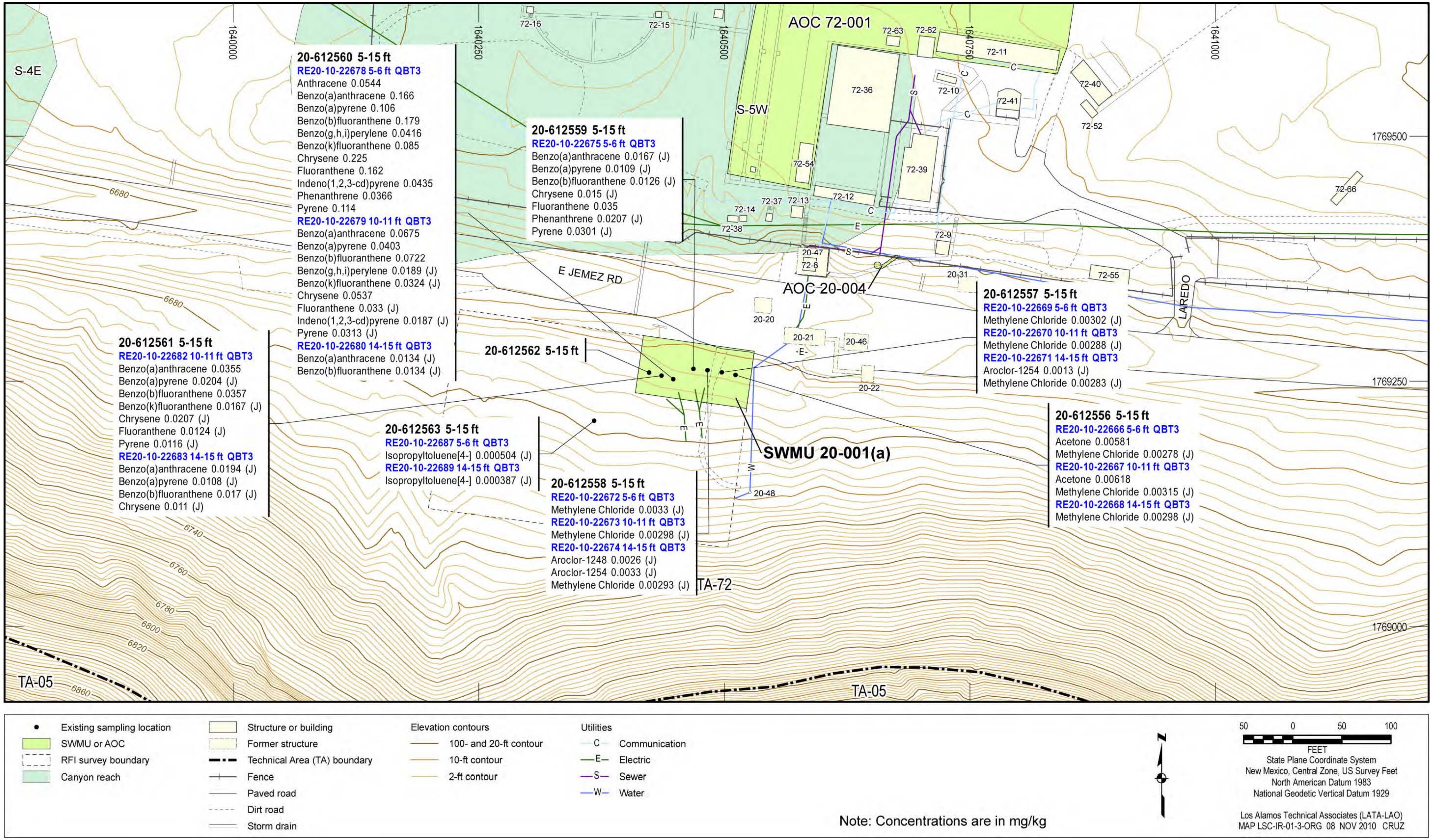


Figure 6.2-3 Organic chemicals detected at SWMU 20-001(a)

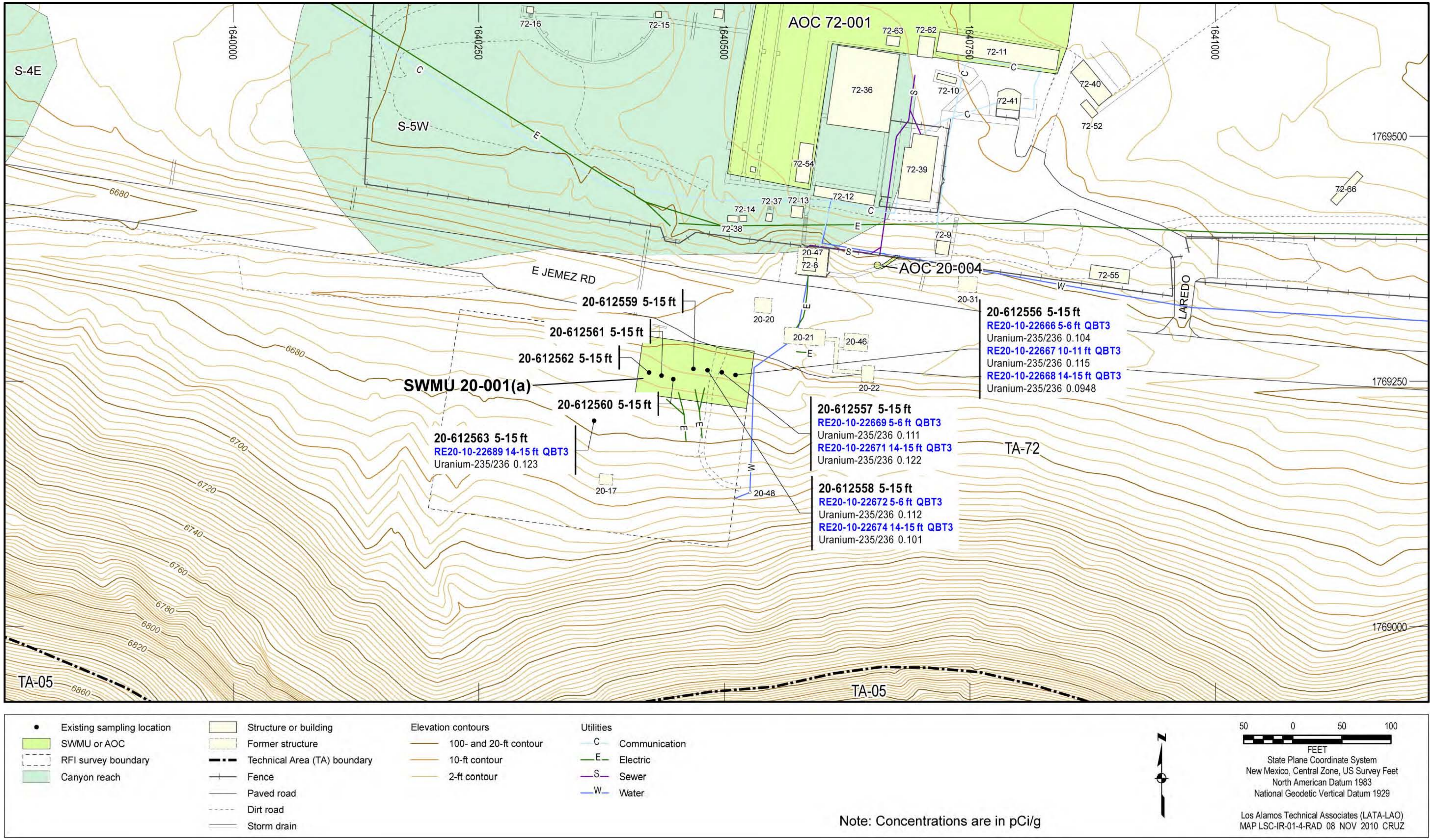


Figure 6.2-4 Radionuclides detected or detected above BVs/FVs at SWMU 20-001(a)

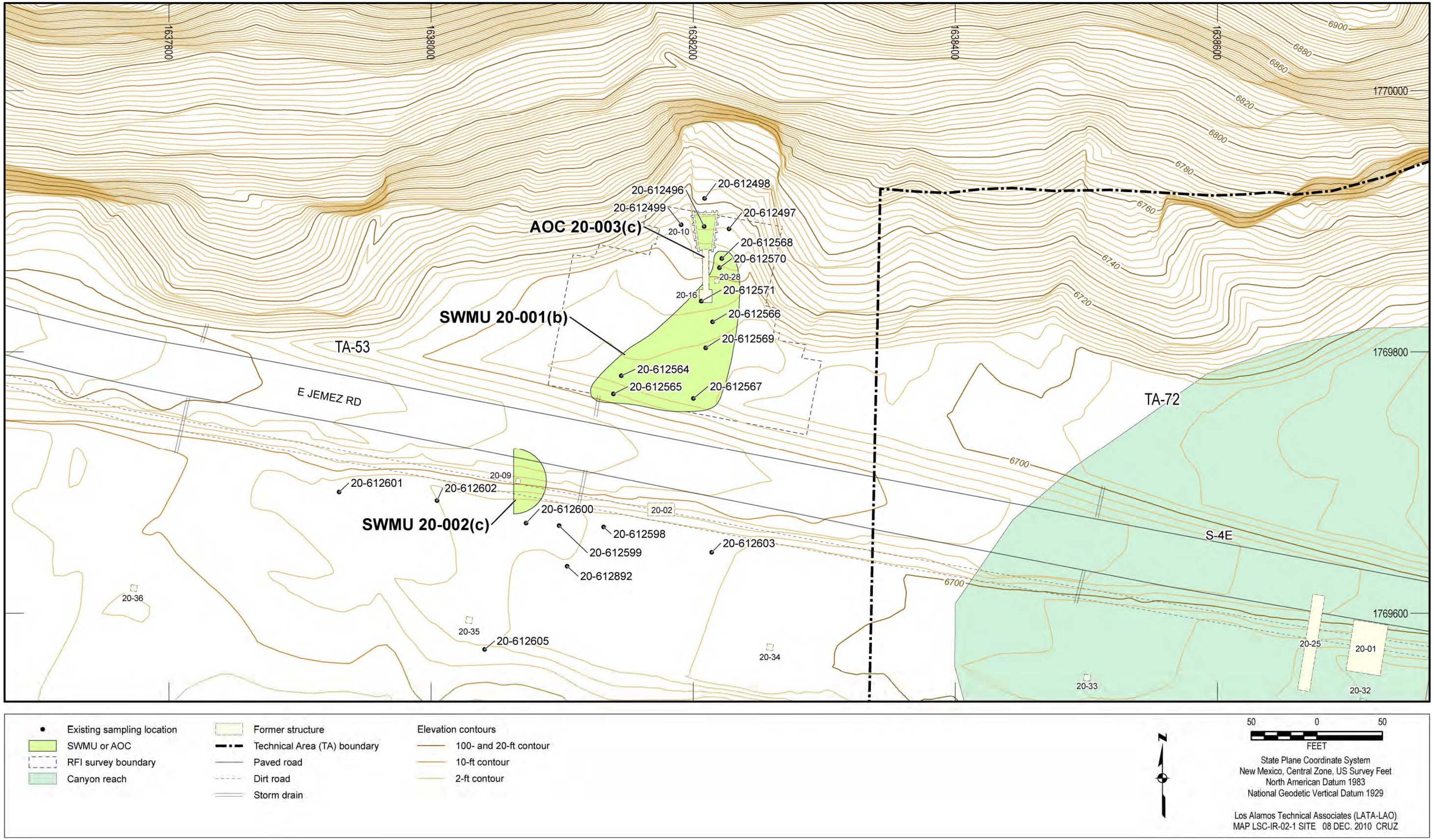


Figure 6.3-1 Site map of SWMUs 20-001(b) and 20-002(c) and AOC 20-003(c)

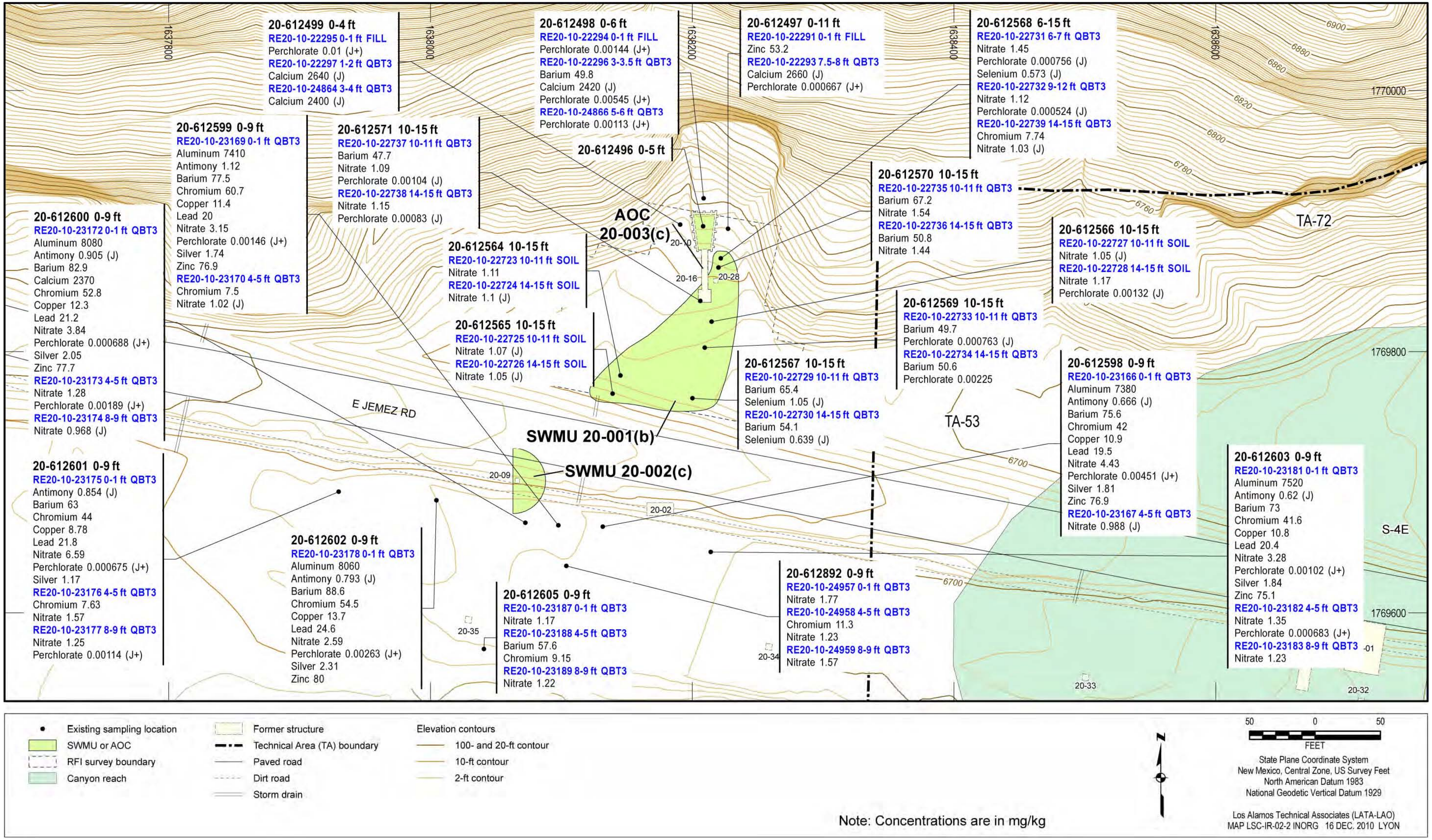
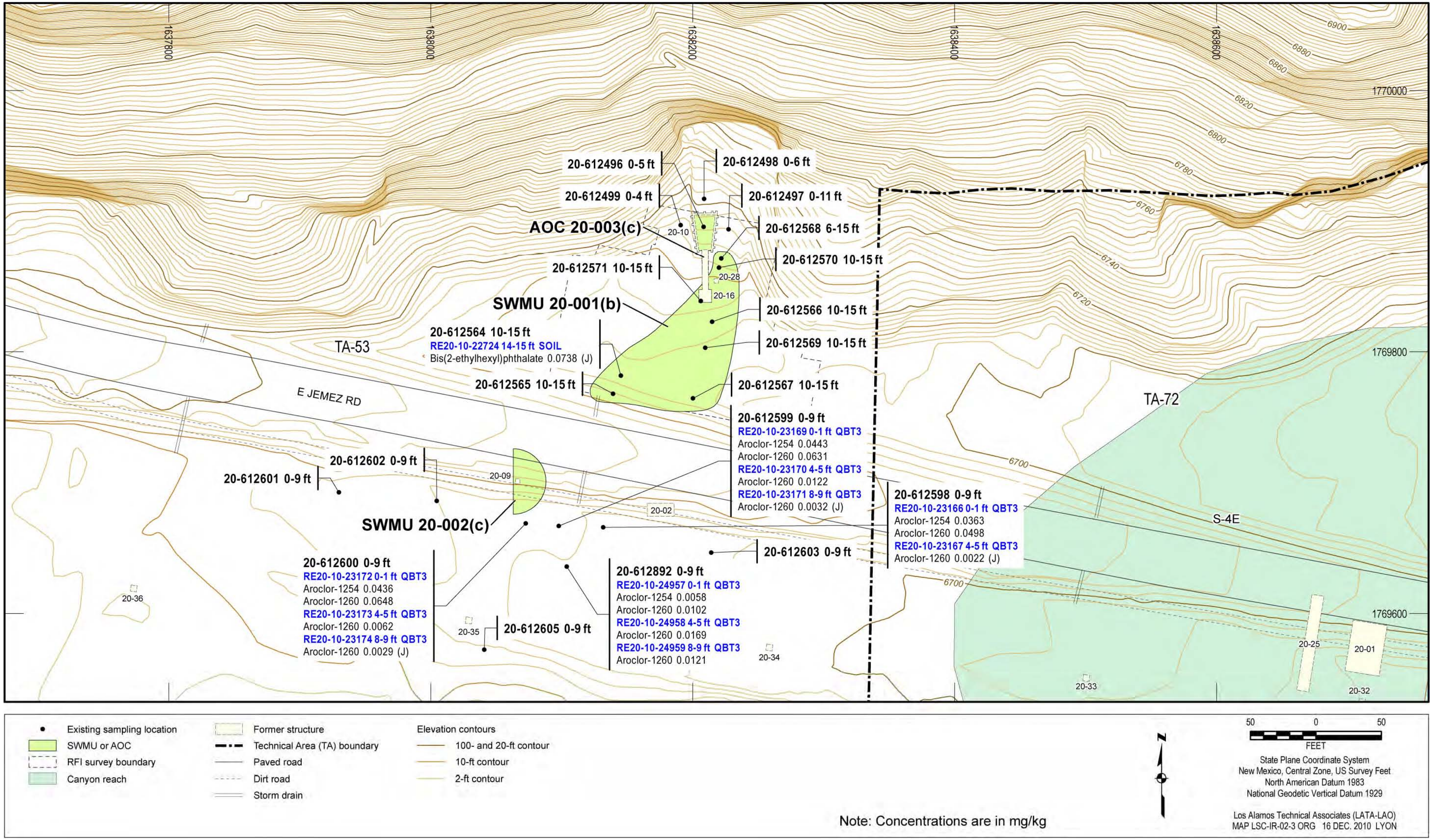


Figure 6.3-2 Inorganic chemicals detected or detected above BVs at SWMUs 20-001(b) and 20-002(c) and AOC 20-003(c)



Note: Concentrations are in mg/kg

Figure 6.3-3 Organic chemicals detected at SWMUs 20-001(b) and 20-002(c) and AOC 20-003(c)

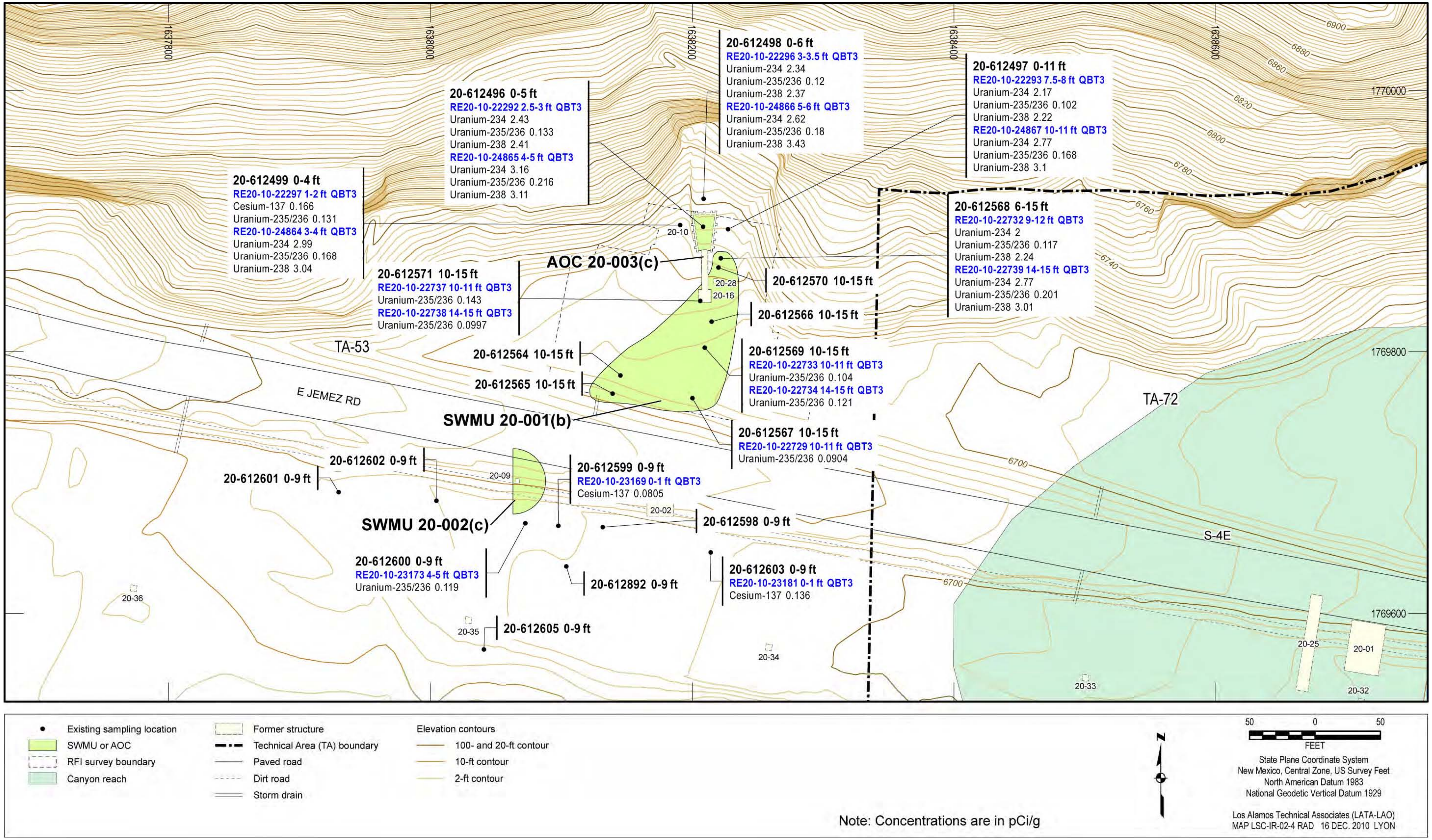


Figure 6.3-4 Radionuclides detected or detected above BVs/FVs at SWMUs 20-001(b) and 20-002(c) and AOC 20-003(c)

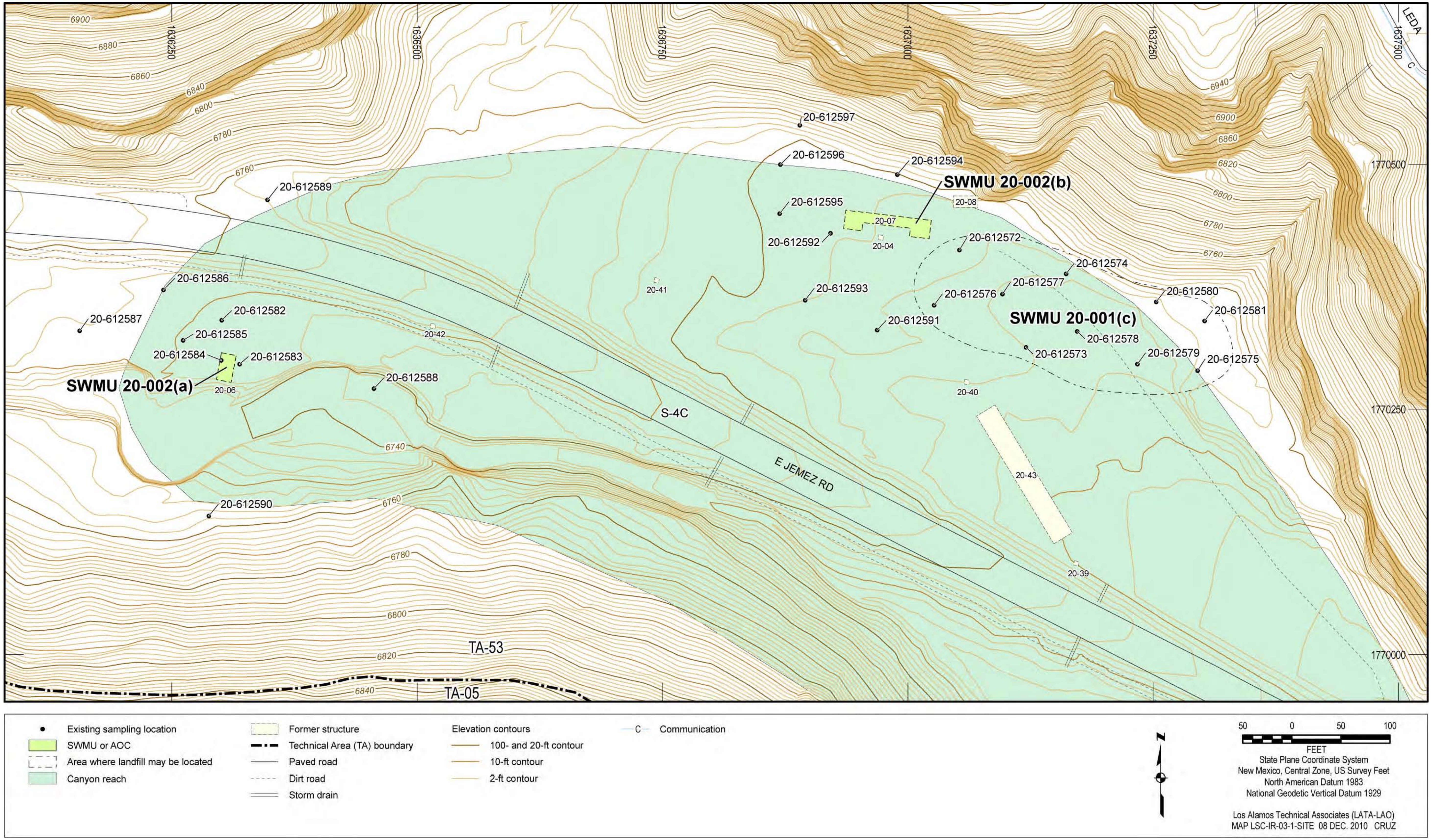


Figure 6.4-1 Site map of SWMUs 20-001(c), 20-002(a), and 20-002(b)

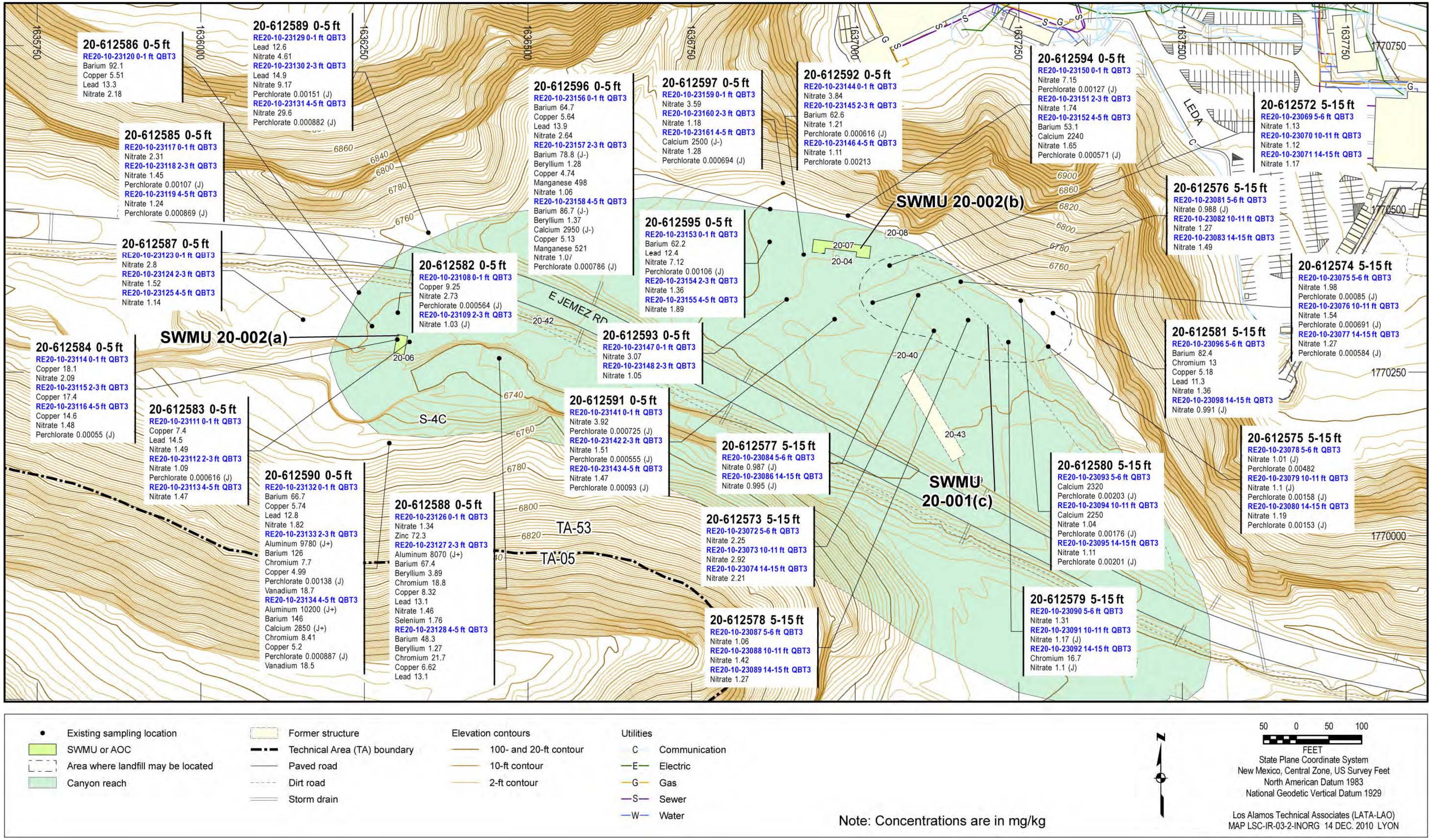


Figure 6.4-2 Inorganic chemicals detected or detected above BVs at SWMUs 20-001(c), 20-002(a), and 20-002(b)

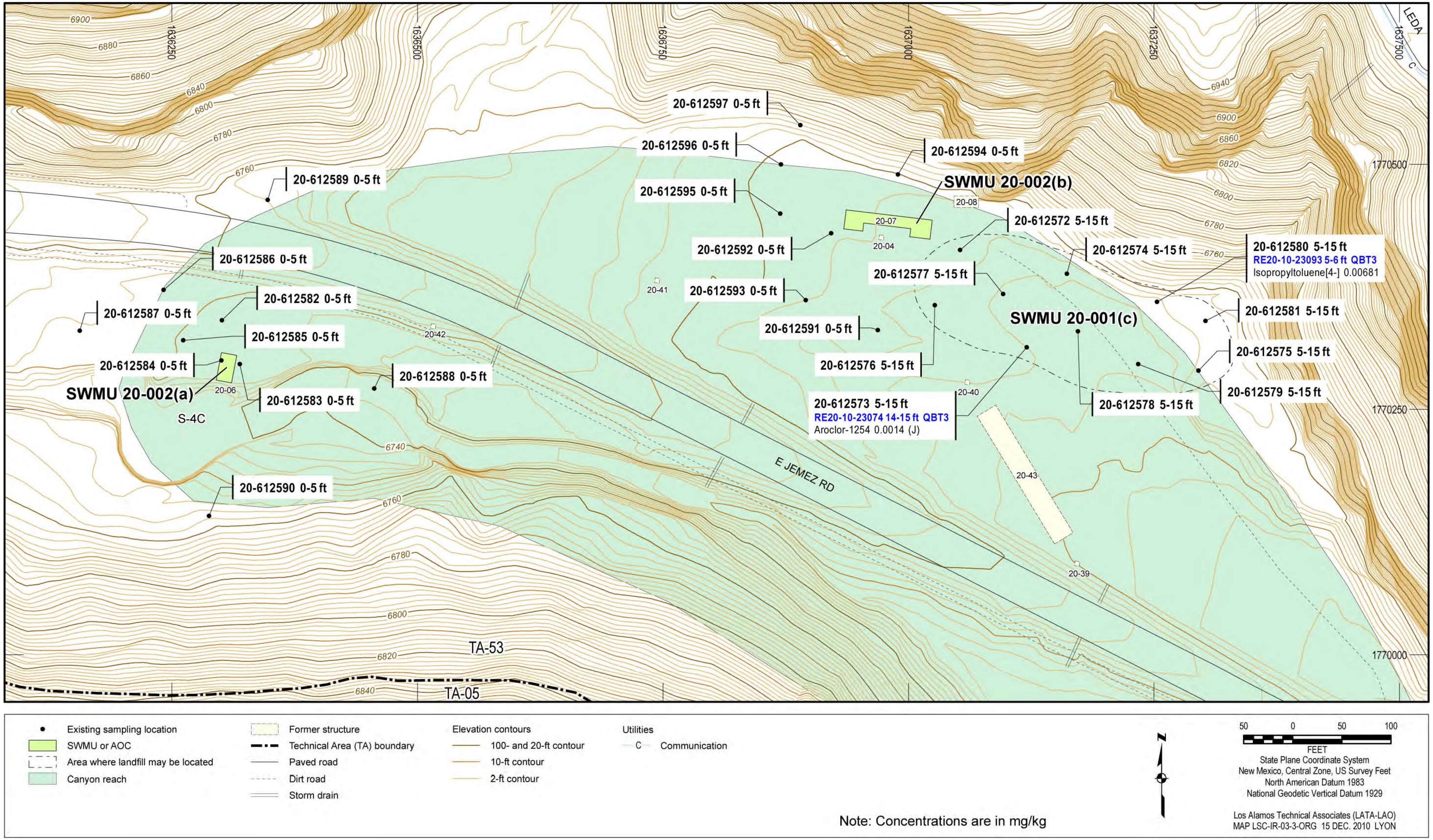


Figure 6.4-3 Organic chemicals detected at SWMUs 20-001(c), 20-002(a), and 20-002(b)

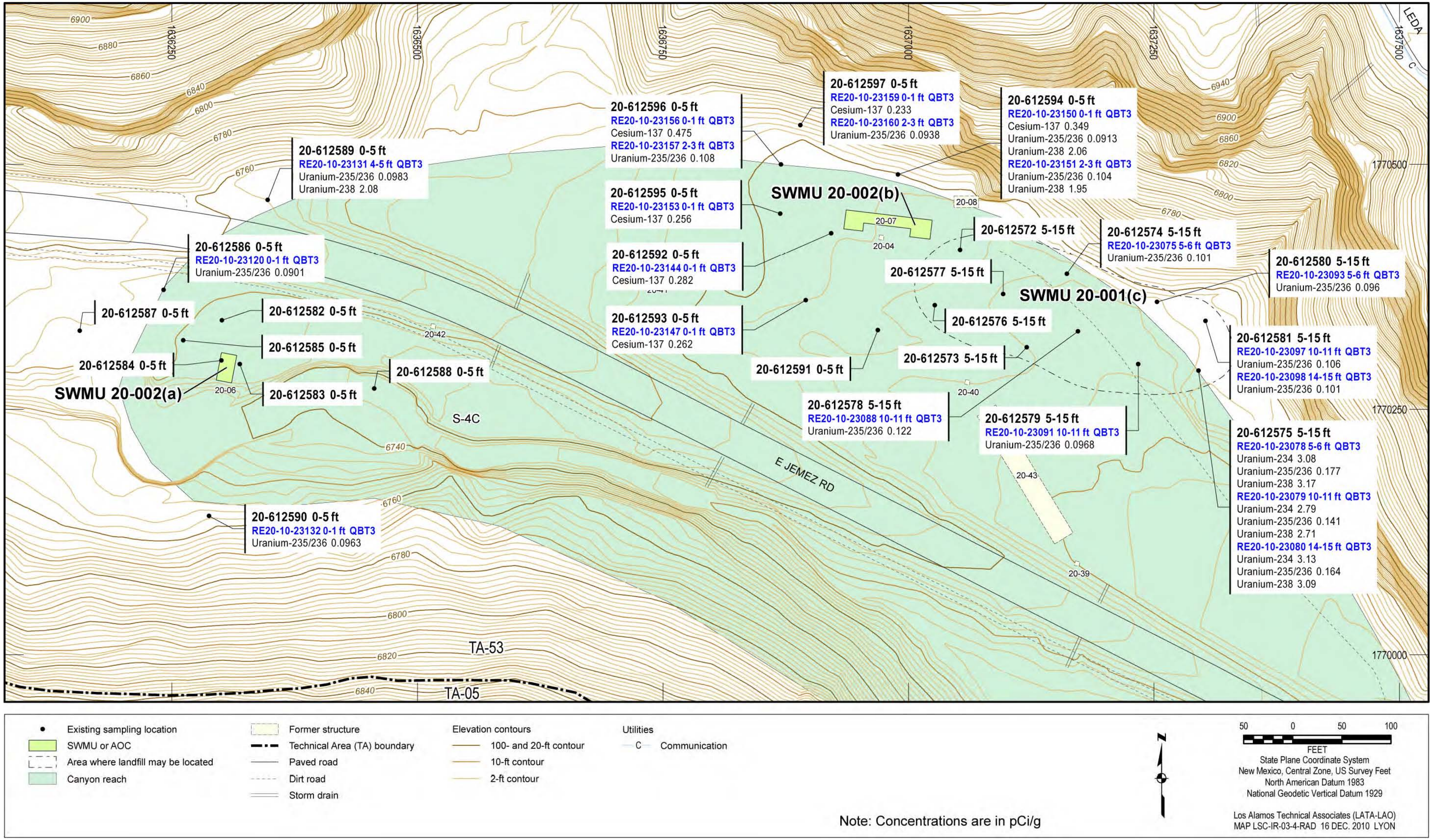


Figure 6.4-4 Radionuclides detected or detected above BVs/FVs at SWMUs 20-001(c), 20-002(a), and 20-002(b)

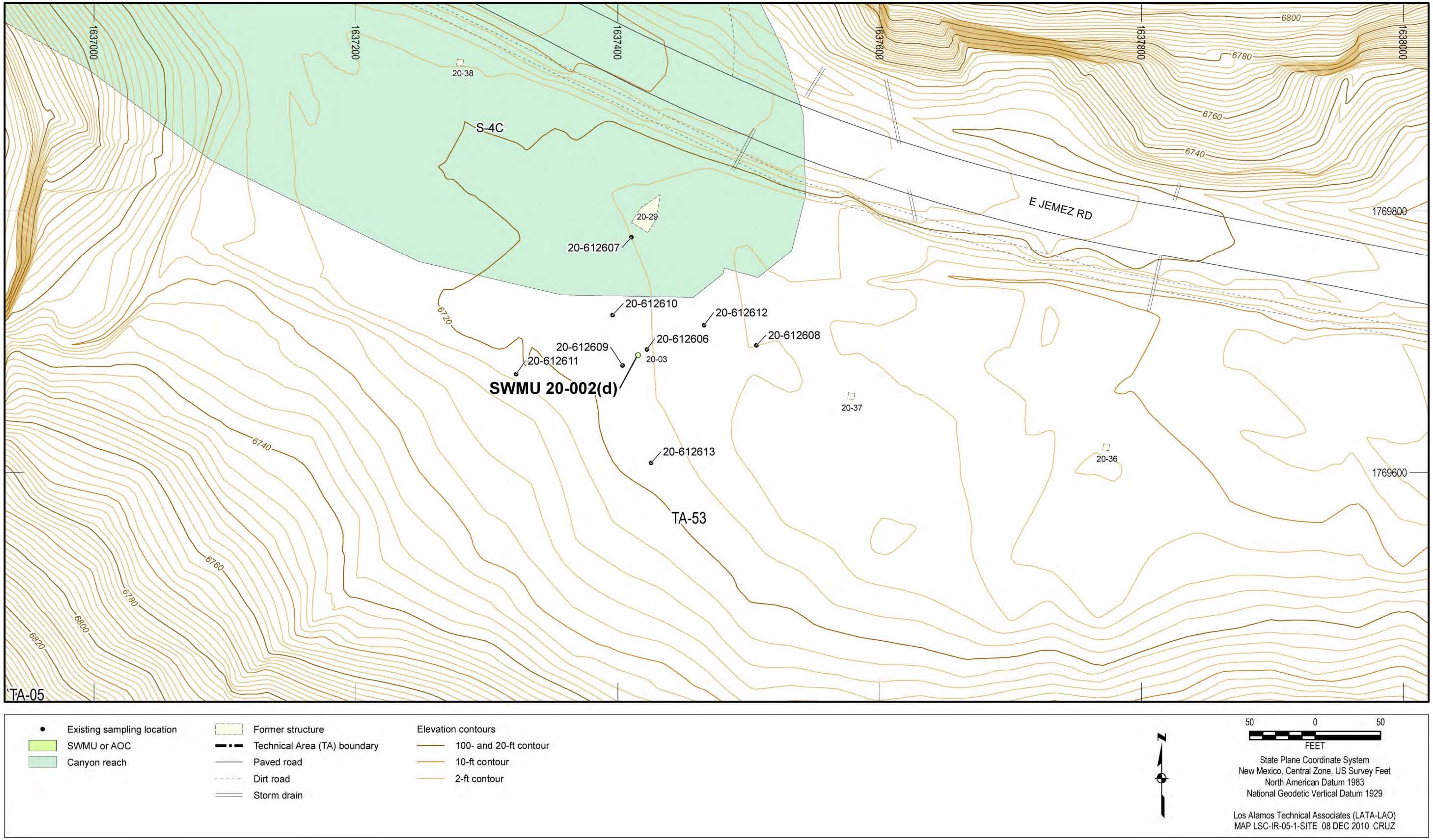


Figure 6.5-1 Site map of SWMU 20-002(d)

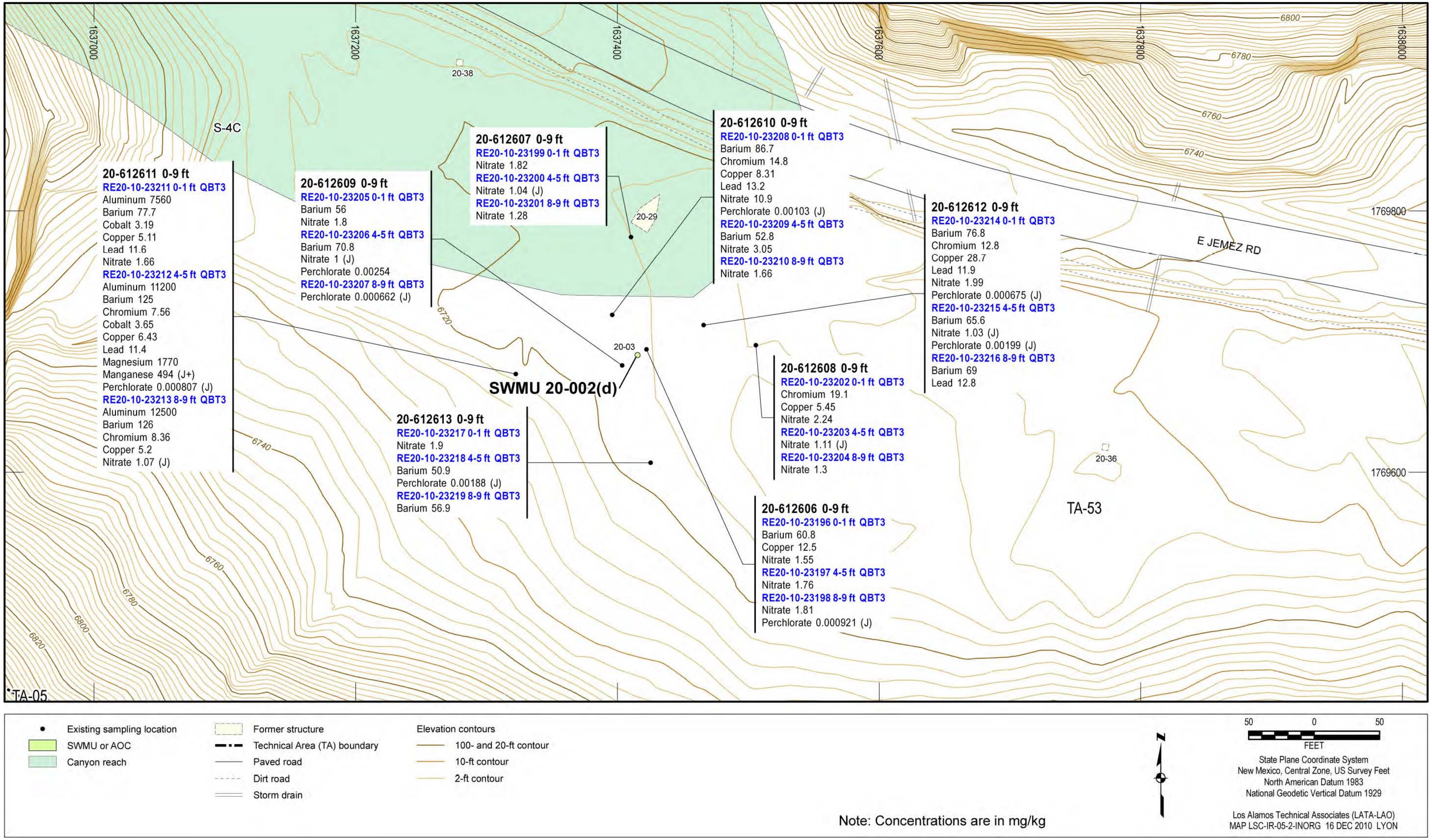


Figure 6.5-2 Inorganic chemicals detected or detected above BVs at SWMU 20-002(d)

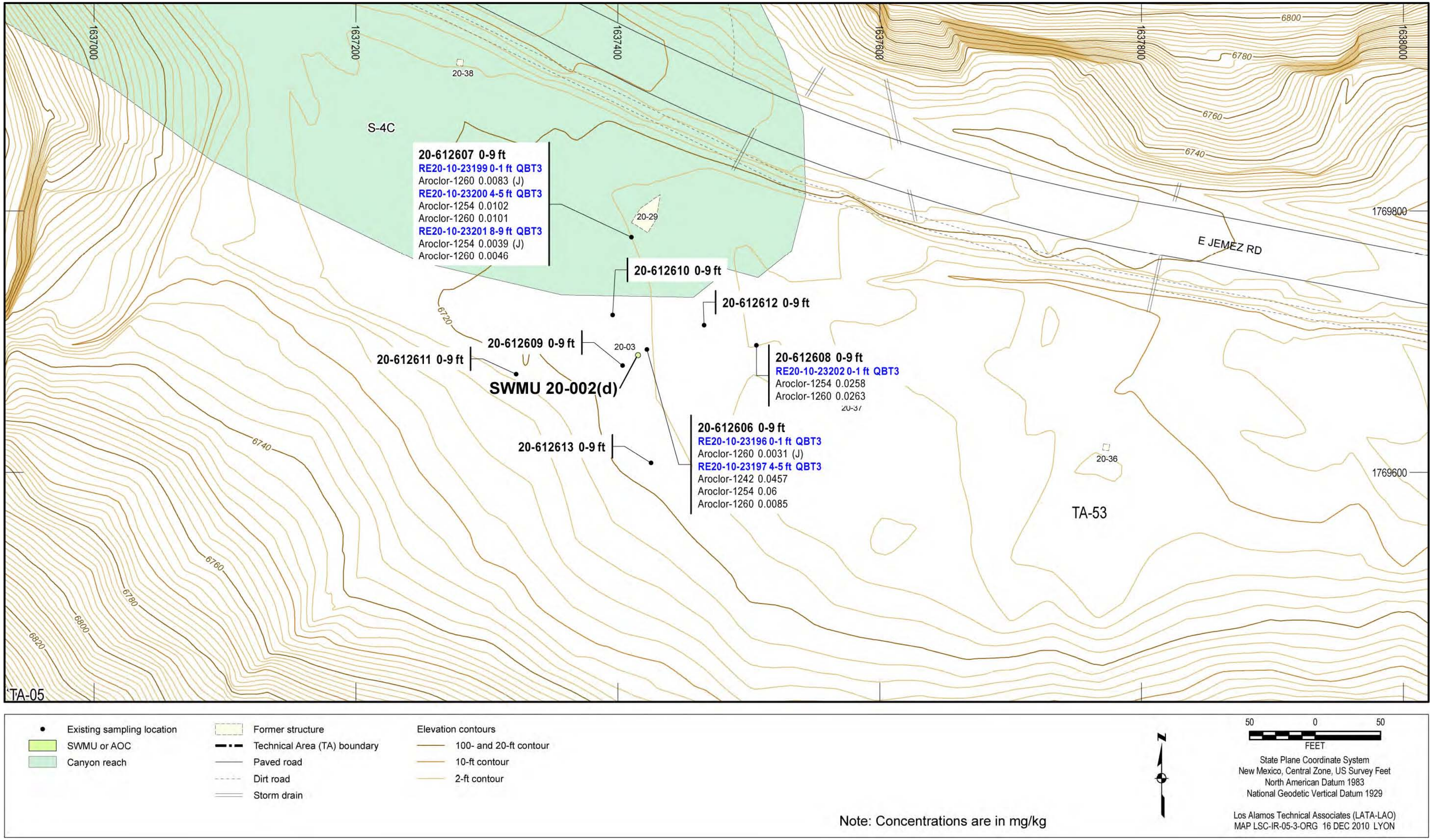


Figure 6.5-3 Organic chemicals detected at SWMU 20-002(d)

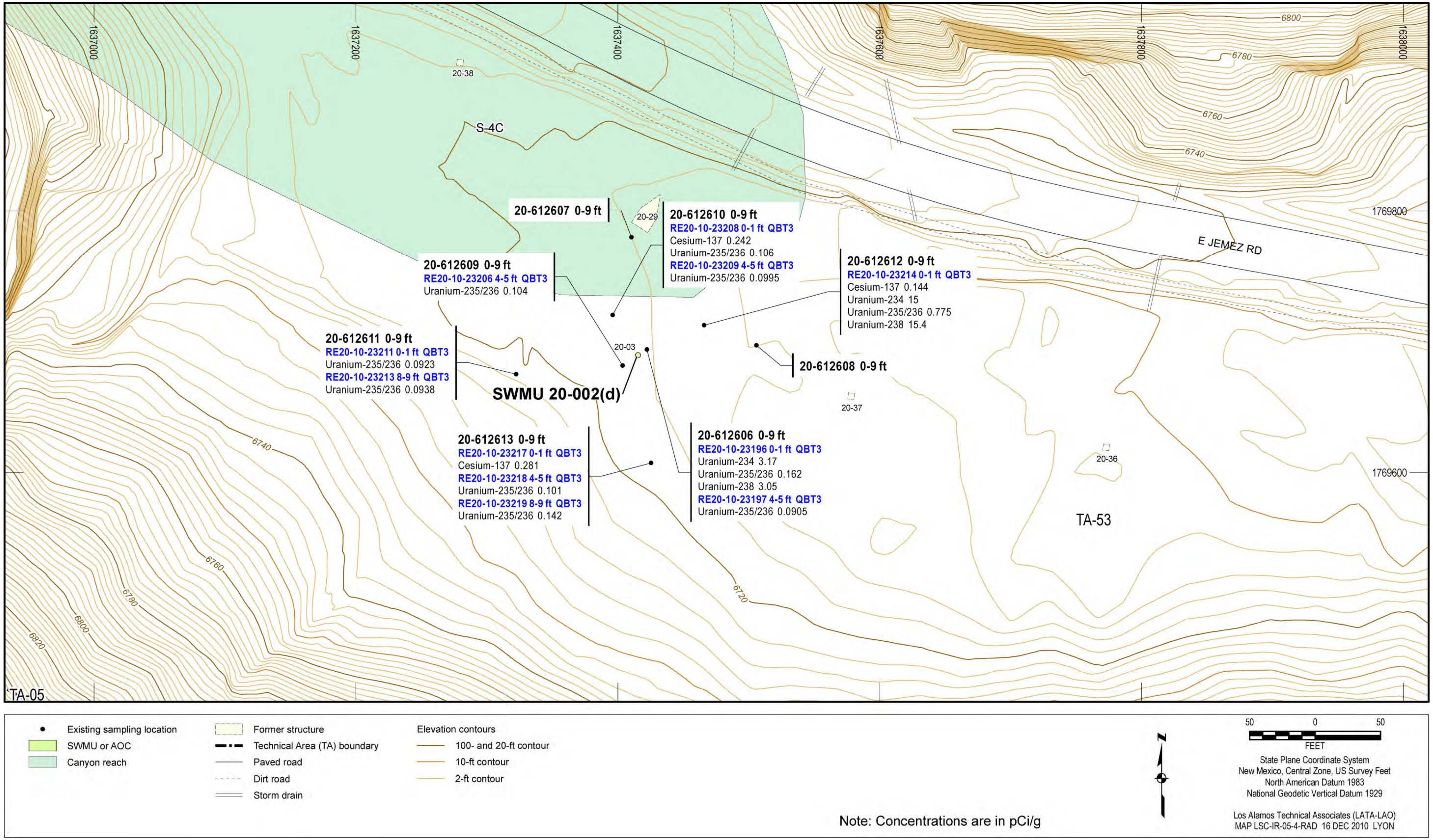


Figure 6.5-4 Radionuclides detected or detected above BVs/FVs at SWMU 20-002(d)

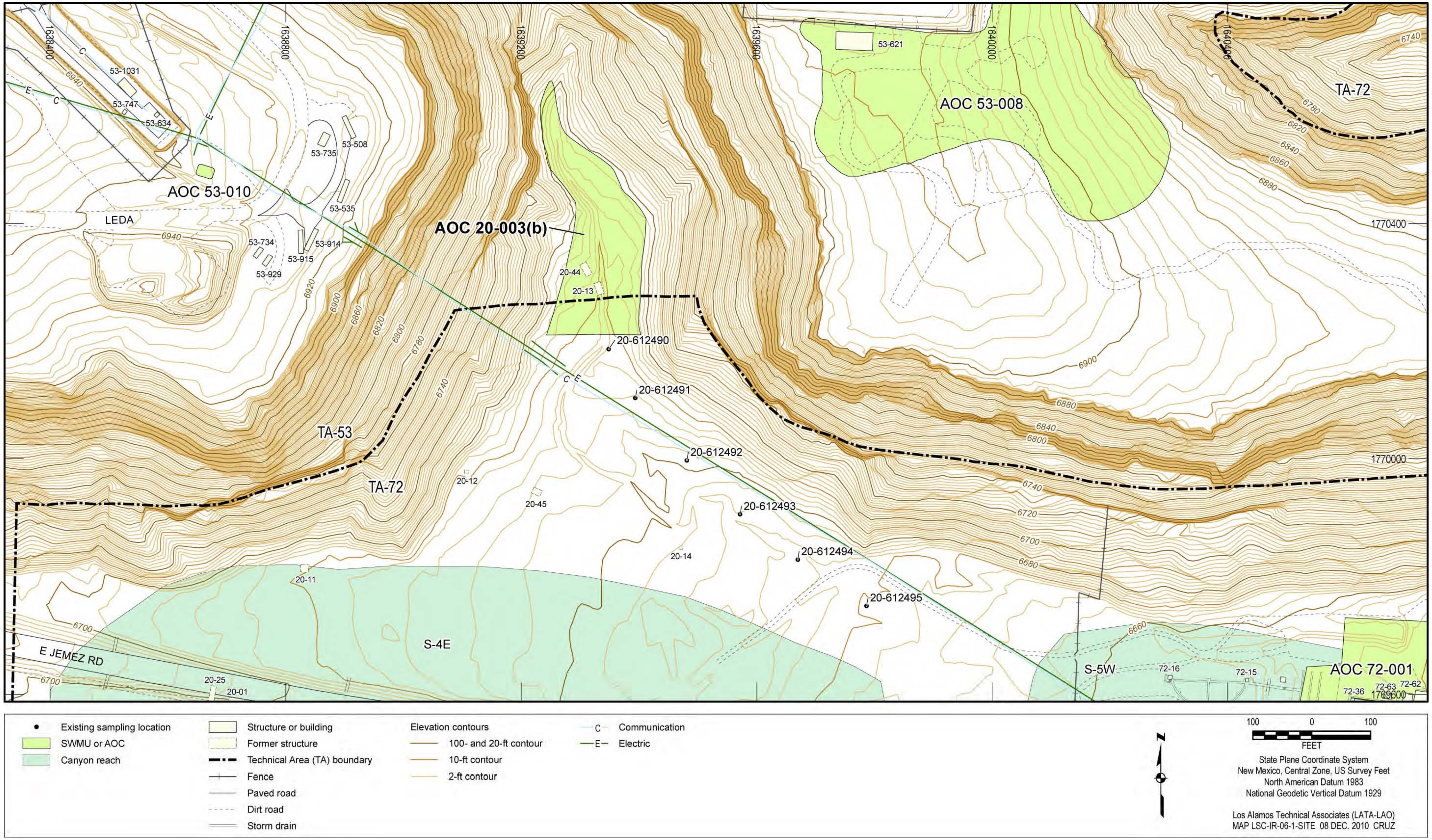
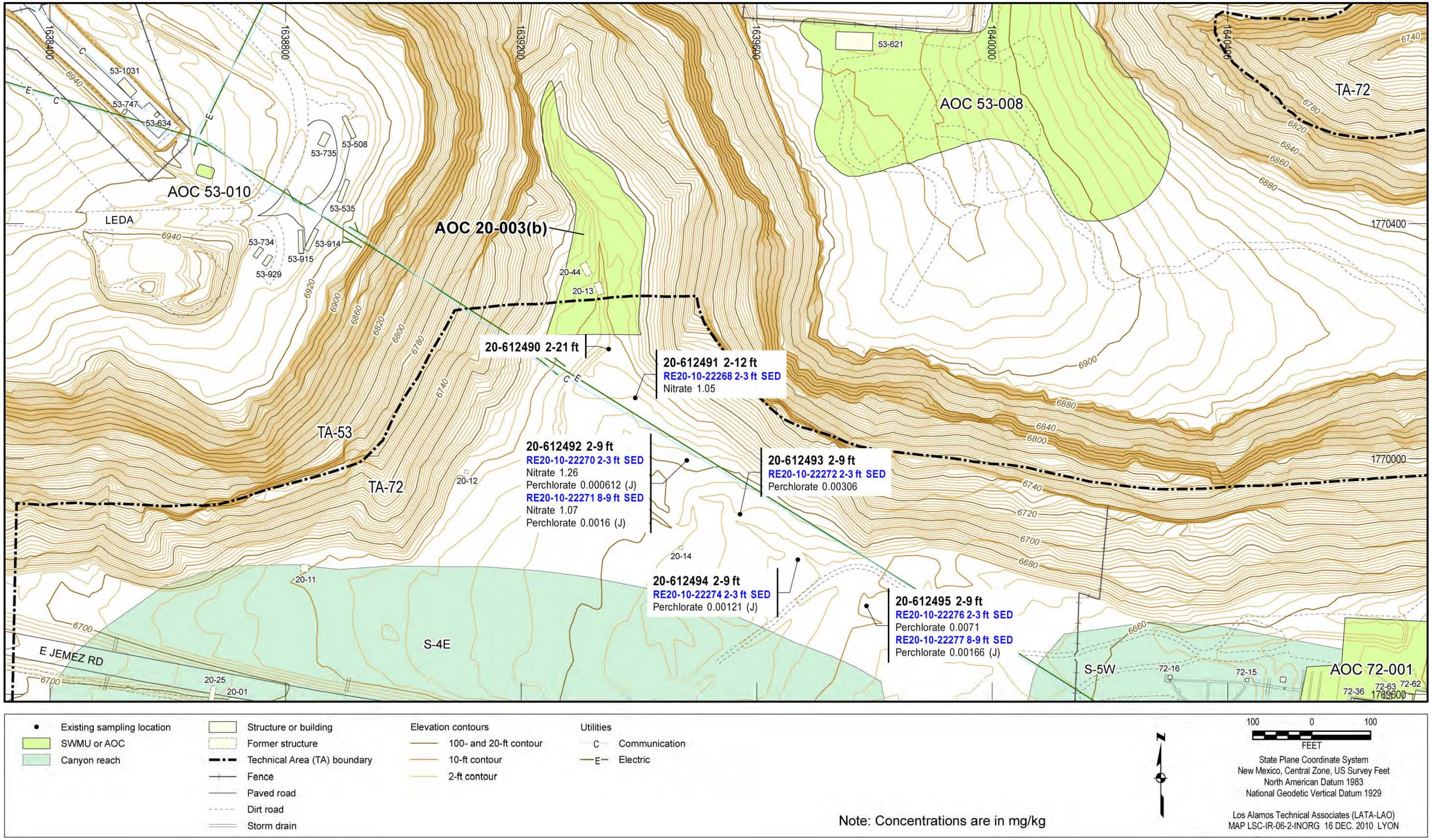


Figure 6.6-1 Site map of AOC 20-003(b)



20-612490 2-21 ft

20-612491 2-12 ft
RE20-10-22268 2-3 ft SED
Nitrate 1.05

20-612492 2-9 ft
RE20-10-22270 2-3 ft SED
Nitrate 1.26
Perchlorate 0.000612 (J)
RE20-10-22271 8-9 ft SED
Nitrate 1.07
Perchlorate 0.0016 (J)

20-612493 2-9 ft
RE20-10-22272 2-3 ft SED
Perchlorate 0.00306

20-612494 2-9 ft
RE20-10-22274 2-3 ft SED
Perchlorate 0.00121 (J)

20-612495 2-9 ft
RE20-10-22276 2-3 ft SED
Perchlorate 0.0071
RE20-10-22277 8-9 ft SED
Perchlorate 0.00166 (J)

Note: Concentrations are in mg/kg

Figure 6.6-2 Inorganic chemicals detected or detected above BVs at AOC 20-003(b)

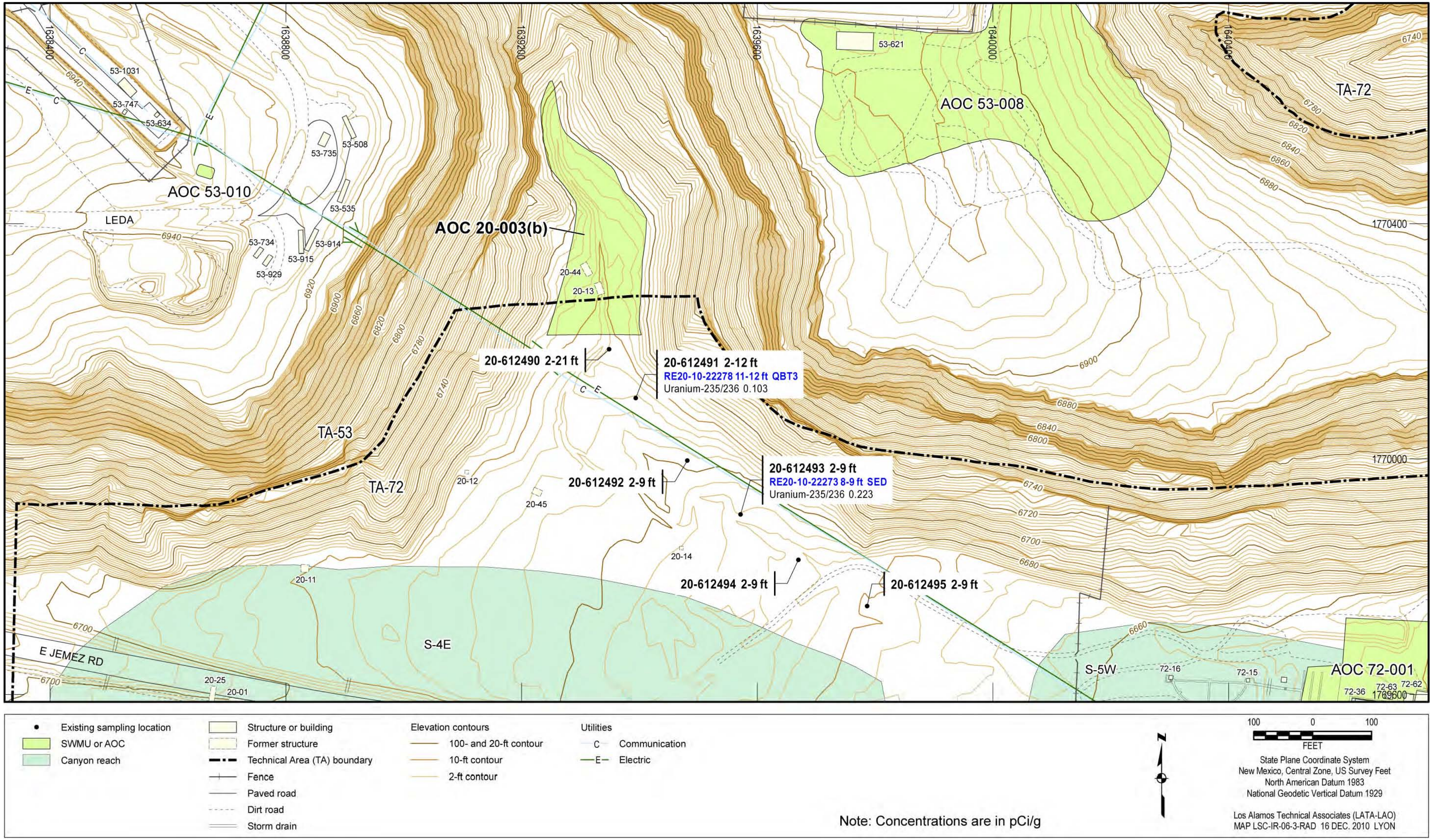


Figure 6.6-3 Radionuclides detected or detected above BVs/FVs at AOC 20-003(b)

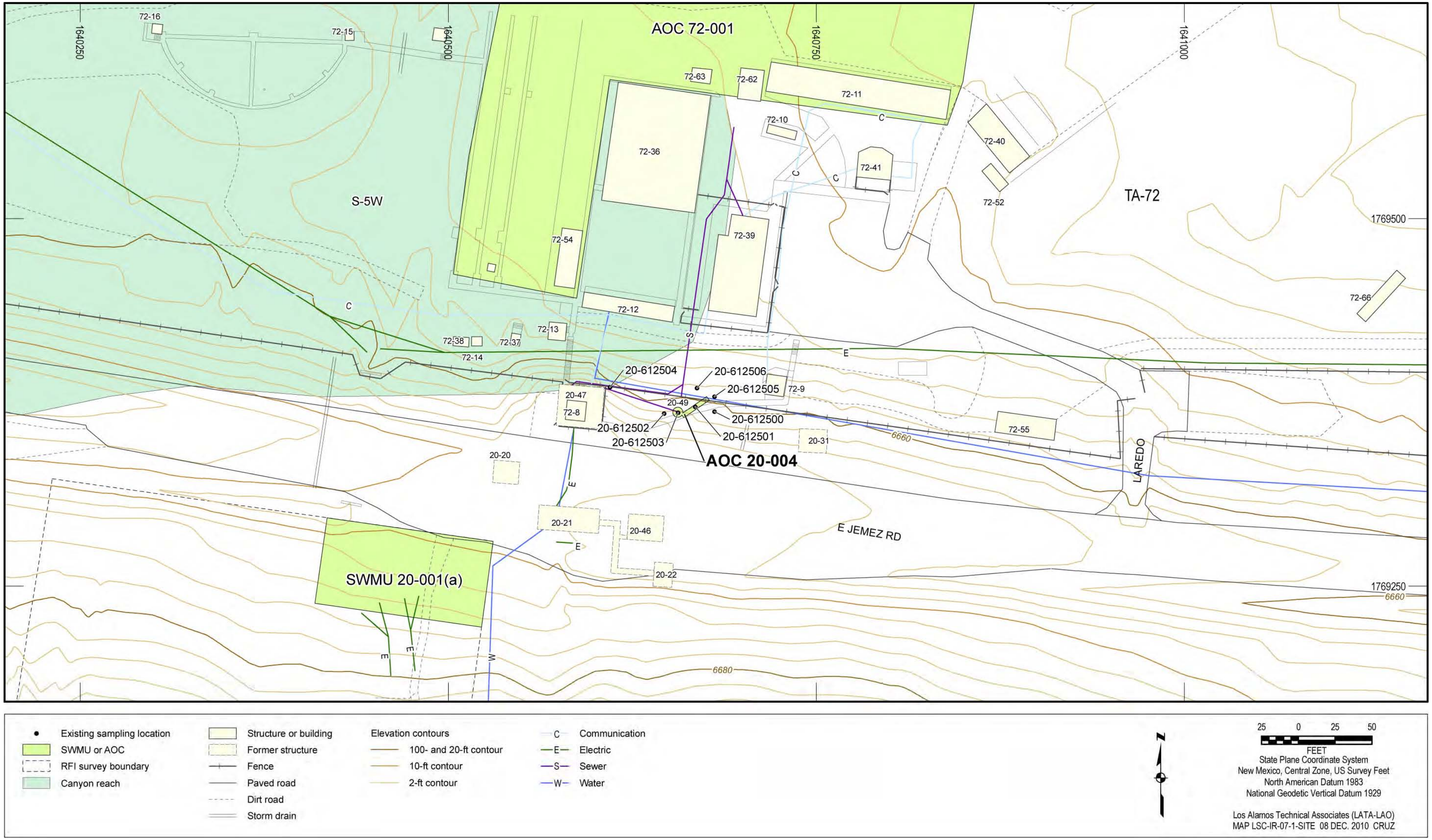
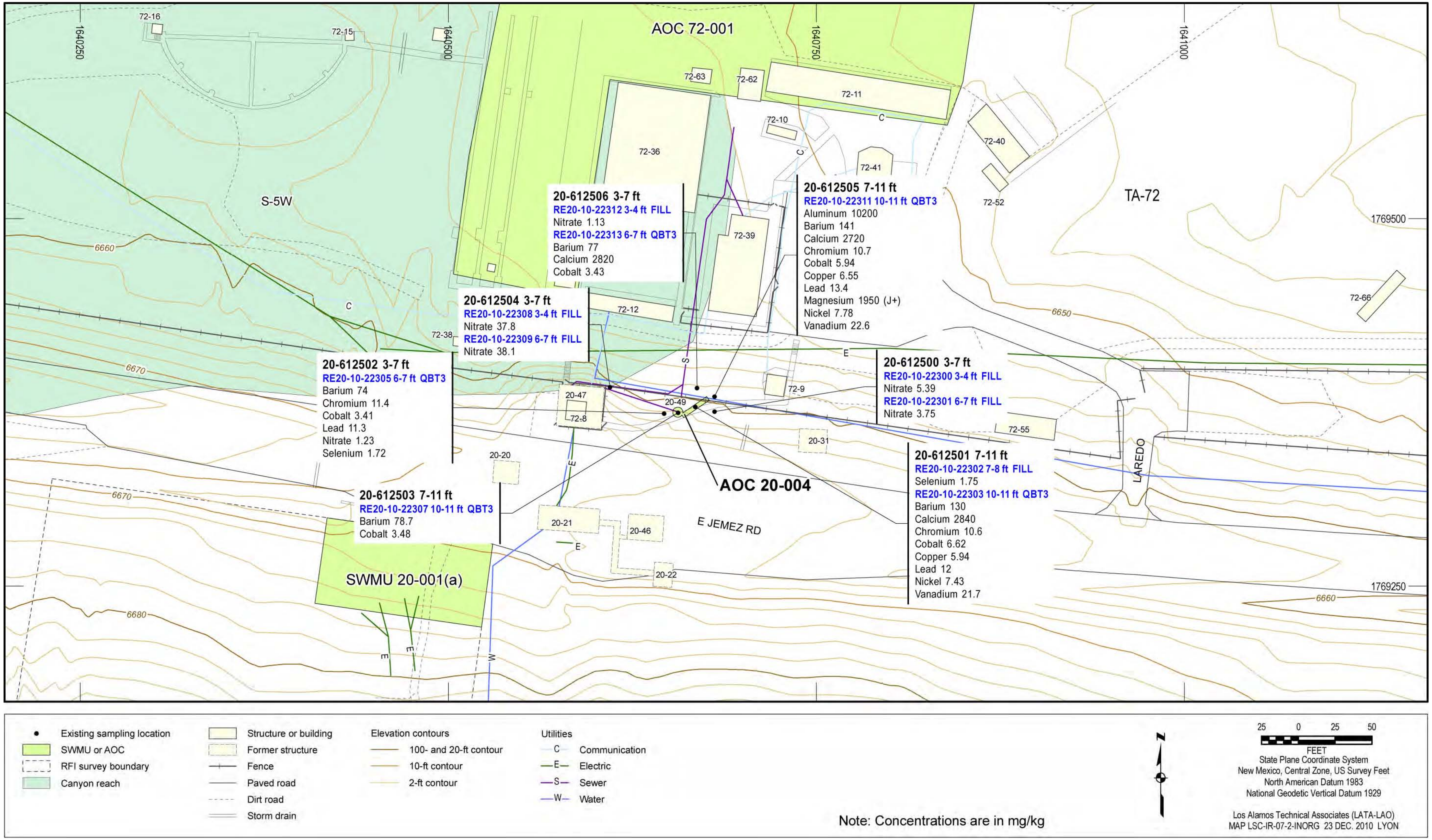


Figure 6.7-1 Site map of AOC 20-004



20-612506 3-7 ft
RE20-10-22312 3-4 ft FILL
Nitrate 1.13
RE20-10-22313 6-7 ft QBT3
Barium 77
Calcium 2820
Cobalt 3.43

20-612505 7-11 ft
RE20-10-22311 10-11 ft QBT3
Aluminum 10200
Barium 141
Calcium 2720
Chromium 10.7
Cobalt 5.94
Copper 6.55
Lead 13.4
Magnesium 1950 (J+)
Nickel 7.78
Vanadium 22.6

20-612504 3-7 ft
RE20-10-22308 3-4 ft FILL
Nitrate 37.8
RE20-10-22309 6-7 ft FILL
Nitrate 38.1

20-612502 3-7 ft
RE20-10-22305 6-7 ft QBT3
Barium 74
Chromium 11.4
Cobalt 3.41
Lead 11.3
Nitrate 1.23
Selenium 1.72

20-612500 3-7 ft
RE20-10-22300 3-4 ft FILL
Nitrate 5.39
RE20-10-22301 6-7 ft FILL
Nitrate 3.75

20-612501 7-11 ft
RE20-10-22302 7-8 ft FILL
Selenium 1.75
RE20-10-22303 10-11 ft QBT3
Barium 130
Calcium 2840
Chromium 10.6
Cobalt 6.62
Copper 5.94
Lead 12
Nickel 7.43
Vanadium 21.7

20-612503 7-11 ft
RE20-10-22307 10-11 ft QBT3
Barium 78.7
Cobalt 3.48

Note: Concentrations are in mg/kg

Figure 6.7-2 Inorganic chemicals detected or detected above BVs at AOC 20-004

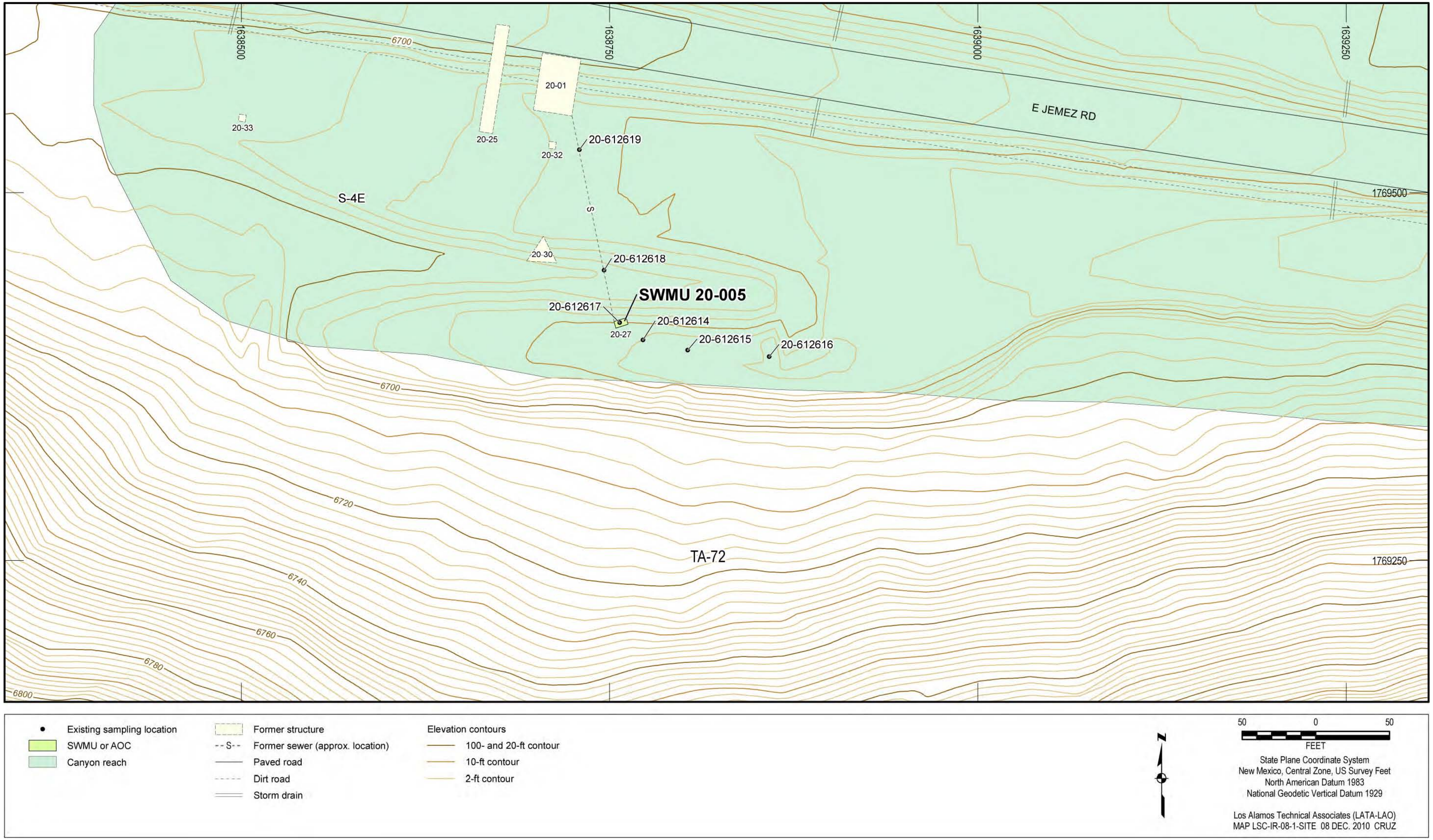


Figure 6.8-1 **Site map of SWMU 20-005**

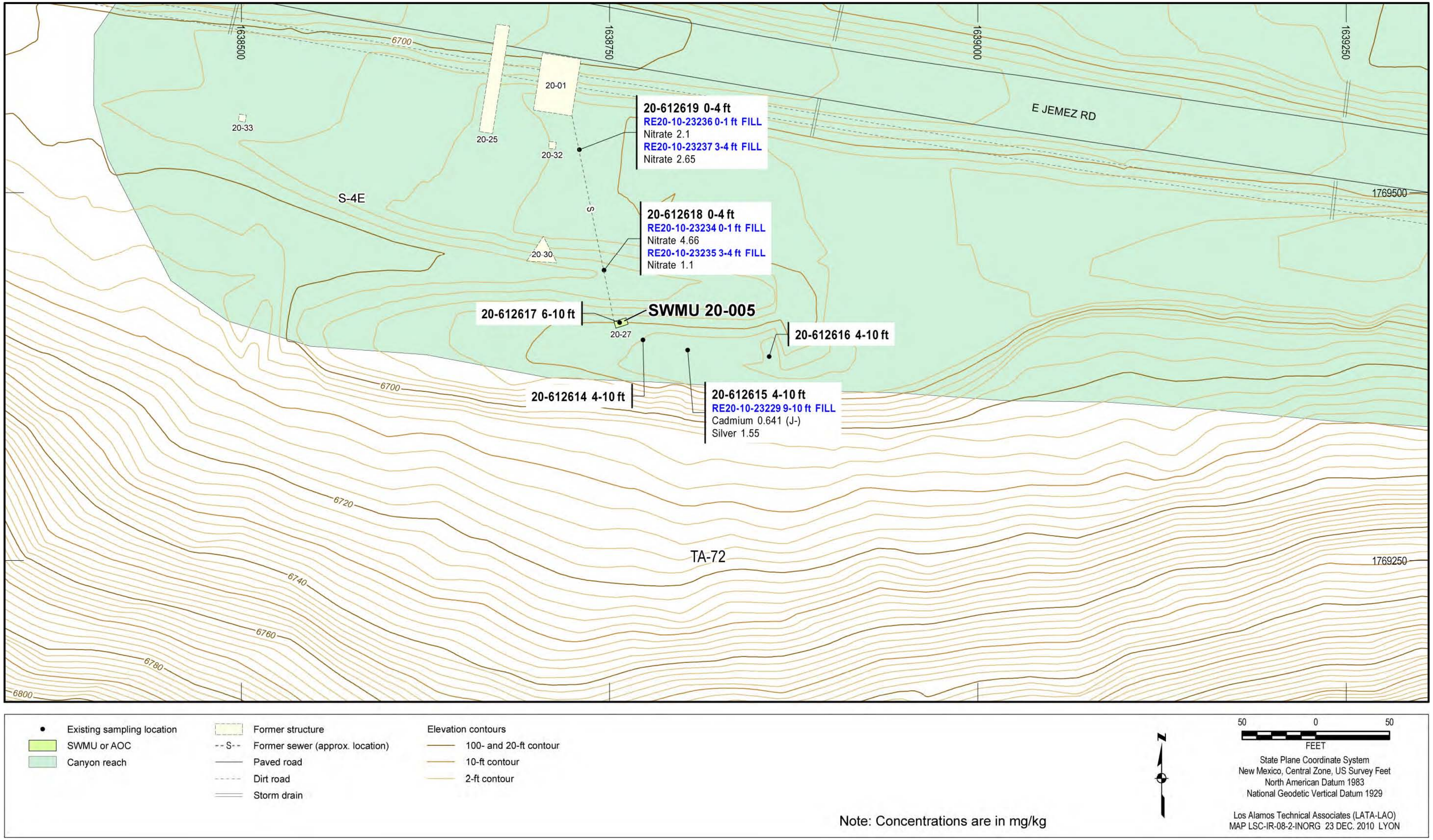


Figure 6.8-2 Inorganic chemicals detected or detected above BVs at SWMU 20-005

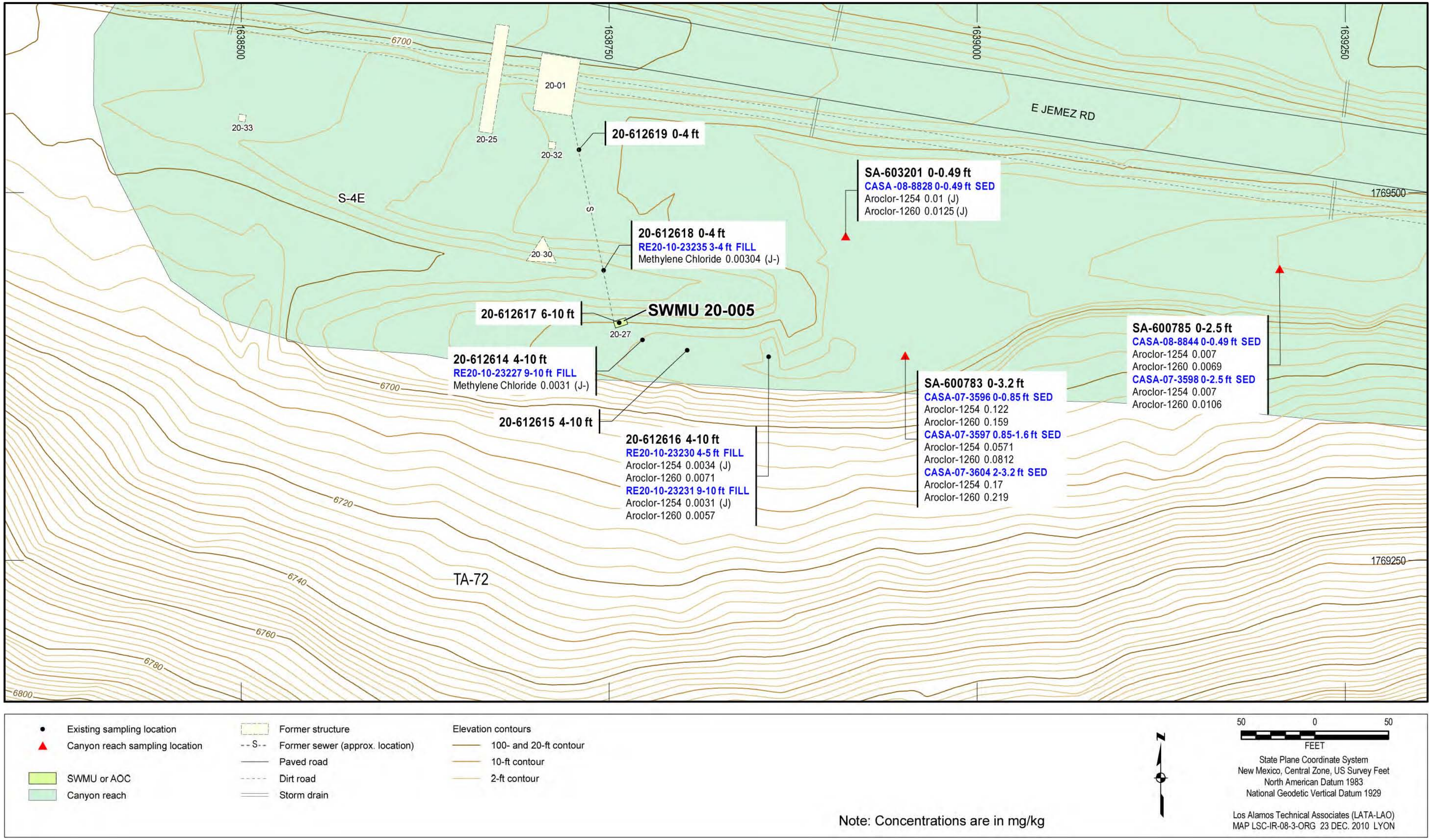


Figure 6.8-3 Organic chemicals detected at SWMU 20-005

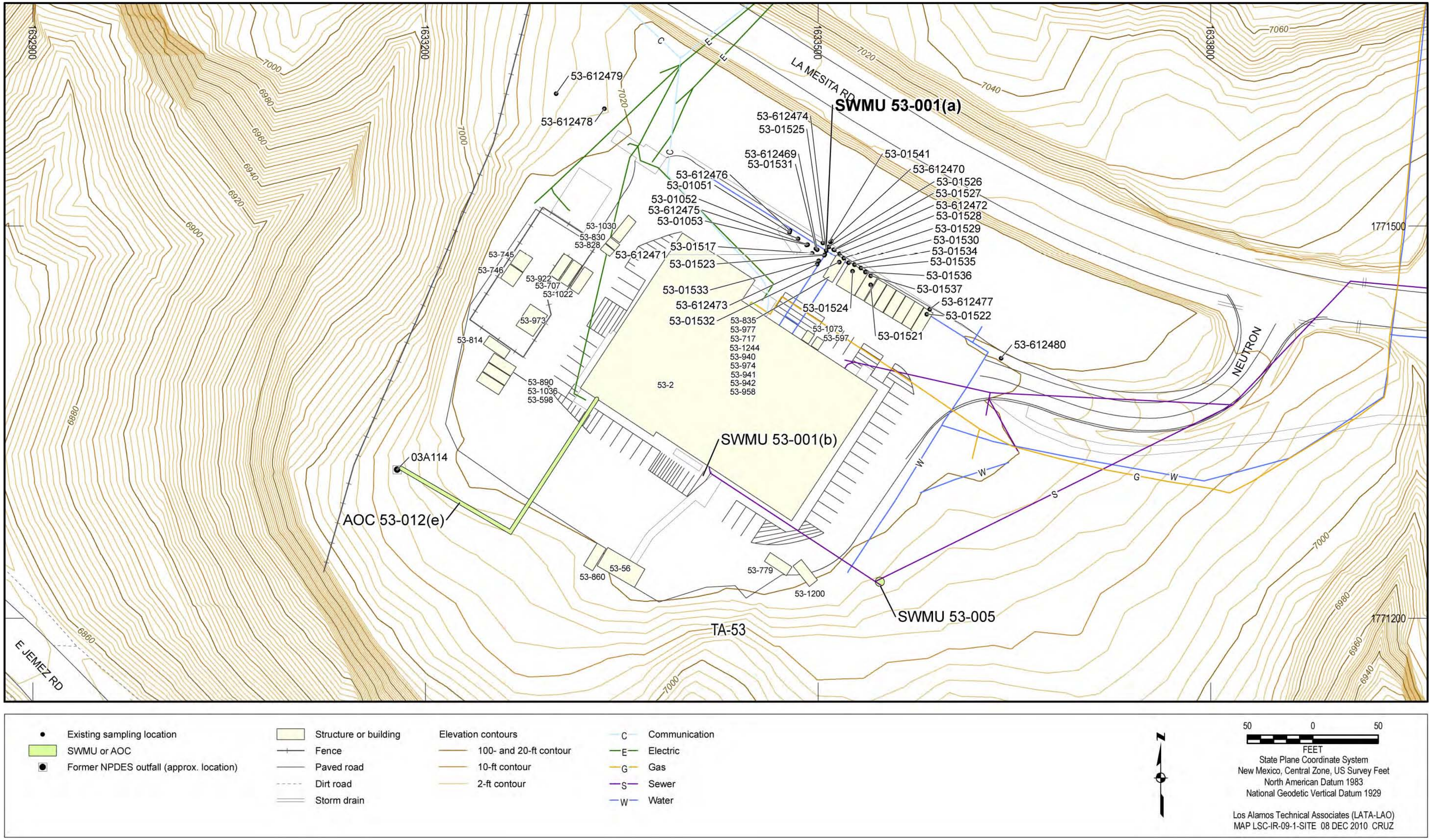


Figure 7.2-1 Site map of SWMU 53-001(a)

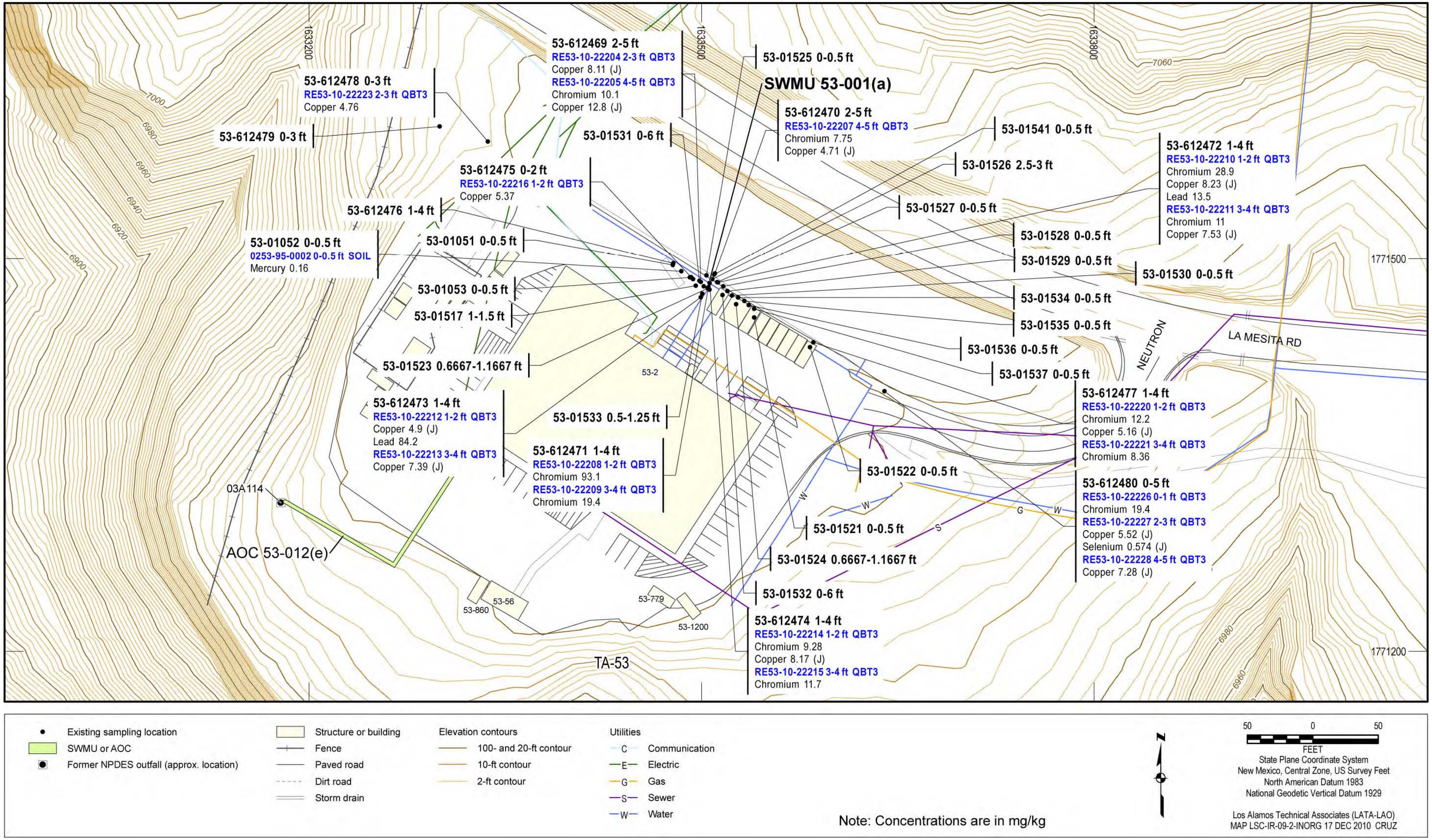


Figure 7.2-2 Inorganic chemicals detected or detected above BVs at SWMU 53-001(a)

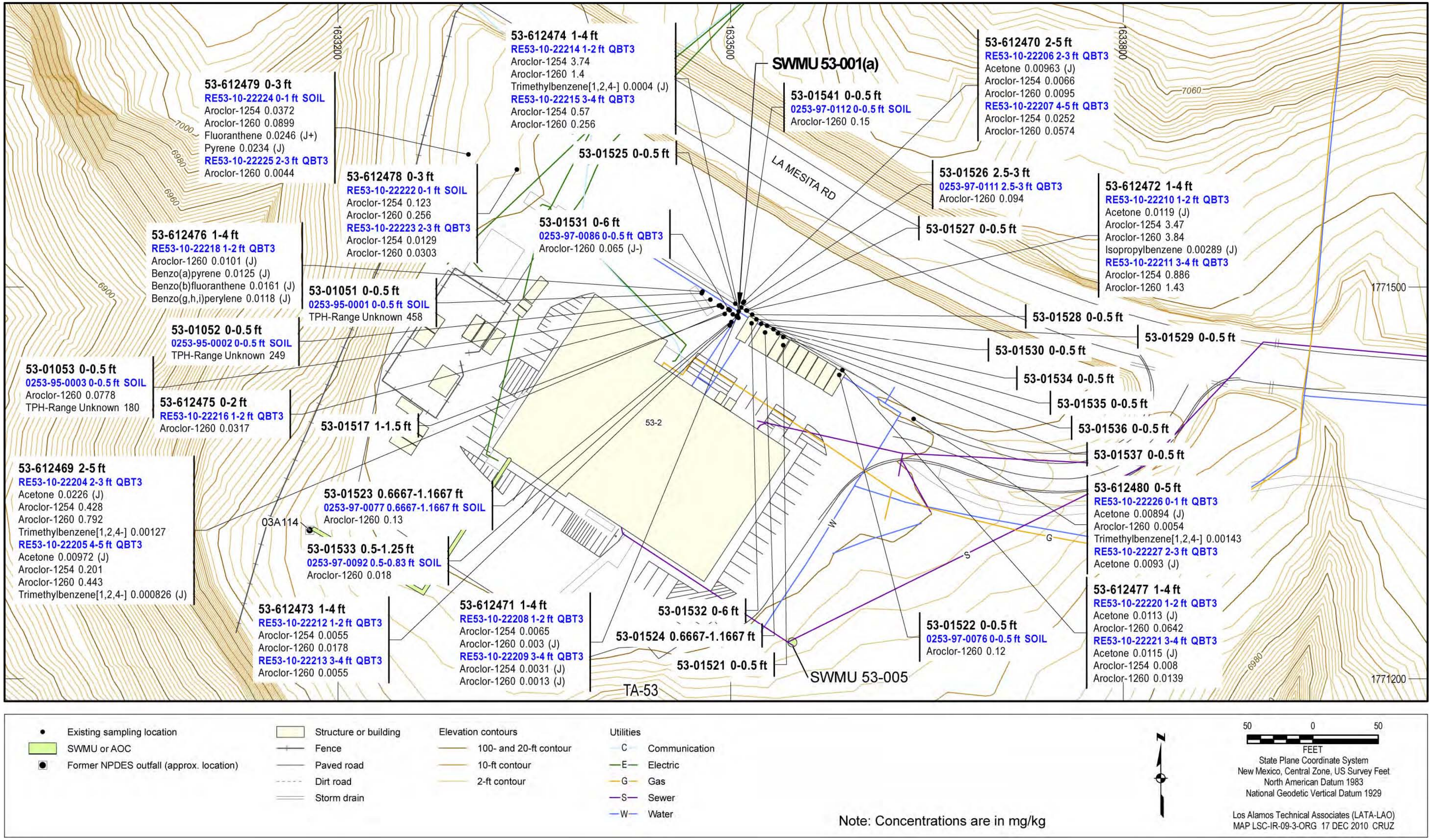


Figure 7.2-3 Organic chemicals detected at SWMU 53-001(a)

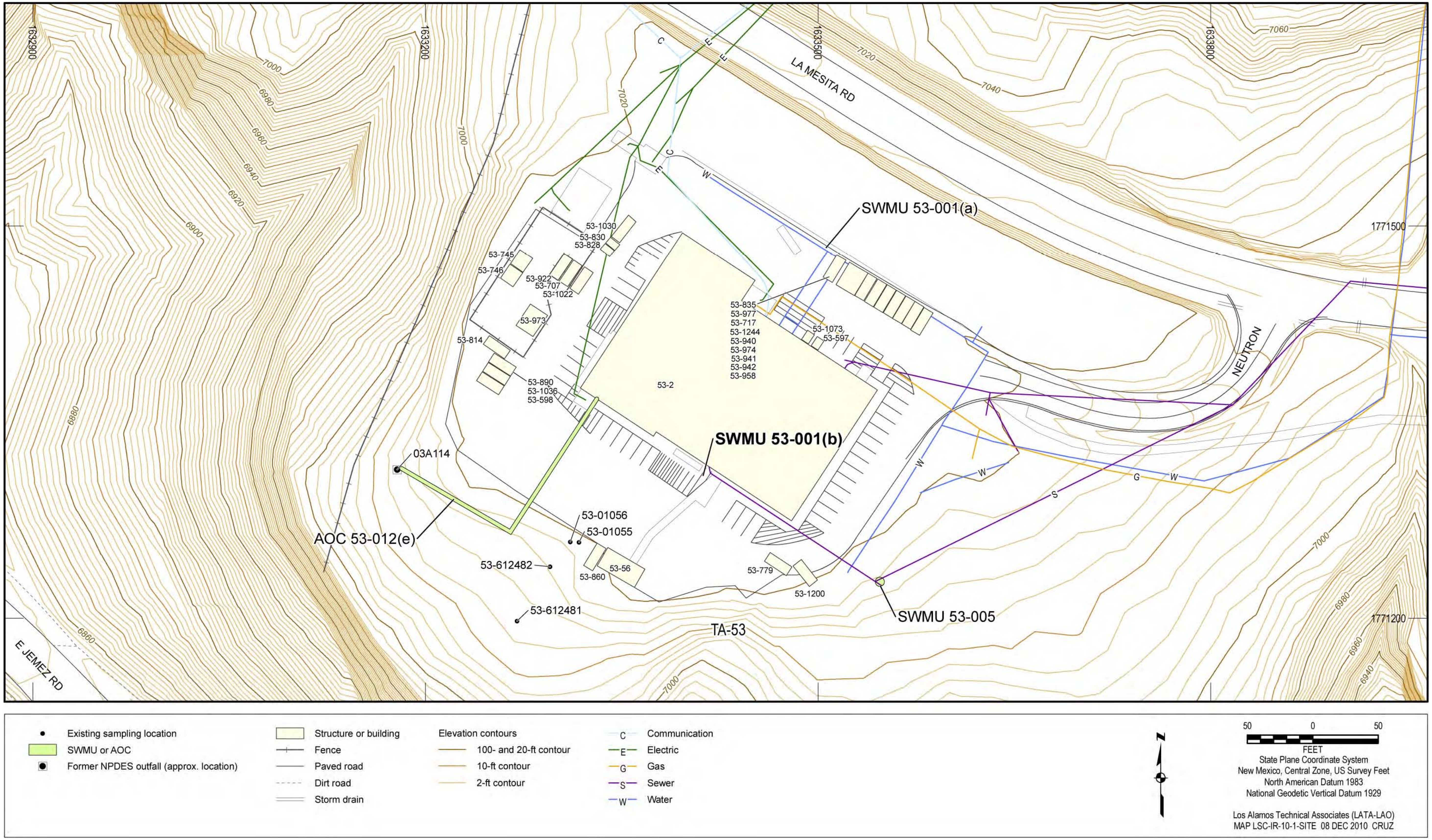


Figure 7.3-1 Site map of SWMU 53-001(b)

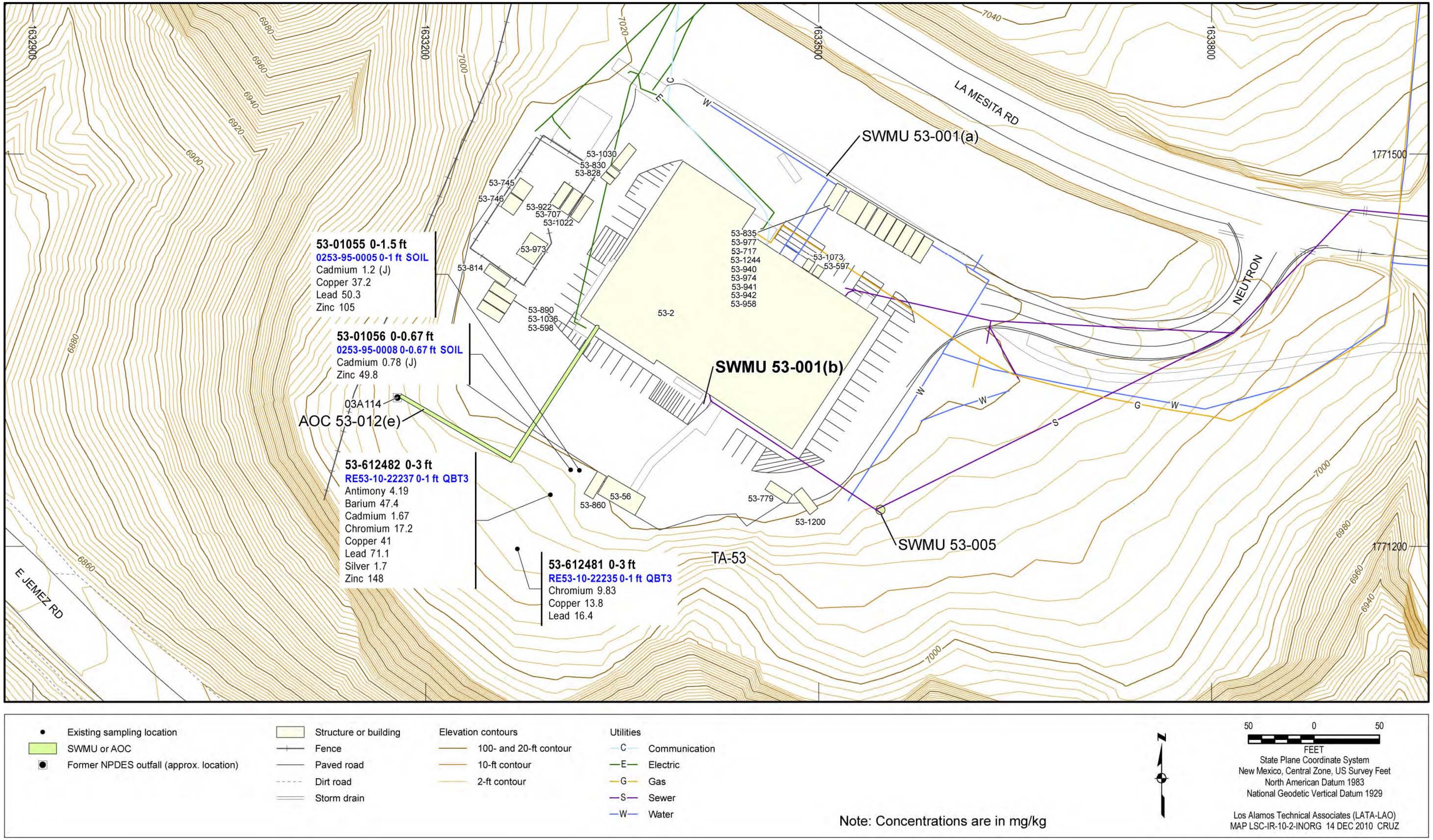


Figure 7.3-2 Inorganic chemicals detected or detected above BVs at SWMU 53-001(b)

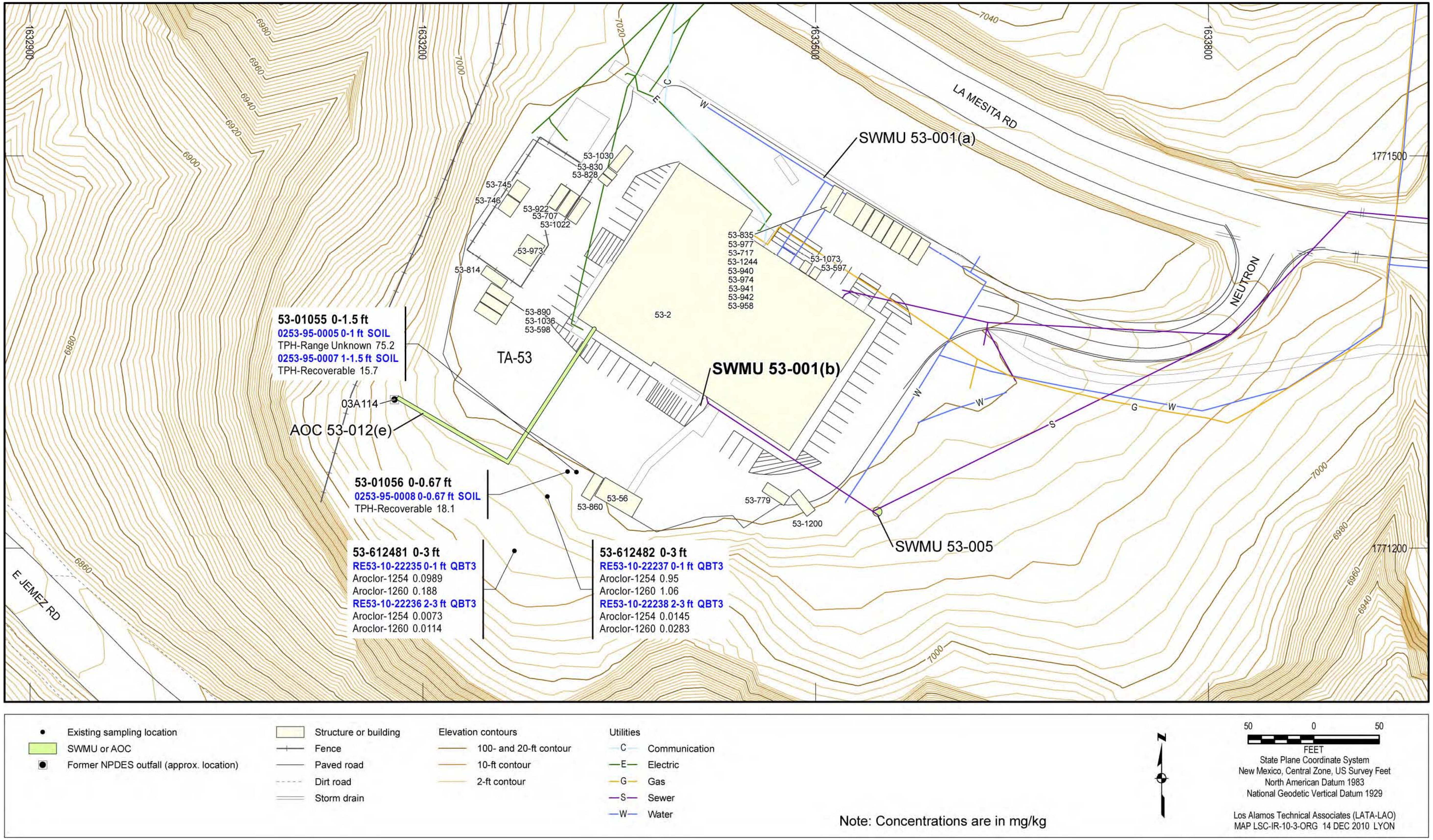


Figure 7.3-3 Organic chemicals detected at SWMU 53-001(b)

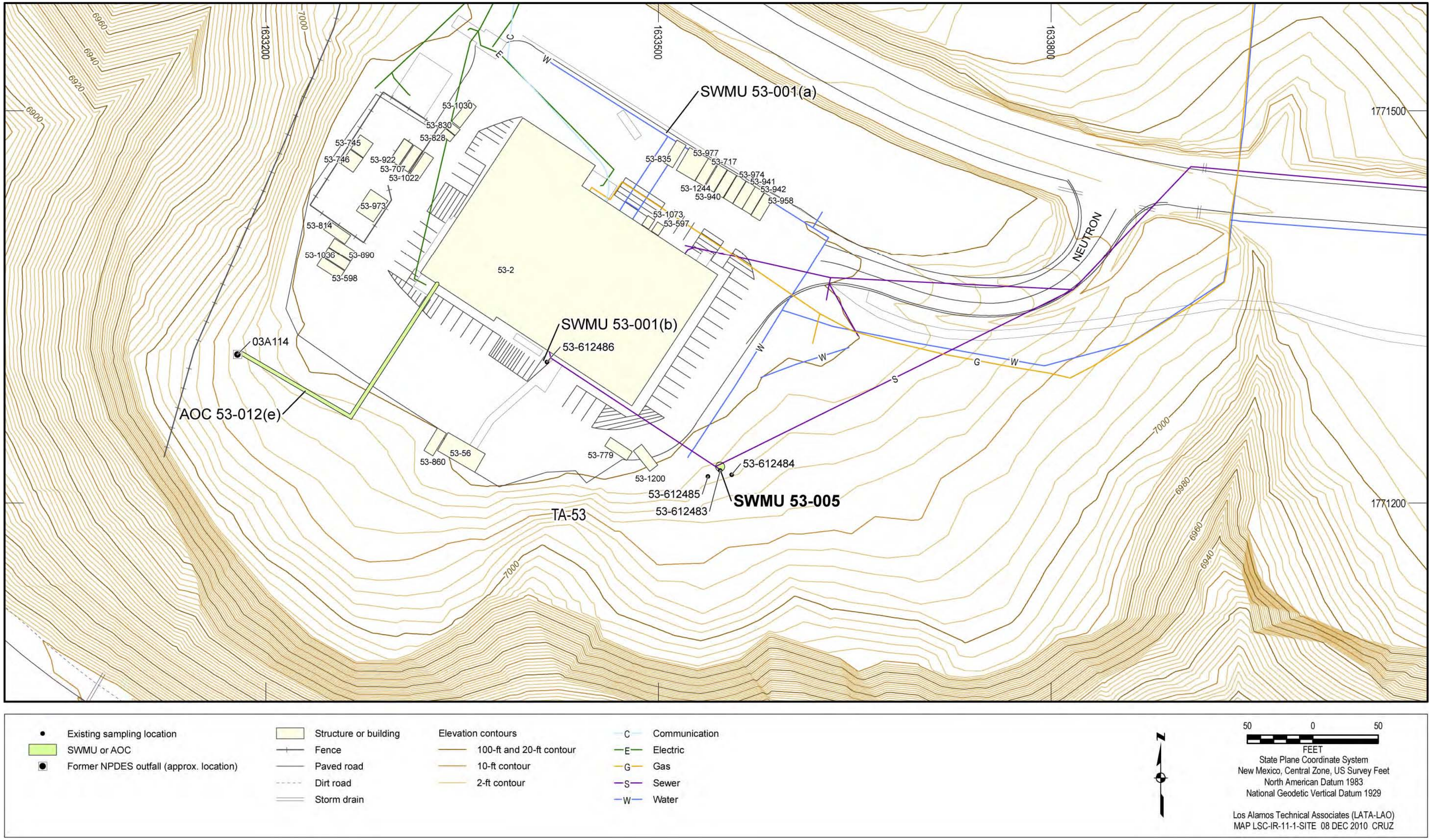


Figure 7.4-1 Site map of SWMU 53-005

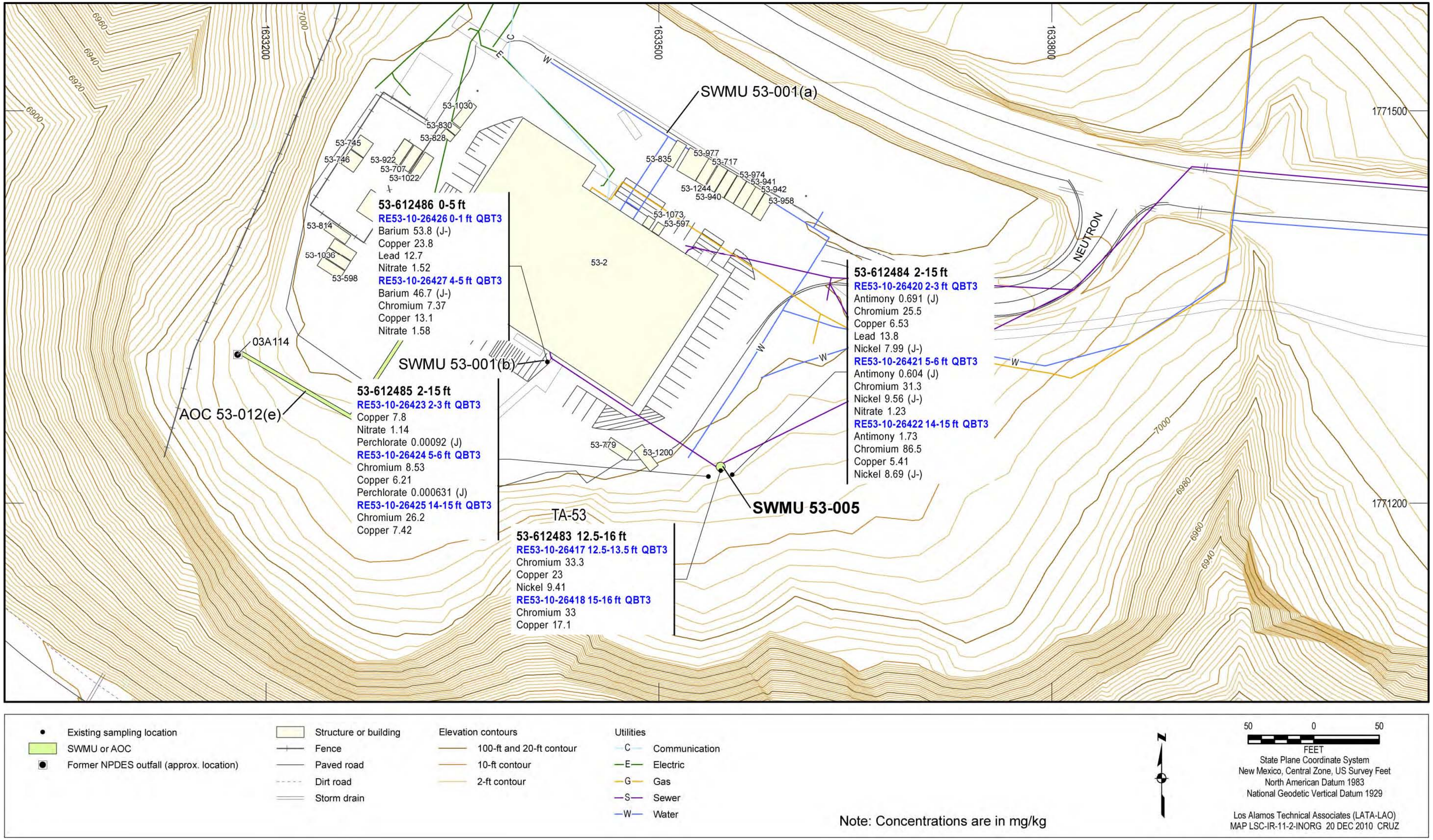
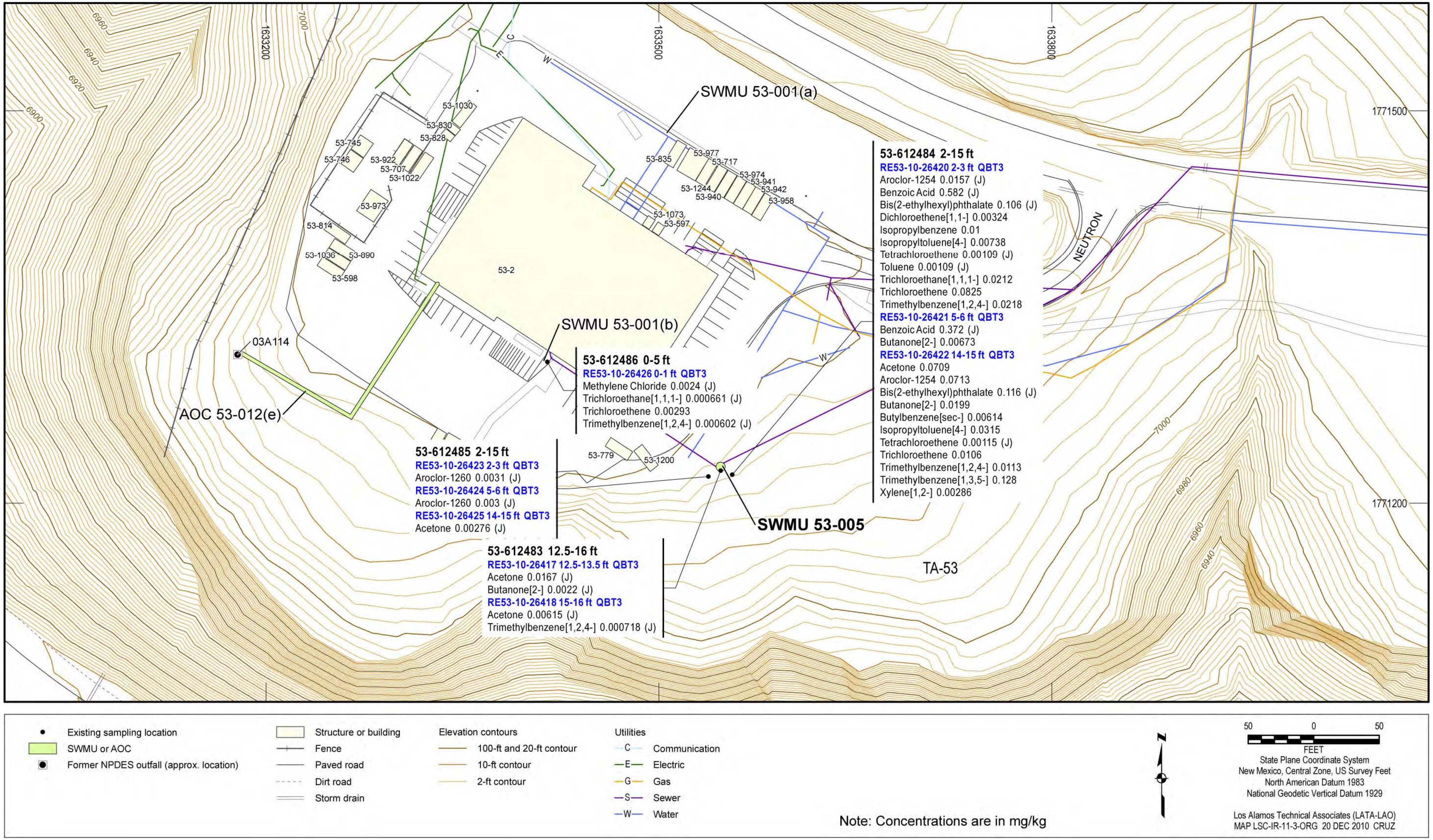


Figure 7.4-2 Inorganic chemicals detected or detected above BVs at SWMU 53-005



53-612484 2-15 ft
RE53-10-26420 2-3 ft QBT3
Aroclor-1254 0.0157 (J)
Benzoic Acid 0.582 (J)
Bis(2-ethylhexyl)phthalate 0.106 (J)
Dichloroethene[1,1-] 0.00324
Isopropylbenzene 0.01
Isopropyltoluene[4-] 0.00738
Tetrachloroethene 0.00109 (J)
Toluene 0.00109 (J)
Trichloroethane[1,1,1-] 0.0212
Trichloroethene 0.0825
Trimethylbenzene[1,2,4-] 0.0218
RE53-10-26421 5-6 ft QBT3
Benzoic Acid 0.372 (J)
Butanone[2-] 0.00673
RE53-10-26422 14-15 ft QBT3
Acetone 0.0709
Aroclor-1254 0.0713
Bis(2-ethylhexyl)phthalate 0.116 (J)
Butanone[2-] 0.0199
Butylbenzene[sec-] 0.00614
Isopropyltoluene[4-] 0.0315
Tetrachloroethene 0.00115 (J)
Trichloroethene 0.0106
Trimethylbenzene[1,2,4-] 0.0113
Trimethylbenzene[1,3,5-] 0.128
Xylene[1,2-] 0.00286

53-612486 0-5 ft
RE53-10-26426 0-1 ft QBT3
Methylene Chloride 0.0024 (J)
Trichloroethane[1,1,1-] 0.000661 (J)
Trichloroethene 0.00293
Trimethylbenzene[1,2,4-] 0.000602 (J)

53-612485 2-15 ft
RE53-10-26423 2-3 ft QBT3
Aroclor-1260 0.0031 (J)
RE53-10-26424 5-6 ft QBT3
Aroclor-1260 0.003 (J)
RE53-10-26425 14-15 ft QBT3
Acetone 0.00276 (J)

53-612483 12.5-16 ft
RE53-10-26417 12.5-13.5 ft QBT3
Acetone 0.0167 (J)
Butanone[2-] 0.0022 (J)
RE53-10-26418 15-16 ft QBT3
Acetone 0.00615 (J)
Trimethylbenzene[1,2,4-] 0.000718 (J)

Note: Concentrations are in mg/kg

Figure 7.4-3 Organic chemicals detected at SWMU 53-005

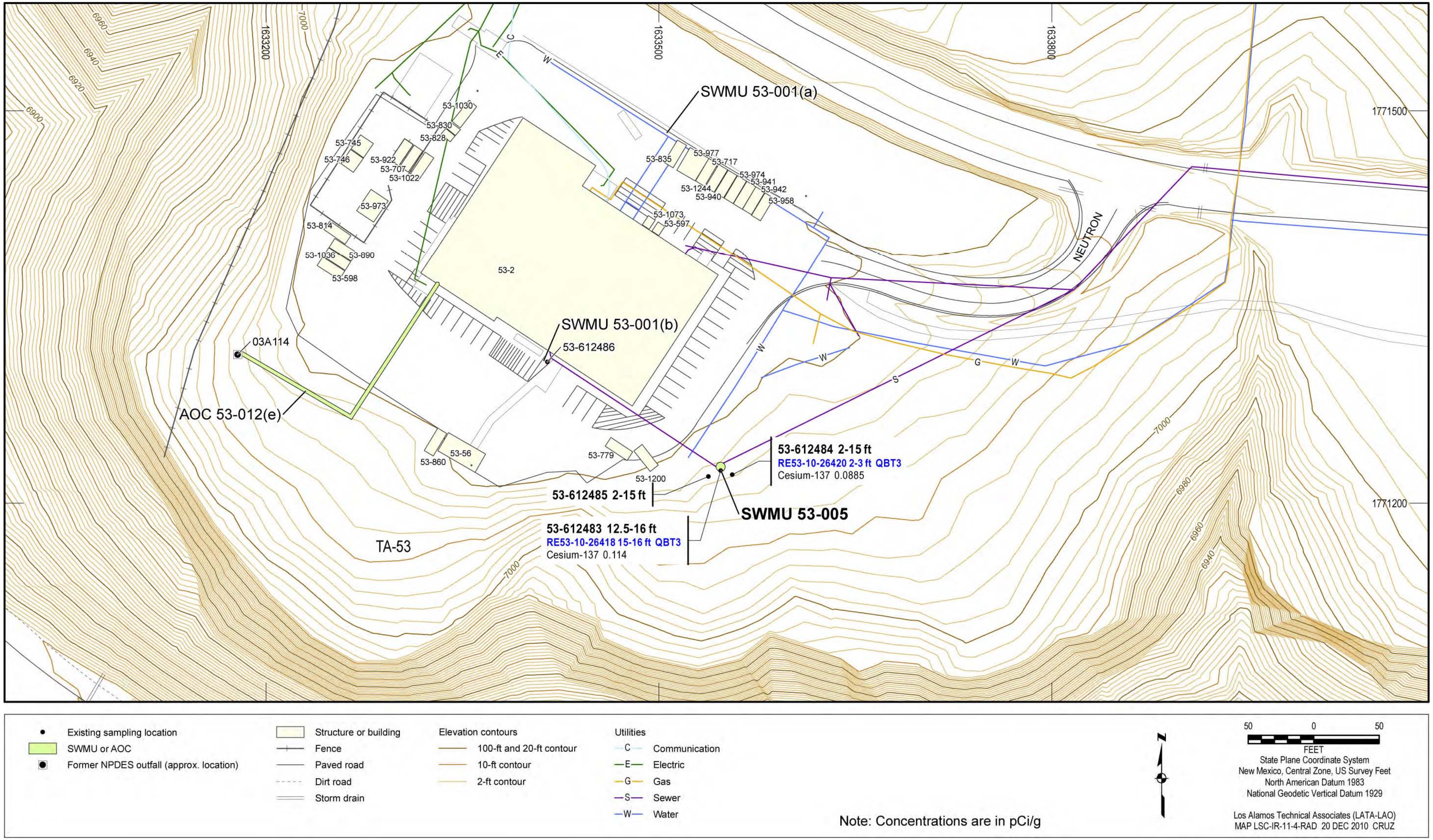


Figure 7.4-4 Radionuclides detected or detected above BVs/FVs at SWMU 53-005

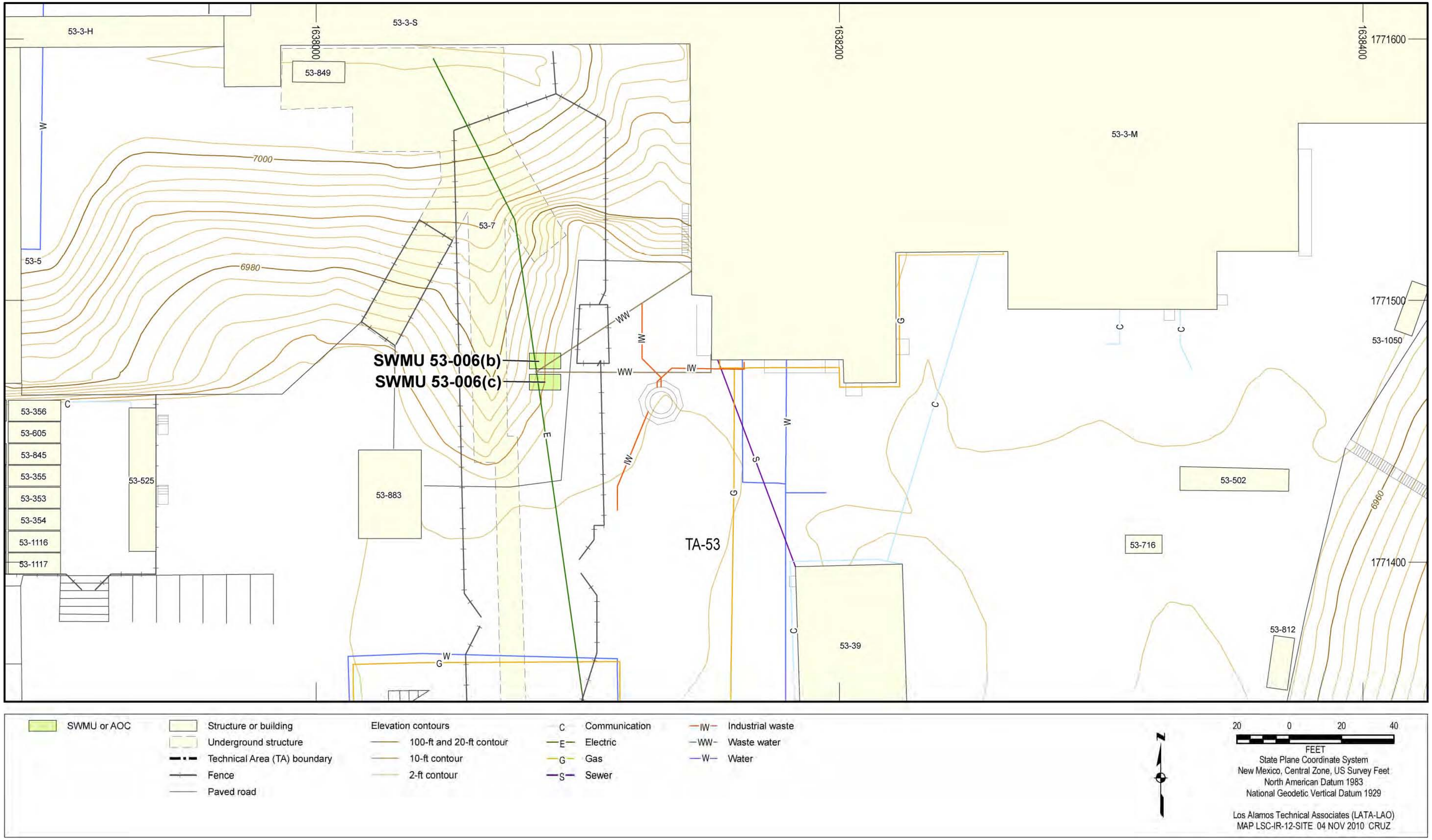


Figure 7.5-1 Site map of SWMUs 53-006(b) and 53-006(c)

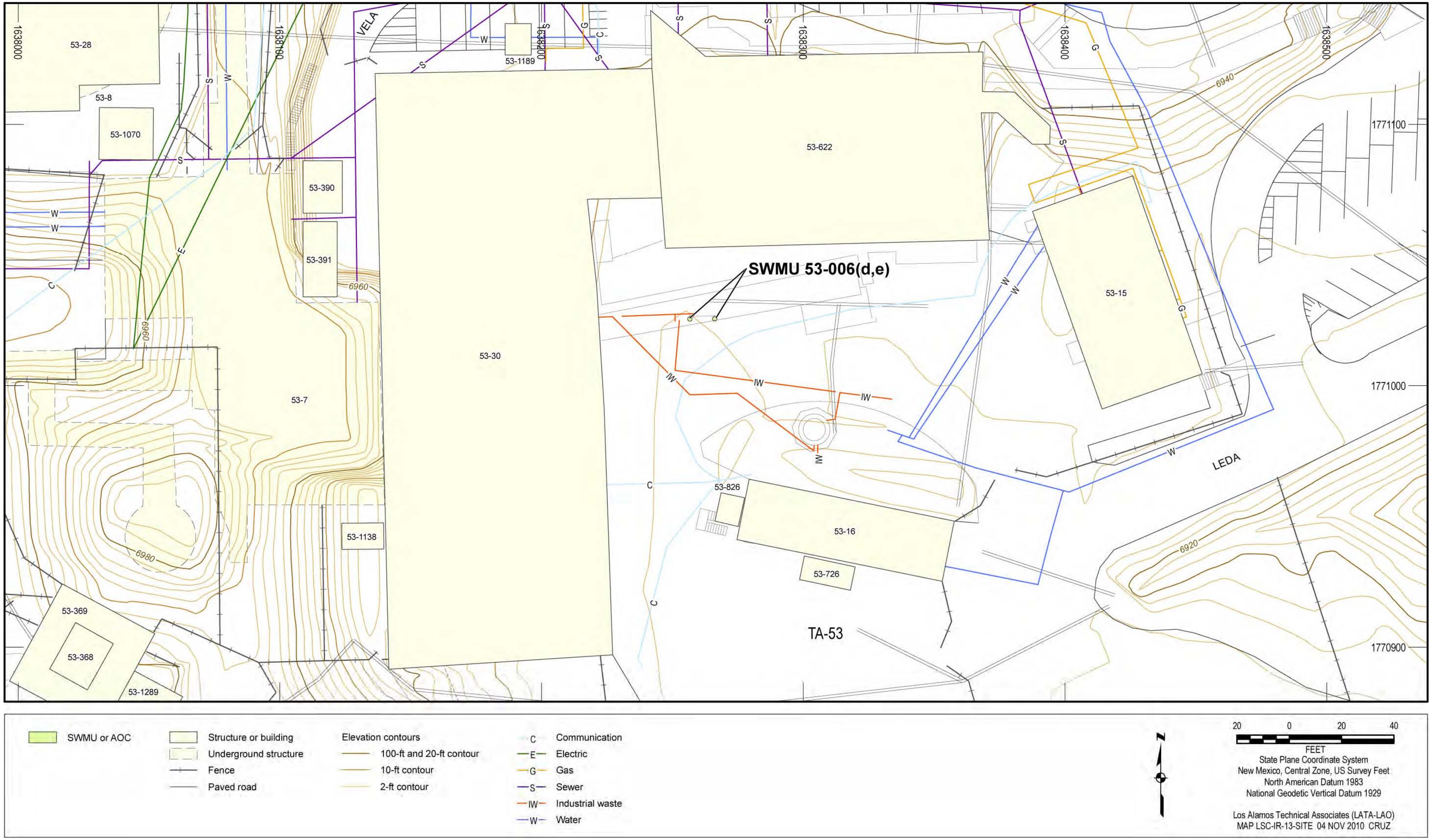


Figure 7.6-1 Site map of SWMUs 53-006(d) and 53-006(e)

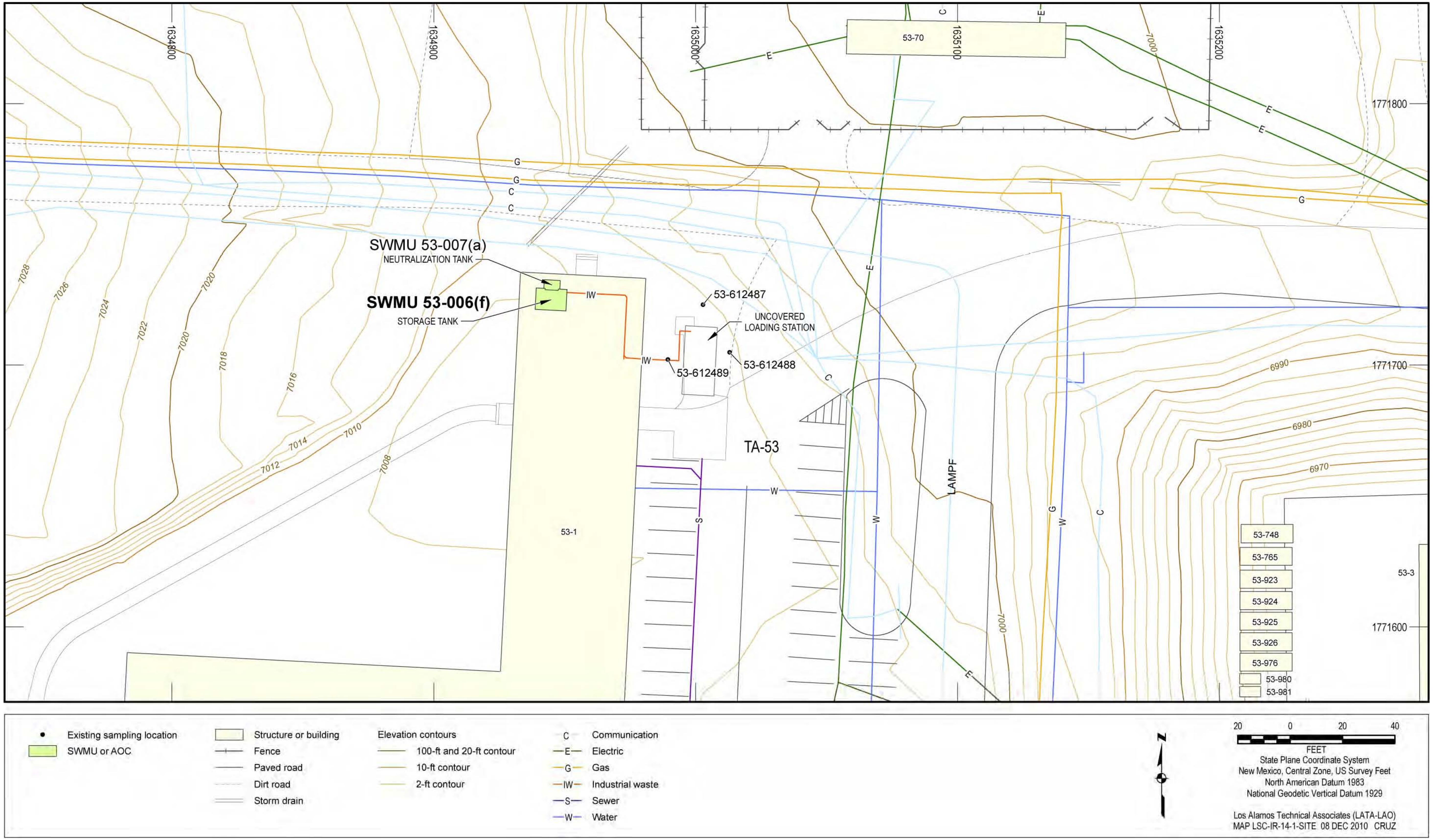
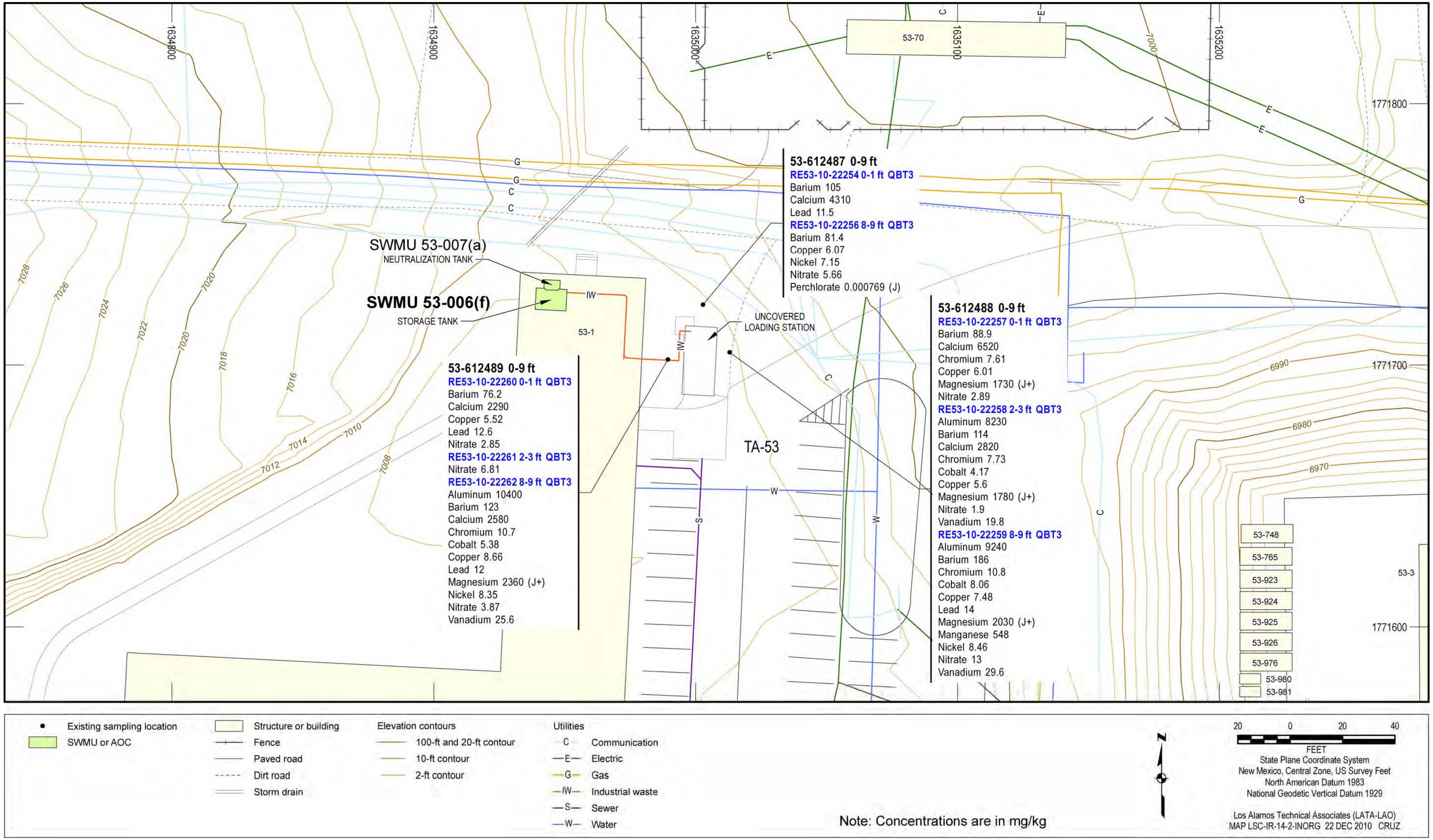


Figure 7.7-1 Site map of SWMU 53-006(f)



53-612487 0-9 ft
RE53-10-22254 0-1 ft QBT3
Barium 105
Calcium 4310
Lead 11.5
RE53-10-22256 8-9 ft QBT3
Barium 81.4
Copper 6.07
Nickel 7.15
Nitrate 5.66
Perchlorate 0.000769 (J)

53-612489 0-9 ft
RE53-10-22260 0-1 ft QBT3
Barium 76.2
Calcium 2290
Copper 5.52
Lead 12.6
Nitrate 2.85
RE53-10-22261 2-3 ft QBT3
Nitrate 6.81
RE53-10-22262 8-9 ft QBT3
Aluminum 10400
Barium 123
Calcium 2580
Chromium 10.7
Cobalt 5.38
Copper 8.66
Lead 12
Magnesium 2360 (J+)
Nickel 8.35
Nitrate 3.87
Vanadium 25.6

53-612488 0-9 ft
RE53-10-22257 0-1 ft QBT3
Barium 88.9
Calcium 6520
Chromium 7.61
Copper 6.01
Magnesium 1730 (J+)
Nitrate 2.89
RE53-10-22258 2-3 ft QBT3
Aluminum 8230
Barium 114
Calcium 2820
Chromium 7.73
Cobalt 4.17
Copper 5.6
Magnesium 1780 (J+)
Nitrate 1.9
Vanadium 19.8
RE53-10-22259 8-9 ft QBT3
Aluminum 9240
Barium 186
Chromium 10.8
Cobalt 8.06
Copper 7.48
Lead 14
Magnesium 2030 (J+)
Manganese 548
Nickel 8.46
Nitrate 13
Vanadium 29.6

Note: Concentrations are in mg/kg

Figure 7.7-2 Inorganic chemicals detected or detected above BVs at SWMU 53-006(f)

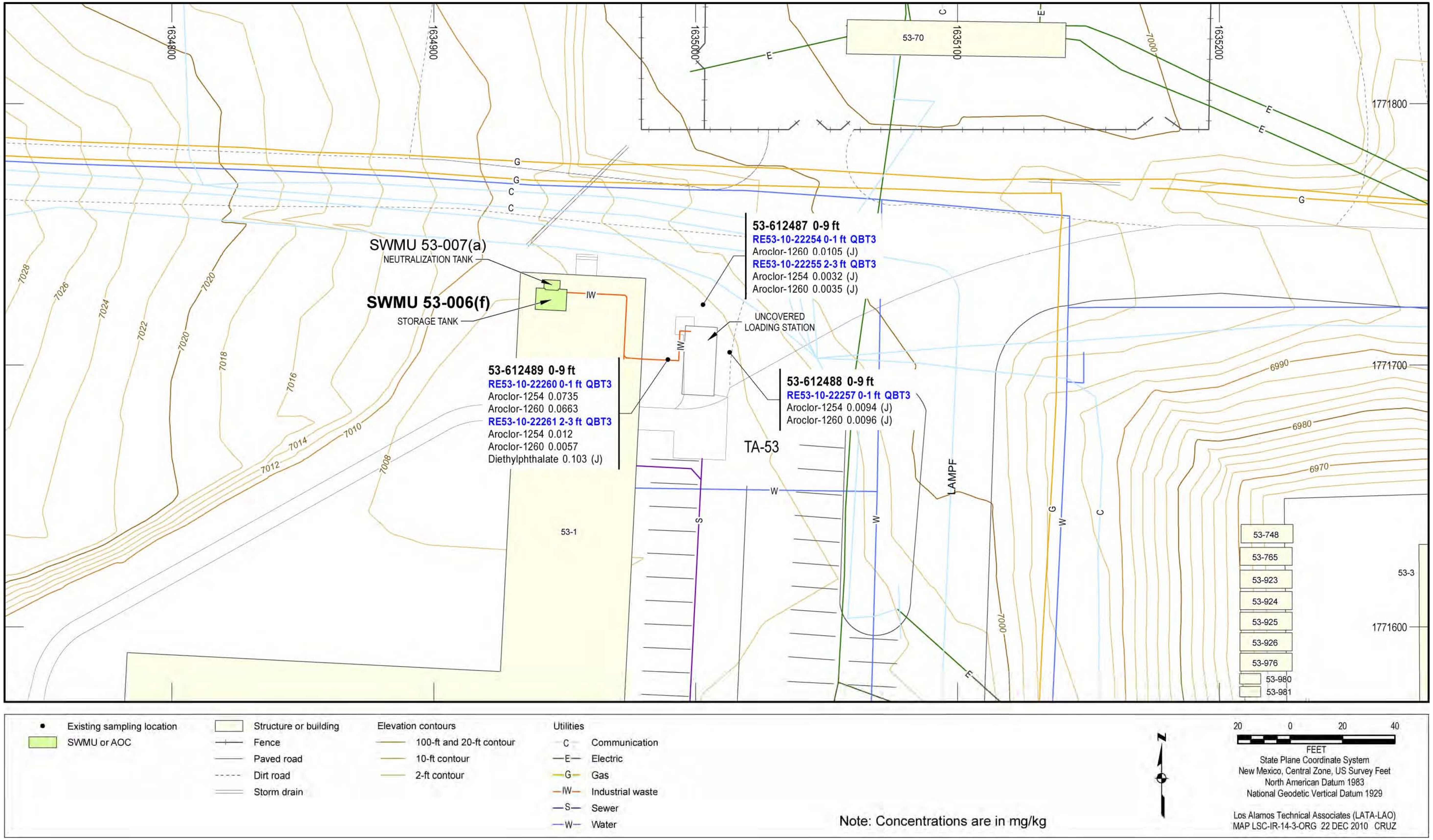


Figure 7.7-3 Organic chemicals detected at SWMU 53-006(f)

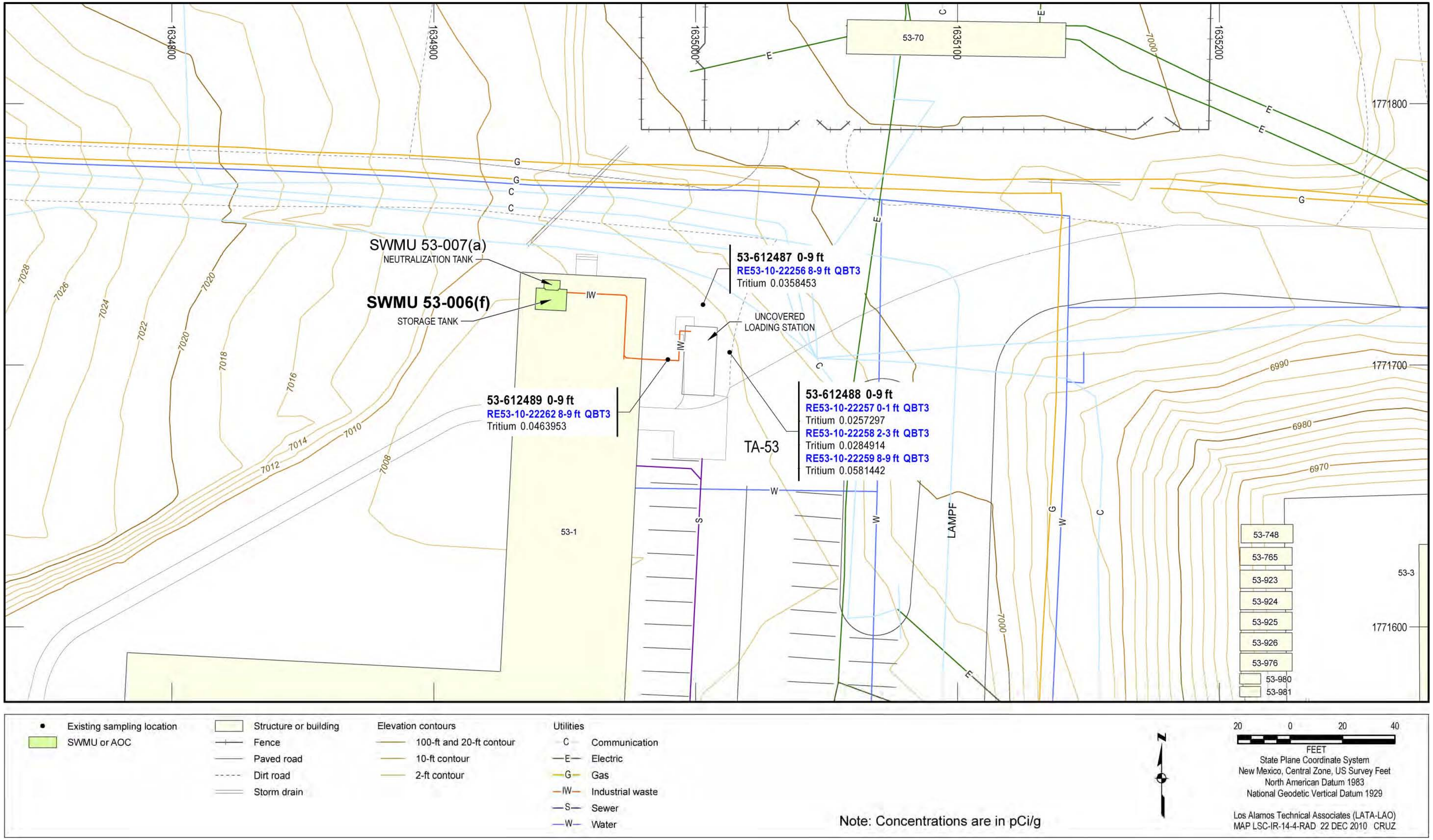


Figure 7.7-4 Radionuclides detected or detected above BVs/FVs at SWMU 53-006(f)

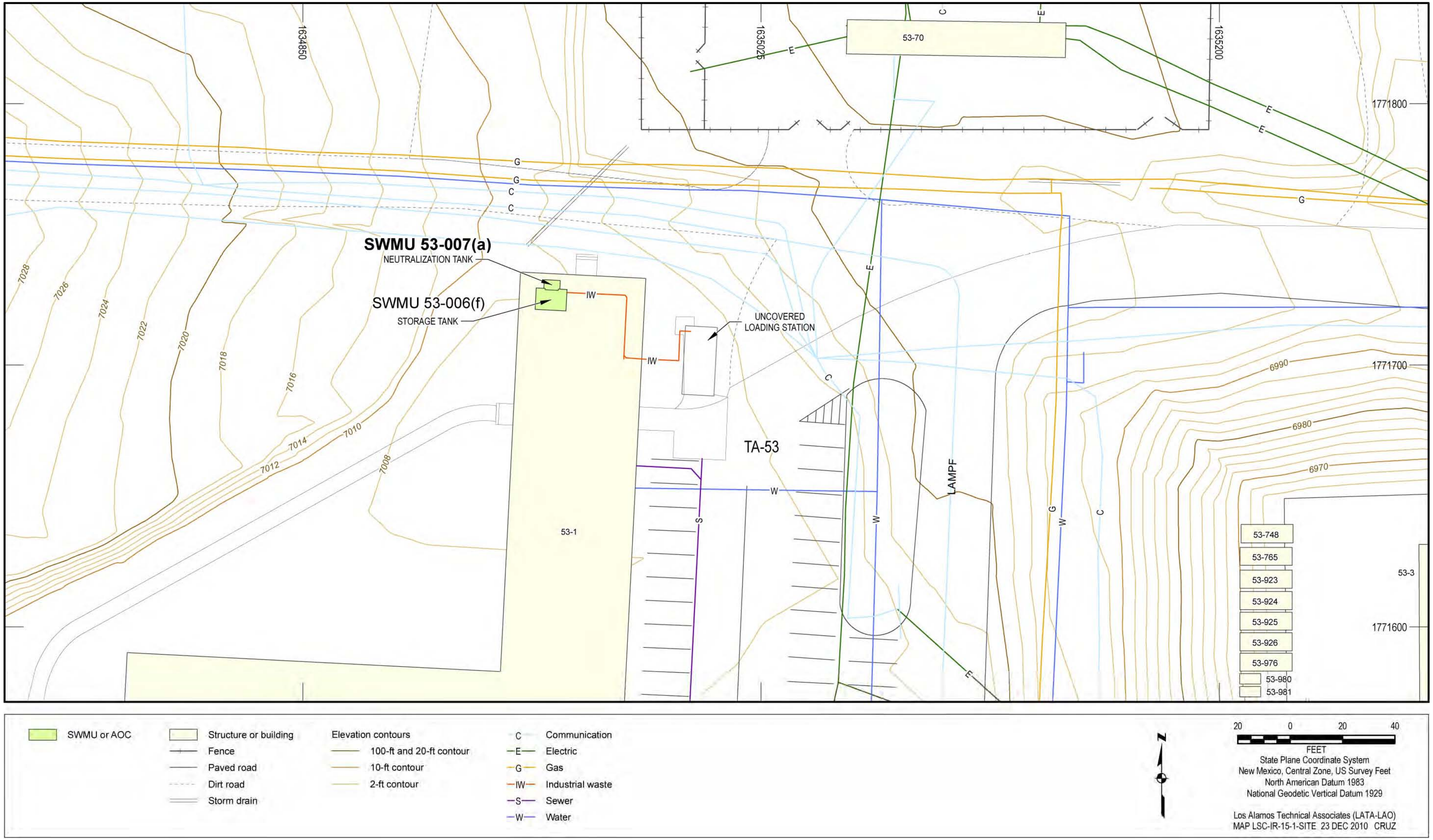


Figure 7.8-1 Site map of SWMU 53-007(a)

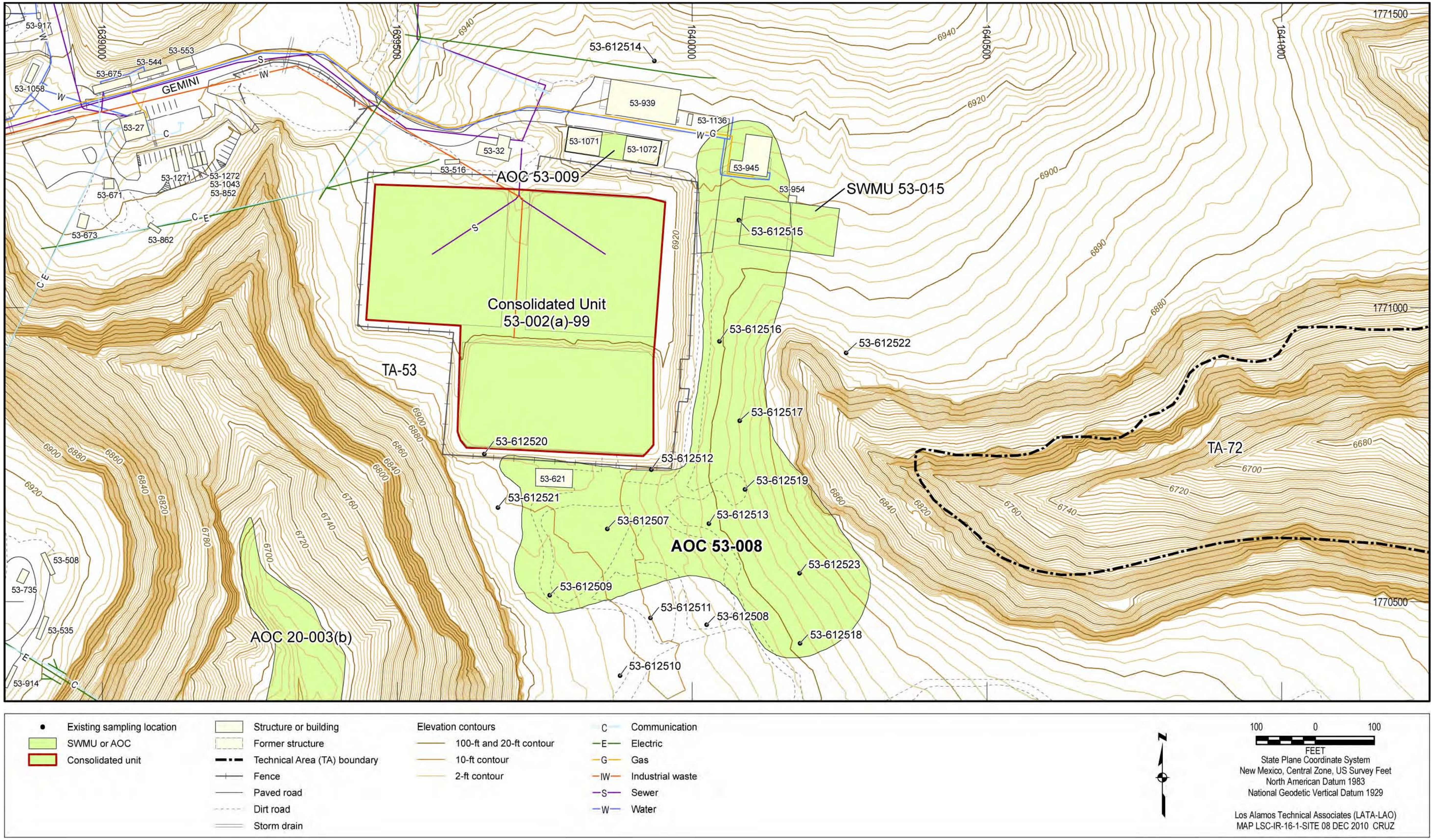


Figure 7.9-1 Site map of AOC 53-008

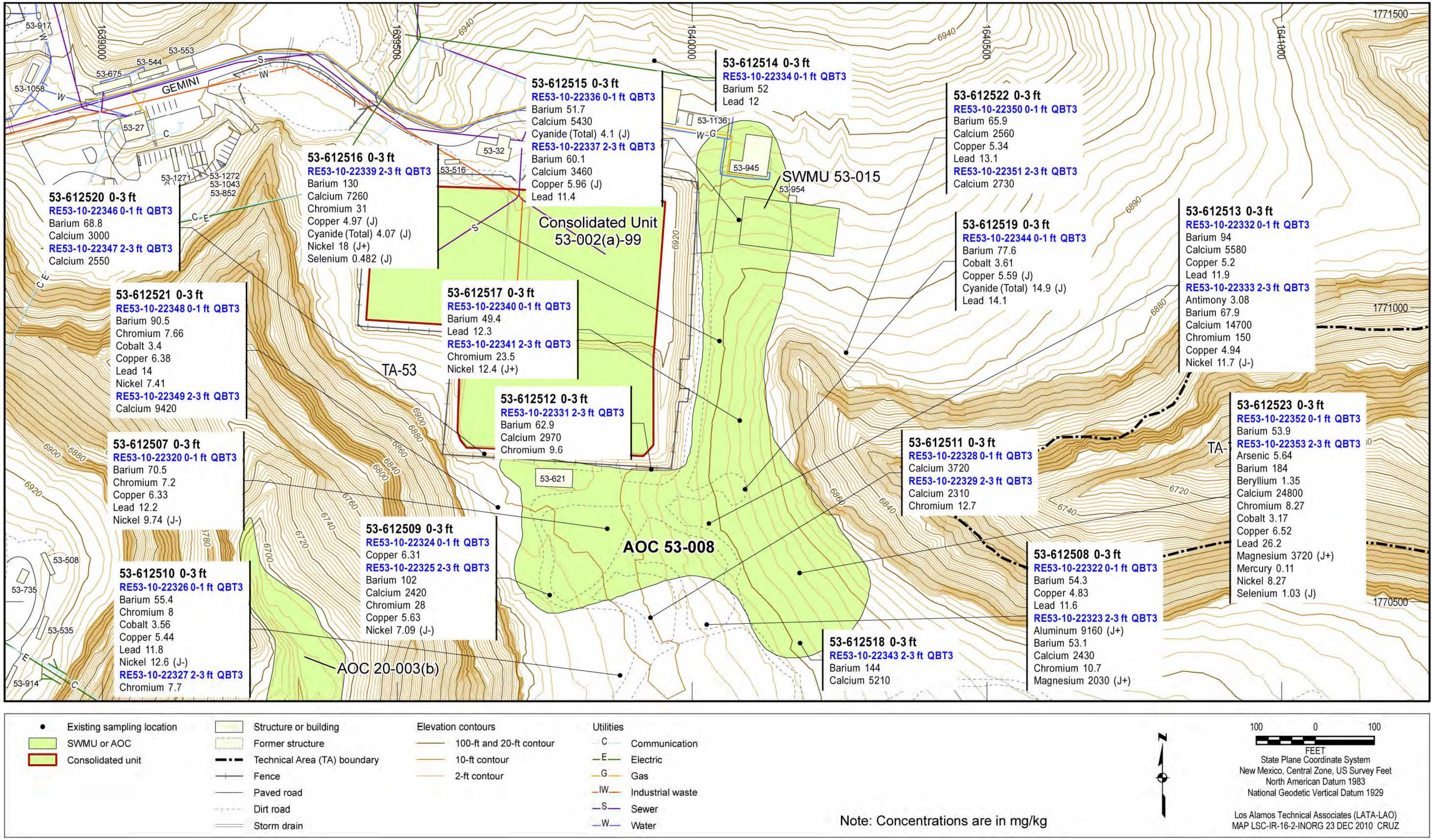


Figure 7.9-2 Inorganic chemicals detected or detected above BVs at AOC 53-008

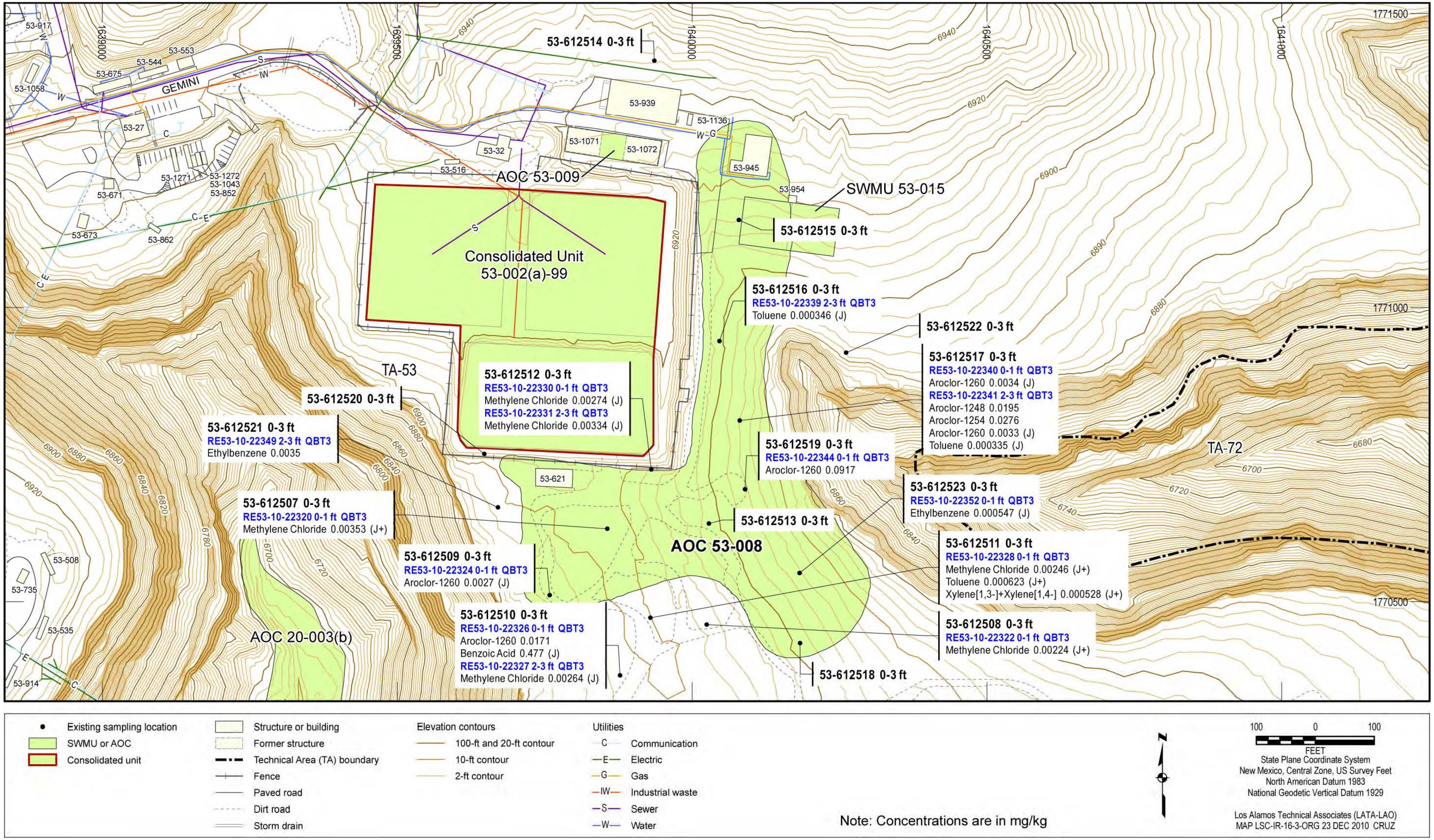


Figure 7.9-3 Organic chemicals detected at AOC 53-008

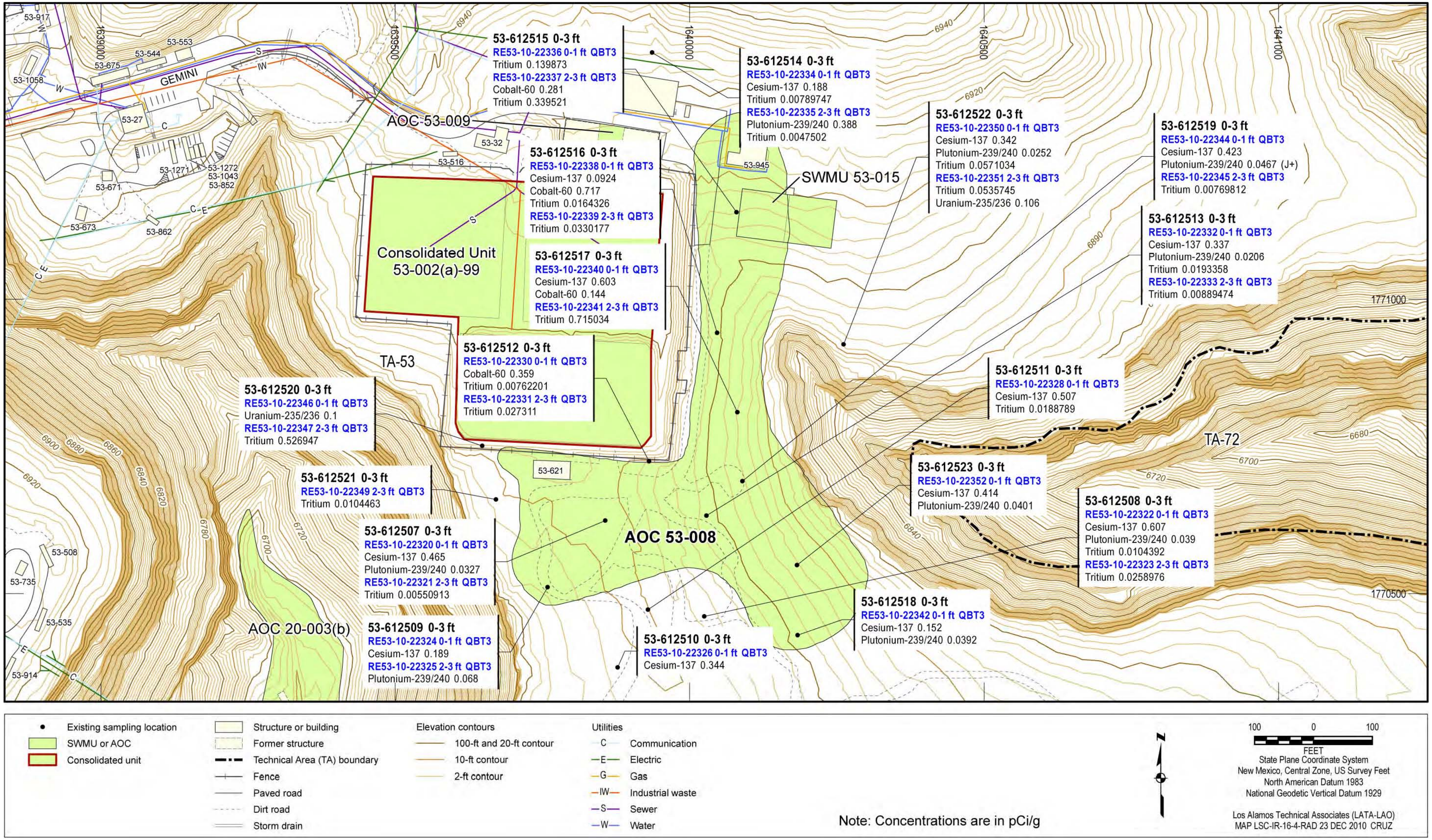


Figure 7.9-4 Radionuclides detected or detected above BVs/FVs at AOC 53-008

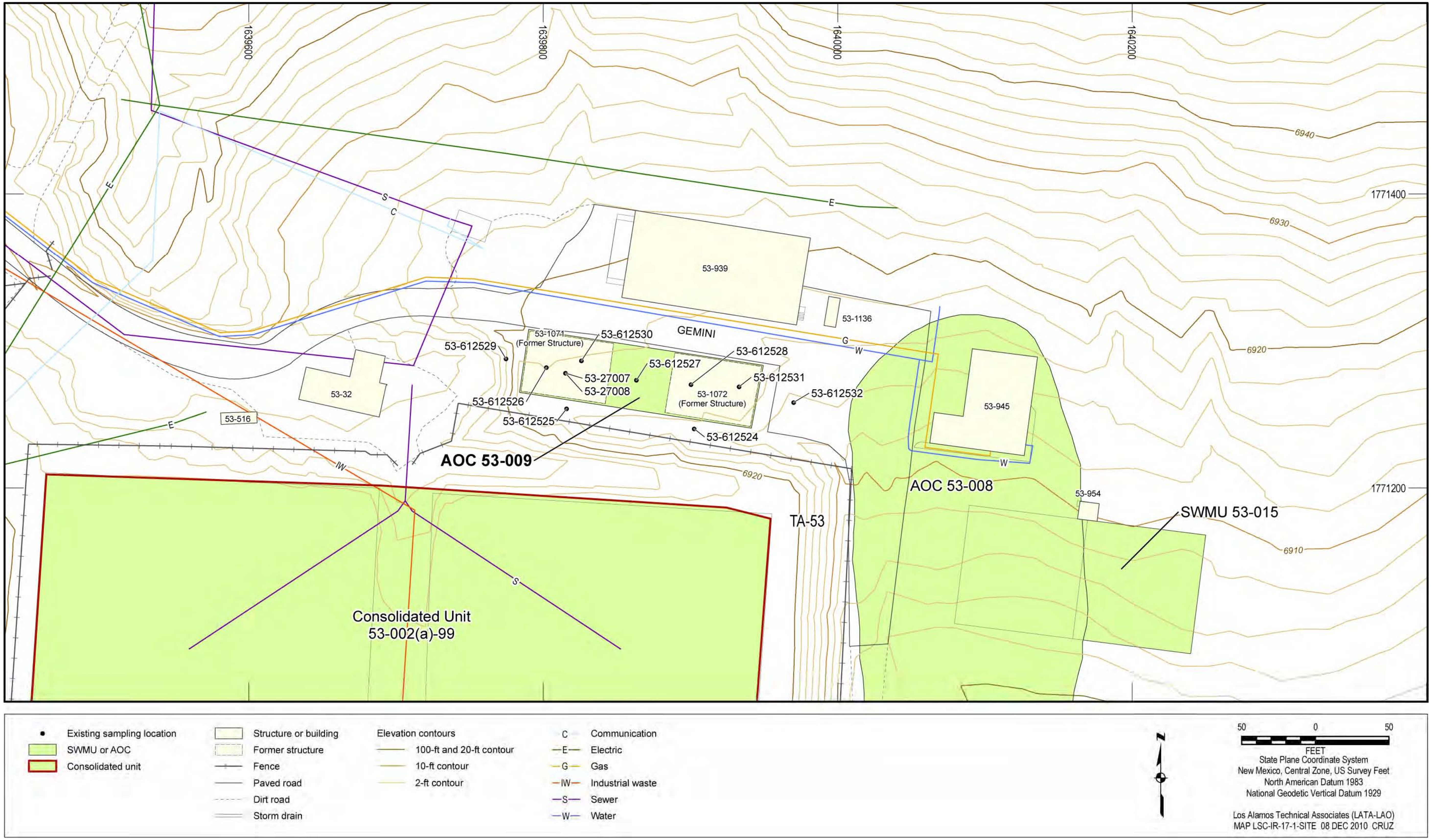


Figure 7.10-1 Site map of AOC 53-009

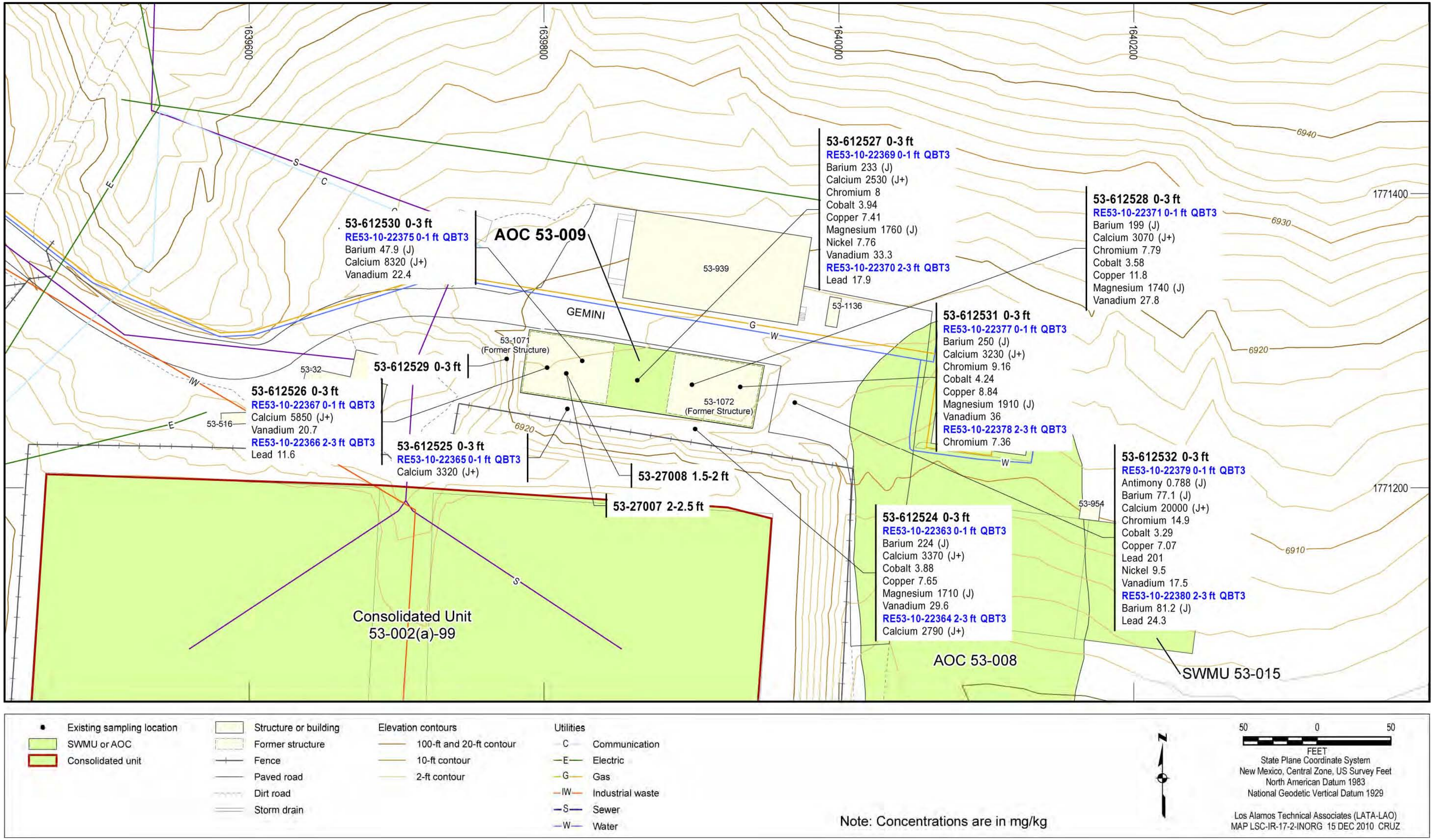


Figure 7.10-2 Inorganic chemicals detected or detected above BVs at AOC 53-009

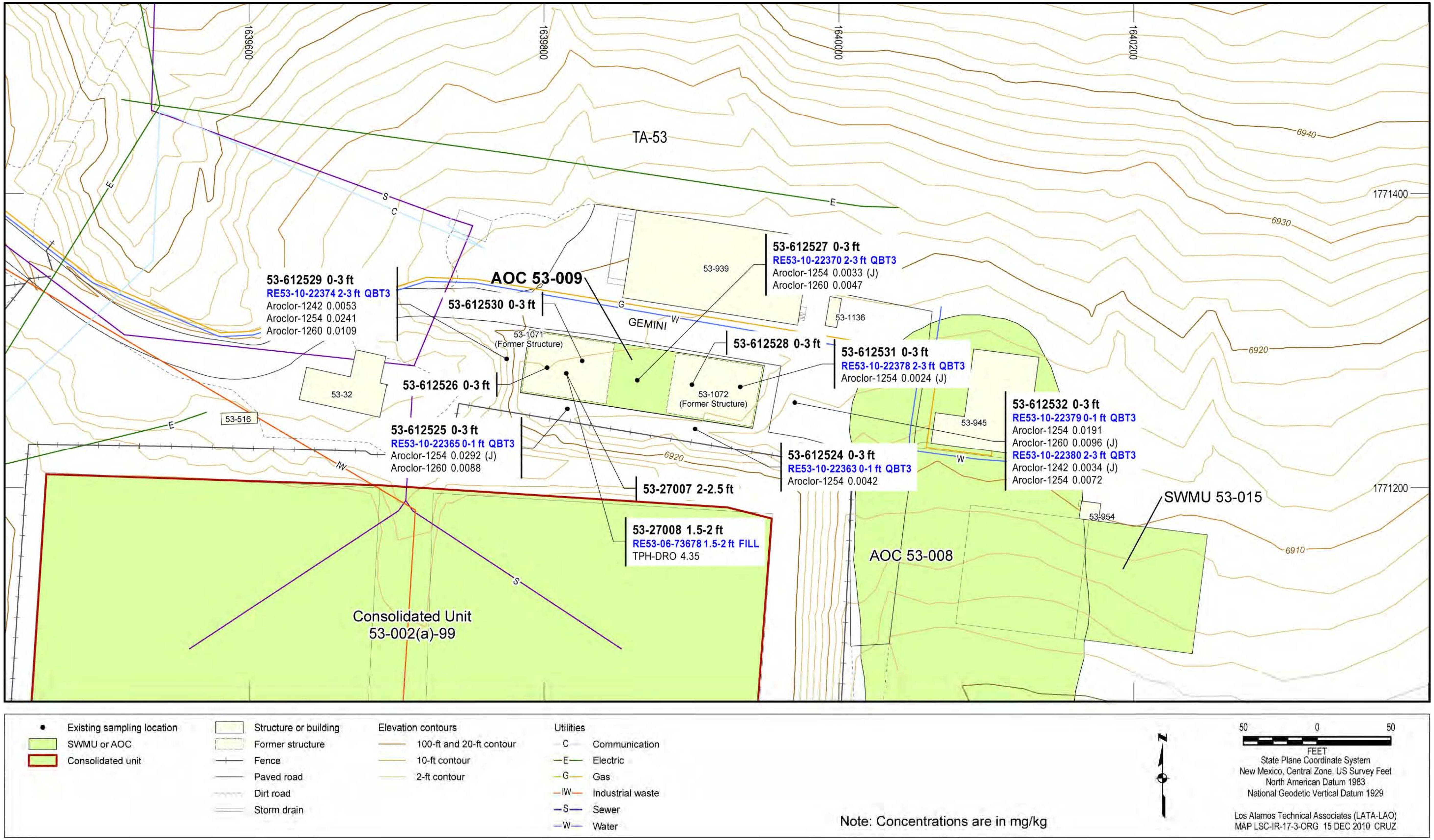


Figure 7.10-3 Organic chemicals detected at AOC 53-009

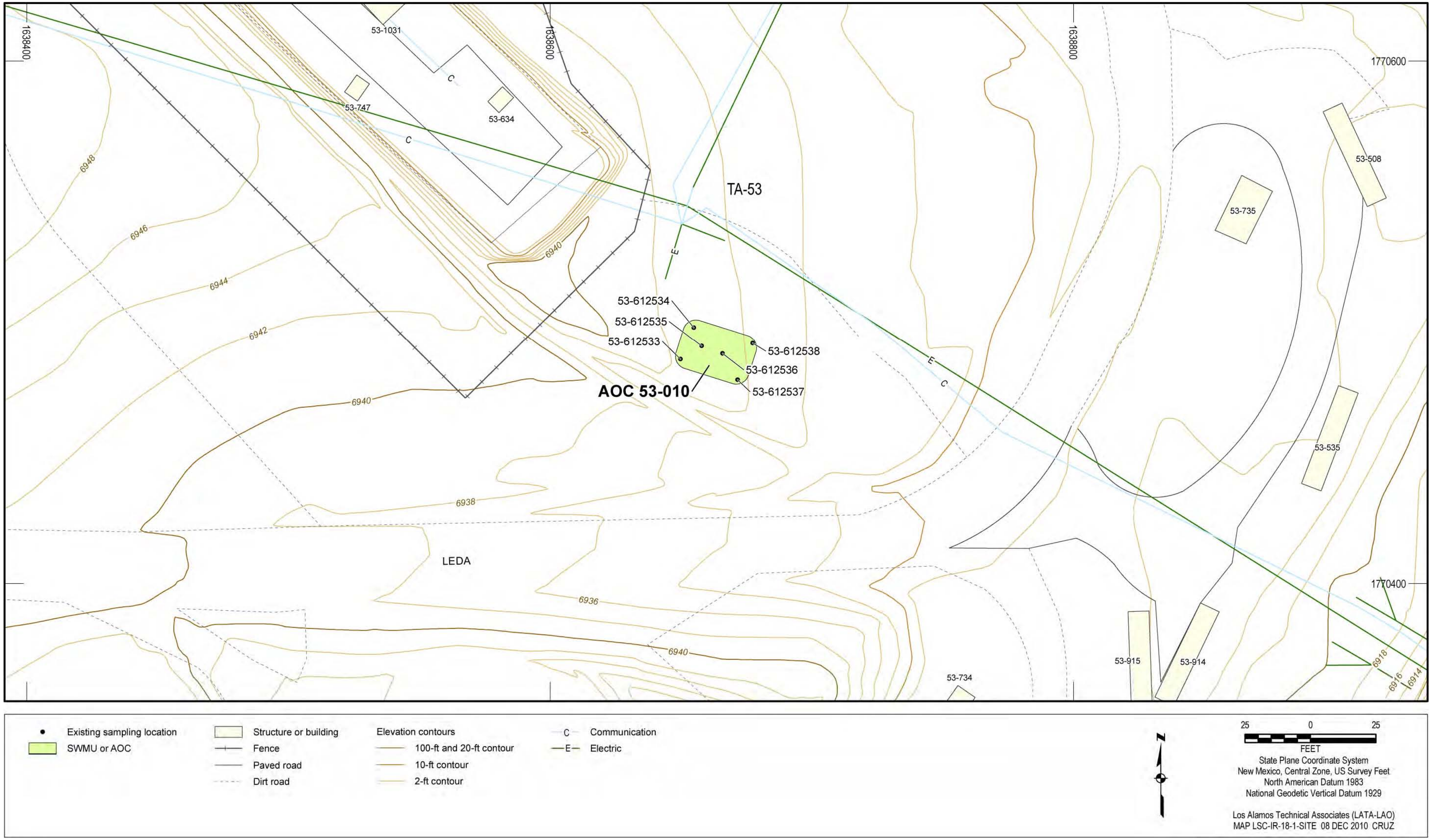


Figure 7.11-1 Site map of AOC 53-010

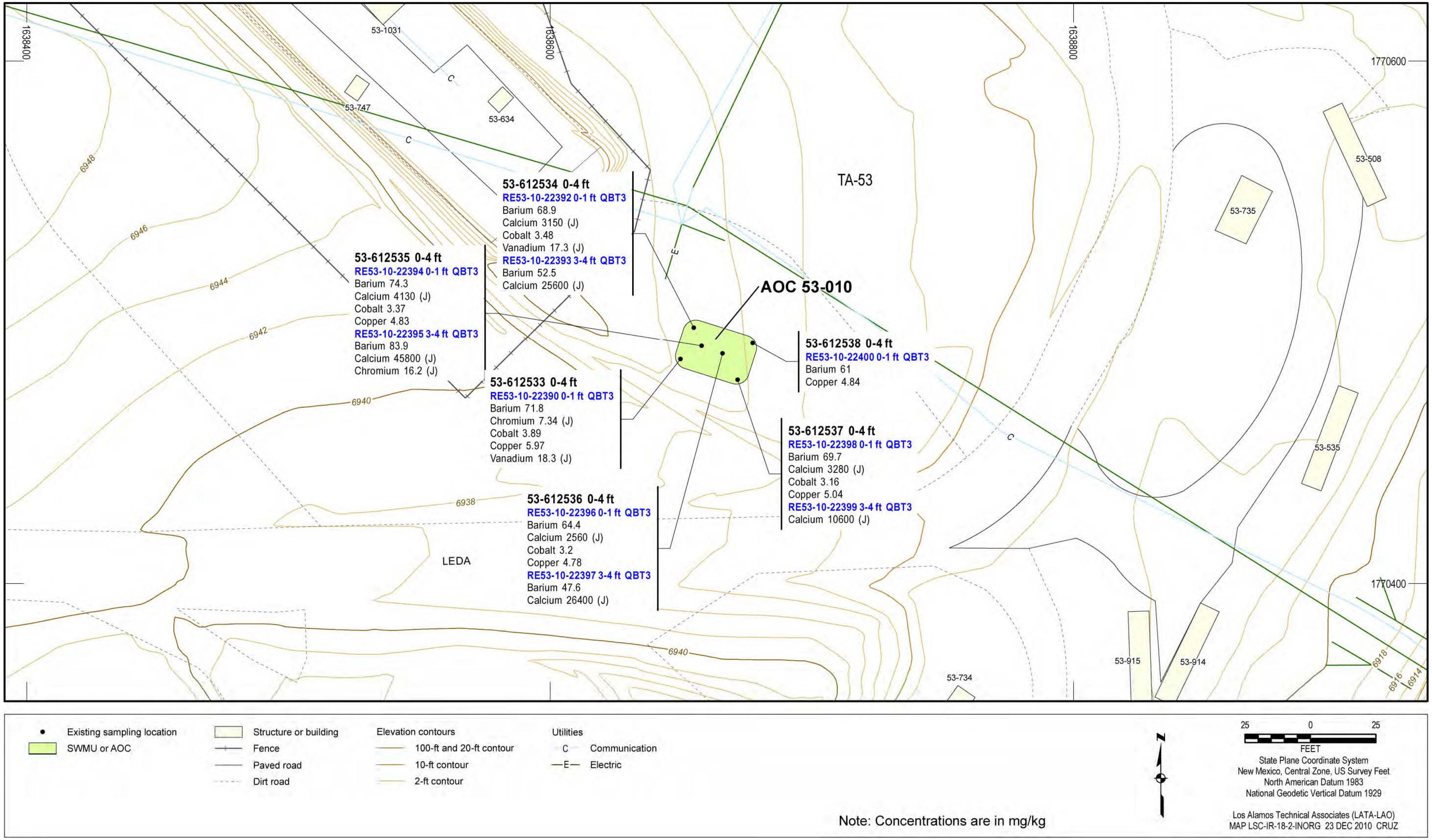
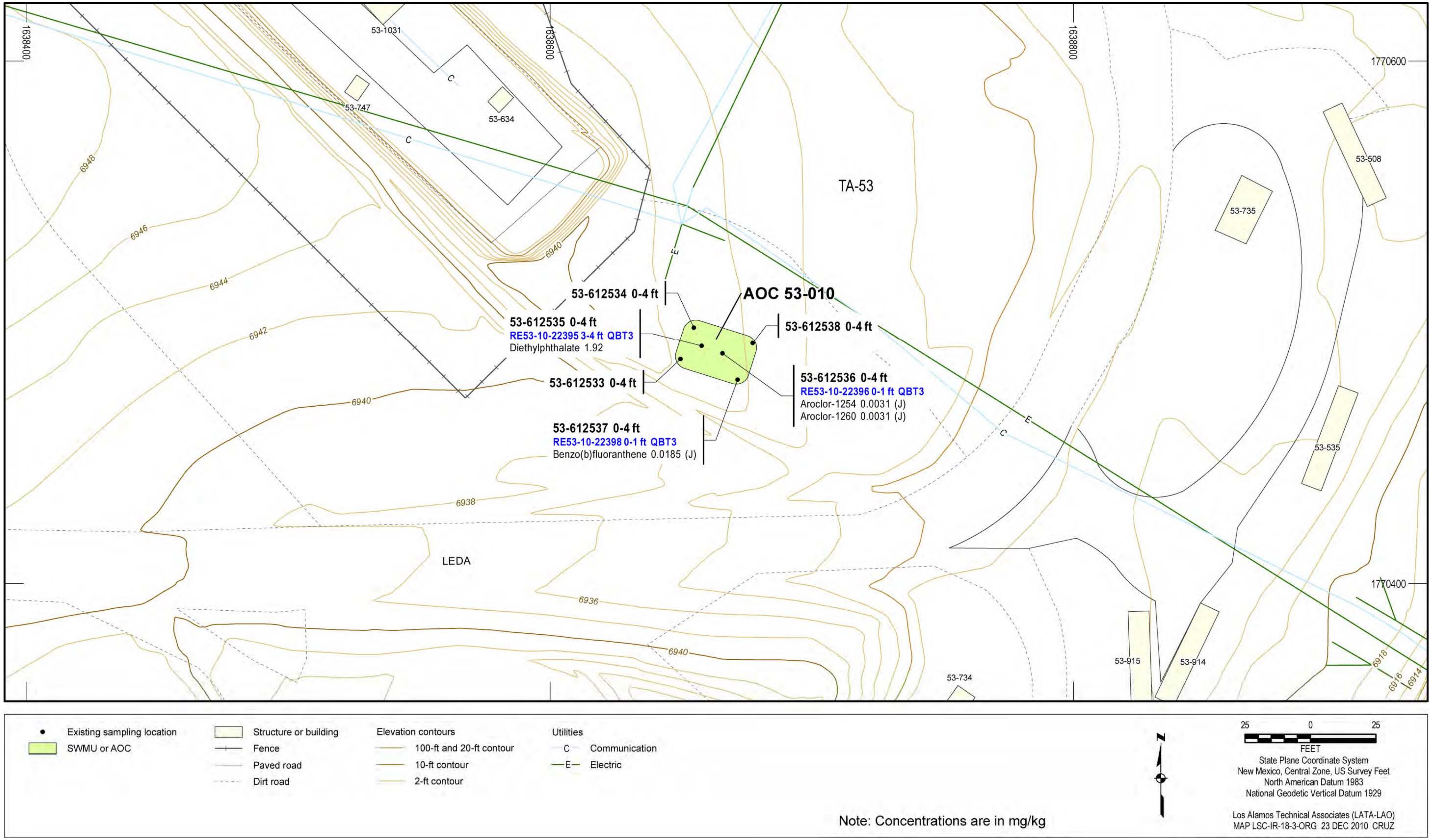


Figure 7.11-2 Inorganic chemicals detected or detected above BVs at AOC 53-010



Note: Concentrations are in mg/kg

Figure 7.11-3 Organic chemicals detected at AOC 53-010

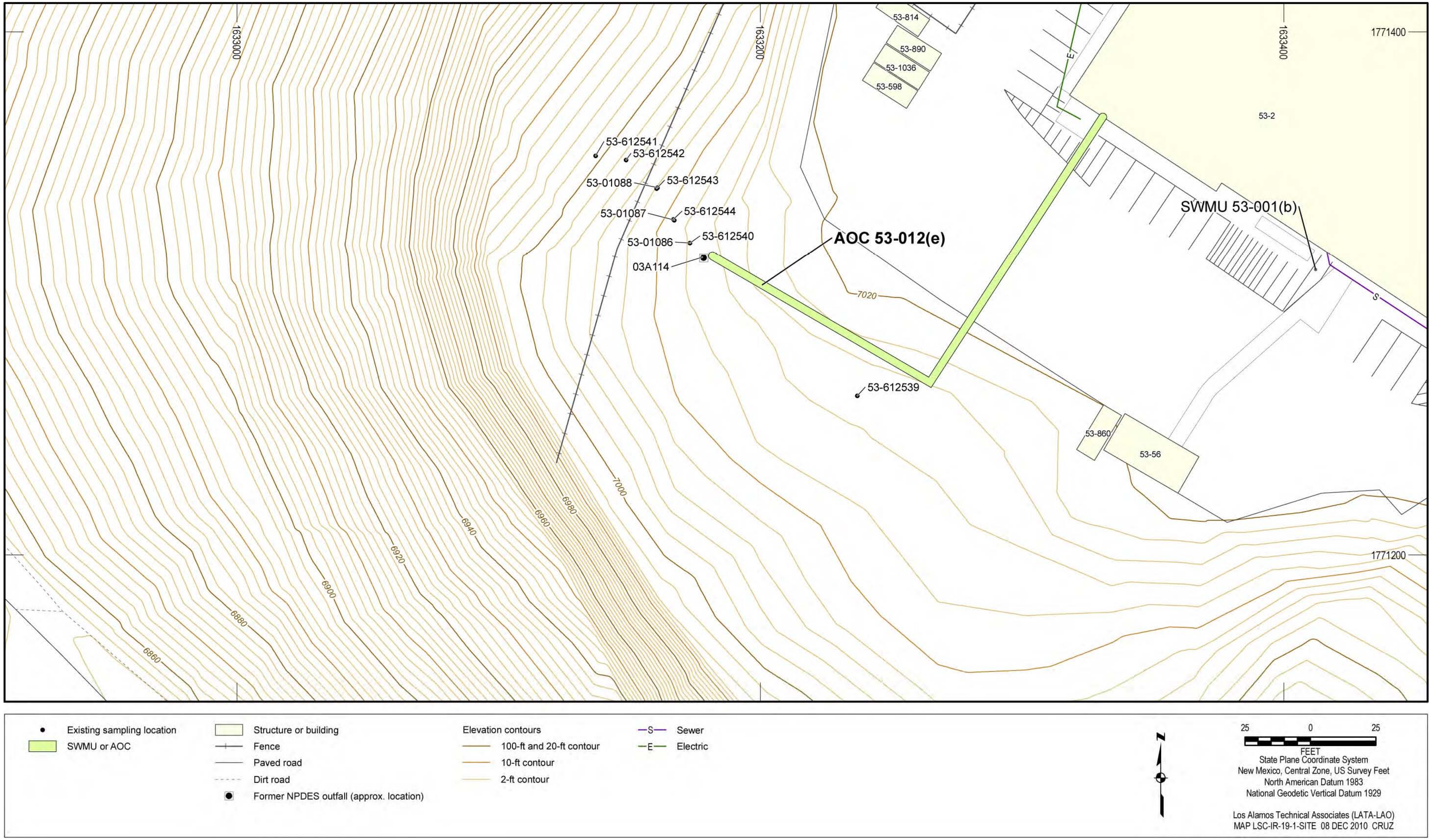


Figure 7.12-1 Site map of AOC 53-012(e)

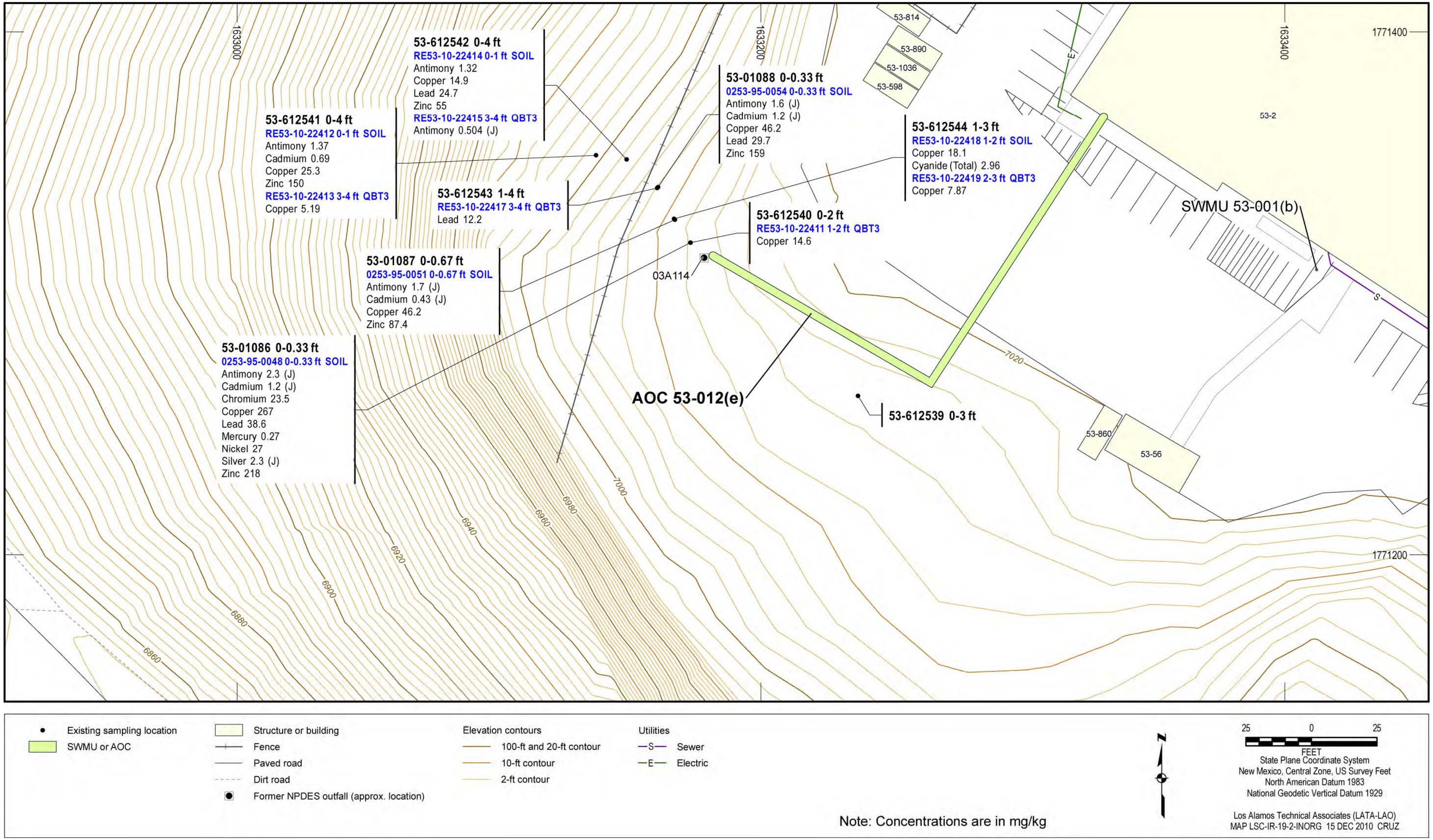


Figure 7.12-2 Inorganic chemicals detected or detected above BVs at AOC 53-012(e)

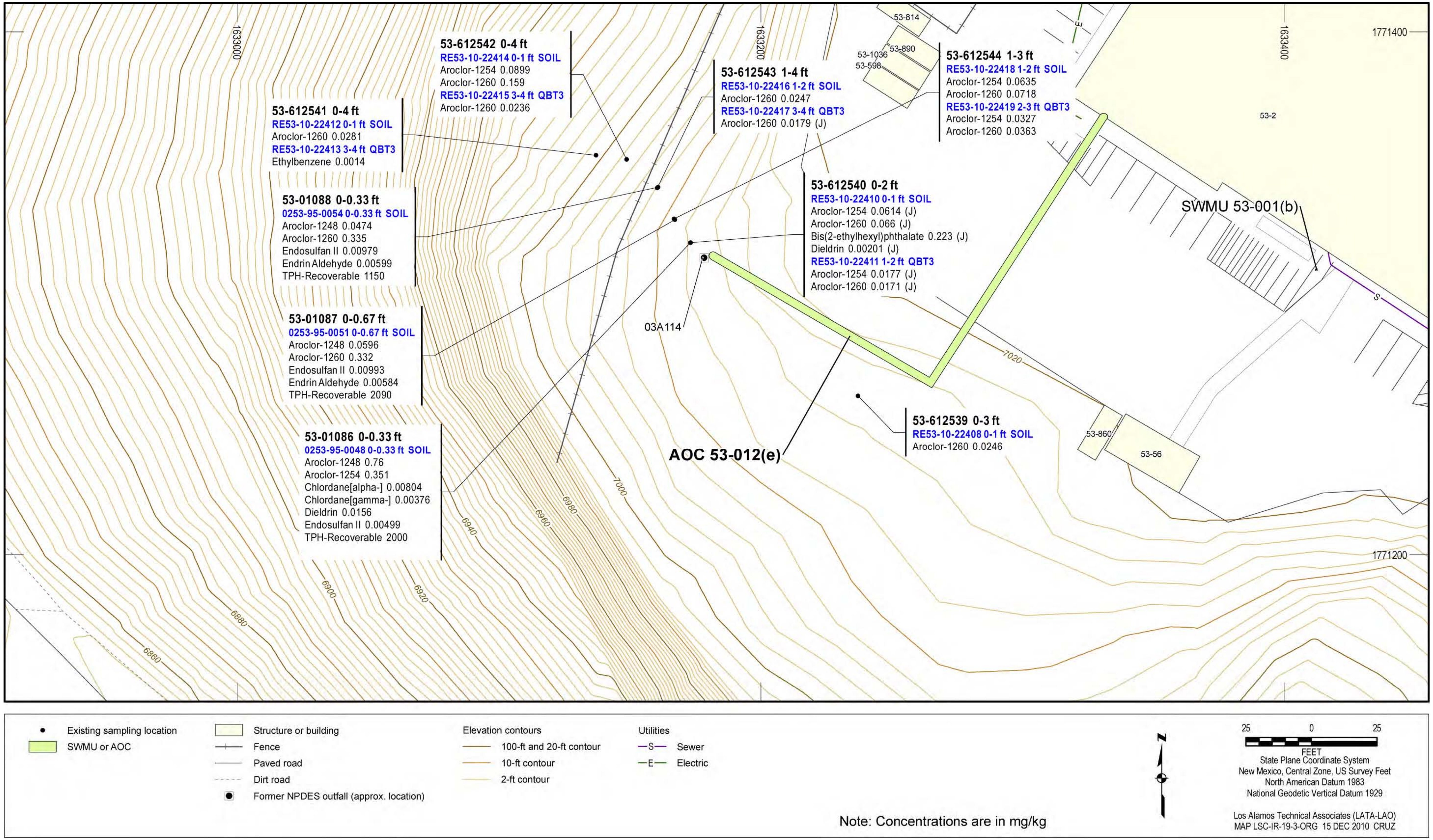


Figure 7.12-3 Organic chemicals detected at AOC 53-012(e)

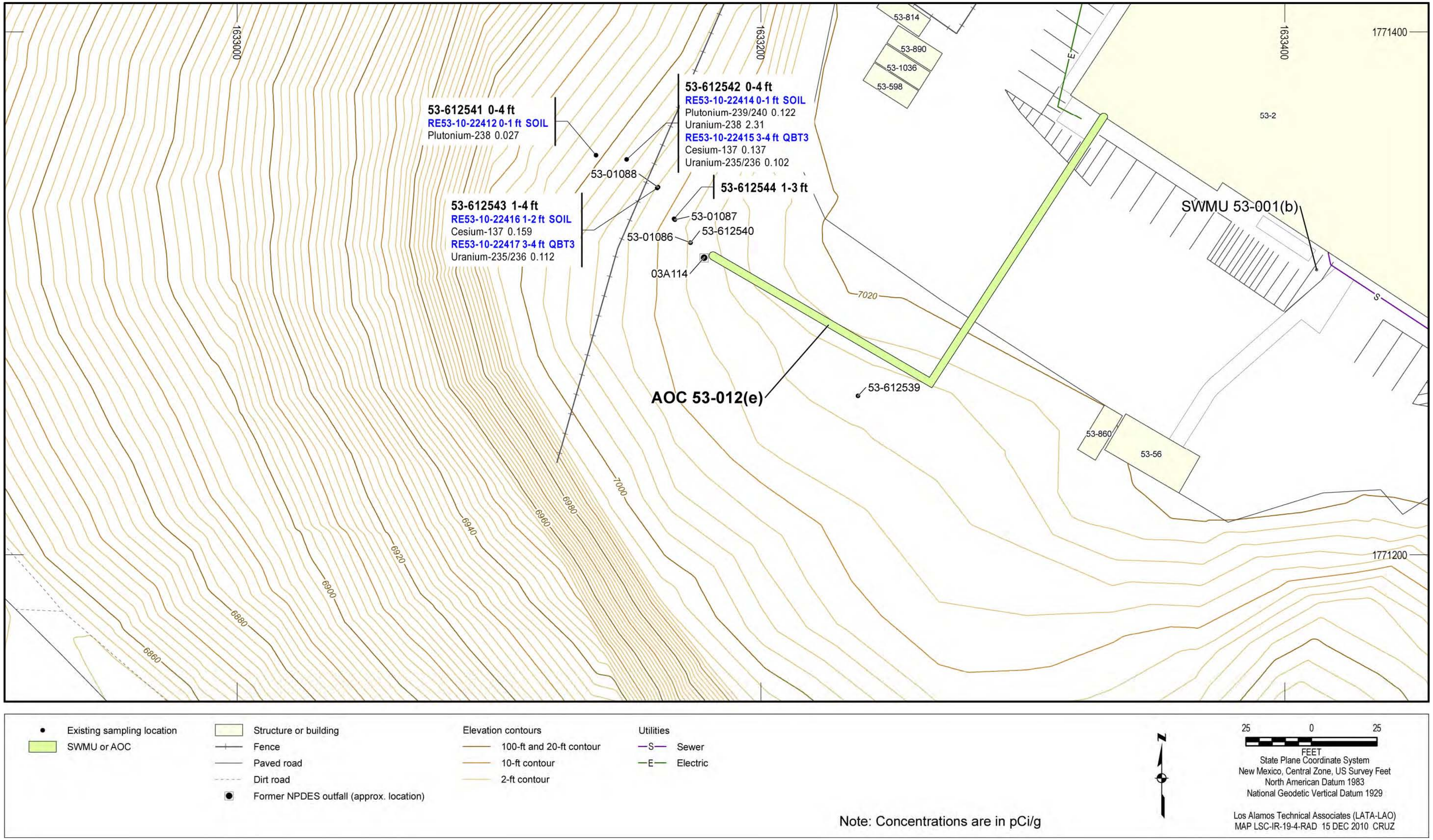


Figure 7.12-4 Radionuclides detected or detected above BVs/FVs at AOC 53-012(e)

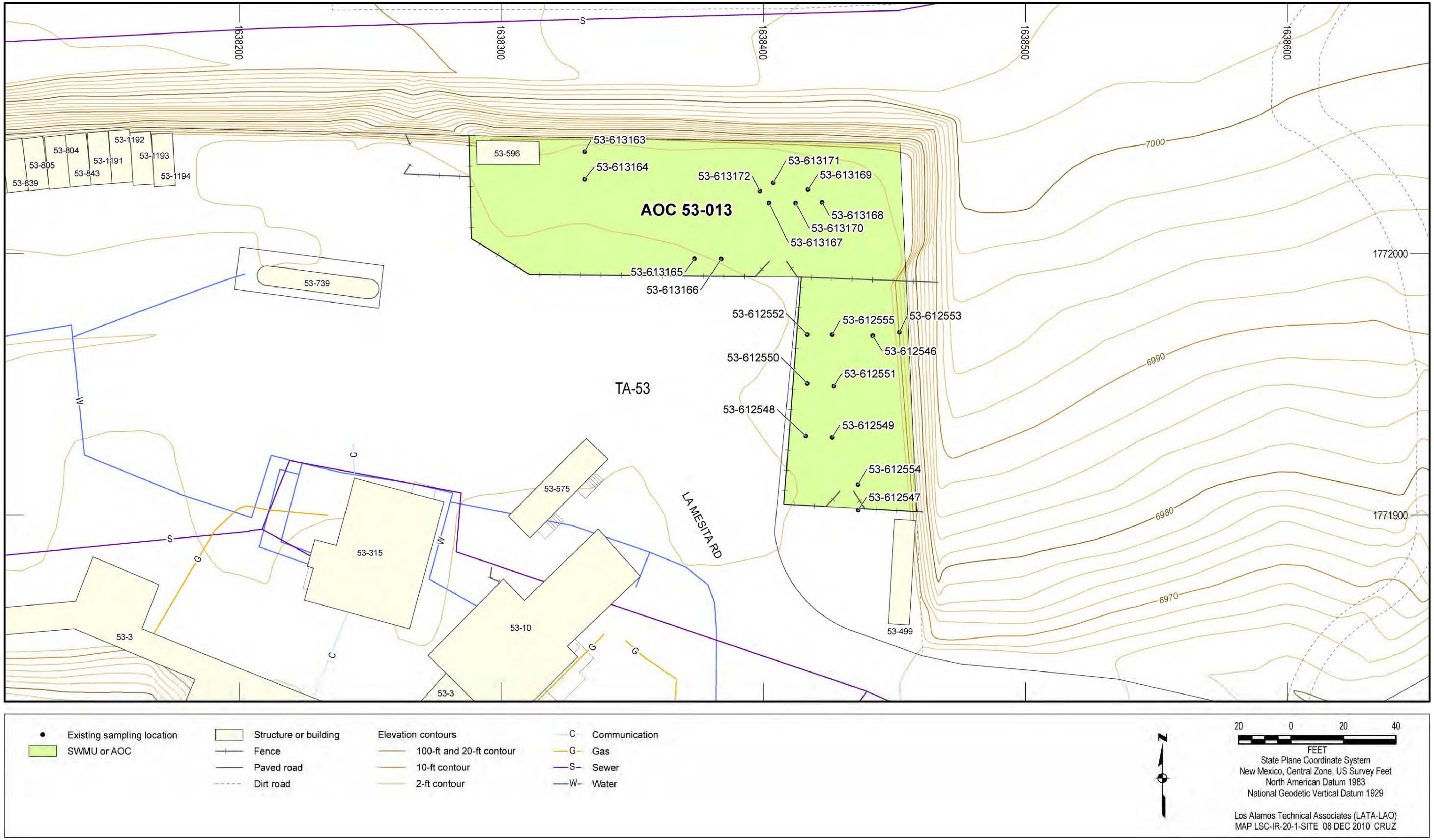


Figure 7.13-1 Site map of AOC 53-013

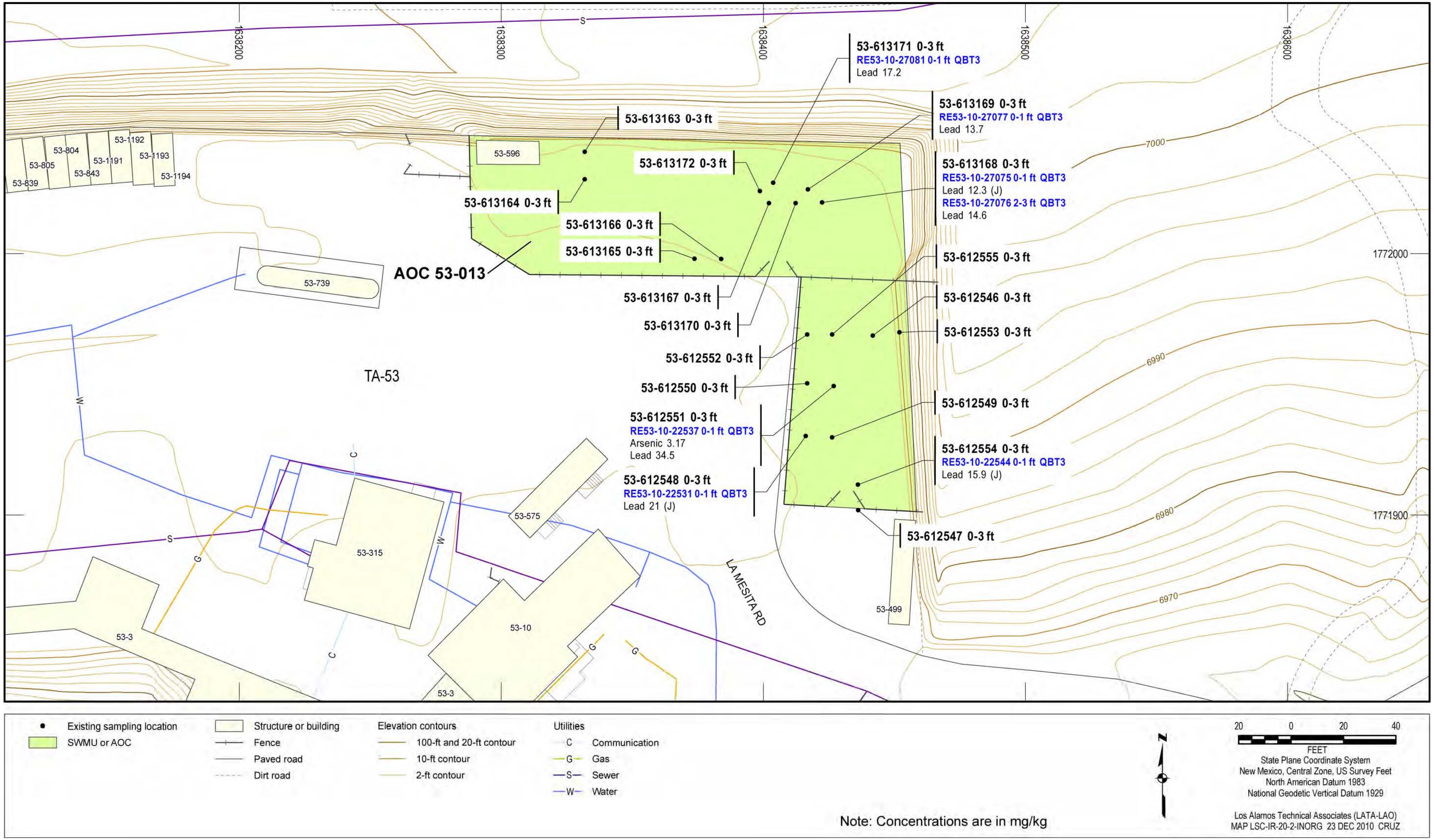


Figure 7.13-2 Inorganic chemicals detected or detected above BVs at AOC 53-013

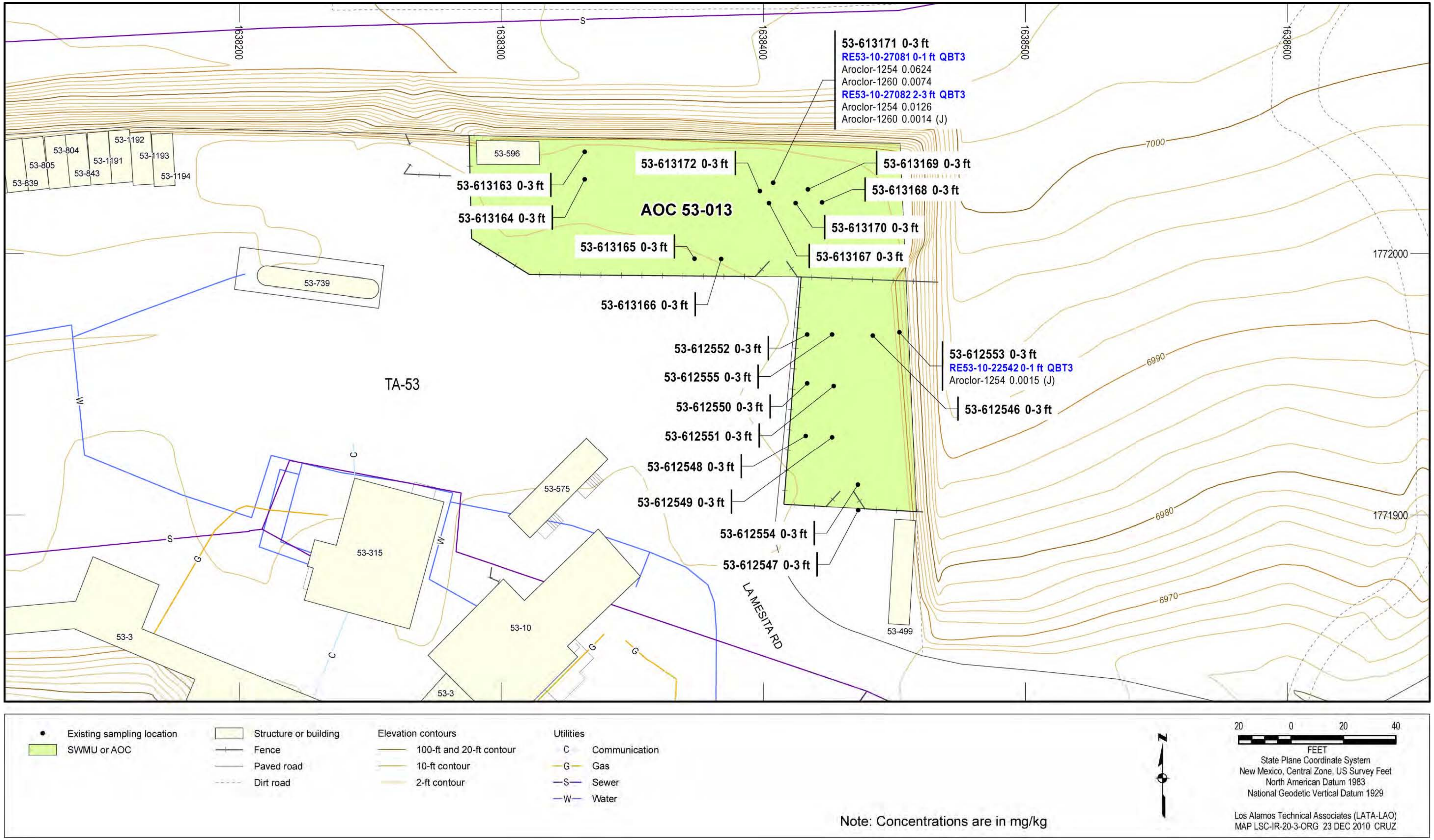


Figure 7.13-3 Organic chemicals detected at AOC 53-013

Figure 7.14-1 Site map of AOC 53-014

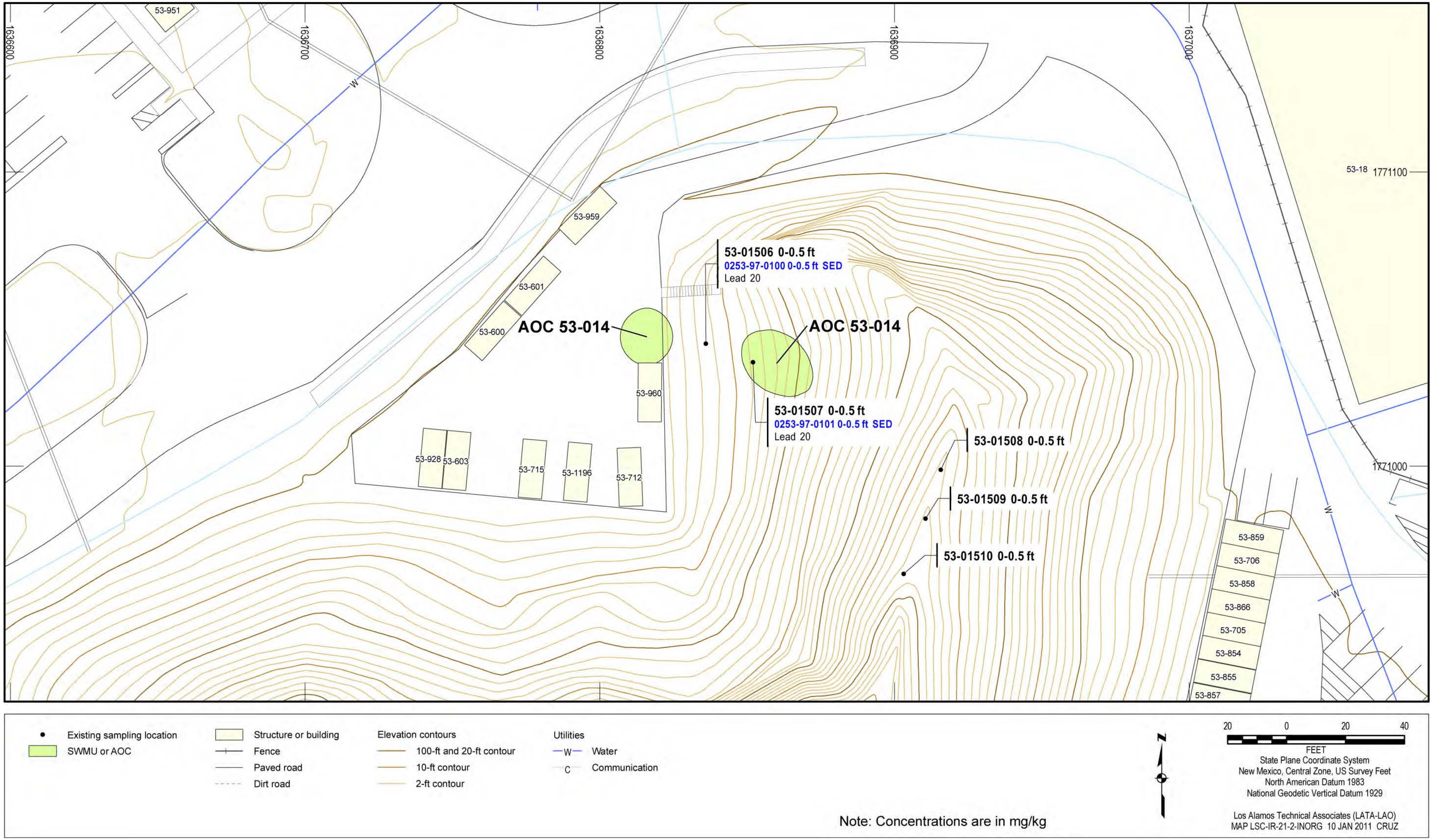


Figure 7.14-2 Inorganic chemicals detected or detected above BVs at AOC 53-014

Figure 7.15-1 Site map of SWMU 53-015

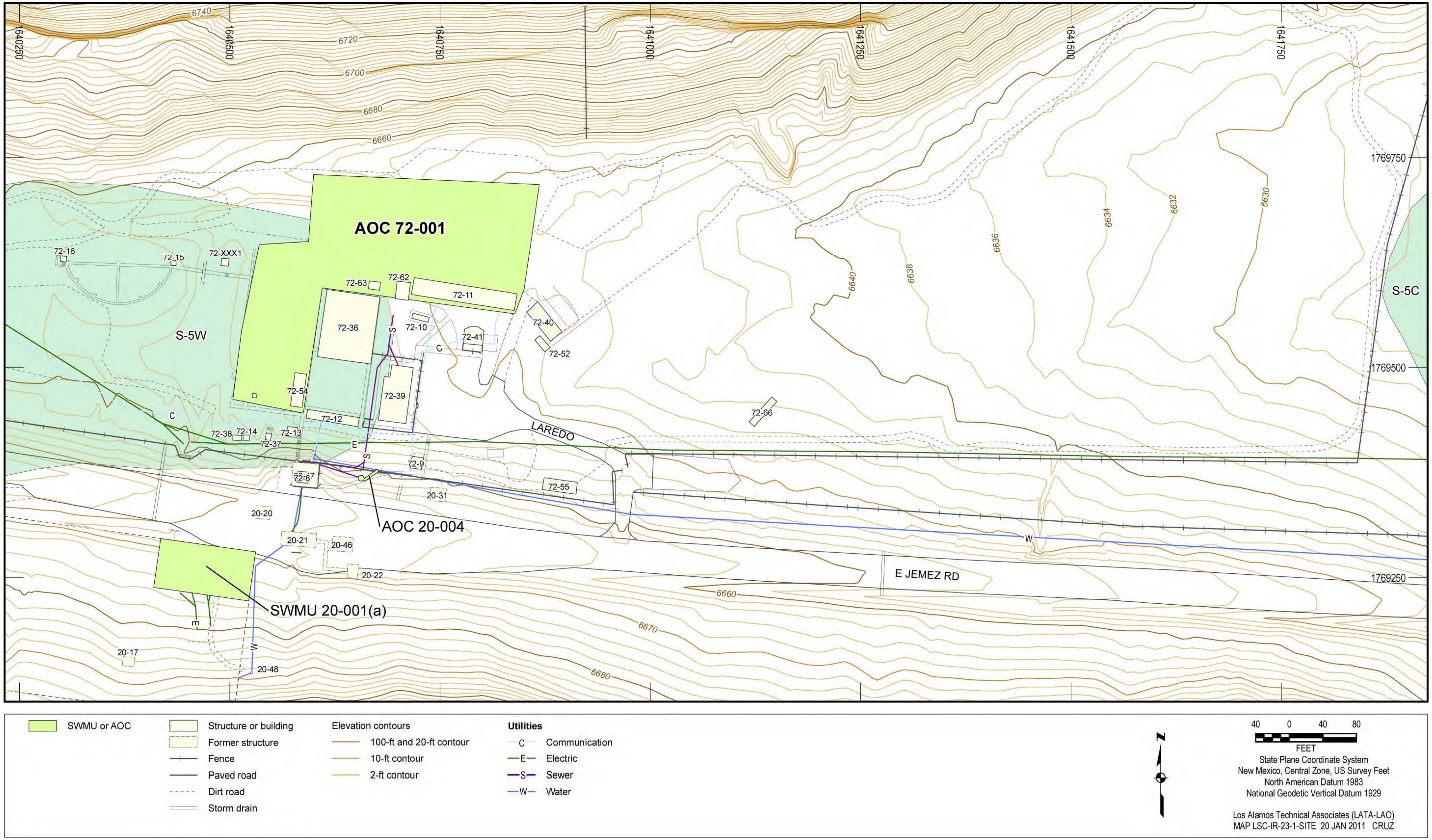


Figure 8.2-1 Site map of AOC 72-001

Table 1.1-1
Sites under Investigation in Lower Sandia Canyon Aggregate Area

Consolidated Unit	SWMU/AOC	Brief Description	Previous Investigation(s)	2010 Investigation
Former TA-20				
	SWMU 20-001(a)	Landfill	1986 geophysical survey, 1995 RFI	Sampled
20-001(b)-00	SWMU 20-001(b)	Landfill	1986 geophysical survey, 1989 radiation survey, 1995 RFI	Sampled
	SWMU 20-002(c)	Former firing point	1995 RFI	Sampled
	AOC 20-003(c)	Former U.S. Navy gun site	1985 radiation survey, 1995 RFI, 1995 VCA	Sampled
20-001(c)-00	SWMU 20-001(c)	Landfill	1995 RFI	Geophysical survey; sampled
	SWMU 20-002(a)	Former firing point	Samples collected in 1985, 1995 RFI	Sampled
	SWMU 20-002(b)	Former steel tanks (firing site)	1985 radiation survey, 1995 RFI	Sampled
	SWMU 20-002(d)	Former firing point	Samples collected in 1985, 1995 RFI	Sampled
	AOC 20-003(b)	Former 20-mm gun firing site	1985 radiation survey, 1995 RFI	Sampled
	AOC 20-004	Septic system	1995 RFI	Sampled
	SWMU 20-005	Septic system	Samples collected in 1985, 1995 RFI	Sampled
TA-53				
	SWMU 53-001(a)	Storage area	1995, 1997 RFIs, 1997 VCA	Sampled
	SWMU 53-001(b)	Storage area	1995 RFI	Sampled
	SWMU 53-005	Former waste disposal pit	1995 RFI	Geophysical survey; sampled
53-006(b)-99	SWMU 53-006(b)	Underground storage tank	Samples collected in 1999	None; delayed characterization per the investigation work plan (LANL 2009, 106660)
	SWMU 53-006(c)	Underground storage tank	Samples collected in 1999	None; delayed characterization per the investigation work plan (LANL 2009, 106660)

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Brief Description	Previous Investigation(s)	2010 Investigation
53-006(d)-99	SWMU 53-006(d)	Underground storage tank	Samples collected in 1999	None; delayed characterization per the investigation work plan (LANL 2009, 106660)
	SWMU 53-006(e)	Underground storage tank	Samples collected in 1999	None; delayed characterization per the investigation work plan (LANL 2009, 106660)
	SWMU 53-006(f)	Underground storage tanks	No RFI activity	Sampled; delayed characterization per the investigation work plan (LANL 2009, 106660)
	SWMU 53-007(a)	Aboveground treatment tank	No RFI activity	None; delayed characterization per the investigation work plan (LANL 2009, 106660)
	AOC 53-008	Storage area	1995 RFI	Sampled
	AOC 53-009	Former storage area	Samples collected in 2006	Sampled
	AOC 53-010	Former storage area	1995 RFI, 1995 VCA	Sampled
	AOC 53-012(e)	Drainline and outfall	1995 RFI	Sampled
	AOC 53-013	Lead spill site	1995 RFI	XRF survey conducted; soil excavated; confirmation samples collected
	AOC 53-014	Lead spill site	Samples collected in 1995, 1997 VCA	None; nature and extent defined per the investigation work plan (LANL 2009, 106660)
	SWMU 53-015	Wastewater treatment facility	No RFI activity	None: listed in Module VIII; not currently subject to corrective action requirement (DOE 1999, 098985)
TA-72				
	AOC 72-001	Small-arms firing range	1995 RFI	None; delayed characterization per the investigation work plan (LANL 2009, 106660)

Note: Shading denotes consolidated unit.

Table 3.2-1
Surveyed Coordinates for Locations Sampled in 2010

SWMU/AOC	Location ID	Easting (ft)	Northing (ft)
Former TA-20			
SWMU 20-001(a)	20-612556	1640511.4	1769256.34
SWMU 20-001(a)	20-612557	1640497.28	1769258.97
SWMU 20-001(a)	20-612558	1640482.83	1769261.27
SWMU 20-001(a)	20-612559	1640468.38	1769262.58
SWMU 20-001(a)	20-612560	1640448.01	1769252.07
SWMU 20-001(a)	20-612561	1640435.86	1769255.68
SWMU 20-001(a)	20-612562	1640423.38	1769258.64
SWMU 20-001(a)	20-612563	1640367.22	1769209.7
SWMU 20-001(b)	20-612564	1638145.08	1769781.77
SWMU 20-001(b)	20-612565	1638139.1	1769767.93
SWMU 20-001(b)	20-612566	1638214.76	1769822.88
SWMU 20-001(b)	20-612567	1638200.25	1769764.38
SWMU 20-001(b)	20-612568	1638221.8	1769871.27
SWMU 20-001(b)	20-612569	1638209.48	1769803.09
SWMU 20-001(b)	20-612570	1638220.04	1769864.23
SWMU 20-001(b)	20-612571	1638206.21	1769838.76
SWMU 20-001(c)	20-612572	1637052.59	1770412.85
SWMU 20-001(c)	20-612573	1637120.41	1770313.23
SWMU 20-001(c)	20-612574	1637161.34	1770388.19
SWMU 20-001(c)	20-612575	1637295.24	1770289.31
SWMU 20-001(c)	20-612576	1637026.7	1770356.14
SWMU 20-001(c)	20-612577	1637096.49	1770367.48
SWMU 20-001(c)	20-612578	1637172.69	1770329.51
SWMU 20-001(c)	20-612579	1637234.09	1770295.97
SWMU 20-001(c)	20-612580	1637253.08	1770359.34
SWMU 20-001(c)	20-612581	1637302.39	1770340.11
SWMU 20-002(a)	20-612582	1636300.64	1770340.81
SWMU 20-002(a)	20-612583	1636318.94	1770296.18
SWMU 20-002(a)	20-612584	1636300.19	1770299.75
SWMU 20-002(a)	20-612585	1636261.37	1770320.28
SWMU 20-002(a)	20-612586	1636241.28	1770371.6
SWMU 20-002(a)	20-612587	1636156.04	1770330.09
SWMU 20-002(a)	20-612588	1636455.95	1770271.18
SWMU 20-002(a)	20-612589	1636347.5	1770463.98
SWMU 20-002(a)	20-612590	1636287.7	1770141.31
SWMU 20-002(b)	20-612591	1636968.8	1770330.76
SWMU 20-002(b)	20-612592	1636921.26	1770429.87

Table 3.2-1 (continued)

SWMU/AOC	Location ID	Easting (ft)	Northing (ft)
SWMU 20-002(b)	20-612593	1636895.48	1770361.23
SWMU 20-002(b)	20-612594	1636989.23	1770489.8
SWMU 20-002(b)	20-612595	1636869.36	1770449.95
SWMU 20-002(b)	20-612596	1636870.03	1770499.84
SWMU 20-002(b)	20-612597	1636889.78	1770540.02
SWMU 20-002(c)	20-612598	1638131.65	1769665.8
SWMU 20-002(c)	20-612599	1638097.6	1769666.83
SWMU 20-002(c)	20-612600	1638072.49	1769668.9
SWMU 20-002(c)	20-612601	1637929.77	1769692.63
SWMU 20-002(c)	20-612602	1638004.4	1769686.09
SWMU 20-002(c)	20-612603	1638214.18	1769646.54
SWMU 20-002(c)	20-612605	1638040.85	1769572.26
SWMU 20-002(c)	20-612892	1638103.79	1769635.88
SWMU 20-002(d)	20-612606	1637422.24	1769693.88
SWMU 20-002(d)	20-612607	1637410.31	1769780.13
SWMU 20-002(d)	20-612608	1637505.81	1769696.98
SWMU 20-002(d)	20-612609	1637403.67	1769681.5
SWMU 20-002(d)	20-612610	1637395.93	1769720.19
SWMU 20-002(d)	20-612611	1637322.27	1769675
SWMU 20-002(d)	20-612612	1637465.88	1769712.45
SWMU 20-002(d)	20-612613	1637425.34	1769607.22
AOC 20-003(b)	20-612490	1639348.64	1770186.23
AOC 20-003(b)	20-612491	1639393.77	1770102.92
AOC 20-003(b)	20-612492	1639481.31	1769997.19
AOC 20-003(b)	20-612493	1639571.64	1769905.45
AOC 20-003(b)	20-612494	1639669.67	1769828.43
AOC 20-003(b)	20-612495	1639786.61	1769750
AOC 20-003(c)	20-612496	1638208.36	1769895.73
AOC 20-003(c)	20-612497	1638227.29	1769894.01
AOC 20-003(c)	20-612498	1638208.71	1769917.06
AOC 20-003(c)	20-612499	1638190.82	1769897.11
AOC 20-004	20-612500	1640680.75	1769368.52
AOC 20-004	20-612501	1640667.82	1769371.81
AOC 20-004	20-612502	1640646.56	1769367.2
AOC 20-004	20-612503	1640655.98	1769367.86
AOC 20-004	20-612504	1640609.83	1769385.07
AOC 20-004	20-612505	1640680.75	1769378.82
AOC 20-004	20-612506	1640668.92	1769384.52
SWMU 20-005	20-612614	1638772.57	1769399.79

Table 3.2-1 (continued)

SWMU 20-005	20-612615	1638803	1769392.83
SWMU 20-005	20-612616	1638858.34	1769388.43
SWMU 20-005	20-612617	1638756.81	1769411.52
SWMU 20-005	20-612618	1638746.32	1769447.05
SWMU 20-005	20-612619	1638729.51	1769529.29
TA-53			
SWMU 53-001(a)	53-01051	1633478.1	1771495.2
SWMU 53-001(a)	53-01052	1633484.6	1771490.4
SWMU 53-001(a)	53-01053	1633491.1	1771485.7
SWMU 53-001(a)	53-01517	1633495.46	1771479.31
SWMU 53-001(a)	53-01521	1633540.16	1771454.95
SWMU 53-001(a)	53-01522	1633582.99	1771432.4
SWMU 53-001(a)	53-01523	1633504.72	1771477.37
SWMU 53-001(a)	53-01524	1633526.4	1771465.14
SWMU 53-001(a)	53-01525	1633503.73	1771487.15
SWMU 53-001(a)	53-01526	1633508.15	1771484.27
SWMU 53-001(a)	53-01527	1633511.94	1771482.05
SWMU 53-001(a)	53-01528	1633516.52	1771478.9
SWMU 53-001(a)	53-01529	1633519.76	1771475.2
SWMU 53-001(a)	53-01530	1633523.28	1771471.8
SWMU 53-001(a)	53-01531	1633498.39	1771482.93
SWMU 53-001(a)	53-01532	1633516.11	1771472.14
SWMU 53-001(a)	53-01533	1633500.58	1771473.16
SWMU 53-001(a)	53-01534	1633527.93	1771470.26
SWMU 53-001(a)	53-01535	1633532.67	1771467.68
SWMU 53-001(a)	53-01536	1633536.12	1771464.53
SWMU 53-001(a)	53-01537	1633540.24	1771461.67
SWMU 53-001(a)	53-01541	1633509.6	1771487.9
SWMU 53-001(a)	53-612469	1633499.37	1771482.13
SWMU 53-001(a)	53-612470	1633510.21	1771488.69
SWMU 53-001(a)	53-612471	1633505.17	1771478.1
SWMU 53-001(a)	53-612472	1633512.48	1771481.88
SWMU 53-001(a)	53-612473	1633499.37	1771470.53
SWMU 53-001(a)	53-612474	1633506.18	1771481.37
SWMU 53-001(a)	53-612475	1633492.05	1771485.91
SWMU 53-001(a)	53-612476	1633478.44	1771496.51
SWMU 53-001(a)	53-612477	1633585.37	1771435.98
SWMU 53-001(a)	53-612478	1633336.63	1771589.83
SWMU 53-001(a)	53-612479	1633299.73	1771601.33
SWMU 53-001(a)	53-612480	1633639.84	1771398.65

Table 3.2-1 (continued)

SWMU 53-001(b)	53-01055	1633317.2	1771258
SWMU 53-001(b)	53-01056	1633310.6	1771258.3
SWMU 53-001(b)	53-612481	1633269.88	1771197.86
SWMU 53-001(b)	53-612482	1633295.09	1771239.27
SWMU 53-005	53-612483	1633547.29	1771224.89
SWMU 53-005	53-612484	1633556.1	1771221.71
SWMU 53-005	53-612485	1633537.91	1771220.34
SWMU 53-005	53-612486	1633414.88	1771307.86
SWMU 53-006(f)	53-612487	1635002.83	1771723.01
SWMU 53-006(f)	53-612488	1635012.97	1771704.88
SWMU 53-006(f)	53-612489	1634989.36	1771702.05
AOC 53-008	53-612507	1639856.38	1770623.74
AOC 53-008	53-612508	1640024.83	1770461.13
AOC 53-008	53-612509	1639758.56	1770510.84
AOC 53-008	53-612510	1639877.63	1770374.59
AOC 53-008	53-612511	1639929.24	1770472.6
AOC 53-008	53-612512	1639930.94	1770724.44
AOC 53-008	53-612513	1640028.5	1770632.48
AOC 53-008	53-612514	1639936.02	1771419.81
AOC 53-008	53-612515	1640079.51	1771148.52
AOC 53-008	53-612516	1640046.54	1770942.98
AOC 53-008	53-612517	1640080.95	1770808.1
AOC 53-008	53-612518	1640183.12	1770429.33
AOC 53-008	53-612519	1640089.68	1770690.71
AOC 53-008	53-612520	1639647.58	1770750.8
AOC 53-008	53-612521	1639670.76	1770659.84
AOC 53-008	53-612522	1640261.38	1770923.32
AOC 53-008	53-612523	1640182.23	1770548.28
AOC 53-009	53-27007	1639815	1771278
AOC 53-009	53-27008	1639815	1771278
AOC 53-009	53-612524	1639902.46	1771240.2
AOC 53-009	53-612525	1639815.83	1771253.76
AOC 53-009	53-612526	1639802.03	1771281.85
AOC 53-009	53-612527	1639863.19	1771273.28
AOC 53-009	53-612528	1639900.31	1771270.19
AOC 53-009	53-612529	1639774.66	1771287.8
AOC 53-009	53-612530	1639825.83	1771286.37
AOC 53-009	53-612531	1639933.09	1771268.83
AOC 53-009	53-612532	1639970.04	1771258.05
AOC 53-010	53-612533	1638649.83	1770485.84

Table 3.2-1 (continued)

AOC 53-010	53-612534	1638654.88	1770497.96
AOC 53-010	53-612535	1638657.9	1770490.89
AOC 53-010	53-612536	1638665.86	1770487.99
AOC 53-010	53-612537	1638671.66	1770477.89
AOC 53-010	53-612538	1638677.35	1770492.03
AOC 53-012(e)	53-01086	1633173	1771319.3
AOC 53-012(e)	53-01087	1633167.1	1771328.1
AOC 53-012(e)	53-01088	1633160.7	1771340.5
AOC 53-012(e)	53-612539	1633237.05	1771260.82
AOC 53-012(e)	53-612540	1633173.11	1771319.37
AOC 53-012(e)	53-612541	1633137.06	1771352.7
AOC 53-012(e)	53-612542	1633148.73	1771351.14
AOC 53-012(e)	53-612543	1633160.37	1771340.19
AOC 53-012(e)	53-612544	1633166.74	1771328.43
AOC 53-013	53-612546	1638441.71	1771968.69
AOC 53-013	53-612547	1638436.18	1771901.79
AOC 53-013	53-612548	1638416.13	1771930.35
AOC 53-013	53-612549	1638426.26	1771929.83
AOC 53-013	53-612550	1638416.75	1771950.41
AOC 53-013	53-612551	1638426.85	1771949.44
AOC 53-013	53-612552	1638416.72	1771969.09
AOC 53-013	53-612553	1638451.96	1771969.89
AOC 53-013	53-612554	1638436.06	1771911.56
AOC 53-013	53-612555	1638426.27	1771969.1
AOC 53-013	53-613163	1638331.79	1772038.88
AOC 53-013	53-613164	1638331.75	1772028.39
AOC 53-013	53-613165	1638373.76	1771997.99
AOC 53-013	53-613166	1638383.9	1771997.95
AOC 53-013	53-613167	1638402.12	1772019.25
AOC 53-013	53-613168	1638422.45	1772019.52
AOC 53-013	53-613169	1638417.03	1772024.49
AOC 53-013	53-613170	1638412.29	1772019.25
AOC 53-013	53-613171	1638403.71	1772027.03
AOC 53-013	53-613172	1638398.66	1772023.89
AOC 53-014	53-01506	1636835.97	1771041.66
AOC 53-014	53-01507	1636852.04	1771035.39
AOC 53-014	53-01508	1636915.74	1770998.7
AOC 53-014	53-01509	1636910.57	1770982.12
AOC 53-014	53-01510	1636903.17	1770963.33

Table 3.2-2
Field-Screening Results for Samples Collected in 2010

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
TA-20							
SWMU 20-001(a)	20-612556	5.0	6.0	RE20-10-22666	0.0	≤15	≤988
SWMU 20-001(a)	20-612556	10.0	11.0	RE20-10-22667	0.0	≤15	≤988
SWMU 20-001(a)	20-612556	14.0	15.0	RE20-10-22668	0.0	≤15	≤988
SWMU 20-001(a)	20-612557	5.0	6.0	RE20-10-22669	0.0	≤15	≤988
SWMU 20-001(a)	20-612557	10.0	11.0	RE20-10-22670	0.0	≤15	≤988
SWMU 20-001(a)	20-612557	14.0	15.0	RE20-10-22671	0.0	≤15	≤988
SWMU 20-001(a)	20-612558	5.0	6.0	RE20-10-22672	0.0	≤15	≤988
SWMU 20-001(a)	20-612558	10.0	11.0	RE20-10-22673	0.0	≤15	≤988
SWMU 20-001(a)	20-612558	14.0	15.0	RE20-10-22674	0.0	≤15	≤988
SWMU 20-001(a)	20-612559	5.0	6.0	RE20-10-22675	0.0	0	≤1085
SWMU 20-001(a)	20-612559	10.0	11.0	RE20-10-22676	0.0	0	≤1085
SWMU 20-001(a)	20-612559	14.0	15.0	RE20-10-22677	0.0	0	≤1085
SWMU 20-001(a)	20-612560	5.0	6.0	RE20-10-22678	0.0	0	≤1085
SWMU 20-001(a)	20-612560	10.0	11.0	RE20-10-22679	0.0	0	≤1085
SWMU 20-001(a)	20-612560	14.0	15.0	RE20-10-22680	0.0	0	≤1085
SWMU 20-001(a)	20-612561	5.0	6.0	RE20-10-22681	0.0	0	≤1085
SWMU 20-001(a)	20-612561	10.0	11.0	RE20-10-22682	0.0	0	≤1085
SWMU 20-001(a)	20-612561	14.0	15.0	RE20-10-22683	0.0	0	≤1085
SWMU 20-001(a)	20-612562	5.0	6.0	RE20-10-22684	0.0	0	≤1085
SWMU 20-001(a)	20-612562	10.0	11.0	RE20-10-22685	0.0	0	≤1085
SWMU 20-001(a)	20-612562	14.0	15.0	RE20-10-22686	0.0	0	≤1085
SWMU 20-001(a)	20-612563	5.0	6.0	RE20-10-22687	0.0	0	≤1085
SWMU 20-001(a)	20-612563	10.0	11.0	RE20-10-22688	0.0	0	≤1085
SWMU 20-001(a)	20-612563	14.0	15.0	RE20-10-22689	0.0	0	≤1085
SWMU 20-001(b)	20-612564	10.0	11.0	RE20-10-22723	0.0	≤4	≤603
SWMU 20-001(b)	20-612564	14.0	15.0	RE20-10-22724	0.0	≤4	≤603
SWMU 20-001(b)	20-612565	10.0	11.0	RE20-10-22725	0.2	≤4	≤603
SWMU 20-001(b)	20-612565	14.0	15.0	RE20-10-22726	0.0	≤4	≤603
SWMU 20-001(b)	20-612566	10.0	11.0	RE20-10-22727	0.1	≤4	≤603
SWMU 20-001(b)	20-612566	14.0	15.0	RE20-10-22728	0.1	≤4	≤603
SWMU 20-001(b)	20-612567	10.0	11.0	RE20-10-22729	0.0	≤10	≤1382
SWMU 20-001(b)	20-612567	14.0	15.0	RE20-10-22730	0.0	≤10	≤1382
SWMU 20-001(b)	20-612568	6.0	7.0	RE20-10-22731	0.2	≤4	≤603
SWMU 20-001(b)	20-612568	9.0	12.0	RE20-10-22732	0.2	≤4	≤603

Table 3.2-2 (continued)

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
SWMU 20-001(b)	20-612568	14.0	15.0	RE20-10-22739	0.1	≤4	≤603
SWMU 20-001(b)	20-612569	10.0	11.0	RE20-10-22733	0.0	≤10	≤1382
SWMU 20-001(b)	20-612569	14.0	15.0	RE20-10-22734	0.0	≤10	≤1382
SWMU 20-001(b)	20-612570	10.0	11.0	RE20-10-22735	0.0	≤10	≤1382
SWMU 20-001(b)	20-612570	14.0	15.0	RE20-10-22736	0.0	≤10	≤1382
SWMU 20-001(b)	20-612571	10.0	11.0	RE20-10-22737	0.0	≤10	≤1382
SWMU 20-001(b)	20-612571	14.0	15.0	RE20-10-22738	0.0	≤10	≤1382
SWMU 20-001(c)	20-612572	5.0	6.0	RE20-10-23069	0.0	≤12	≤1042
SWMU 20-001(c)	20-612572	10.0	11.0	RE20-10-23070	0.0	≤12	≤1042
SWMU 20-001(c)	20-612572	14.0	15.0	RE20-10-23071	0.0	≤12	≤1042
SWMU 20-001(c)	20-612573	5.0	6.0	RE20-10-23072	0.0	≤12	≤1042
SWMU 20-001(c)	20-612573	10.0	11.0	RE20-10-23073	0.0	≤12	≤1042
SWMU 20-001(c)	20-612573	14.0	15.0	RE20-10-23074	0.0	≤12	≤1042
SWMU 20-001(c)	20-612574	5.0	6.0	RE20-10-23075	0.0	≤18	≤1102
SWMU 20-001(c)	20-612574	10.0	11.0	RE20-10-23076	0.0	≤18	≤1102
SWMU 20-001(c)	20-612574	14.0	15.0	RE20-10-23077	0.0	≤18	≤1102
SWMU 20-001(c)	20-612575	5.0	6.0	RE20-10-23078	0.0	≤18	≤1102
SWMU 20-001(c)	20-612575	10.0	11.0	RE20-10-23079	0.0	≤18	≤1102
SWMU 20-001(c)	20-612575	14.0	15.0	RE20-10-23080	0.0	≤18	≤1102
SWMU 20-001(c)	20-612576	5.0	6.0	RE20-10-23081	0.0	≤12	≤1042
SWMU 20-001(c)	20-612576	10.0	11.0	RE20-10-23082	0.0	≤12	≤1042
SWMU 20-001(c)	20-612576	14.0	15.0	RE20-10-23083	0.0	≤12	≤1042
SWMU 20-001(c)	20-612577	5.0	6.0	RE20-10-23084	0.0	≤12	≤1042
SWMU 20-001(c)	20-612577	10.0	11.0	RE20-10-23085	0.0	≤12	≤1042
SWMU 20-001(c)	20-612577	14.0	15.0	RE20-10-23086	0.0	≤12	≤1042
SWMU 20-001(c)	20-612578	5.0	6.0	RE20-10-23087	0.0	≤18	≤1102
SWMU 20-001(c)	20-612578	10.0	11.0	RE20-10-23088	0.0	≤18	≤1102
SWMU 20-001(c)	20-612578	14.0	15.0	RE20-10-23089	0.0	≤18	≤1102
SWMU 20-001(c)	20-612579	5.0	6.0	RE20-10-23090	0.0	≤18	≤1102
SWMU 20-001(c)	20-612579	10.0	11.0	RE20-10-23091	0.0	≤18	≤1102
SWMU 20-001(c)	20-612579	14.0	15.0	RE20-10-23092	0.0	≤18	≤1102
SWMU 20-001(c)	20-612580	5.0	6.0	RE20-10-23093	0.0	≤18	≤1102
SWMU 20-001(c)	20-612580	10.0	11.0	RE20-10-23094	0.0	≤18	≤1102
SWMU 20-001(c)	20-612580	14.0	15.0	RE20-10-23095	0.0	≤18	≤1102
SWMU 20-001(c)	20-612581	5.0	6.0	RE20-10-23096	0.0	≤18	≤1102
SWMU 20-001(c)	20-612581	10.0	11.0	RE20-10-23097	0.0	≤18	≤1102

Table 3.2-2 (continued)

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
SWMU 20-001(c)	20-612581	14.0	15.0	RE20-10-23098	0.0	≤18	≤1102
SWMU 20-002(a)	20-612582	0.0	1.0	RE20-10-23108	0.0	≤10	≤1042
SWMU 20-002(a)	20-612582	2.0	3.0	RE20-10-23109	0.0	≤10	≤1042
SWMU 20-002(a)	20-612582	4.0	5.0	RE20-10-23110	0.0	≤10	≤1042
SWMU 20-002(a)	20-612583	0.0	1.0	RE20-10-23111	0.0	≤10	≤1042
SWMU 20-002(a)	20-612583	2.0	3.0	RE20-10-23112	0.0	≤10	≤1042
SWMU 20-002(a)	20-612583	4.0	5.0	RE20-10-23113	0.0	≤10	≤1042
SWMU 20-002(a)	20-612584	0.0	1.0	RE20-10-23114	0.0	≤10	≤1042
SWMU 20-002(a)	20-612584	2.0	3.0	RE20-10-23115	0.0	≤10	≤1042
SWMU 20-002(a)	20-612584	4.0	5.0	RE20-10-23116	0.0	≤10	≤1042
SWMU 20-002(a)	20-612585	0.0	1.0	RE20-10-23117	0.0	≤10	≤1042
SWMU 20-002(a)	20-612585	2.0	3.0	RE20-10-23118	0.0	≤10	≤1042
SWMU 20-002(a)	20-612585	4.0	5.0	RE20-10-23119	0.0	≤10	≤1042
SWMU 20-002(a)	20-612586	0.0	1.0	RE20-10-23120	0.0	≤10	≤1042
SWMU 20-002(a)	20-612586	2.0	3.0	RE20-10-23121	0.0	≤10	≤1042
SWMU 20-002(a)	20-612586	4.0	5.0	RE20-10-23122	0.0	≤10	≤1042
SWMU 20-002(a)	20-612587	0.0	1.0	RE20-10-23123	0.0	≤10	≤1042
SWMU 20-002(a)	20-612587	2.0	3.0	RE20-10-23124	0.0	≤10	≤1042
SWMU 20-002(a)	20-612587	4.0	5.0	RE20-10-23125	0.0	≤10	≤1042
SWMU 20-002(a)	20-612588	0.0	1.0	RE20-10-23126	0.0	≤10	≤1042
SWMU 20-002(a)	20-612588	2.0	3.0	RE20-10-23127	0.0	≤12	≤1052
SWMU 20-002(a)	20-612588	4.0	5.0	RE20-10-23128	0.0	≤12	≤1052
SWMU 20-002(a)	20-612589	0.0	1.0	RE20-10-23129	0.0	≤12	≤1052
SWMU 20-002(a)	20-612589	2.0	3.0	RE20-10-23130	0.0	≤12	≤1052
SWMU 20-002(a)	20-612589	4.0	5.0	RE20-10-23131	0.0	≤12	≤1052
SWMU 20-002(a)	20-612590	0.0	1.0	RE20-10-23132	0.0	≤12	≤1052
SWMU 20-002(a)	20-612590	2.0	3.0	RE20-10-23133	0.0	≤12	≤1052
SWMU 20-002(a)	20-612590	4.0	5.0	RE20-10-23134	0.0	≤12	≤1052
SWMU 20-002(b)	20-612591	0.0	1.0	RE20-10-23141	0.0	≤7	≤848
SWMU 20-002(b)	20-612591	2.0	3.0	RE20-10-23142	0.0	≤7	≤848
SWMU 20-002(b)	20-612591	4.0	5.0	RE20-10-23143	0.0	≤7	≤848
SWMU 20-002(b)	20-612592	0.0	1.0	RE20-10-23144	0.0	≤7	≤848
SWMU 20-002(b)	20-612592	2.0	3.0	RE20-10-23145	0.0	≤7	≤848
SWMU 20-002(b)	20-612592	4.0	5.0	RE20-10-23146	0.0	≤7	≤848
SWMU 20-002(b)	20-612593	0.0	1.0	RE20-10-23147	0.0	≤7	≤848
SWMU 20-002(b)	20-612593	2.0	3.0	RE20-10-23148	0.0	≤7	≤848

Table 3.2-2 (continued)

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
SWMU 20-002(b)	20-612593	4.0	5.0	RE20-10-23149	0.0	≤7	≤848
SWMU 20-002(b)	20-612594	0.0	1.0	RE20-10-23150	0.0	≤7	≤848
SWMU 20-002(b)	20-612594	2.0	3.0	RE20-10-23151	0.0	≤7	≤848
SWMU 20-002(b)	20-612594	4.0	5.0	RE20-10-23152	0.0	≤7	≤848
SWMU 20-002(b)	20-612595	0.0	1.0	RE20-10-23153	0.0	≤8	≤848
SWMU 20-002(b)	20-612595	2.0	3.0	RE20-10-23154	0.0	≤7	≤848
SWMU 20-002(b)	20-612595	4.0	5.0	RE20-10-23155	0.0	≤7	≤848
SWMU 20-002(b)	20-612596	0.0	1.0	RE20-10-23156	0.0	≤7	≤848
SWMU 20-002(b)	20-612596	2.0	3.0	RE20-10-23157	0.0	≤7	≤848
SWMU 20-002(b)	20-612596	4.0	5.0	RE20-10-23158	0.0	≤7	≤848
SWMU 20-002(b)	20-612597	0.0	1.0	RE20-10-23159	0.0	≤7	≤848
SWMU 20-002(b)	20-612597	2.0	3.0	RE20-10-23160	0.0	≤7	≤848
SWMU 20-002(b)	20-612597	4.0	5.0	RE20-10-23161	0.0	≤7	≤848
SWMU 20-002(c)	20-612598	0.0	1.0	RE20-10-23166	0.0	≤19	≤1299
SWMU 20-002(c)	20-612598	4.0	5.0	RE20-10-23167	0.0	≤19	≤1299
SWMU 20-002(c)	20-612598	8.0	9.0	RE20-10-23168	0.0	≤19	≤1299
SWMU 20-002(c)	20-612599	0.0	1.0	RE20-10-23169	0.0	≤19	≤1299
SWMU 20-002(c)	20-612599	4.0	5.0	RE20-10-23170	0.0	≤19	≤1299
SWMU 20-002(c)	20-612599	8.0	9.0	RE20-10-23171	0.0	≤19	≤1299
SWMU 20-002(c)	20-612600	0.0	1.0	RE20-10-23172	0.0	≤19	≤1299
SWMU 20-002(c)	20-612600	4.0	5.0	RE20-10-23173	0.0	≤19	≤1299
SWMU 20-002(c)	20-612600	8.0	9.0	RE20-10-23174	0.0	≤19	≤1299
SWMU 20-002(c)	20-612601	0.0	1.0	RE20-10-23175	0.0	≤13	≤1382
SWMU 20-002(c)	20-612601	4.0	5.0	RE20-10-23176	0.0	≤13	≤1382
SWMU 20-002(c)	20-612601	8.0	9.0	RE20-10-23177	0.0	≤13	≤1382
SWMU 20-002(c)	20-612602	0.0	1.0	RE20-10-23178	0.0	≤13	≤1382
SWMU 20-002(c)	20-612602	4.0	5.0	RE20-10-23179	0.0	≤13	≤1382
SWMU 20-002(c)	20-612602	8.0	9.0	RE20-10-23180	0.0	≤13	≤1382
SWMU 20-002(c)	20-612603	0.0	1.0	RE20-10-23181	0.0	≤19	≤1299
SWMU 20-002(c)	20-612603	4.0	5.0	RE20-10-23182	0.0	≤19	≤1299
SWMU 20-002(c)	20-612603	8.0	9.0	RE20-10-23183	0.0	≤19	≤1299
SWMU 20-002(c)	20-612605	0.0	1.0	RE20-10-23187	0.0	≤19	≤1299
SWMU 20-002(c)	20-612605	4.0	5.0	RE20-10-23188	0.0	≤19	≤1299
SWMU 20-002(c)	20-612605	8.0	9.0	RE20-10-23189	0.0	≤19	≤1299
SWMU 20-002(c)	20-612892	0.0	1.0	RE20-10-24957	0.0	≤19	≤1299
SWMU 20-002(c)	20-612892	4.0	5.0	RE20-10-24958	0.0	≤19	≤1299

Table 3.2-2 (continued)

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
SWMU 20-002(c)	20-612892	8.0	9.0	RE20-10-24959	0.0	≤19	≤1299
SWMU 20-002(d)	20-612606	0.0	1.0	RE20-10-23196	0.0	≤26	≤1140
SWMU 20-002(d)	20-612606	4.0	5.0	RE20-10-23197	0.0	≤26	≤1140
SWMU 20-002(d)	20-612606	8.0	9.0	RE20-10-23198	0.0	≤26	≤1140
SWMU 20-002(d)	20-612607	0.0	1.0	RE20-10-23199	0.0	≤26	≤1140
SWMU 20-002(d)	20-612607	4.0	5.0	RE20-10-23200	0.0	≤26	≤1140
SWMU 20-002(d)	20-612607	8.0	9.0	RE20-10-23201	0.0	≤26	≤1140
SWMU 20-002(d)	20-612608	0.0	1.0	RE20-10-23202	0.0	≤26	≤1140
SWMU 20-002(d)	20-612608	4.0	5.0	RE20-10-23203	0.0	≤26	≤1140
SWMU 20-002(d)	20-612608	8.0	9.0	RE20-10-23204	0.0	≤26	≤1140
SWMU 20-002(d)	20-612609	0.0	1.0	RE20-10-23205	0.0	≤26	≤1140
SWMU 20-002(d)	20-612609	4.0	5.0	RE20-10-23206	0.0	≤26	≤1140
SWMU 20-002(d)	20-612609	8.0	9.0	RE20-10-23207	0.0	≤26	≤1140
SWMU 20-002(d)	20-612610	0.0	1.0	RE20-10-23208	0.0	≤26	≤1140
SWMU 20-002(d)	20-612610	4.0	5.0	RE20-10-23209	0.0	≤26	≤1140
SWMU 20-002(d)	20-612610	8.0	9.0	RE20-10-23210	0.0	≤26	≤1140
SWMU 20-002(d)	20-612611	0.0	1.0	RE20-10-23211	0.0	≤26	≤1140
SWMU 20-002(d)	20-612611	4.0	5.0	RE20-10-23212	0.0	≤26	≤1140
SWMU 20-002(d)	20-612611	8.0	9.0	RE20-10-23213	0.0	≤26	≤1140
SWMU 20-002(d)	20-612612	0.0	1.0	RE20-10-23214	0.0	≤26	≤1140
SWMU 20-002(d)	20-612612	4.0	5.0	RE20-10-23215	0.0	≤26	≤1140
SWMU 20-002(d)	20-612612	8.0	9.0	RE20-10-23216	0.0	≤26	≤1140
SWMU 20-002(d)	20-612613	0.0	1.0	RE20-10-23217	0.0	≤26	≤1140
SWMU 20-002(d)	20-612613	4.0	5.0	RE20-10-23218	0.0	≤26	≤1140
SWMU 20-002(d)	20-612613	8.0	9.0	RE20-10-23219	0.0	≤26	≤1140
AOC 20-003(b)	20-612490	2.0	3.0	RE20-10-22266	0.0	0	≤891
AOC 20-003(b)	20-612490	8.0	9.0	RE20-10-22267	0.2	0	≤891
AOC 20-003(b)	20-612490	20.0	21.0	RE20-10-22279	0.0	0	≤891
AOC 20-003(b)	20-612491	2.0	3.0	RE20-10-22268	0.0	0	≤891
AOC 20-003(b)	20-612491	8.0	9.0	RE20-10-22269	0.0	0	≤891
AOC 20-003(b)	20-612491	11.0	12.0	RE20-10-22278	0.0	0	≤891
AOC 20-003(b)	20-612492	2.0	3.0	RE20-10-22270	0.0	0	≤891
AOC 20-003(b)	20-612492	8.0	9.0	RE20-10-22271	0.0	0	≤891
AOC 20-003(b)	20-612493	2.0	3.0	RE20-10-22272	0.0	0	≤891
AOC 20-003(b)	20-612493	8.0	9.0	RE20-10-22273	0.0	0	≤891
AOC 20-003(b)	20-612494	2.0	3.0	RE20-10-22274	0.0	0	≤891

Table 3.2-2 (continued)

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
AOC 20-003(b)	20-612494	8.0	9.0	RE20-10-22275	0.0	0	≤891
AOC 20-003(b)	20-612495	2.0	3.0	RE20-10-22276	0.0	0	≤891
AOC 20-003(b)	20-612495	8.0	9.0	RE20-10-22277	0.0	0	≤891
AOC 20-003(c)	20-612496	0.0	1.0	RE20-10-22290	0.0	≤4	603
AOC 20-003(c)	20-612496	2.5	3.0	RE20-10-22292	0.0	≤4	≤603
AOC 20-003(c)	20-612496	4.0	5.0	RE20-10-24865	0.0	≤4	≤603
AOC 20-003(c)	20-612497	0.0	1.0	RE20-10-22291	0.0	≤4	≤603
AOC 20-003(c)	20-612497	7.5	8.0	RE20-10-22293	0.0	≤4	≤603
AOC 20-003(c)	20-612497	10.0	11.0	RE20-10-24867	0.0	≤4	≤603
AOC 20-003(c)	20-612498	0.0	1.0	RE20-10-22294	0.0	≤4	≤603
AOC 20-003(c)	20-612498	0.0	1.0	RE20-10-22295	0.0	≤4	≤603
AOC 20-003(c)	20-612498	3.0	5.0	RE20-10-22296	0.0	≤4	≤603
AOC 20-003(c)	20-612498	5.0	6.0	RE20-10-24866	0.0	≤4	≤603
AOC 20-003(c)	20-612499	1.0	2.0	RE20-10-22297	0.0	≤4	≤603
AOC 20-003(c)	20-612499	3.0	4.0	RE20-10-24864	0.0	≤4	≤603
AOC 20-004	20-612500	3.0	4.0	RE20-10-22300	0.0	≤11	≤1368
AOC 20-004	20-612500	6.0	7.0	RE20-10-22301	0.0	≤11	≤1368
AOC 20-004	20-612501	7.0	8.0	RE20-10-22302	0.0	≤11	≤1368
AOC 20-004	20-612501	10.0	11.0	RE20-10-22303	0.0	≤11	≤1368
AOC 20-004	20-612502	3.0	4.0	RE20-10-22304	0.0	≤11	≤1368
AOC 20-004	20-612502	6.0	7.0	RE20-10-22305	0.0	≤11	≤1368
AOC 20-004	20-612503	7.0	8.0	RE20-10-22306	0.0	≤11	≤1368
AOC 20-004	20-612503	10.0	11.0	RE20-10-22307	0.0	≤11	≤1368
AOC 20-004	20-612504	3.0	4.0	RE20-10-22308	0.0	≤11	≤1368
AOC 20-004	20-612504	6.0	7.0	RE20-10-22309	0.0	≤11	≤1368
AOC 20-004	20-612505	7.0	8.0	RE20-10-22310	0.0	≤11	≤1368
AOC 20-004	20-612505	10.0	11.0	RE20-10-22311	0.0	≤11	1368
AOC 20-004	20-612506	3.0	4.0	RE20-10-22312	0.0	≤11	≤1368
AOC 20-004	20-612506	6.0	7.0	RE20-10-22313	0.0	≤11	≤1368
SWMU 20-005	20-612614	4.0	5.0	RE20-10-23226	0.0	≤7	≤1403
SWMU 20-005	20-612614	9.0	10.0	RE20-10-23227	0.0	≤7	≤1403
SWMU 20-005	20-612615	4.0	5.0	RE20-10-23228	0.0	≤7	≤1403
SWMU 20-005	20-612615	9.0	10.0	RE20-10-23229	0.0	≤7	≤1403
SWMU 20-005	20-612616	4.0	5.0	RE20-10-23230	0.0	≤7	≤1403
SWMU 20-005	20-612616	9.0	10.0	RE20-10-23231	0.0	≤7	≤1403
SWMU 20-005	20-612617	6.0	7.0	RE20-10-23232	0.0	≤7	≤1403

Table 3.2-2 (continued)

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
SWMU 20-005	20-612617	9.0	10.0	RE20-10-23233	0.0	≤7	≤1403
SWMU 20-005	20-612618	0.0	1.0	RE20-10-23234	0.0	≤7	≤1403
SWMU 20-005	20-612618	3.0	4.0	RE20-10-23235	0.0	≤7	≤1403
SWMU 20-005	20-612619	0.0	1.0	RE20-10-23236	0.0	≤7	≤1403
SWMU 20-005	20-612619	3.0	4.0	RE20-10-23237	0.0	≤7	≤1403
TA-53							
SWMU 53-001(a)	53-612469	2	3	RE53-10-22204	0.0	≤36	≤1157
SWMU 53-001(a)	53-612469	4	5	RE53-10-22205	0.0	≤36	≤1157
SWMU 53-001(a)	53-612470	2	3	RE53-10-22206	0.0	≤36	≤1157
SWMU 53-001(a)	53-612470	4	5	RE53-10-22207	0.0	≤36	≤1157
SWMU 53-001(a)	53-612471	1	2	RE53-10-22208	0.0	≤36	≤1157
SWMU 53-001(a)	53-612471	3	4	RE53-10-22209	0.0	≤36	≤1157
SWMU 53-001(a)	53-612472	1	2	RE53-10-22210	0.0	≤36	≤1157
SWMU 53-001(a)	53-612472	3	4	RE53-10-22211	0.0	≤36	≤1157
SWMU 53-001(a)	53-612473	1	2	RE53-10-22212	0.0	≤36	≤1157
SWMU 53-001(a)	53-612473	3	4	RE53-10-22213	0.0	≤36	≤1157
SWMU 53-001(a)	53-612474	1	2	RE53-10-22214	0.0	≤36	≤1157
SWMU 53-001(a)	53-612474	3	4	RE53-10-22215	0.0	≤36	≤1157
SWMU 53-001(a)	53-612475	1	2	RE53-10-22216	0.0	≤24	≤1193
SWMU 53-001(a)	53-612475	3	4	RE53-10-22217	0.0	≤24	≤1193
SWMU 53-001(a)	53-612476	1	2	RE53-10-22218	0.0	≤24	≤1193
SWMU 53-001(a)	53-612476	3	4	RE53-10-22219	0.0	≤24	≤1193
SWMU 53-001(a)	53-612477	1	2	RE53-10-22220	0.0	≤36	≤1157
SWMU 53-001(a)	53-612477	3	4	RE53-10-22221	0.0	≤36	≤1157
SWMU 53-001(a)	53-612478	0	1	RE53-10-22222	0.0	≤10	≤1340
SWMU 53-001(a)	53-612478	2	3	RE53-10-22223	0.0	≤10	≤1340
SWMU 53-001(a)	53-612479	0	1	RE53-10-22224	0.0	≤10	≤1340
SWMU 53-001(a)	53-612479	2	3	RE53-10-22225	0.0	≤10	≤1340
SWMU 53-001(a)	53-612480	0	1	RE53-10-22226	0.0	≤36	≤1157
SWMU 53-001(a)	53-612480	2	3	RE53-10-22227	0.0	≤36	≤1157
SWMU 53-001(a)	53-612480	4	5	RE53-10-22228	0.0	≤36	≤1157
SWMU 53-001(b)	53-612481	0	1	RE53-10-22235	0.0	≤10	≤1340
SWMU 53-001(b)	53-612481	2	3	RE53-10-22236	0.0	≤10	≤1340
SWMU 53-001(b)	53-612482	0	1	RE53-10-22237	0.0	≤10	≤1340
SWMU 53-001(b)	53-612482	2	3	RE53-10-22238	0.0	≤10	≤1340
SWMU 53-005	53-612483	12.5	13.5	RE53-10-26417	0.0	0	≤1252

Table 3.2-2 (continued)

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
SWMU 53-005	53-612483	15	16	RE53-10-26418	0.0	0	≤1252
SWMU 53-005	53-612484	2	3	RE53-10-26420	0.0	≤17	≤1284
SWMU 53-005	53-612484	5	6	RE53-10-26421	4.2	≤17	≤1284
SWMU 53-005	53-612484	14	15	RE53-10-26422	25.1	≤17	≤1284
SWMU 53-005	53-612485	2	3	RE53-10-26423	8.9	≤27	≤1079
SWMU 53-005	53-612485	5	6	RE53-10-26424	1.9	≤27	≤1079
SWMU 53-005	53-612485	14	15	RE53-10-26425	0.0	≤27	≤1079
SWMU 53-005	53-612486	0	1	RE53-10-26426	0.0	≤17	≤1284
SWMU 53-005	53-612486	4	5	RE53-10-26427	0.0	≤17	≤1284
SWMU 53-006(f)	53-612487	0	1	RE53-10-22254	0.0	≤11	≤1383
SWMU 53-006(f)	53-612487	2	3	RE53-10-22255	0.0	≤11	≤1383
SWMU 53-006(f)	53-612487	8	9	RE53-10-22256	0.0	≤11	≤1383
SWMU 53-006(f)	53-612488	0	1	RE53-10-22257	0.0	≤11	≤1383
SWMU 53-006(f)	53-612488	2	3	RE53-10-22258	0.0	≤11	≤1383
SWMU 53-006(f)	53-612488	8	9	RE53-10-22259	0.0	≤11	≤1383
SWMU 53-006(f)	53-612489	0	1	RE53-10-22260	0.0	≤11	≤1383
SWMU 53-006(f)	53-612489	2	3	RE53-10-22261	0.0	≤11	≤1383
SWMU 53-006(f)	53-612489	8	9	RE53-10-22262	0.0	≤11	≤1383
AOC 53-008	53-612507	0	1	RE53-10-22320	0.0	≤9	≤1192
AOC 53-008	53-612507	2	3	RE53-10-22321	0.0	≤9	≤1192
AOC 53-008	53-612508	0	1	RE53-10-22322	0.0	≤9	≤1192
AOC 53-008	53-612508	2	3	RE53-10-22323	0.0	≤9	≤1192
AOC 53-008	53-612509	0	1	RE53-10-22324	0.0	≤9	≤1192
AOC 53-008	53-612509	2	3	RE53-10-22325	0.0	≤9	≤1192
AOC 53-008	53-612510	0	1	RE53-10-22326	0.0	≤9	≤1192
AOC 53-008	53-612510	2	3	RE53-10-22327	0.0	≤9	≤1192
AOC 53-008	53-612511	0	1	RE53-10-22328	0.0	≤9	≤1192
AOC 53-008	53-612511	2	3	RE53-10-22329	0.0	≤9	≤1192
AOC 53-008	53-612512	0	1	RE53-10-22330	0.0	≤9	≤1192
AOC 53-008	53-612512	2	3	RE53-10-22331	0.0	≤9	≤1192
AOC 53-008	53-612513	0	1	RE53-10-22332	0.0	≤9	≤1192
AOC 53-008	53-612513	2	3	RE53-10-22333	0.0	≤9	≤1192
AOC 53-008	53-612514	0	1	RE53-10-22334	0.0	≤9	≤1192
AOC 53-008	53-612514	2	3	RE53-10-22335	0.0	≤9	≤1192
AOC 53-008	53-612515	0	1	RE53-10-22336	0.0	≤9	≤1192
AOC 53-008	53-612515	2	3	RE53-10-22337	0.0	≤9	≤1192

Table 3.2-2 (continued)

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
AOC 53-008	53-612516	0	1	RE53-10-22338	0.0	≤9	≤1192
AOC 53-008	53-612516	2	3	RE53-10-22339	0.0	≤9	≤1192
AOC 53-008	53-612517	0	1	RE53-10-22340	0.0	≤9	≤1192
AOC 53-008	53-612517	2	3	RE53-10-22341	0.0	≤9	≤1192
AOC 53-008	53-612518	0	1	RE53-10-22342	0.0	≤9	≤1192
AOC 53-008	53-612518	2	3	RE53-10-22343	0.0	≤9	≤1192
AOC 53-008	53-612519	0	1	RE53-10-22344	0.0	≤9	≤1192
AOC 53-008	53-612519	2	3	RE53-10-22345	0.0	≤9	≤1192
AOC 53-008	53-612520	0	1	RE53-10-22346	0.0	≤19	≤1245
AOC 53-008	53-612520	2	3	RE53-10-22347	0.0	≤19	≤1245
AOC 53-008	53-612521	0	1	RE53-10-22348	0.0	≤19	≤1245
AOC 53-008	53-612521	2	3	RE53-10-22349	0.0	≤19	≤1245
AOC 53-008	53-612522	0	1	RE53-10-22350	0.0	≤19	≤1245
AOC 53-008	53-612522	2	3	RE53-10-22351	0.0	≤19	≤1245
AOC 53-008	53-612523	0	1	RE53-10-22352	0.0	≤19	≤1245
AOC 53-008	53-612523	2	3	RE53-10-22353	0.0	≤19	≤1245
AOC 53-009	53-612524	0	1	RE53-10-22363	0.0	≤19	≤1245
AOC 53-009	53-612524	2	3	RE53-10-22364	0.0	≤19	≤1245
AOC 53-009	53-612525	0	1	RE53-10-22365	0.0	≤19	≤1245
AOC 53-009	53-612525	2	3	RE53-10-22368	0.0	≤19	≤1245
AOC 53-009	53-612526	2	3	RE53-10-22366	0.0	≤19	≤1245
AOC 53-009	53-612526	0	1	RE53-10-22367	0.0	≤19	≤1245
AOC 53-009	53-612527	0	1	RE53-10-22369	0.0	≤19	≤1245
AOC 53-009	53-612527	2	3	RE53-10-22370	0.0	≤19	≤1245
AOC 53-009	53-612528	0	1	RE53-10-22371	0.0	≤19	≤1245
AOC 53-009	53-612528	2	3	RE53-10-22372	0.0	≤19	≤1245
AOC 53-009	53-612529	0	1	RE53-10-22373	0.0	≤24	≤1139
AOC 53-009	53-612529	2	3	RE53-10-22374	0.0	≤24	≤1139
AOC 53-009	53-612530	0	1	RE53-10-22375	0.0	≤24	≤1139
AOC 53-009	53-612530	2	3	RE53-10-22376	0.0	≤24	≤1139
AOC 53-009	53-612531	0	1	RE53-10-22377	0.0	≤24	≤1139
AOC 53-009	53-612531	2	3	RE53-10-22378	0.0	≤24	≤1139
AOC 53-009	53-612532	0	1	RE53-10-22379	0.0	≤24	≤1139
AOC 53-009	53-612532	2	3	RE53-10-22380	0.0	≤24	≤1134
AOC 53-010	53-612533	0	1	RE53-10-22390	0.0	≤11	≤1383
AOC 53-010	53-612533	3	4	RE53-10-22391	0.0	≤11	≤1383

Table 3.2-2 (continued)

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
AOC 53-010	53-612534	0	1	RE53-10-22392	0.0	≤11	≤1383
AOC 53-010	53-612534	3	4	RE53-10-22393	0.0	≤11	≤1383
AOC 53-010	53-612535	0	1	RE53-10-22394	0.0	≤11	≤1383
AOC 53-010	53-612535	3	4	RE53-10-22395	0.0	≤11	≤1383
AOC 53-010	53-612536	0	1	RE53-10-22396	0.0	≤11	≤1383
AOC 53-010	53-612536	3	4	RE53-10-22397	0.0	≤11	≤1383
AOC 53-010	53-612537	0	1	RE53-10-22398	0.0	≤11	≤1383
AOC 53-010	53-612537	3	4	RE53-10-22399	0.0	≤11	≤1383
AOC 53-010	53-612538	0	1	RE53-10-22400	0.0	≤11	≤1383
AOC 53-010	53-612538	3	4	RE53-10-22401	0.0	≤11	≤1383
AOC 53-012(e)	53-612539	0	1	RE53-10-22408	0.0	≤10	≤1340
AOC 53-012(e)	53-612539	2	3	RE53-10-22409	0.0	≤10	≤1340
AOC 53-012(e)	53-612540	0	1	RE53-10-22410	0.0	≤10	≤1340
AOC 53-012(e)	53-612540	1	2	RE53-10-22411	0.0	≤10	≤1340
AOC 53-012(e)	53-612541	0	1	RE53-10-22412	0.0	≤10	≤1340
AOC 53-012(e)	53-612541	3	4	RE53-10-22413	0.0	≤10	≤1340
AOC 53-012(e)	53-612542	0	1	RE53-10-22414	0.0	≤10	≤1340
AOC 53-012(e)	53-612542	3	4	RE53-10-22415	0.0	≤10	≤1340
AOC 53-012(e)	53-612543	1	2	RE53-10-22416	0.0	≤10	≤1340
AOC 53-012(e)	53-612543	3	4	RE53-10-22417	0.0	≤10	≤1340
AOC 53-012(e)	53-612544	1	2	RE53-10-22418	0.0	≤10	≤1340
AOC 53-012(e)	53-612544	2	3	RE53-10-22419	0.0	≤10	≤1340
AOC 53-013	53-612546	0	1	RE53-10-22527	0.0	≤22	≤1107
AOC 53-013	53-612546	2	3	RE53-10-22528	0.0	≤22	≤1107
AOC 53-013	53-612547	0	1	RE53-10-22529	0.0	≤32	≤1120
AOC 53-013	53-612547	2	3	RE53-10-22530	0.0	≤32	≤1120
AOC 53-013	53-612548	0	1	RE53-10-22531	0.0	≤32	≤1120
AOC 53-013	53-612548	2	3	RE53-10-22532	0.0	≤32	≤1120
AOC 53-013	53-612549	0	1	RE53-10-22533	0.0	≤32	≤1120
AOC 53-013	53-612549	2	3	RE53-10-22534	0.0	≤32	≤1120
AOC 53-013	53-612550	0	1	RE53-10-22535	0.0	≤32	≤1120
AOC 53-013	53-612550	2	3	RE53-10-22536	0.0	≤32	≤1120
AOC 53-013	53-612551	0	1	RE53-10-22537	0.0	≤32	≤1120
AOC 53-013	53-612551	2	3	RE53-10-22538	0.0	≤32	≤1120
AOC 53-013	53-612552	0	1	RE53-10-22539	0.0	≤32	≤1120
AOC 53-013	53-612552	2	3	RE53-10-22540	0.0	≤32	≤1120

Table 3.2-2 (continued)

SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/ Gamma Reading (dpm)*
AOC 53-013	53-612553	0	1	RE53-10-22542	0.0	≤22	≤1107
AOC 53-013	53-612553	2	3	RE53-10-22543	0.0	≤22	≤1107
AOC 53-013	53-612554	0	1	RE53-10-22544	0.0	≤32	≤1120
AOC 53-013	53-612554	2	3	RE53-10-22545	0.0	≤32	≤1120
AOC 53-013	53-612555	0	1	RE53-10-22546	0.0	≤32	≤1120
AOC 53-013	53-612555	2	3	RE53-10-22547	0.0	≤32	≤1120
AOC 53-013	53-613163	0	1	RE53-10-27065	0.0	≤17	≤1219
AOC 53-013	53-613163	2	3	RE53-10-27066	0.0	≤17	≤1219
AOC 53-013	53-613164	0	1	RE53-10-27067	0.0	≤17	≤1219
AOC 53-013	53-613164	2	3	RE53-10-27068	0.0	≤17	≤1219
AOC 53-013	53-613165	0	1	RE53-10-27069	0.0	≤17	≤1219
AOC 53-013	53-613165	2	3	RE53-10-27070	0.0	≤17	≤1219
AOC 53-013	53-613166	0	1	RE53-10-27071	0.0	≤17	≤1219
AOC 53-013	53-613166	2	3	RE53-10-27072	0.0	≤17	≤1219
AOC 53-013	53-613167	0	1	RE53-10-27073	0.0	≤17	≤1219
AOC 53-013	53-613167	2	3	RE53-10-27074	0.0	≤17	≤1219
AOC 53-013	53-613168	0	1	RE53-10-27075	0.0	≤17	≤1219
AOC 53-013	53-613168	2	3	RE53-10-27076	0.0	≤17	≤1219
AOC 53-013	53-613169	0	1	RE53-10-27077	0.0	≤17	≤1219
AOC 53-013	53-613169	2	3	RE53-10-27078	0.0	≤17	≤1219
AOC 53-013	53-613170	0	1	RE53-10-27079	0.0	≤17	≤1219
AOC 53-013	53-613170	2	3	RE53-10-27080	0.0	≤17	≤1219
AOC 53-013	53-613171	0	1	RE53-10-27081	0.0	≤17	≤1219
AOC 53-013	53-613171	2	3	RE53-10-27082	0.0	≤17	≤1219
AOC 53-013	53-613172	0	1	RE53-10-27083	0.0	≤17	≤1219
AOC 53-013	53-613172	2	3	RE53-10-27084	0.0	≤17	≤1219

* Results reported represent site background levels.

Table 6.2-1
Samples Collected and Analyses Requested at SWMU 20-001(a)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides	Isotopic Uranium	Strontium-90
RE20-10-22666	20-612556	5–6	QBT3	10-3800	10-3800	10-3800	10-3800	10-3799	10-3799	10-3799	10-3799	10-3801	10-3801	10-3801
RE20-10-22667	20-612556	10–11	QBT3	10-3800	10-3800	10-3800	10-3800	10-3799	10-3799	10-3799	10-3799	10-3801	10-3801	10-3801
RE20-10-22668	20-612556	14–15	QBT3	10-3800	10-3800	10-3800	10-3800	10-3799	10-3799	10-3799	10-3799	10-3801	10-3801	10-3801
RE20-10-22669	20-612557	5–6	QBT3	10-3800	10-3800	10-3800	10-3800	10-3799	10-3799	10-3799	10-3799	10-3801	10-3801	10-3801
RE20-10-22670	20-612557	10–11	QBT3	10-3800	10-3800	10-3800	10-3800	10-3799	10-3799	10-3799	10-3799	10-3801	10-3801	10-3801
RE20-10-22671	20-612557	14–15	QBT3	10-3800	10-3800	10-3800	10-3800	10-3799	10-3799	10-3799	10-3799	10-3801	10-3801	10-3801
RE20-10-22672	20-612558	5–6	QBT3	10-3800	10-3800	10-3800	10-3800	10-3799	10-3799	10-3799	10-3799	10-3801	10-3801	10-3801
RE20-10-22673	20-612558	10–11	QBT3	10-3800	10-3800	10-3800	10-3800	10-3799	10-3799	10-3799	10-3799	10-3801	10-3801	10-3801
RE20-10-22674	20-612558	14–15	QBT3	10-3800	10-3800	10-3800	10-3800	10-3799	10-3799	10-3799	10-3799	10-3801	10-3801	10-3801
RE20-10-22675	20-612559	5–6	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—*	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22676	20-612559	10–11	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22677	20-612559	14–15	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22678	20-612560	5–6	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22679	20-612560	10–11	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22680	20-612560	14–15	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22681	20-612561	5–6	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22682	20-612561	10–11	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22683	20-612561	14–15	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22684	20-612562	5–6	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosives Compounds	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides	Isotopic Uranium	Strontium-90
RE20-10-22685	20-612562	10–11	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22686	20-612562	14–15	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22687	20-612563	5–6	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22688	20-612563	10–11	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827
RE20-10-22689	20-612563	14–15	QBT3	10-3826	10-3826	10-3826	10-3826	10-3825	—	10-3825	10-3825	10-3827	10-3827	10-3827

* — = Analysis not requested.

Table 6.2-2
Inorganic Chemicals above BVs at SWMU 20-001(a)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Calcium	Copper	Lead	Nickel	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**2200**	**4.66**	**11.2**	**6.58**	**na[b]**	**na**	**0.3**
Construction Worker SSL[c]				**124**	**4350**	**na**	**12400**	**800**	**6190**	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**224000**	**na**	**45400**	**800**	**22700**	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**15600**	**na**	**3130**	**400**	**1560**	**125000**	**54.8**	**391**
RE20-10-22666	20-612556	5–6	QBT3	1.04 (U)	68.3	—[d]	5.52	—	—	—	—	1.04 (U)
RE20-10-22667	20-612556	10–11	QBT3	1.02 (U)	72.2	—	—	—	—	0.94 (J)	0.00113 (J)	1.03 (U)
RE20-10-22668	20-612556	14–15	QBT3	1.02 (U)	72.3	—	4.8	—	—	0.938 (J)	0.000852 (J)	0.999 (U)
RE20-10-22669	20-612557	5–6	QBT3	1.03 (U)	82.3	—	5.61	11.8	—	1.02 (J)	0.00279	1.05 (U)
RE20-10-22670	20-612557	10–11	QBT3	1.05 (U)	79.3	—	5.54	12.1	—	0.988 (J)	0.00243	1.05 (U)
RE20-10-22671	20-612557	14–15	QBT3	1.02 (U)	80	—	5.56	11.9	—	1.01 (J)	0.0015 (J)	1.05 (U)
RE20-10-22672	20-612558	5–6	QBT3	1.03 (U)	86.6	—	7.32	11.6	6.66	0.98 (J)	0.00201 (J)	1.04 (U)
RE20-10-22673	20-612558	10–11	QBT3	1.04 (U)	78.5	—	5.06	—	—	—	0.00137 (J)	1.04 (U)
RE20-10-22674	20-612558	14–15	QBT3	0.99 (U)	72	—	5.44	—	—	0.961 (J)	0.00345	1.02 (U)
RE20-10-22675	20-612559	5–6	QBT3	1.02 (U)	89.3 (J-)	2700	6.01	—	—	—	0.000765 (J)	0.98 (U)
RE20-10-22676	20-612559	10–11	QBT3	1.03 (U)	75.8 (J-)	—	5.04	—	—	—	0.00193 (J)	1.04 (U)
RE20-10-22677	20-612559	14–15	QBT3	1.04 (U)	71.3 (J-)	—	—	—	—	—	0.00151 (J)	0.957 (U)
RE20-10-22678	20-612560	5–6	QBT3	1.03 (U)	87 (J-)	—	6.25	—	—	—	—	1.02 (U)
RE20-10-22679	20-612560	10–11	QBT3	0.97 (U)	87.9 (J-)	—	6.12	—	—	—	0.00102 (J)	1.03 (U)
RE20-10-22680	20-612560	14–15	QBT3	0.955 (U)	65.6 (J-)	—	—	—	—	—	0.00161 (J)	1.04 (U)
RE20-10-22681	20-612561	5–6	QBT3	1.05 (U)	72.2 (J-)	—	5.46	—	—	—	0.000979 (J)	1.04 (U)
RE20-10-22682	20-612561	10–11	QBT3	1.04 (U)	75.8 (J-)	—	6.74	11.3	—	—	0.000886 (J)	1.02 (U)

Table 6.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Calcium	Copper	Lead	Nickel	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**2200**	**4.66**	**11.2**	**6.58**	**na**[b]	**na**	**0.3**
Construction Worker SSL[c]				**124**	**4350**	**na**	**12400**	**800**	**6190**	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**224000**	**na**	**45400**	**800**	**22700**	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**15600**	**na**	**3130**	**400**	**1560**	**125000**	**54.8**	**391**
RE20-10-22683	20-612561	14–15	QBT3	1.02 (U)	84.2 (J-)	—	5.56	11.9	—	—	0.00116 (J)	1.01 (U)
RE20-10-22684	20-612562	5–6	QBT3	1.05 (U)	108 (J-)	3120	7.75	—	—	—	0.00115 (J)	1.02 (U)
RE20-10-22685	20-612562	10–11	QBT3	1.02 (U)	54.9 (J-)	—	—	—	—	—	0.000835 (J)	0.997 (U)
RE20-10-22686	20-612562	14–15	QBT3	1.02 (U)	55.6 (J-)	—	—	—	—	—	0.000947 (J)	0.981 (U)
RE20-10-22687	20-612563	5–6	QBT3	0.998 (U)	63.5 (J-)	—	—	—	—	—	0.00126 (J)	1.02 (U)
RE20-10-22688	20-612563	10–11	QBT3	1.04 (U)	78.6 (J-)	2590	—	—	—	—	0.00146 (J)	1.04 (U)
RE20-10-22689	20-612563	14–15	QBT3	1.03 (U)	60.9 (J-)	—	—	—	—	—	0.00217	0.999 (U)

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070).

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

Table 6.2-3
Organic Chemicals Detected at SWMU 20-001(a)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Anthracene	Aroclor-1248	Aroclor-1254	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Isopropyltoluene[4-]	Methylene Chloride	Phenanthrene	Pyrene
Construction Worker SSL[a]				**263000**	**66800**	**75.8**	**4.36**	**213**	**21.3**	**213**	**6680[b]**	**2060**	**20600**	**8910**	**213**	**10300[c]**	**10600**	**7150**	**6680**
Industrial SSL[a]				**851000**	**183000**	**8.26**	**8.26**	**23.4**	**2.34**	**23.4**	**18300[b]**	**234**	**2340**	**24400**	**23.4**	**14900[c]**	**1090**	**20500**	**18300**
Residential SSL[a]				**67500**	**17200**	**2.22**	**1.12**	**6.21**	**0.621**	**6.21**	**1720[b]**	**62.1**	**621**	**2290**	**6.21**	**3210[c]**	**199**	**1830**	**1720**
RE20-10-22666	20-612556	5–6	QBT3	0.00581	—[d]	—	—	—	—	—	—	—	—	—	—	—	0.00278 (J)	—	—
RE20-10-22667	20-612556	10–11	QBT3	0.00618	—	—	—	—	—	—	—	—	—	—	—	—	0.00315 (J)	—	—
RE20-10-22668	20-612556	14–15	QBT3	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00298 (J)	—	—
RE20-10-22669	20-612557	5–6	QBT3	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00302 (J)	—	—
RE20-10-22670	20-612557	10–11	QBT3	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00288 (J)	—	—
RE20-10-22671	20-612557	14–15	QBT3	—	—	—	0.0013 (J)	—	—	—	—	—	—	—	—	—	0.00283 (J)	—	—
RE20-10-22672	20-612558	5–6	QBT3	—	—	—	—	—	—	—	—	—	—	—	—	—	0.0033 (J)	—	—
RE20-10-22673	20-612558	10–11	QBT3	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00298 (J)	—	—
RE20-10-22674	20-612558	14–15	QBT3	—	—	0.0026 (J)	0.0033 (J)	—	—	—	—	—	—	—	—	—	0.00293 (J)	—	—
RE20-10-22675	20-612559	5–6	QBT3	—	—	NA[e]	NA	0.0167 (J)	0.0109 (J)	0.0126 (J)	—	—	0.015 (J)	0.035	—	—	—	0.0207 (J)	0.0301 (J)
RE20-10-22678	20-612560	5–6	QBT3	—	0.0544	NA	NA	0.166	0.106	0.179	0.0416	0.085	0.225	0.162	0.0435	—	—	0.0366	0.114
RE20-10-22679	20-612560	10–11	QBT3	—	—	NA	NA	0.0675	0.0403	0.0722	0.0189 (J)	0.0324 (J)	0.0537	0.033 (J)	0.0187 (J)	—	—	—	0.0313 (J)
RE20-10-22680	20-612560	14–15	QBT3	—	—	NA	NA	0.0134 (J)	—	0.0134 (J)	—	—	—	—	—	—	—	—	—
RE20-10-22682	20-612561	10–11	QBT3	—	—	NA	NA	0.0355	0.0204 (J)	0.0357	—	0.0167 (J)	0.0207 (J)	0.0124 (J)	—	—	—	—	0.0116 (J)
RE20-10-22683	20-612561	14–15	QBT3	—	—	NA	NA	0.0194 (J)	0.0108 (J)	0.017 (J)	—	—	0.011 (J)	—	—	—	—	—	—
RE20-10-22687	20-612563	5–6	QBT3	—	—	NA	NA	—	—	—	—	—	—	—	—	0.000504 (J)	—	—	—
RE20-10-22689	20-612563	14–15	QBT3	—	—	NA	NA	—	—	—	—	—	—	—	—	0.000387 (J)	—	—	—

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

[a] SSLs are from NMED (2009, 108070).

[b] Pyrene was used as surrogate based on structural similarity.

[c] Isopropylbenzene was used as surrogate based on structural similarity.

[d] — = Not detected.

[e] NA = Not analyzed.

Table 6.2-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 20-001(a)

Sample ID	Location ID	Depth (ft)	Media	Uranium-235/236
Qbt 2, 3, 4 BV[a]				**0.09**
Construction Worker SAL[b]				**43**
Industrial SAL[b]				**87**
Residential SAL[b]				**17**
RE20-10-22666	20-612556	5–6	QBT3	0.104
RE20-10-22667	20-612556	10–11	QBT3	0.115
RE20-10-22668	20-612556	14–15	QBT3	0.0948
RE20-10-22669	20-612557	5–6	QBT3	0.111
RE20-10-22671	20-612557	14–15	QBT3	0.122
RE20-10-22672	20-612558	5–6	QBT3	0.112
RE20-10-22674	20-612558	14–15	QBT3	0.101
RE20-10-22689	20-612563	14–15	QBT3	0.123

Note: Results are in pCi/g.

[a] BVs are from LANL (1998, 059730).

[b] SALs are from LANL (2009, 107655).

Table 6.3-1
Samples Collected and Analyses Requested at SWMU 20-001(b)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides	Isotopic Uranium
RE20-10-22723	20-612564	10–11	SOIL	10-3942	10-3942	10-3942	10-3942	10-3941	10-3941	10-3941	10-3941	10-3943	10-3943
RE20-10-22724	20-612564	14–15	SOIL	10-3942	10-3942	10-3942	10-3942	10-3941	10-3941	10-3941	10-3941	10-3943	10-3943
RE20-10-22725	20-612565	10–11	SOIL	10-3942	10-3942	10-3942	10-3942	10-3941	10-3941	10-3941	10-3941	10-3943	10-3943
RE20-10-22726	20-612565	14–15	SOIL	10-3942	10-3942	10-3942	10-3942	10-3941	10-3941	10-3941	10-3941	10-3943	10-3943
RE20-10-22727	20-612566	10–11	SOIL	10-3942	10-3942	10-3942	10-3942	10-3941	10-3941	10-3941	10-3941	10-3943	10-3943
RE20-10-22728	20-612566	14–15	SOIL	10-3942	10-3942	10-3942	10-3942	10-3941	10-3941	10-3941	10-3941	10-3943	10-3943
RE20-10-22729	20-612567	10–11	QBT3	10-3976	10-3976	10-3976	10-3976	10-3975	10-3975	10-3975	10-3975	10-3977	10-3977
RE20-10-22730	20-612567	14–15	QBT3	10-3976	10-3976	10-3976	10-3976	10-3975	10-3975	10-3975	10-3975	10-3977	10-3977
RE20-10-22731	20-612568	6–7	QBT3	10-3942	10-3942	10-3942	10-3942	10-3941	—*	10-3941	10-3941	10-3943	10-3943
RE20-10-22732	20-612568	9–12	QBT3	10-3942	10-3942	10-3942	10-3942	10-3941	—	10-3941	10-3941	10-3943	10-3943
RE20-10-22739	20-612568	14–15	QBT3	10-3942	10-3942	10-3942	10-3942	10-3941	10-3941	10-3941	10-3941	10-3943	10-3943
RE20-10-22733	20-612569	10–11	QBT3	10-3976	10-3976	10-3976	10-3976	10-3975	10-3975	10-3975	10-3975	10-3977	10-3977
RE20-10-22734	20-612569	14–15	QBT3	10-3976	10-3976	10-3976	10-3976	10-3975	10-3975	10-3975	10-3975	10-3977	10-3977
RE20-10-22735	20-612570	10–11	QBT3	10-3976	10-3976	10-3976	10-3976	10-3975	10-3975	10-3975	10-3975	10-3977	10-3977
RE20-10-22736	20-612570	14–15	QBT3	10-3976	10-3976	10-3976	10-3976	10-3975	10-3975	10-3975	10-3975	10-3977	10-3977
RE20-10-22737	20-612571	10–11	QBT3	10-3976	10-3976	10-3976	10-3976	10-3975	10-3975	10-3975	10-3975	10-3977	10-3977
RE20-10-22738	20-612571	14–15	QBT3	10-3976	10-3976	10-3976	10-3976	10-3975	10-3975	10-3975	10-3975	10-3977	10-3977

* — = Analysis not requested.

Table 6.3-2
Inorganic Chemicals above BVs at SWMU 20-001(b)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Cadmium	Chromium	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**1.63**	**7.14**	**na**[b]	**na**	**0.3**
Soil BV[a]				**0.83**	**295**	**0.4**	**19.3**	**na**	**na**	**1.52**
Construction Worker SSL[c]				**124**	**4350**	**309**	**449**[d]	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**224000**	**1120**	**2920**[d]	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**15600**	**77.9**	**219**[d]	**125000**	**54.8**	**391**
RE20-10-22723	20-612564	10–11	SOIL	1.05 (U)	—[e]	0.525 (U)	—	1.11	—	—
RE20-10-22724	20-612564	14–15	SOIL	1.03 (U)	—	0.517 (U)	—	1.1 (J)	—	—
RE20-10-22725	20-612565	10–11	SOIL	1.13 (U)	—	0.565 (U)	—	1.07 (J)	—	—
RE20-10-22726	20-612565	14–15	SOIL	1.11 (U)	—	0.556 (U)	—	1.05 (J)	—	—
RE20-10-22727	20-612566	10–11	SOIL	0.971 (U)	—	—	—	1.05 (J)	—	—
RE20-10-22728	20-612566	14–15	SOIL	0.951 (U)	—	0.476 (U)	—	1.17	0.00132 (J)	—
RE20-10-22729	20-612567	10–11	QBT3	1.14 (U)	65.4	—	—	—	—	1.05 (J)
RE20-10-22730	20-612567	14–15	QBT3	1.02 (U)	54.1	—	—	—	—	0.639 (J)
RE20-10-22731	20-612568	6–7	QBT3	0.944 (U)	—	—	—	1.45	0.000756 (J)	0.573 (J)
RE20-10-22732	20-612568	9–12	QBT3	1.01 (U)	—	—	—	1.12	0.000524 (J)	0.868 (U)
RE20-10-22739	20-612568	14–15	QBT3	1.03 (U)	—	—	7.74	1.03 (J)	—	1.03 (U)
RE20-10-22733	20-612569	10–11	QBT3	0.905 (U)	49.7	—	—	—	0.000763 (J)	0.916 (U)
RE20-10-22734	20-612569	14–15	QBT3	0.949 (U)	50.6	—	—	—	0.00225	0.985 (U)
RE20-10-22735	20-612570	10–11	QBT3	0.936 (U)	67.2	—	—	1.54	—	1.01 (U)
RE20-10-22736	20-612570	14–15	QBT3	1.02 (U)	50.8	—	—	1.44	—	1.01 (U)

Table 6.3-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Cadmium	Chromium	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**1.63**	**7.14**	**na**[b]	**na**	**0.3**
Soil BV[a]				**0.83**	**295**	**0.4**	**19.3**	**na**	**na**	**1.52**
Construction Worker SSL[c]				**124**	**4350**	**309**	**449**[d]	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**224000**	**1120**	**2920**[d]	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**15600**	**77.9**	**219**[d]	**125000**	**54.8**	**391**
RE20-10-22737	20-612571	10–11	QBT3	0.88 (U)	47.7	—	—	1.09	0.00104 (J)	1.02 (U)
RE20-10-22738	20-612571	14–15	QBT3	0.953 (U)	—	—	—	1.15	0.00083 (J)	1.03 (U)

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070).

[d] SSLs are for hexavalent chromium.

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

Table 6.3-3
Organic Chemicals Detected at SWMU 20-001(b)

Sample ID	Location ID	Depth (ft)	Media	Bis(2-ethylhexyl)phthalate
Construction Worker SSL*				**4760**
Industrial SSL*				**1370**
Residential SSL*				**347**
RE20-10-22724	20-612564	14–15	SOIL	0.0738 (J)

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

* SSLs are from NMED (2009, 108070).

Table 6.3-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 20-001(b)

Sample ID	Location ID	Depth (ft)	Media	Uranium-234	Uranium-235/236	Uranium-238
Qbt 2, 3, 4 BV[a]				**1.98**	**0.09**	**1.93**
Construction Worker SAL[b]				**220**	**43**	**160**
Industrial SAL[b]				**1500**	**87**	**430**
Residential SAL[b]				**170**	**17**	**87**
RE20-10-22729	20-612567	10–11	QBT3	—[c]	0.0904	—
RE20-10-22732	20-612568	9–12	QBT3	2	0.117	2.24
RE20-10-22739	20-612568	14–15	QBT3	2.77	0.201	3.01
RE20-10-22733	20-612569	10–11	QBT3	—	0.104	—
RE20-10-22734	20-612569	14–15	QBT3	—	0.121	—
RE20-10-22737	20-612571	10–11	QBT3	—	0.143	—
RE20-10-22738	20-612571	14–15	QBT3	—	0.0997	—

Note: Results are in pCi/g.

[a] BVs are from LANL (1998, 059730).

[b] SALs are from LANL (2009, 107655).

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

Table 6.3-5
Samples Collected and Analyses Requested at SWMU 20-002(c)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	Gamma-Emitting Radionuclides	Isotopic Uranium	Strontium-90
RE20-10-23166	20-612598	0–1	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	10-4017	10-4019	10-4019	10-4019
RE20-10-23167	20-612598	4–5	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	10-4017	10-4019	10-4019	10-4019
RE20-10-23168	20-612598	8–9	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	10-4017	10-4019	10-4019	10-4019
RE20-10-23169	20-612599	0–1	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	10-4017	10-4019	10-4019	10-4019
RE20-10-23170	20-612599	4–5	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	10-4017	10-4019	10-4019	10-4019
RE20-10-23171	20-612599	8–9	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	10-4017	10-4019	10-4019	10-4019
RE20-10-23172	20-612600	0–1	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	10-4017	10-4019	10-4019	10-4019
RE20-10-23173	20-612600	4–5	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	10-4017	10-4019	10-4019	10-4019
RE20-10-23174	20-612600	8–9	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	10-4017	10-4019	10-4019	10-4019
RE20-10-23175	20-612601	0–1	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—*	10-4019	10-4019	10-4019
RE20-10-23176	20-612601	4–5	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—	10-4019	10-4019	10-4019
RE20-10-23177	20-612601	8–9	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—	10-4019	10-4019	10-4019
RE20-10-23178	20-612602	0–1	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—	10-4019	10-4019	10-4019
RE20-10-23179	20-612602	4–5	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—	10-4019	10-4019	10-4019
RE20-10-23180	20-612602	8–9	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—	10-4019	10-4019	10-4019
RE20-10-23181	20-612603	0–1	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—	10-4019	10-4019	10-4019
RE20-10-23182	20-612603	4–5	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—	10-4019	10-4019	10-4019
RE20-10-23183	20-612603	8–9	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—	10-4019	10-4019	10-4019
RE20-10-23187	20-612605	0–1	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—	10-4019	10-4019	10-4019
RE20-10-23188	20-612605	4–5	QBT3	10-4018	10-4018	10-4018	10-4018	10-4017	—	10-4019	10-4019	10-4019

Table 6.3-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	Gamma-Emitting Radionuclides	Isotopic Uranium	Strontium-90
RE20-10-23189	20-612605	8–9	QBT3	10-4021	10-4021	10-4021	10-4021	10-4020	—	10-4022	10-4022	10-4022
RE20-10-24957	20-612892	0–1	QBT3	10-4021	10-4021	10-4021	10-4021	10-4020	10-4020	10-4022	10-4022	10-4022
RE20-10-24958	20-612892	4–5	QBT3	10-4021	10-4021	10-4021	10-4021	10-4020	10-4020	10-4022	10-4022	10-4022
RE20-10-24959	20-612892	8–9	QBT3	10-4021	10-4021	10-4021	10-4021	10-4020	10-4020	10-4022	10-4022	10-4022

* — = Analysis not requested.

Table 6.3-6
Inorganic Chemicals above BVs at SWMU 20-002(c)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Calcium	Chromium	Copper	Lead	Nitrate	Perchlorate	Selenium	Silver	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**2200**	**7.14**	**4.66**	**11.2**	**na**[b]	**na**	**0.3**	**1**	**63.5**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**na**	**449**[d]	**12400**	**800**	**496000**	**217**	**1550**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**454**	**224000**	**na**	**2920**[d]	**45400**	**800**	**1820000**	**795**	**5680**	**5680**	**341000**
Residential SSL[c]				**78100**	**31.3**	**15600**	**na**	**219**[d]	**3130**	**400**	**125000**	**54.8**	**391**	**391**	**23500**
RE20-10-23166	20-612598	0–1	QBT3	7380	0.666 (J)	75.6	—[e]	42	10.9	19.5	4.43	0.00451 (J+)	1.07 (UJ)	1.81	76.9
RE20-10-23167	20-612598	4–5	QBT3	—	0.913 (U)	—	—	—	—	—	0.988 (J)	—	0.972 (UJ)	—	—
RE20-10-23168	20-612598	8–9	QBT3	—	0.901 (U)	—	—	—	—	—	—	—	0.991 (UJ)	—	—
RE20-10-23169	20-612599	0–1	QBT3	7410	1.12	77.5	—	60.7	11.4	20	3.15	0.00146 (J+)	1.07 (UJ)	1.74	76.9
RE20-10-23170	20-612599	4–5	QBT3	—	0.986 (U)	—	—	7.5	—	—	1.02 (J)	—	0.911 (UJ)	—	—
RE20-10-23171	20-612599	8–9	QBT3	—	0.919 (U)	—	—	—	—	—	—	—	1.01 (UJ)	—	—
RE20-10-23172	20-612600	0–1	QBT3	8080	0.905 (J)	82.9	2370	52.8	12.3	21.2	3.84	0.000688 (J+)	1.1 (UJ)	2.05	77.7
RE20-10-23173	20-612600	4–5	QBT3	—	0.998 (U)	—	—	—	—	—	1.28	0.00189 (J+)	0.962 (UJ)	—	—
RE20-10-23174	20-612600	8–9	QBT3	—	0.901 (U)	—	—	—	—	—	0.968 (J)	—	1 (UJ)	—	—
RE20-10-23175	20-612601	0–1	QBT3	—	0.854 (J)	63	—	44	8.78	21.8	6.59	0.000675 (J+)	1.03 (UJ)	1.17	—
RE20-10-23176	20-612601	4–5	QBT3	—	0.93 (U)	—	—	7.63	—	—	1.57	—	0.89 (UJ)	—	—
RE20-10-23177	20-612601	8–9	QBT3	—	0.985 (U)	—	—	—	—	—	1.25	0.00114 (J+)	1.03 (UJ)	—	—
RE20-10-23178	20-612602	0–1	QBT3	8060	0.793 (J)	88.6	—	54.5	13.7	24.6	2.59	0.00263 (J+)	1.11 (UJ)	2.31	80
RE20-10-23179	20-612602	4–5	QBT3	—	0.982 (U)	—	—	—	—	—	—	—	0.973 (UJ)	—	—
RE20-10-23180	20-612602	8–9	QBT3	—	1 (U)	—	—	—	—	—	—	—	0.956 (UJ)	—	—
RE20-10-23181	20-612603	0–1	QBT3	7520	0.62 (J)	73	—	41.6	10.8	20.4	3.28	0.00102 (J+)	0.975 (UJ)	1.84	75.1
RE20-10-23182	20-612603	4–5	QBT3	—	0.994 (U)	—	—	—	—	—	1.35	0.000683 (J+)	0.95 (UJ)	—	—
RE20-10-23183	20-612603	8–9	QBT3	—	1.06 (U)	—	—	—	—	—	1.23	—	1 (UJ)	—	—

Table 6.3-6 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Calcium	Chromium	Copper	Lead	Nitrate	Perchlorate	Selenium	Silver	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**2200**	**7.14**	**4.66**	**11.2**	**na[b]**	**na**	**0.3**	**1**	**63.5**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**na**	**449[d]**	**12400**	**800**	**496000**	**217**	**1550**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**454**	**224000**	**na**	**2920[d]**	**45400**	**800**	**1820000**	**795**	**5680**	**5680**	**341000**
Residential SSL[c]				**78100**	**31.3**	**15600**	**na**	**219[d]**	**3130**	**400**	**125000**	**54.8**	**391**	**391**	**23500**
RE20-10-23187	20-612605	0–1	QBT3	—	0.97 (U)	—	—	—	—	—	1.17	—	1.04 (UJ)	—	—
RE20-10-23188	20-612605	4–5	QBT3	—	1.05 (U)	57.6	—	9.15	—	—	—	—	1.14 (UJ)	—	—
RE20-10-23189	20-612605	8–9	QBT3	—	1.03 (U)	—	—	—	—	—	1.22	—	1.15 (U)	—	—
RE20-10-24957	20-612892	0–1	QBT3	—	0.891 (U)	—	—	—	—	—	1.77	—	0.954 (U)	—	—
RE20-10-24958	20-612892	4–5	QBT3	—	0.899 (U)	—	—	11.3	—	—	1.23	—	1.02 (U)	—	—
RE20-10-24959	20-612892	8–9	QBT3	—	1.01 (U)	—	—	—	—	—	1.57	—	1.06 (U)	—	—

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070).

[d] SSLs are for hexavalent chromium.

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

Table 6.3-7
Organic Chemicals Detected at SWMU 20-002(c)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Construction Worker SSL[a]				**4.36**	**75.8**
Industrial SSL[a]				**8.26**	**8.26**
Residential SSL[a]				**1.12**	**2.22**
RE20-10-23166	20-612598	0–1	QBT3	0.0363	0.0498
RE20-10-23167	20-612598	4–5	QBT3	—[b]	0.0022 (J)
RE20-10-23169	20-612599	0–1	QBT3	0.0443	0.0631
RE20-10-23170	20-612599	4–5	QBT3	—	0.0122
RE20-10-23171	20-612599	8–9	QBT3	—	0.0032 (J)
RE20-10-23172	20-612600	0–1	QBT3	0.0436	0.0648
RE20-10-23173	20-612600	4–5	QBT3	—	0.0062
RE20-10-23174	20-612600	8–9	QBT3	—	0.0029 (J)
RE20-10-24957	20-612892	0–1	QBT3	0.0058	0.0102
RE20-10-24958	20-612892	4–5	QBT3	—	0.0169
RE20-10-24959	20-612892	8–9	QBT3	—	0.0121

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

[a] SSLs are from NMED (2009, 108070).

[b] — = Not detected.

Table 6.3-8
Radionuclides Detected or Detected above BVs/FVs at SWMU 20-002(c)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Uranium-235/236
Qbt 2, 3, 4 BV[a]				**na[b]**	**0.09**
Construction Worker SAL[c]				**18**	**43**
Industrial SAL[c]				**23**	**87**
Residential SAL[c]				**5.6**	**17**
RE20-10-23169	20-612599	0–1	QBT3	0.0805	—[d]
RE20-10-23173	20-612600	4–5	QBT3	—	0.119
RE20-10-23181	20-612603	0–1	QBT3	0.136	—

Note: Results are in pCi/g.

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

[b] na = Not available.

[c] SALs are from LANL (2009, 107655).

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

Table 6.3-9
Samples Collected and Analyses Requested at AOC 20-003(c)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	Gamma-Emitting Radionuclides	Isotopic Uranium	Strontium-90
RE20-10-22290	20-612496	0–1	FILL	10-3945	10-3945	10-3945	10-3945	10-3944	10-3944	10-3946	10-3946	10-3946
RE20-10-22292	20-612496	2.5–3	QBT3	10-3945	10-3945	10-3945	10-3945	10-3944	10-3944	10-3946	10-3946	10-3946
RE20-10-24865	20-612496	4–5	QBT3	10-3945	10-3945	10-3945	10-3945	10-3944	10-3944	10-3946	10-3946	10-3946
RE20-10-22291	20-612497	0–1	FILL	10-3945	10-3945	10-3945	10-3945	10-3944	10-3944	10-3946	10-3946	10-3946
RE20-10-22293	20-612497	7.5–8	QBT3	10-3945	10-3945	10-3945	10-3945	10-3944	10-3944	10-3946	10-3946	10-3946
RE20-10-24867	20-612497	10–11	QBT3	10-3945	10-3945	10-3945	10-3945	10-3944	10-3944	10-3946	10-3946	10-3946
RE20-10-22294	20-612498	0–1	FILL	10-3945	10-3945	10-3945	10-3945	10-3944	—*	10-3946	10-3946	10-3946
RE20-10-22296	20-612498	3–3.5	QBT3	10-3945	10-3945	10-3945	10-3945	10-3944	—	10-3946	10-3946	10-3946
RE20-10-24866	20-612498	5–6	QBT3	10-3945	10-3945	10-3945	10-3945	10-3944	—	10-3946	10-3946	10-3946
RE20-10-22295	20-612499	0–1	FILL	10-3945	10-3945	10-3945	10-3945	10-3944	—	10-3946	10-3946	10-3946
RE20-10-22297	20-612499	1–2	QBT3	10-3945	10-3945	10-3945	10-3945	10-3944	—	10-3946	10-3946	10-3946
RE20-10-24864	20-612499	3–4	QBT3	10-3945	10-3945	10-3945	10-3945	10-3944	—	10-3946	10-3946	10-3946

* — = Analysis not requested.

Table 6.3-10
Inorganic Chemicals above BVs at AOC 20-003(c)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Calcium	Perchlorate	Selenium	Thallium	Zinc
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**2200**	**na**[b]	**0.3**	**1.1**	**63.5**
Soil BV[a]				**0.83**	**295**	**6120**	**na**	**1.52**	**0.73**	**48.8**
Construction Worker SSL[c]				**124**	**4350**	**na**	**217**	**1550**	**20.4**	**92900**
Industrial SSL[c]				**454**	**224000**	**na**	**795**	**5680**	**74.9**	**341000**
Residential SSL[c]				**31.3**	**15600**	**na**	**54.8**	**391**	**5.16**	**23500**
RE20-10-22290	20-612496	0–1	FILL	1.05 (U)	—[d]	—	—	—	—	—
RE20-10-22292	20-612496	2.5–3	QBT3	1 (U)	—	—	—	1.01 (UJ)	—	—
RE20-10-24865	20-612496	4–5	QBT3	1.01 (U)	—	—	—	1.03 (UJ)	—	—
RE20-10-22291	20-612497	0–1	FILL	1.05 (U)	—	—	—	—	—	53.2
RE20-10-22293	20-612497	7.5–8	QBT3	1.02 (U)	—	2660 (J)	0.000667 (J+)	0.994 (UJ)	—	—
RE20-10-24867	20-612497	10–11	QBT3	1.04 (U)	—	—	—	1.05 (UJ)	—	—
RE20-10-22294	20-612498	0–1	FILL	1.07 (U)	—	—	0.00144 (J+)	—	—	—
RE20-10-22296	20-612498	3–3.5	QBT3	1.01 (U)	49.8	2420 (J)	0.00545 (J+)	0.974 (UJ)	—	—
RE20-10-24866	20-612498	5–6	QBT3	1.06 (U)	—	—	0.00113 (J+)	1.07 (UJ)	—	—
RE20-10-22295	20-612499	0–1	FILL	1.04 (U)	—	—	0.01 (J+)	—	1.07 (U)	—
RE20-10-22297	20-612499	1–2	QBT3	1.01 (U)	—	2640 (J)	—	1.02 (UJ)	—	—
RE20-10-24864	20-612499	3–4	QBT3	1.03 (U)	—	2400 (J)	—	1.03 (UJ)	—	—

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070).

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

Table 6.3-11
Radionuclides Detected or Detected above BVs/FVs at AOC 20-003(c)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Uranium-234	Uranium-235/236	Uranium-238
Qbt 2, 3, 4 BV[a]				**na**[b]	**1.98**	**0.09**	**1.93**
Construction Worker SAL[c]				**18**	**220**	**43**	**160**
Industrial SAL[c]				**23**	**1500**	**87**	**430**
Residential SAL[c]				**5.6**	**170**	**17**	**87**
RE20-10-22292	20-612496	2.5–3	QBT3	—[d]	2.43	0.133	2.41
RE20-10-24865	20-612496	4–5	QBT3	—	3.16	0.216	3.11
RE20-10-22293	20-612497	7.5–8	QBT3	—	2.17	0.102	2.22
RE20-10-24867	20-612497	10–11	QBT3	—	2.77	0.168	3.1
RE20-10-22296	20-612498	3–3.5	QBT3	—	2.34	0.12	2.37
RE20-10-24866	20-612498	5–6	QBT3	—	2.62	0.18	3.43
RE20-10-22297	20-612499	1–2	QBT3	0.166	—	0.131	—
RE20-10-24864	20-612499	3–4	QBT3	—	2.99	0.168	3.04

Note: Results are in pCi/g.

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

[b] na = Not available.

[c] SALs are from LANL (2009, 107655).

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

Table 6.4-1
Samples Collected and Analyses Requested at SWMU 20-001(c)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides	Isotopic Uranium	Strontium-90
RE20-10-23069	20-612572	5–6	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	10-4243	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23070	20-612572	10–11	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	10-4243	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23071	20-612572	14–15	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	10-4243	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23072	20-612573	5–6	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	10-4243	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23073	20-612573	10–11	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	10-4243	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23074	20-612573	14–15	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	10-4243	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23075	20-612574	5–6	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	10-4267	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23076	20-612574	10–11	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	10-4267	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23077	20-612574	14–15	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	10-4267	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23078	20-612575	5–6	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	10-4267	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23079	20-612575	10–11	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	10-4267	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23080	20-612575	14–15	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	10-4267	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23081	20-612576	5–6	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	—*	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23082	20-612576	10–11	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	—	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23083	20-612576	14–15	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	—	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23084	20-612577	5–6	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	—	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23085	20-612577	10–11	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	—	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23086	20-612577	14–15	QBT3	10-4244	10-4244	10-4244	10-4244	10-4243	—	10-4243	10-4243	10-4245	10-4245	10-4245
RE20-10-23087	20-612578	5–6	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23088	20-612578	10–11	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23089	20-612578	14–15	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23090	20-612579	5–6	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269

Table 6.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides	Isotopic Uranium	Strontium-90
RE20-10-23091	20-612579	10–11	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23092	20-612579	14–15	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23093	20-612580	5–6	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23094	20-612580	10–11	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23095	20-612580	14–15	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23096	20-612581	5–6	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23097	20-612581	10–11	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269
RE20-10-23098	20-612581	14–15	QBT3	10-4268	10-4268	10-4268	10-4268	10-4267	—	10-4267	10-4267	10-4269	10-4269	10-4269

* — = Analysis not requested.

Table 6.4-2
Inorganic Chemicals above BVs at SWMU 20-001(c)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Calcium	Chromium	Copper	Lead	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**2200**	**7.14**	**4.66**	**11.2**	**na[b]**	**na**	**0.3**
Construction Worker SSL[c]				**124**	**4350**	**na**	**449[d]**	**12400**	**800**	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**224000**	**na**	**2920[d]**	**45400**	**800**	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**15600**	**na**	**219[d]**	**3130**	**400**	**125000**	**54.8**	**391**
RE20-10-23069	20-612572	5–6	QBT3	1.03 (U)	—[e]	—	—	—	—	1.13	—	1.06 (U)
RE20-10-23070	20-612572	10–11	QBT3	0.997 (U)	—	—	—	—	—	1.12	—	1 (U)
RE20-10-23071	20-612572	14–15	QBT3	0.996 (U)	—	—	—	—	—	1.17	—	1.04 (U)
RE20-10-23072	20-612573	5–6	QBT3	0.985 (U)	—	—	—	—	—	2.25	—	1 (U)
RE20-10-23073	20-612573	10–11	QBT3	0.977 (U)	—	—	—	—	—	2.92	—	1 (U)
RE20-10-23074	20-612573	14–15	QBT3	1 (U)	—	—	—	—	—	2.21	—	0.982 (U)
RE20-10-23075	20-612574	5–6	QBT3	1 (U)	—	—	—	—	—	1.98	0.00085 (J)	0.969 (U)
RE20-10-23076	20-612574	10–11	QBT3	0.993 (U)	—	—	—	—	—	1.54	0.000691 (J)	0.972 (U)
RE20-10-23077	20-612574	14–15	QBT3	0.882 (U)	—	—	—	—	—	1.27	0.000584 (J)	0.48 (U)
RE20-10-23078	20-612575	5–6	QBT3	1.02 (U)	—	—	—	—	—	1.01 (J)	0.00482	1.04 (U)
RE20-10-23079	20-612575	10–11	QBT3	1.08 (U)	—	—	—	—	—	1.1 (J)	0.00158 (J)	1.04 (U)
RE20-10-23080	20-612575	14–15	QBT3	1.07 (U)	—	—	—	—	—	1.19	0.00153 (J)	1.06 (U)
RE20-10-23081	20-612576	5–6	QBT3	1.03 (U)	—	—	—	—	—	0.988 (J)	—	1.02 (U)
RE20-10-23082	20-612576	10–11	QBT3	0.962 (U)	—	—	—	—	—	1.27	—	1.01 (U)
RE20-10-23083	20-612576	14–15	QBT3	1.08 (U)	—	—	—	—	—	1.49	—	1.01 (U)
RE20-10-23084	20-612577	5–6	QBT3	1.06 (U)	—	—	—	—	—	0.987 (J)	—	1.01 (U)
RE20-10-23085	20-612577	10–11	QBT3	1 (U)	—	—	—	—	—	—	—	1.01 (U)
RE20-10-23086	20-612577	14–15	QBT3	1.01 (U)	—	—	—	—	—	0.995 (J)	—	0.959 (U)
RE20-10-23087	20-612578	5–6	QBT3	0.998 (U)	—	—	—	—	—	1.06	—	1.03 (U)

Table 6.4-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Calcium	Chromium	Copper	Lead	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**2200**	**7.14**	**4.66**	**11.2**	**na**[b]	**na**	**0.3**
Construction Worker SSL[c]				**124**	**4350**	**na**	**449**[d]	**12400**	**800**	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**224000**	**na**	**2920**[d]	**45400**	**800**	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**15600**	**na**	**219**[d]	**3130**	**400**	**125000**	**54.8**	**391**
RE20-10-23088	20-612578	10–11	QBT3	1 (U)	—	—	—	—	—	1.42	—	1.02 (U)
RE20-10-23089	20-612578	14–15	QBT3	1.04 (U)	—	—	—	—	—	1.27	—	1 (U)
RE20-10-23090	20-612579	5–6	QBT3	1.03 (U)	—	—	—	—	—	1.31	—	0.979 (U)
RE20-10-23091	20-612579	10–11	QBT3	1.15 (U)	—	—	—	—	—	1.17 (J)	—	1.1 (U)
RE20-10-23092	20-612579	14–15	QBT3	1.1 (U)	—	—	16.7	—	—	1.1 (J)	—	1.02 (U)
RE20-10-23093	20-612580	5–6	QBT3	0.986 (U)	—	2320	—	—	—	—	0.00203 (J)	1.03 (U)
RE20-10-23094	20-612580	10–11	QBT3	1.02 (U)	—	2250	—	—	—	1.04	0.00176 (J)	1.02 (U)
RE20-10-23095	20-612580	14–15	QBT3	1.02 (U)	—	—	—	—	—	1.11	0.00201 (J)	1.01 (U)
RE20-10-23096	20-612581	5–6	QBT3	1.11 (U)	82.4	—	13	5.18	11.3	1.36	—	0.732 (U)
RE20-10-23097	20-612581	10–11	QBT3	1.04 (U)	—	—	—	—	—	—	—	1.03 (U)
RE20-10-23098	20-612581	14–15	QBT3	1.03 (U)	—	—	—	—	—	0.991 (J)	—	1.06 (U)

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070).

[d] SSLs are for hexavalent chromium.

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

Table 6.4-3
Organic Chemicals Detected at SWMU 20-001(c)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Isopropyltoluene[4-]
Construction Worker SSL[a]				**4.36**	**10300**[b]
Industrial SSL[a]				**8.26**	**14900**[b]
Residential SSL[a]				**1.12**	**3210**[b]
RE20-10-23074	20-612573	14–15	QBT3	0.0014 (J)	—[c]
RE20-10-23093	20-612580	5–6	QBT3	NA[d]	0.00681

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

[a] SSLs are from NMED (2009, 108070).

[b] Isopropylbenzene was used as surrogate based on structural similarity.

[c] — = Not detected.

[d] NA = Not analyzed.

Table 6.4-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 20-001(c)

Sample ID	Location ID	Depth (ft)	Media	Uranium-234	Uranium-235/236	Uranium-238
Qbt 2, 3, 4 BV[a]				**1.98**	**0.09**	**1.93**
Construction Worker SAL[b]				**220**	**43**	**160**
Industrial SAL[b]				**1500**	**87**	**430**
Residential SAL[b]				**170**	**17**	**87**
RE20-10-23075	20-612574	5–6	QBT3	—[c]	0.101	—
RE20-10-23078	20-612575	5–6	QBT3	3.08	0.177	3.17
RE20-10-23079	20-612575	10–11	QBT3	2.79	0.141	2.71
RE20-10-23080	20-612575	14–15	QBT3	3.13	0.164	3.09
RE20-10-23088	20-612578	10–11	QBT3	—	0.122	—
RE20-10-23091	20-612579	10–11	QBT3	—	0.0968	—
RE20-10-23093	20-612580	5–6	QBT3	—	0.096	—
RE20-10-23097	20-612581	10–11	QBT3	—	0.106	—
RE20-10-23098	20-612581	14–15	QBT3	—	0.101	—

Note: Results are in pCi/g.

[a] BVs are from LANL (1998, 059730).

[b] SALs are from LANL (2009, 107655).

[c] — = Not detected or not detected above BV/FV.

Table 6.4-5
Samples Collected and Analyses Requested at SWMU 20-002(a)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	Isotopic Uranium
RE20-10-23108	20-612582	0–1	QBT3	10-4091	10-4091	10-4091	10-4091	10-4090	10-4090	10-4090
RE20-10-23109	20-612582	2–3	QBT3	10-4091	10-4091	10-4091	10-4091	10-4090	10-4090	10-4090
RE20-10-23110	20-612582	4–5	QBT3	10-4093	10-4093	10-4093	10-4093	10-4092	10-4092	10-4092
RE20-10-23111	20-612583	0–1	QBT3	10-4091	10-4091	10-4091	10-4091	10-4090	10-4090	10-4090
RE20-10-23112	20-612583	2–3	QBT3	10-4091	10-4091	10-4091	10-4091	10-4090	10-4090	10-4090
RE20-10-23113	20-612583	4–5	QBT3	10-4091	10-4091	10-4091	10-4091	10-4090	10-4090	10-4090
RE20-10-23114	20-612584	0–1	QBT3	10-4091	10-4091	10-4091	10-4091	10-4090	10-4090	10-4090
RE20-10-23115	20-612584	2–3	QBT3	10-4091	10-4091	10-4091	10-4091	10-4090	10-4090	10-4090
RE20-10-23116	20-612584	4–5	QBT3	10-4091	10-4091	10-4091	10-4091	10-4090	10-4090	10-4090
RE20-10-23117	20-612585	0–1	QBT3	10-4093	10-4093	10-4093	10-4093	10-4092	—*	10-4092
RE20-10-23118	20-612585	2–3	QBT3	10-4091	10-4091	10-4091	10-4091	10-4090	—	10-4090
RE20-10-23119	20-612585	4–5	QBT3	10-4091	10-4091	10-4091	10-4091	10-4090	—	10-4090
RE20-10-23120	20-612586	0–1	QBT3	10-4093	10-4093	10-4093	10-4093	10-4092	—	10-4092
RE20-10-23121	20-612586	2–3	QBT3	10-4093	10-4093	10-4093	10-4093	10-4092	—	10-4092
RE20-10-23122	20-612586	4–5	QBT3	10-4093	10-4093	10-4093	10-4093	10-4092	—	10-4092
RE20-10-23123	20-612587	0–1	QBT3	10-4093	10-4093	10-4093	10-4093	10-4092	—	10-4092
RE20-10-23124	20-612587	2–3	QBT3	10-4093	10-4093	10-4093	10-4093	10-4092	—	10-4092
RE20-10-23125	20-612587	4–5	QBT3	10-4093	10-4093	10-4093	10-4093	10-4092	—	10-4092
RE20-10-23126	20-612588	0–1	QBT3	10-4093	10-4093	10-4093	10-4093	10-4092	—	10-4092
RE20-10-23127	20-612588	2–3	QBT3	10-4123	10-4123	10-4123	10-4123	10-4122	—	10-4124
RE20-10-23128	20-612588	4–5	QBT3	10-4123	10-4123	10-4123	10-4123	10-4122	—	10-4124

Table 6.4-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	Isotopic Uranium
RE20-10-23129	20-612589	0–1	QBT3	10-4123	10-4123	10-4123	10-4123	10-4122	—	10-4124
RE20-10-23130	20-612589	2–3	QBT3	10-4123	10-4123	10-4123	10-4123	10-4122	—	10-4124
RE20-10-23131	20-612589	4–5	QBT3	10-4123	10-4123	10-4123	10-4123	10-4122	—	10-4124
RE20-10-23132	20-612590	0–1	QBT3	10-4123	10-4123	10-4123	10-4123	10-4122	—	10-4124
RE20-10-23133	20-612590	2–3	QBT3	10-4123	10-4123	10-4123	10-4123	10-4122	—	10-4124
RE20-10-23134	20-612590	4–5	QBT3	10-4123	10-4123	10-4123	10-4123	10-4122	—	10-4124

* — = Analysis not requested.

Table 6.4-6
Inorganic Chemicals above BVs at SWMU 20-002(a)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Beryllium	Calcium	Chromium	Copper	Lead	Nitrate	Perchlorate	Selenium	Thallium	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**1.21**	**2200**	**7.14**	**4.66**	**11.2**	**na[b]**	**na**	**0.3**	**1.1**	**17**	**63.5**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**144**	**na**	**449[d]**	**12400**	**800**	**496000**	**217**	**1550**	**20.4**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**454**	**224000**	**2260**	**na**	**2920[d]**	**45400**	**800**	**1820000**	**795**	**5680**	**74.9**	**5680**	**341000**
Residential SSL[c]				**78100**	**31.3**	**15600**	**156**	**na**	**219[d]**	**3130**	**400**	**125000**	**54.8**	**391**	**5.16**	**391**	**23500**
RE20-10-23108	20-612582	0–1	QBT3	—[e]	1.09 (U)	—	—	—	—	9.25	—	2.73	0.000564 (J)	1.09 (U)	—	—	—
RE20-10-23109	20-612582	2–3	QBT3	—	1.06 (U)	—	—	—	—	—	—	1.03 (J)	—	0.97 (U)	—	—	—
RE20-10-23110	20-612582	4–5	QBT3	—	1.05 (U)	—	—	—	—	—	—	—	—	1.02 (U)	—	—	—
RE20-10-23111	20-612583	0–1	QBT3	—	1.02 (U)	—	—	—	—	7.4	14.5	1.49	—	1.06 (U)	—	—	—
RE20-10-23112	20-612583	2–3	QBT3	—	0.974 (U)	—	—	—	—	—	—	1.09	0.000616 (J)	0.964 (U)	—	—	—
RE20-10-23113	20-612583	4–5	QBT3	—	1.01 (U)	—	—	—	—	—	—	1.47	—	0.944 (U)	—	—	—
RE20-10-23114	20-612584	0–1	QBT3	—	1.05 (U)	—	—	—	—	18.1	—	2.09	—	1.1 (U)	—	—	—
RE20-10-23115	20-612584	2–3	QBT3	—	1.02 (U)	—	—	—	—	17.4	—	—	—	0.97 (U)	—	—	—
RE20-10-23116	20-612584	4–5	QBT3	—	1.01 (U)	—	—	—	—	14.6	—	1.48	0.00055 (J)	1.02 (U)	—	—	—
RE20-10-23117	20-612585	0–1	QBT3	—	1.07 (U)	—	—	—	—	—	—	2.31	—	1.05 (U)	—	—	—
RE20-10-23118	20-612585	2–3	QBT3	—	0.983 (U)	—	—	—	—	—	—	1.45	0.00107 (J)	0.941 (U)	—	—	—
RE20-10-23119	20-612585	4–5	QBT3	—	0.992 (U)	—	—	—	—	—	—	1.24	0.000869 (J)	0.992 (U)	—	—	—
RE20-10-23120	20-612586	0–1	QBT3	—	1.07 (U)	92.1	—	—	—	5.51	13.3	2.18	—	1.06 (U)	—	—	—
RE20-10-23121	20-612586	2–3	QBT3	—	1.02 (U)	—	—	—	—	—	—	—	—	1.03 (U)	—	—	—
RE20-10-23122	20-612586	4–5	QBT3	—	0.988 (U)	—	—	—	—	—	—	—	—	0.99 (U)	—	—	—
RE20-10-23123	20-612587	0–1	QBT3	—	1.08 (U)	—	—	—	—	—	—	2.8	—	1.07 (U)	—	—	—
RE20-10-23124	20-612587	2–3	QBT3	—	0.889 (U)	—	—	—	—	—	—	1.52	—	1.02 (U)	—	—	—
RE20-10-23125	20-612587	4–5	QBT3	—	0.983 (U)	—	—	—	—	—	—	1.14	—	1.02 (U)	—	—	—
RE20-10-23126	20-612588	0–1	QBT3	—	1.11 (U)	—	—	—	—	—	—	1.34	—	1.08 (U)	—	—	72.3
RE20-10-23127	20-612588	2–3	QBT3	8070 (J+)	1.27 (U)	67.4	3.89	—	18.8	8.32	13.1	1.46	—	1.76	1.29 (U)	—	—
RE20-10-23128	20-612588	4–5	QBT3	—	1.19 (U)	48.3	1.27	—	21.7	6.62	13.1	—	—	1.22 (U)	—	—	—
RE20-10-23129	20-612589	0–1	QBT3	—	1.03 (U)	—	—	—	—	—	12.6	4.61	—	1.01 (U)	—	—	—
RE20-10-23130	20-612589	2–3	QBT3	—	1.05 (U)	—	—	—	—	—	14.9	9.17	0.00151 (J)	1.02 (U)	—	—	—
RE20-10-23131	20-612589	4–5	QBT3	—	1.01 (U)	—	—	—	—	—	—	29.6	0.000882 (J)	1.03 (U)	—	—	—

Table 6.4-6 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Beryllium	Calcium	Chromium	Copper	Lead	Nitrate	Perchlorate	Selenium	Thallium	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**1.21**	**2200**	**7.14**	**4.66**	**11.2**	**na**[b]	**na**	**0.3**	**1.1**	**17**	**63.5**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**144**	**na**	**449**[d]	**12400**	**800**	**496000**	**217**	**1550**	**20.4**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**454**	**224000**	**2260**	**na**	**2920**[d]	**45400**	**800**	**1820000**	**795**	**5680**	**74.9**	**5680**	**341000**
Residential SSL[c]				**78100**	**31.3**	**15600**	**156**	**na**	**219**[d]	**3130**	**400**	**125000**	**54.8**	**391**	**5.16**	**391**	**23500**
RE20-10-23132	20-612590	0–1	QBT3	—	1.12 (U)	66.7	—	—	—	5.74	12.8	1.82	—	1.08 (U)	—	—	—
RE20-10-23133	20-612590	2–3	QBT3	9780 (J+)	1.05 (U)	126	—	—	7.7	4.99	—	—	0.00138 (J)	1.06 (U)	—	18.7	—
RE20-10-23134	20-612590	4–5	QBT3	10200 (J+)	1.04 (U)	146	—	2850 (J+)	8.41	5.2	—	—	0.000887 (J)	1.04 (U)	—	18.5	—

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070).

[d] SSLs are for hexavalent chromium.

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

Table 6.4-7
Radionuclides Detected or Detected above BVs/FVs at SWMU 20-002(a)

Sample ID	Location ID	Depth (ft)	Media	Uranium-235/236	Uranium-238
Qbt 2, 3, 4 BV[a]				**0.09**	**1.93**
Construction Worker SAL[b]				**43**	**160**
Industrial SAL[b]				**87**	**430**
Residential SAL[b]				**17**	**87**
RE20-10-23120	20-612586	0–1	QBT3	0.0901	—c
RE20-10-23131	20-612589	4–5	QBT3	0.0983	2.08
RE20-10-23132	20-612590	0–1	QBT3	0.0963	—

Note: Results are in pCi/g.

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

[b] SALs are from LANL (2009, 107655).

[c] — = Not detected or not detected above BV/FV.

Table 6.4-8
Samples Collected and Analyses Requested at SWMU 20-002(b)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	Gamma-Emitting Radionuclides	Isotopic Uranium
RE20-10-23141	20-612591	0–1	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	10-4096	10-4096	10-4096
RE20-10-23142	20-612591	2–3	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	10-4096	10-4096	10-4096
RE20-10-23143	20-612591	4–5	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	10-4096	10-4096	10-4096
RE20-10-23144	20-612592	0–1	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	10-4096	10-4096	10-4096
RE20-10-23145	20-612592	2–3	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	10-4096	10-4096	10-4096
RE20-10-23146	20-612592	4–5	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	10-4096	10-4096	10-4096
RE20-10-23147	20-612593	0–1	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	—*	10-4096	10-4096
RE20-10-23148	20-612593	2–3	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	—	10-4096	10-4096
RE20-10-23149	20-612593	4–5	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	—	10-4096	10-4096
RE20-10-23150	20-612594	0–1	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	—	10-4096	10-4096
RE20-10-23151	20-612594	2–3	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	—	10-4096	10-4096
RE20-10-23152	20-612594	4–5	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	—	10-4096	10-4096
RE20-10-23153	20-612595	0–1	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	—	10-4096	10-4096
RE20-10-23154	20-612595	2–3	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	—	10-4096	10-4096
RE20-10-23155	20-612595	4–5	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	—	10-4096	10-4096
RE20-10-23156	20-612596	0–1	QBT3	10-4097	10-4097	10-4097	10-4097	10-4096	—	10-4096	10-4096
RE20-10-23157	20-612596	2–3	QBT3	10-4095	10-4095	10-4095	10-4095	10-4094	—	10-4094	10-4094
RE20-10-23158	20-612596	4–5	QBT3	10-4095	10-4095	10-4095	10-4095	10-4094	—	10-4094	10-4094
RE20-10-23159	20-612597	0–1	QBT3	10-4095	10-4095	10-4095	10-4095	10-4094	—	10-4094	10-4094
RE20-10-23160	20-612597	2–3	QBT3	10-4095	10-4095	10-4095	10-4095	10-4094	—	10-4094	10-4094
RE20-10-23161	20-612597	4–5	QBT3	10-4095	10-4095	10-4095	10-4095	10-4094	—	10-4094	10-4094

* — = Analysis not requested.

Table 6.4-9
Inorganic Chemicals above BVs at SWMU 20-002(b)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Beryllium	Calcium	Copper	Lead	Manganese	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**1.21**	**2200**	**4.66**	**11.2**	**482**	**na**[b]	**na**	**0.3**
Construction Worker SSL[c]				**124**	**4350**	**144**	**na**	**12400**	**800**	**463**	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**224000**	**2260**	**na**	**45400**	**800**	**145000**	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**15600**	**156**	**na**	**3130**	**400**	**10700**	**125000**	**54.8**	**391**
RE20-10-23141	20-612591	0–1	QBT3	1.09 (U)	—[d]	—	—	—	—	—	3.92	0.000725 (J)	1.07 (U)
RE20-10-23142	20-612591	2–3	QBT3	1.02 (U)	—	—	—	—	—	—	1.51	0.000555 (J)	1 (U)
RE20-10-23143	20-612591	4–5	QBT3	1.01 (U)	—	—	—	—	—	—	1.47	0.00093 (J)	0.907 (U)
RE20-10-23144	20-612592	0–1	QBT3	1.05 (U)	—	—	—	—	—	—	3.84	—	1.06 (U)
RE20-10-23145	20-612592	2–3	QBT3	0.926 (U)	62.6	—	—	—	—	—	1.21	0.000616 (J)	0.9 (U)
RE20-10-23146	20-612592	4–5	QBT3	0.901 (U)	—	—	—	—	—	—	1.11	0.00213	0.975 (U)
RE20-10-23147	20-612593	0–1	QBT3	1.06 (U)	—	—	—	—	—	—	3.07	—	1.1 (U)
RE20-10-23148	20-612593	2–3	QBT3	0.917 (U)	—	—	—	—	—	—	1.05	—	0.911 (U)
RE20-10-23149	20-612593	4–5	QBT3	1.04 (U)	—	—	—	—	—	—	—	—	0.967 (U)
RE20-10-23150	20-612594	0–1	QBT3	1.06 (U)	—	—	—	—	—	—	7.15	0.00127 (J)	1.08 (U)
RE20-10-23151	20-612594	2–3	QBT3	1.01 (U)	—	—	—	—	—	—	1.74	—	1.02 (U)
RE20-10-23152	20-612594	4–5	QBT3	0.977 (U)	53.1	—	2240	—	—	—	1.65	0.000571 (J)	1.02 (U)
RE20-10-23153	20-612595	0–1	QBT3	1.11 (U)	62.2	—	—	—	12.4	—	7.12	0.00106 (J)	1.03 (U)
RE20-10-23154	20-612595	2–3	QBT3	0.948 (U)	—	—	—	—	—	—	1.36	—	0.951 (U)
RE20-10-23155	20-612595	4–5	QBT3	0.963 (U)	—	—	—	—	—	—	1.89	—	1.02 (U)
RE20-10-23156	20-612596	0–1	QBT3	1.07 (U)	64.7	—	—	5.64	13.9	—	2.64	—	1.09 (U)
RE20-10-23157	20-612596	2–3	QBT3	1.01 (U)	78.8 (J-)	1.28	—	4.74	—	498	1.06	—	1.01 (U)

Table 6.4-9 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Beryllium	Calcium	Copper	Lead	Manganese	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**1.21**	**2200**	**4.66**	**11.2**	**482**	**na**[b]	**na**	**0.3**
Construction Worker SSL[c]				**124**	**4350**	**144**	**na**	**12400**	**800**	**463**	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**224000**	**2260**	**na**	**45400**	**800**	**145000**	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**15600**	**156**	**na**	**3130**	**400**	**10700**	**125000**	**54.8**	**391**
RE20-10-23158	20-612596	4–5	QBT3	0.991 (U)	86.7 (J-)	1.37	2950 (J-)	5.13	—	521	1.07	0.000786 (J)	1.01 (U)
RE20-10-23159	20-612597	0–1	QBT3	1.02 (U)	—	—	—	—	—	—	3.59	—	1.03 (U)
RE20-10-23160	20-612597	2–3	QBT3	0.996 (U)	—	—	—	—	—	—	1.18	—	1.01 (U)
RE20-10-23161	20-612597	4–5	QBT3	0.985 (U)	—	—	2500 (J-)	—	—	—	1.28	0.000694 (J)	0.995 (U)

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070).

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

Table 6.4-10
Radionuclides Detected or Detected above BVs/FVs at SWMU 20-002(b)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Uranium-235/236	Uranium-238
Qbt 2, 3, 4 BV[a]				**na**[b]	**0.09**	**1.93**
Construction Worker SAL[c]				**18**	**43**	**160**
Industrial SAL[c]				**23**	**87**	**430**
Residential SAL[c]				**5.6**	**17**	**87**
RE20-10-23144	20-612592	0–1	QBT3	0.282	—[d]	—
RE20-10-23147	20-612593	0–1	QBT3	0.262	—	—
RE20-10-23150	20-612594	0–1	QBT3	0.349	0.0913	2.06
RE20-10-23151	20-612594	2–3	QBT3	—	0.104	1.95
RE20-10-23153	20-612595	0–1	QBT3	0.256	—	—
RE20-10-23156	20-612596	0–1	QBT3	0.475	—	—
RE20-10-23157	20-612596	2–3	QBT3	—	0.108	—
RE20-10-23159	20-612597	0–1	QBT3	0.233	—	—
RE20-10-23160	20-612597	2–3	QBT3	—	0.0938	—

Note: Results are in pCi/g.

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

[b] na = Not available.

[c] SALs are from LANL (2009, 107655).

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

Table 6.5-1
Samples Collected and Analyses Requested at SWMU 20-002(d)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	Gamma-Emitting Radionuclides	Isotopic Uranium	Strontium-90
RE20-10-23196	20-612606	0–1	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	10-4064	10-4066	10-4066	10-4066
RE20-10-23197	20-612606	4–5	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	10-4064	10-4066	10-4066	10-4066
RE20-10-23198	20-612606	8–9	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	10-4064	10-4066	10-4066	10-4066
RE20-10-23199	20-612607	0–1	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	10-4064	10-4066	10-4066	10-4066
RE20-10-23200	20-612607	4–5	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	10-4064	10-4066	10-4066	10-4066
RE20-10-23201	20-612607	8–9	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	10-4064	10-4066	10-4066	10-4066
RE20-10-23202	20-612608	0–1	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	10-4064	10-4066	10-4066	10-4066
RE20-10-23203	20-612608	4–5	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	10-4064	10-4066	10-4066	10-4066
RE20-10-23204	20-612608	8–9	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	10-4064	10-4066	10-4066	10-4066
RE20-10-23205	20-612609	0–1	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—*	10-4066	10-4066	10-4066
RE20-10-23206	20-612609	4–5	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—	10-4066	10-4066	10-4066
RE20-10-23207	20-612609	8–9	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—	10-4066	10-4066	10-4066
RE20-10-23208	20-612610	0–1	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—	10-4066	10-4066	10-4066
RE20-10-23209	20-612610	4–5	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—	10-4066	10-4066	10-4066
RE20-10-23210	20-612610	8–9	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—	10-4066	10-4066	10-4066
RE20-10-23211	20-612611	0–1	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—	10-4066	10-4066	10-4066
RE20-10-23212	20-612611	4–5	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—	10-4066	10-4066	10-4066
RE20-10-23213	20-612611	8–9	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—	10-4066	10-4066	10-4066
RE20-10-23214	20-612612	0–1	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—	10-4066	10-4066	10-4066
RE20-10-23215	20-612612	4–5	QBT3	10-4065	10-4065	10-4065	10-4065	10-4064	—	10-4066	10-4066	10-4066

Table 6.5-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	Explosive Compounds	PCBs	Gamma-Emitting Radionuclides	Isotopic Uranium	Strontium-90
RE20-10-23216	20-612612	8–9	QBT3	10-4068	10-4068	10-4068	10-4068	10-4067	—	10-4069	10-4069	10-4069
RE20-10-23217	20-612613	0–1	QBT3	10-4068	10-4068	10-4068	10-4068	10-4067	—	10-4069	10-4069	10-4069
RE20-10-23218	20-612613	4–5	QBT3	10-4068	10-4068	10-4068	10-4068	10-4067	—	10-4069	10-4069	10-4069
RE20-10-23219	20-612613	8–9	QBT3	10-4068	10-4068	10-4068	10-4068	10-4067	—	10-4069	10-4069	10-4069

* — = Analysis not requested.

Table 6.5-2
Inorganic Chemicals above BVs at SWMU 20-002(d)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Chromium	Cobalt	Copper	Lead	Magnesium	Manganese	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**7.14**	**3.14**	**4.66**	**11.2**	**1690**	**482**	**na[b]**	**na**	**0.3**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**449[d]**	**34.6[e]**	**12400**	**800**	**na**	**463**	**496000**	**217**	**1550**
Industrial SSL[c]				**1130000**	**454**	**224000**	**2920[d]**	**300[f]**	**45400**	**800**	**na**	**145000**	**1820000**	**795**	**5680**
Residential SSL[c]				**78100**	**31.3**	**15600**	**219[d]**	**23[f]**	**3130**	**400**	**na**	**10700**	**125000**	**54.8**	**391**
RE20-10-23196	20-612606	0–1	QBT3	—[g]	1.05 (U)	60.8	—	—	12.5	—	—	—	1.55	—	1.04 (U)
RE20-10-23197	20-612606	4–5	QBT3	—	0.976 (U)	—	—	—	—	—	—	—	1.76	—	0.982 (U)
RE20-10-23198	20-612606	8–9	QBT3	—	1.01 (U)	—	—	—	—	—	—	—	1.81	0.000921 (J)	0.999 (U)
RE20-10-23199	20-612607	0–1	QBT3	—	1.04 (U)	—	—	—	—	—	—	—	1.82	—	0.98 (U)
RE20-10-23200	20-612607	4–5	QBT3	—	1.05 (U)	—	—	—	—	—	—	—	1.04 (J)	—	1.07 (U)
RE20-10-23201	20-612607	8–9	QBT3	—	1.15 (U)	—	—	—	—	—	—	—	1.28	—	1.14 (U)
RE20-10-23202	20-612608	0–1	QBT3	—	—	—	19.1	—	5.45	—	—	—	2.24	—	1.14 (U)
RE20-10-23203	20-612608	4–5	QBT3	—	1.09 (U)	—	—	—	—	—	—	—	1.11 (J)	—	1.13 (U)
RE20-10-23204	20-612608	8–9	QBT3	—	1.1 (U)	—	—	—	—	—	—	—	1.3	—	1.08 (U)
RE20-10-23205	20-612609	0–1	QBT3	—	1.07 (U)	56	—	—	—	—	—	—	1.8	—	1.07 (U)
RE20-10-23206	20-612609	4–5	QBT3	—	1.04 (U)	70.8	—	—	—	—	—	—	1 (J)	0.00254	1.02 (U)
RE20-10-23207	20-612609	8–9	QBT3	—	1 (U)	—	—	—	—	—	—	—	—	0.000662 (J)	0.955 (U)
RE20-10-23208	20-612610	0–1	QBT3	—	1.11 (U)	86.7	14.8	—	8.31	13.2	—	—	10.9	0.00103 (J)	1.13 (U)
RE20-10-23209	20-612610	4–5	QBT3	—	1.05 (U)	52.8	—	—	—	—	—	—	3.05	—	1.03 (U)
RE20-10-23210	20-612610	8–9	QBT3	—	1.08 (U)	—	—	—	—	—	—	—	1.66	—	1.06 (U)
RE20-10-23211	20-612611	0–1	QBT3	7560	1.03 (U)	77.7	—	3.19	5.11	11.6	—	—	1.66	—	1.05 (U)
RE20-10-23212	20-612611	4–5	QBT3	11200	1.06 (U)	125	7.56	3.65	6.43	11.4	1770	494 (J+)	—	0.000807 (J)	1.06 (U)
RE20-10-23213	20-612611	8–9	QBT3	12500	0.973 (U)	126	8.36	—	5.2	—	—	—	1.07 (J)	—	1.01 (U)

Table 6.5-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Chromium	Cobalt	Copper	Lead	Magnesium	Manganese	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**7.14**	**3.14**	**4.66**	**11.2**	**1690**	**482**	**na[b]**	**na**	**0.3**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**449[d]**	**34.6[e]**	**12400**	**800**	**na**	**463**	**496000**	**217**	**1550**
Industrial SSL[c]				**1130000**	**454**	**224000**	**2920[d]**	**300[f]**	**45400**	**800**	**na**	**145000**	**1820000**	**795**	**5680**
Residential SSL[c]				**78100**	**31.3**	**15600**	**219[d]**	**23[f]**	**3130**	**400**	**na**	**10700**	**125000**	**54.8**	**391**
RE20-10-23214	20-612612	0–1	QBT3	—	0.974 (U)	76.8	12.8	—	28.7	11.9	—	—	1.99	0.000675 (J)	0.976 (U)
RE20-10-23215	20-612612	4–5	QBT3	—	1.01 (U)	65.6	—	—	—	—	—	—	1.03 (J)	0.00199 (J)	1.04 (U)
RE20-10-23216	20-612612	8–9	QBT3	—	1.12 (U)	69	—	—	—	12.8	—	—	—	—	1.05 (U)
RE20-10-23217	20-612613	0–1	QBT3	—	1.04 (U)	—	—	—	—	—	—	—	1.9	—	1.03 (U)
RE20-10-23218	20-612613	4–5	QBT3	—	1.05 (U)	50.9	—	—	—	—	—	—	—	0.00188 (J)	1.03 (U)
RE20-10-23219	20-612613	8–9	QBT3	—	0.996 (U)	56.9	—	—	—	—	—	—	—	—	0.988 (U)

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070), unless otherwise noted.

[d] SSLs are for hexavalent chromium.

[e] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

[f] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

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

Table 6.5-3
Organic Chemicals Detected at SWMU 20-002(d)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1242	Aroclor-1254	Aroclor-1260
Construction Worker SSL[a]				**75.8**	**4.36**	**75.8**
Industrial SSL[a]				**8.26**	**8.26**	**8.26**
Residential SSL[a]				**2.22**	**1.12**	**2.22**
RE20-10-23196	20-612606	0–1	QBT3	—[b]	—	0.0031 (J)
RE20-10-23197	20-612606	4–5	QBT3	0.0457	0.06	0.0085
RE20-10-23199	20-612607	0–1	QBT3	—	—	0.0083 (J)
RE20-10-23200	20-612607	4–5	QBT3	—	0.0102	0.0101
RE20-10-23201	20-612607	8–9	QBT3	—	0.0039 (J)	0.0046
RE20-10-23202	20-612608	0–1	QBT3	—	0.0258	0.0263

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

[a] SSLs are from NMED (2009, 108070).

[b] — = Not detected.

Table 6.5-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 20-002(d)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Uranium-234	Uranium-235/236	Uranium-238
Qbt 2, 3, 4 BV[a]				**na**[b]	**1.98**	**0.09**	**1.93**
Construction Worker SAL[c]				**18**	**220**	**43**	**160**
Industrial SAL[c]				**23**	**1500**	**87**	**430**
Residential SAL[c]				**5.6**	**170**	**17**	**87**
RE20-10-23196	20-612606	0–1	QBT3	—[d]	3.17	0.162	3.05
RE20-10-23197	20-612606	4–5	QBT3	—	—	0.0905	—
RE20-10-23206	20-612609	4–5	QBT3	—	—	0.104	—
RE20-10-23208	20-612610	0–1	QBT3	0.242	—	0.106	—
RE20-10-23209	20-612610	4–5	QBT3	—	—	0.0995	—
RE20-10-23211	20-612611	0–1	QBT3	—	—	0.0923	—
RE20-10-23213	20-612611	8–9	QBT3	—	—	0.0938	—
RE20-10-23214	20-612612	0–1	QBT3	0.144	15	0.775	15.4
RE20-10-23217	20-612613	0–1	QBT3	0.281	—	—	—
RE20-10-23218	20-612613	4–5	QBT3	—	—	0.101	—
RE20-10-23219	20-612613	8–9	QBT3	—	—	0.142	—

Note: Results are in pCi/g.

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

[b] na = Not available.

[c] SALs are from LANL (2009, 107655).

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

Table 6.6-1
Samples Collected and Analyses Requested at AOC 20-003(b)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	PCBs	Isotopic Uranium
RE20-10-22266	20-612490	2–3	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22267	20-612490	8–9	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22279	20-612490	20–21	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22268	20-612491	2–3	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22269	20-612491	8–9	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22278	20-612491	11–12	QBT3	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22270	20-612492	2–3	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22271	20-612492	8–9	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22272	20-612493	2–3	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22273	20-612493	8–9	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22274	20-612494	2–3	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22275	20-612494	8–9	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22276	20-612495	2–3	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935
RE20-10-22277	20-612495	8–9	SED	10-3936	10-3936	10-3936	10-3936	10-3935	10-3935

Table 6.6-2
Inorganic Chemicals above BVs at AOC 20-003(b)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Cadmium	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**1.63**	**na**[b]	**na**	**0.3**
Sediment BV[a]				**0.83**	**0.4**	**na**	**na**	**0.3**
Construction Worker SSL[c]				**124**	**309**	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**1120**	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**77.9**	**125000**	**54.8**	**391**
RE20-10-22266	20-612490	2–3	SED	1.14 (U)	0.572 (U)	—[d]	—	1.11 (U)
RE20-10-22267	20-612490	8–9	SED	1.07 (U)	0.533 (U)	—	—	1.09 (U)
RE20-10-22279	20-612490	20–21	SED	1.04 (U)	0.518 (U)	—	—	1.03 (U)
RE20-10-22268	20-612491	2–3	SED	0.973 (U)	0.487 (U)	1.05	—	1.02 (U)
RE20-10-22269	20-612491	8–9	SED	0.986 (U)	0.493 (U)	—	—	1.02 (U)
RE20-10-22278	20-612491	11–12	QBT3	0.955 (U)	—	—	—	0.978 (U)
RE20-10-22270	20-612492	2–3	SED	1 (U)	—	1.26	0.000612 (J)	1.02 (U)
RE20-10-22271	20-612492	8–9	SED	1.02 (U)	0.508 (U)	1.07	0.0016 (J)	0.936 (U)
RE20-10-22272	20-612493	2–3	SED	0.96 (U)	0.48 (U)	—	0.00306	1.02 (U)
RE20-10-22273	20-612493	8–9	SED	0.96 (U)	0.48 (U)	—	—	1.01 (U)
RE20-10-22274	20-612494	2–3	SED	0.986 (U)	0.493 (U)	—	0.00121 (J)	1.06 (U)
RE20-10-22275	20-612494	8–9	SED	1.12 (U)	0.558 (U)	—	—	1.09 (U)
RE20-10-22276	20-612495	2–3	SED	1.01 (U)	0.507 (U)	—	0.0071	0.995 (U)
RE20-10-22277	20-612495	8–9	SED	0.949 (U)	0.474 (U)	—	0.00166 (J)	1.01 (U)

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070).

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

Table 6.6-3
Radionuclides Detected or Detected above BVs/FVs at AOC 20-003(b)

Sample ID	Location ID	Depth (ft)	Media	Uranium-235/236
Qbt 2, 3, 4 BV[a]				**0.09**
Sediment BV[a]				**0.2**
Construction Worker SAL[b]				**43**
Industrial SAL[b]				**87**
Residential SAL[b]				**17**
RE20-10-22278	20-612491	11–12	QBT3	0.103
RE20-10-22273	20-612493	8–9	SED	0.223

Note: Results are in pCi/g.

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

[b] SALs are from LANL (2009, 107655).

Table 6.7-1
Samples Collected and Analyses Requested at AOC 20-004

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Cyanide (Total)	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides
RE20-10-22300	20-612500	3–4	FILL	10-3898	10-3898	10-3898	10-3897	10-3897	10-3897	10-3899
RE20-10-22301	20-612500	6–7	FILL	10-3898	10-3898	10-3898	10-3897	10-3897	10-3897	10-3899
RE20-10-22302	20-612501	7–8	FILL	10-3898	10-3898	10-3898	10-3897	10-3897	10-3897	10-3899
RE20-10-22303	20-612501	10–11	QBT3	10-3898	10-3898	10-3898	10-3897	10-3897	10-3897	10-3899
RE20-10-22304	20-612502	3–4	FILL	10-3898	10-3898	10-3898	10-3897	10-3897	10-3897	10-3899
RE20-10-22305	20-612502	6–7	QBT3	10-3898	10-3898	10-3898	10-3897	10-3897	10-3897	10-3899
RE20-10-22306	20-612503	7–8	FILL	10-3898	10-3898	10-3898	—*	10-3897	10-3897	10-3899
RE20-10-22307	20-612503	10–11	QBT3	10-3898	10-3898	10-3898	—	10-3897	10-3897	10-3899
RE20-10-22308	20-612504	3–4	FILL	10-3898	10-3898	10-3898	—	10-3897	10-3897	10-3899
RE20-10-22309	20-612504	6–7	FILL	10-3898	10-3898	10-3898	—	10-3897	10-3897	10-3899
RE20-10-22310	20-612505	7–8	FILL	10-3898	10-3898	10-3898	—	10-3897	10-3897	10-3899
RE20-10-22311	20-612505	10–11	QBT3	10-3898	10-3898	10-3898	—	10-3897	10-3897	10-3899
RE20-10-22312	20-612506	3–4	FILL	10-3898	10-3898	10-3898	—	10-3897	10-3897	10-3899
RE20-10-22313	20-612506	6–7	QBT3	10-3898	10-3898	10-3898	—	10-3897	10-3897	10-3899

* — = Analysis not requested.

Table 6.7-2
Inorganic Chemicals above BVs at AOC 20-004

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Lead	Magnesium	Nickel	Nitrate	Selenium	Vanadium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**11.2**	**1690**	**6.58**	**na[b]**	**0.3**	**17**
Soil BV[a]				**29200**	**0.83**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**22.3**	**4610**	**15.4**	**na**	**1.52**	**39.6**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**309**	**na**	**449[d]**	**34.6[e]**	**12400**	**800**	**na**	**6190**	**496000**	**1550**	**1550**
Industrial SSL[c]				**1130000**	**454**	**224000**	**1120**	**na**	**2920[d]**	**300[f]**	**45400**	**800**	**na**	**22700**	**1820000**	**5680**	**5680**
Residential SSL[c]				**78100**	**31.3**	**15600**	**77.9**	**na**	**219[d]**	**23[f]**	**3130**	**400**	**na**	**1560**	**125000**	**391**	**391**
RE20-10-22300	20-612500	3–4	FILL	—[g]	0.995 (U)	—	0.498 (U)	—	—	—	—	—	—	—	5.39	—	—
RE20-10-22301	20-612500	6–7	FILL	—	1.07 (U)	—	0.537 (U)	—	—	—	—	—	—	—	3.75	—	—
RE20-10-22302	20-612501	7–8	FILL	—	1 (U)	—	0.5 (U)	—	—	—	—	—	—	—	—	1.75	—
RE20-10-22303	20-612501	10–11	QBT3	—	5.01 (U)	130	—	2840	10.6	6.62	5.94	12	—	7.43	—	1 (U)	21.7
RE20-10-22304	20-612502	3–4	FILL	—	1.03 (U)	—	0.514 (U)	—	—	—	—	—	—	—	—	—	—
RE20-10-22305	20-612502	6–7	QBT3	—	1.08 (U)	74	—	—	11.4	3.41	—	11.3	—	—	1.23	1.72	—
RE20-10-22306	20-612503	7–8	FILL	—	1.06 (U)	—	0.528 (U)	—	—	—	—	—	—	—	—	—	—
RE20-10-22307	20-612503	10–11	QBT3	—	0.963 (U)	78.7	—	—	—	3.48	—	—	—	—	—	1.01 (U)	—
RE20-10-22308	20-612504	3–4	FILL	—	0.968 (U)	—	0.484 (U)	—	—	—	—	—	—	—	37.8	—	—
RE20-10-22309	20-612504	6–7	FILL	—	1.05 (U)	—	0.524 (U)	—	—	—	—	—	—	—	38.1	—	—
RE20-10-22310	20-612505	7–8	FILL	—	5.35 (U)	—	0.535 (U)	—	—	—	—	—	—	—	—	—	—
RE20-10-22311	20-612505	10–11	QBT3	10200	4.71 (U)	141	—	2720	10.7	5.94	6.55	13.4	1950 (J+)	7.78	—	1.09 (U)	22.6
RE20-10-22312	20-612506	3–4	FILL	—	1.06 (U)	—	0.532 (U)	—	—	—	—	—	—	—	1.13	—	—
RE20-10-22313	20-612506	6–7	QBT3	—	0.957 (U)	77	—	2820	—	3.43	—	—	—	—	—	0.911 (U)	—

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070), unless otherwise noted.

[d] SSLs are for hexavalent chromium.

[e] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) ,and the equation and parameters are from NMED (2009, 108070).

[f] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

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

Table 6.8-1
Samples Collected and Analyses Requested at SWMU 20-005

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Cyanide (Total)	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides
RE20-10-23226	20-612614	4–5	FILL	10-3881	10-3881	10-3881	10-3880	10-3880	10-3880	10-3882
RE20-10-23227	20-612614	9–10	FILL	10-3881	10-3881	10-3881	10-3880	10-3880	10-3880	10-3882
RE20-10-23228	20-612615	4–5	FILL	10-3881	10-3881	10-3881	10-3880	10-3880	10-3880	10-3882
RE20-10-23229	20-612615	9–10	FILL	10-3881	10-3881	10-3881	10-3880	10-3880	10-3880	10-3882
RE20-10-23230	20-612616	4–5	FILL	10-3881	10-3881	10-3881	10-3880	10-3880	10-3880	10-3882
RE20-10-23231	20-612616	9–10	FILL	10-3881	10-3881	10-3881	10-3880	10-3880	10-3880	10-3882
RE20-10-23232	20-612617	6–7	FILL	10-3881	10-3881	10-3881	—*	10-3880	10-3880	10-3882
RE20-10-23233	20-612617	9–10	FILL	10-3881	10-3881	10-3881	—	10-3880	10-3880	10-3882
RE20-10-23234	20-612618	0–1	FILL	10-3881	10-3881	10-3881	—	10-3880	10-3880	10-3882
RE20-10-23235	20-612618	3–4	FILL	10-3881	10-3881	10-3881	—	10-3880	10-3880	10-3882
RE20-10-23236	20-612619	0–1	FILL	10-3881	10-3881	10-3881	—	10-3880	10-3880	10-3882
RE20-10-23237	20-612619	3–4	FILL	10-3881	10-3881	10-3881	—	10-3880	10-3880	10-3882

*— = Analysis not requested.

Table 6.8-2
Inorganic Chemicals above BVs at SWMU 20-005

Sample ID	Location ID	Depth (ft)	Media	Antimony	Cadmium	Nitrate	Silver
Soil BV[a]				**0.83**	**0.4**	**na**[b]	**1**
Construction Worker SSL[c]				**124**	**309**	**496000**	**1550**
Industrial SSL[c]				**454**	**1120**	**1820000**	**5680**
Residential SSL[c]				**31.3**	**77.9**	**125000**	**391**
RE20-10-23226	20-612614	4–5	FILL	1.03 (UJ)	0.513 (UJ)	—[d]	—
RE20-10-23227	20-612614	9–10	FILL	1.04 (UJ)	0.518 (UJ)	—	—
RE20-10-23228	20-612615	4–5	FILL	1.06 (UJ)	0.53 (UJ)	—	—
RE20-10-23229	20-612615	9–10	FILL	1.02 (UJ)	0.641 (J-)	—	1.55
RE20-10-23230	20-612616	4–5	FILL	1.13 (UJ)	—	—	—
RE20-10-23231	20-612616	9–10	FILL	1.12 (UJ)	0.56 (UJ)	—	—
RE20-10-23232	20-612617	6–7	FILL	1.04 (UJ)	0.52 (UJ)	—	—
RE20-10-23233	20-612617	9–10	FILL	1.03 (UJ)	0.517 (UJ)	—	—
RE20-10-23234	20-612618	0–1	FILL	1.02 (UJ)	0.51 (UJ)	4.66	—
RE20-10-23235	20-612618	3–4	FILL	1.05 (UJ)	0.527 (UJ)	1.1	—
RE20-10-23236	20-612619	0–1	FILL	0.992 (UJ)	0.496 (UJ)	2.1	—
RE20-10-23237	20-612619	3–4	FILL	0.987 (UJ)	0.493 (UJ)	2.65	—

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070).

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

Table 6.8-3
Organic Chemicals Detected at SWMU 20-005

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260	Methylene Chloride
Construction Worker SSL[a]				**4.36**	**75.8**	**10600**
Industrial SSL[a]				**8.26**	**8.26**	**1090**
Residential SSL[a]				**1.12**	**2.22**	**199**
RE20-10-23227	20-612614	9–10	FILL	—[b]	—	0.0031 (J-)
RE20-10-23230	20-612616	4–5	FILL	0.0034 (J)	0.0071	—
RE20-10-23231	20-612616	9–10	FILL	0.0031 (J)	0.0057	—
RE20-10-23235	20-612618	3–4	FILL	NA[c]	NA	0.00304 (J-)

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

[a] SSLs are from NMED (2009, 108070).

[b] — = Not detected.

[c] NA = Not analyzed.

Table 7.2-1
Samples Collected and Analyses Requested at SWMU 53-001(a)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	PCBs	SVOCs	VOCs	Pesticides	Pesticides/PCBs	TPH
0253-95-0001	53-01051	0–0.5	SOIL	185	—*	—	184	—	184	184
0253-95-0002	53-01052	0–0.5	SOIL	185	—	—	184	—	184	184
0253-95-0003	53-01053	0–0.5	SOIL	185	—	—	184	—	184	184
0253-97-0070	53-01517	1–1.5	QBT3	—	3476R	—	—	—	—	—
0253-97-0075	53-01521	0–0.5	SOIL	—	3476R	—	—	—	—	—
0253-97-0076	53-01522	0–0.5	SOIL	—	3476R	—	—	—	—	—
0253-97-0077	53-01523	0.6667–1.1667	SOIL	—	3682R	—	—	—	—	—
0253-97-0078	53-01524	0.6667–1.1667	QBT3	—	3682R	—	—	—	—	—
0253-97-0079	53-01525	0–0.5	SOIL	—	3682R	—	—	—	—	—
0253-97-0111	53-01526	2.5–3	QBT3	—	3730R	—	—	—	—	—
0253-97-0081	53-01527	0–0.5	SOIL	—	3682R	—	—	—	—	—
0253-97-0082	53-01528	0–0.5	SOIL	—	3682R	—	—	—	—	—
0253-97-0083	53-01529	0–0.5	SOIL	—	3682R	—	—	—	—	—
0253-97-0084	53-01530	0–0.5	SOIL	—	3682R	—	—	—	—	—
0253-97-0086	53-01531	0–0.5	QBT3	—	3682R	—	—	—	—	—
0253-97-0087	53-01531	2.5–3	QBT3	—	3682R	—	—	—	—	—
0253-97-0088	53-01531	5.5–6	QBT3	—	3682R	—	—	—	—	—
0253-97-0089	53-01532	0–0.5	QBT3	—	3682R	—	—	—	—	—
0253-97-0090	53-01532	2.5–3	QBT3	—	3682R	—	—	—	—	—
0253-97-0091	53-01532	5.5–6	QBT3	—	3682R	—	—	—	—	—
0253-97-0092	53-01533	0.5–0.83	SOIL	—	3682R	—	—	—	—	—
0253-97-0093	53-01533	0.83–1.25	SOIL	—	3682R	—	—	—	—	—
0253-97-0105	53-01534	0–0.5	SOIL	—	3682R	—	—	—	—	—
0253-97-0106	53-01535	0–0.5	SOIL	—	3682R	—	—	—	—	—
0253-97-0107	53-01536	0–0.5	SOIL	—	3682R	—	—	—	—	—
0253-97-0108	53-01537	0–0.5	SOIL	—	3682R	—	—	—	—	—
0253-97-0112	53-01541	0–0.5	SOIL	—	3730R	—	—	—	—	—
RE53-10-22204	53-612469	2–3	QBT3	10-4374	10-4373	10-4373	10-4373	10-4373	—	—
RE53-10-22205	53-612469	4–5	QBT3	10-4374	10-4373	10-4373	10-4373	10-4373	—	—
RE53-10-22206	53-612470	2–3	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22207	53-612470	4–5	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22208	53-612471	1–2	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22209	53-612471	3–4	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—

Table 7.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	PCBs	SVOCs	VOCs	Pesticides	Pesticides/PCBs	TPH
RE53-10-22210	53-612472	1–2	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22211	53-612472	3–4	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22212	53-612473	1–2	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22213	53-612473	3–4	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22214	53-612474	1–2	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22215	53-612474	3–4	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22217	53-612475	0–0	QBT3	10-4325	10-4324	10-4324	10-4324	—	—	—
RE53-10-22216	53-612475	1–2	QBT3	10-4325	10-4324	10-4324	10-4324	—	—	—
RE53-10-22218	53-612476	1–2	QBT3	10-4325	10-4324	10-4324	10-4324	—	—	—
RE53-10-22219	53-612476	3–4	QBT3	10-4325	10-4324	10-4324	10-4324	—	—	—
RE53-10-22220	53-612477	1–2	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22221	53-612477	3–4	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22222	53-612478	0–1	SOIL	10-4290	10-4290	10-4290	10-4290	—	—	—
RE53-10-22223	53-612478	2–3	QBT3	10-4290	10-4290	10-4290	10-4290	—	—	—
RE53-10-22224	53-612479	0–1	SOIL	10-4290	10-4290	10-4290	10-4290	—	—	—
RE53-10-22225	53-612479	2–3	QBT3	10-4290	10-4290	10-4290	10-4290	—	—	—
RE53-10-22226	53-612480	0–1	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22227	53-612480	2–3	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—
RE53-10-22228	53-612480	4–5	QBT3	10-4374	10-4373	10-4373	10-4373	—	—	—

* — = Analysis not requested.

Table 7.2-2
Inorganic Chemicals above BVs at SWMU 53-001(a)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Chromium	Copper	Lead	Mercury	Selenium	Silver	Thallium
Qbt 2, 3, 4 BV[a]				**0.5**	**7.14**	**4.66**	**11.2**	**0.1**	**0.3**	**1**	**1.1**
Soil BV[a]				**0.83**	**19.3**	**14.7**	**22.3**	**0.1**	**1.52**	**1**	**0.73**
Construction Worker SSL[b]				**124**	**449**[c]	**12400**	**800**	**92.9**[d]	**1550**	**1550**	**20.4**
Industrial SSL[b]				**454**	**2920**[c]	**45400**	**800**	**310**[e]	**5680**	**5680**	**74.9**
Residential SSL[b]				**31.3**	**219**[c]	**3130**	**400**	**23**[e]	**391**	**391**	**5.16**
0253-95-0001	53-01051	0–0.5	SOIL	—[f]	—	—	—	0.12 (U)	—	1.5 (U)	1.5 (U)
0253-95-0002	53-01052	0–0.5	SOIL	—	—	—	—	0.16	—	1.5 (U)	1.5 (U)
0253-95-0003	53-01053	0–0.5	SOIL	—	—	—	—	—	—	1.5 (U)	1.5 (U)
RE53-10-22204	53-612469	2–3	QBT3	1.08 (U)	—	8.11 (J)	—	—	1.03 (U)	—	—
RE53-10-22205	53-612469	4–5	QBT3	1.06 (U)	10.1	12.8 (J)	—	—	1.06 (U)	—	—
RE53-10-22206	53-612470	2–3	QBT3	1.03 (U)	—	—	—	—	1.02 (U)	—	—
RE53-10-22207	53-612470	4–5	QBT3	0.96 (U)	7.75	4.71 (J)	—	—	0.995 (U)	—	—
RE53-10-22208	53-612471	1–2	QBT3	1.07 (U)	93.1	—	—	—	1.09 (U)	—	—
RE53-10-22209	53-612471	3–4	QBT3	1.04 (U)	19.4	—	—	—	1.1 (U)	—	—
RE53-10-22210	53-612472	1–2	QBT3	1.01 (U)	28.9	8.23 (J)	13.5	—	1.09 (U)	—	—
RE53-10-22211	53-612472	3–4	QBT3	1.07 (U)	11	7.53 (J)	—	—	1.07 (U)	—	—
RE53-10-22212	53-612473	1–2	QBT3	1.05 (U)	—	4.9 (J)	84.2	—	1.1 (U)	—	—
RE53-10-22213	53-612473	3–4	QBT3	1.15 (U)	—	7.39 (J)	—	—	1.12 (U)	—	—
RE53-10-22214	53-612474	1–2	QBT3	1.03 (U)	9.28	8.17 (J)	—	—	0.974 (U)	—	—
RE53-10-22215	53-612474	3–4	QBT3	1 (U)	11.7	—	—	—	1.04 (U)	—	—
RE53-10-22217	53-612475	0–0	QBT3	0.999 (U)	—	—	—	—	1.07 (U)	—	—
RE53-10-22216	53-612475	1–2	QBT3	1.07 (U)	—	5.37	—	—	1.07 (U)	—	—

Table 7.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Chromium	Copper	Lead	Mercury	Selenium	Silver	Thallium
Qbt 2, 3, 4 BV[a]				**0.5**	**7.14**	**4.66**	**11.2**	**0.1**	**0.3**	**1**	**1.1**
Soil BV[a]				**0.83**	**19.3**	**14.7**	**22.3**	**0.1**	**1.52**	**1**	**0.73**
Construction Worker SSL[b]				**124**	**449**[c]	**12400**	**800**	**92.9**[d]	**1550**	**1550**	**20.4**
Industrial SSL[b]				**454**	**2920**[c]	**45400**	**800**	**310**[e]	**5680**	**5680**	**74.9**
Residential SSL[b]				**31.3**	**219**[c]	**3130**	**400**	**23**[e]	**391**	**391**	**5.16**
RE53-10-22218	53-612476	1–2	QBT3	1.01 (U)	—	—	—	—	1 (U)	—	—
RE53-10-22219	53-612476	3–4	QBT3	1.09 (U)	—	—	—	—	1.07 (U)	—	—
RE53-10-22220	53-612477	1–2	QBT3	1.05 (U)	12.2	5.16 (J)	—	—	1.09 (U)	—	—
RE53-10-22221	53-612477	3–4	QBT3	1.06 (U)	8.36	—	—	—	1.04 (U)	—	—
RE53-10-22222	53-612478	0–1	SOIL	1.01 (U)	—	—	—	—	—	—	—
RE53-10-22223	53-612478	2–3	QBT3	1.04 (U)	—	4.76	—	—	1.08 (U)	—	—
RE53-10-22224	53-612479	0–1	SOIL	1.11 (U)	—	—	—	—	—	—	—
RE53-10-22225	53-612479	2–3	QBT3	1.04 (U)	—	—	—	—	1.01 (U)	—	—
RE53-10-22226	53-612480	0–1	QBT3	1.03 (U)	19.4	—	—	—	1.08 (U)	—	—
RE53-10-22227	53-612480	2–3	QBT3	1.05 (U)	—	5.52 (J)	—	—	0.574 (J)	—	—
RE53-10-22228	53-612480	4–5	QBT3	1.04 (U)	—	7.28 (J)	—	—	1.04 (U)	—	—

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

[a] BVs are from LANL (1998, 059730).

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

[c] SSLs are for hexavalent chromium.

[d] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

[e] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

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

Table 7.2-3
Organic Chemicals Detected at SWMU 53-001(a)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Aroclor-1254	Aroclor-1260	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Fluoranthene	Isopropylbenzene	Pyrene	TPH	Trimethylbenzene[1,2,4-]
Construction Worker SSL[a]				**263000**	**4.36**	**75.8**	**21.3**	**213**	**6680[b]**	**8910**	**10300**	**6680**	**na[c]**	**688[d]**
Industrial SSL[a]				**851000**	**8.26**	**8.26**	**2.34**	**23.4**	**18300[b]**	**24400**	**14900**	**18300**	**1440[e]**	**260[f]**
Residential SSL[a]				**67500**	**1.12**	**2.22**	**0.621**	**6.21**	**1720[b]**	**2290**	**3210**	**1720**	**3040[e]**	**62[f]**
0253-95-0001	53-01051	0–0.5	SOIL	—[g]	—	—	NA[h]	NA	NA	NA	—	NA	458	—
0253-95-0002	53-01052	0–0.5	SOIL	—	—	—	NA	NA	NA	NA	—	NA	249	—
0253-95-0003	53-01053	0–0.5	SOIL	—	—	0.0778	NA	NA	NA	NA	—	NA	180	—
0253-97-0076	53-01522	0–0.5	SOIL	NA	—	0.12	NA	NA	NA	NA	NA	NA	NA	NA
0253-97-0077	53-01523	0.6667–1.1667	SOIL	NA	—	0.13	NA	NA	NA	NA	NA	NA	NA	NA
0253-97-0111	53-01526	2.5–3	QBT3	NA	—	0.094	NA	NA	NA	NA	NA	NA	NA	NA
0253-97-0086	53-01531	0–0.5	QBT3	NA	—	0.065 (J-)	NA	NA	NA	NA	NA	NA	NA	NA
0253-97-0092	53-01533	0.5–0.83	SOIL	NA	—	0.018	NA	NA	NA	NA	NA	NA	NA	NA
0253-97-0112	53-01541	0–0.5	SOIL	NA	—	0.15	NA	NA	NA	NA	NA	NA	NA	NA
RE53-10-22204	53-612469	2–3	QBT3	0.0226 (J)	0.428	0.792	—	—	—	—	—	—	NA	0.00127
RE53-10-22205	53-612469	4–5	QBT3	0.00972 (J)	0.201	0.443	—	—	—	—	—	—	NA	0.000826 (J)
RE53-10-22206	53-612470	2–3	QBT3	0.00963 (J)	0.0066	0.0095	—	—	—	—	—	—	NA	—
RE53-10-22207	53-612470	4–5	QBT3	—	0.0252	0.0574	—	—	—	—	—	—	NA	—
RE53-10-22208	53-612471	1–2	QBT3	—	0.0065	0.003 (J)	—	—	—	—	—	—	NA	—
RE53-10-22209	53-612471	3–4	QBT3	—	0.0031 (J)	0.0013 (J)	—	—	—	—	—	—	NA	—
RE53-10-22210	53-612472	1–2	QBT3	0.0119 (J)	3.47	3.84	—	—	—	—	0.00289 (J)	—	NA	—
RE53-10-22211	53-612472	3–4	QBT3	—	0.886	1.43	—	—	—	—	—	—	NA	—
RE53-10-22212	53-612473	1–2	QBT3	—	0.0055	0.0178	—	—	—	—	—	—	NA	—
RE53-10-22213	53-612473	3–4	QBT3	—	—	0.0055	—	—	—	—	—	—	NA	—
RE53-10-22214	53-612474	1–2	QBT3	—	3.74	1.4	—	—	—	—	—	—	NA	0.0004 (J)
RE53-10-22215	53-612474	3–4	QBT3	—	0.57	0.256	—	—	—	—	—	—	NA	—
RE53-10-22216	53-612475	1–2	QBT3	—	—	0.0317	—	—	—	—	—	—	NA	—
RE53-10-22218	53-612476	1–2	QBT3	—	—	0.0101 (J)	0.0125 (J)	0.0161 (J)	0.0118 (J)	—	—	—	NA	—
RE53-10-22220	53-612477	1–2	QBT3	0.0113 (J)	—	0.0642	—	—	—	—	—	—	NA	—
RE53-10-22221	53-612477	3–4	QBT3	0.0115 (J)	0.008	0.0139	—	—	—	—	—	—	NA	—

Table 7.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Aroclor-1254	Aroclor-1260	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Fluoranthene	Isopropylbenzene	Pyrene	TPH	Trimethylbenzene[1,2,4-]
Construction Worker SSL[a]				**263000**	**4.36**	**75.8**	**21.3**	**213**	**6680[b]**	**8910**	**10300**	**6680**	**na[c]**	**688[d]**
Industrial SSL[a]				**851000**	**8.26**	**8.26**	**2.34**	**23.4**	**18300[b]**	**24400**	**14900**	**18300**	**1440[e]**	**260[f]**
Residential SSL[a]				**67500**	**1.12**	**2.22**	**0.621**	**6.21**	**1720[b]**	**2290**	**3210**	**1720**	**3040[e]**	**62[f]**
RE53-10-22222	53-612478	0–1	SOIL	—	0.123	0.256	—	—	—	—	—	—	NA	—
RE53-10-22223	53-612478	2–3	QBT3	—	0.0129	0.0303	—	—	—	—	—	—	NA	—
RE53-10-22224	53-612479	0–1	SOIL	—	0.0372	0.0899	—	—	—	0.0246 (J+)	—	0.0234 (J)	NA	—
RE53-10-22225	53-612479	2–3	QBT3	—	—	0.0044	—	—	—	—	—	—	NA	—
RE53-10-22226	53-612480	0–1	QBT3	0.00894 (J)	—	0.0054	—	—	—	—	—	—	NA	0.00143
RE53-10-22227	53-612480	2–3	QBT3	0.0093 (J)	—	—	—	—	—	—	—	—	NA	—

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

[a] SSLs are from NMED (2009, 108070).

[b] Pyrene used as surrogate based on structural similarity.

[c] na = Not available.

[d] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

[e] Screening guidelines for mineral oil dielectric fluid from NMED (2006, 094614).

[f] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

[g] — = Not detected.

[h] NA = Not analyzed.

Table 7.3-1
Samples Collected and Analyses Requested at SWMU 53-001(b)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	PCBs	VOCs	TPH
0253-95-0005	53-01055	0–1	SOIL	211	210	210	210
0253-95-0007	53-01055	1–1.5	SOIL	211	210	210	210
0253-95-0008	53-01056	0–0.67	SOIL	211	210	210	210
RE53-10-22235	53-612481	0–1	QBT3	10-4299	10-4299	—*	—
RE53-10-22236	53-612481	2–3	QBT3	10-4299	10-4299	—	—
RE53-10-22237	53-612482	0–1	QBT3	10-4299	10-4299	—	—
RE53-10-22238	53-612482	2–3	QBT3	10-4299	10-4299	—	—

*— = Analysis not requested.

Table 7.3-2
Inorganic Chemicals above BVs at SWMU 53-001(b)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver	Zinc
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**1.63**	**7.14**	**4.66**	**11.2**	**0.1**	**0.3**	**1**	**63.5**
Soil BV[a]				**0.83**	**295**	**0.4**	**19.3**	**14.7**	**22.3**	**0.1**	**1.52**	**1**	**48.8**
Construction Worker SSL[b]				**124**	**4350**	**309**	**449[c]**	**12400**	**800**	**92.9[d]**	**1550**	**1550**	**92900**
Industrial SSL[b]				**454**	**224000**	**1120**	**2920[c]**	**45400**	**800**	**310[e]**	**5680**	**5680**	**341000**
Residential SSL[b]				**31.3**	**15600**	**77.9**	**219[c]**	**3130**	**400**	**23[e]**	**391**	**391**	**23500**
0253-95-0005	53-01055	0–1	SOIL	6 (U)	—[f]	1.2 (J)	—	37.2	50.3	0.23 (U)	—	—	105
0253-95-0007	53-01055	1–1.5	SOIL	5.8 (U)	—	0.7 (U)	—	—	—	0.23 (U)	—	—	—
0253-95-0008	53-01056	0–0.67	SOIL	6.1 (U)	—	0.78 (J)	—	—	—	0.25 (U)	—	—	49.8
RE53-10-22235	53-612481	0–1	QBT3	1.11 (U)	—	—	9.83	13.8	16.4	—	1.18 (U)	—	—
RE53-10-22236	53-612481	2–3	QBT3	1.03 (U)	—	—	—	—	—	—	0.959 (U)	—	—
RE53-10-22237	53-612482	0–1	QBT3	4.19	47.4	1.67	17.2	41	71.1	—	1.34 (U)	1.7	148
RE53-10-22238	53-612482	2–3	QBT3	1.14 (U)	—	—	—	—	—	—	1.08 (U)	—	—

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

[a] BVs are from LANL (1998, 059730).

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

[c] SSLs are for hexavalent chromium.

[d] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

[e] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

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

Table 7.3-3
Organic Chemicals Detected at SWMU 53-001(b)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260	TPH
Construction Worker SSL[a]				**4.36**	**75.8**	**na**[b]
Industrial SSL[a]				**8.26**	**8.26**	**200**[c]
Residential SSL[a]				**1.12**	**2.22**	**200**[c]
0253-95-0005	53-01055	0–1	SOIL	—[d]	—	75.2
0253-95-0007	53-01055	1–1.5	SOIL	—	—	15.7
0253-95-0008	53-01056	0–0.67	SOIL	—	—	18.1
RE53-10-22235	53-612481	0–1	QBT3	0.0989	0.188	NA[e]
RE53-10-22236	53-612481	2–3	QBT3	0.0073	0.0114	NA
RE53-10-22237	53-612482	0–1	QBT3	0.95	1.06	NA
RE53-10-22238	53-612482	2–3	QBT3	0.0145	0.0283	NA

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

[a] SSLs are from NMED (2009, 108070).

[b] na = Not available.

[c] Screening guidelines for unknown oil are from NMED (2006, 094614).

[d] — = Not detected.

[e] NA = Not analyzed.

Table 7.4-1
Samples Collected and Analyses Requested at SWMU 53-005

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides
RE53-10-26417	53-612483	12.5–13.5	QBT3	10-4618	10-4618	10-4618	10-4618	10-4618	10-4618	10-4618	10-4618
RE53-10-26418	53-612483	15–16	QBT3	10-4618	10-4618	10-4618	10-4618	10-4618	10-4618	10-4618	10-4618
RE53-10-26420	53-612484	2–3	QBT3	10-4582	10-4582	10-4582	10-4582	10-4581	10-4581	10-4581	10-4583
RE53-10-26421	53-612484	5–6	QBT3	10-4582	10-4582	10-4582	10-4582	10-4581	10-4581	10-4581	10-4583
RE53-10-26422	53-612484	14–15	QBT3	10-4582	10-4582	10-4582	10-4582	10-4581	10-4581	10-4581	10-4583
RE53-10-26423	53-612485	2–3	QBT3	10-4617	10-4617	10-4617	10-4617	10-4616	10-4616	10-4616	10-4617
RE53-10-26424	53-612485	5–6	QBT3	10-4617	10-4617	10-4617	10-4617	10-4616	10-4616	10-4616	10-4617
RE53-10-26425	53-612485	14–15	QBT3	10-4617	10-4617	10-4617	10-4617	10-4616	10-4616	10-4616	10-4617
RE53-10-26426	53-612486	0–1	QBT3	10-4582	10-4582	10-4582	10-4582	10-4581	10-4581	10-4581	10-4583
RE53-10-26427	53-612486	4–5	QBT3	10-4582	10-4582	10-4582	10-4582	10-4581	10-4581	10-4581	10-4583

Table 7.4-2
Inorganic Chemicals above BVs at SWMU 53-005

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Chromium	Copper	Lead	Nickel	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**7.14**	**4.66**	**11.2**	**6.58**	**na**[b]	**na**	**0.3**
Construction Worker SSL[c]				**124**	**4350**	**449**[d]	**12400**	**800**	**6190**	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**224000**	**2920**[d]	**45400**	**800**	**22700**	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**15600**	**219**[d]	**3130**	**400**	**1560**	**125000**	**54.8**	**391**
RE53-10-26417	53-612483	12.5–13.5	QBT3	0.957 (U)	—[e]	33.3	23	—	9.41	—	—	0.927 (U)
RE53-10-26418	53-612483	15–16	QBT3	0.994 (U)	—	33	17.1	—	—	—	—	1.04 (U)
RE53-10-26420	53-612484	2–3	QBT3	0.691 (J)	—	25.5	6.53	13.8	7.99 (J-)	—	—	1.05 (U)
RE53-10-26421	53-612484	5–6	QBT3	0.604 (J)	—	31.3	—	—	9.56 (J-)	1.23	—	1.01 (U)
RE53-10-26422	53-612484	14–15	QBT3	1.73	—	86.5	5.41	—	8.69 (J-)	—	—	1.02 (U)
RE53-10-26423	53-612485	2–3	QBT3	1.03 (U)	—	—	7.8	—	—	1.14	0.00092 (J)	1.03 (U)
RE53-10-26424	53-612485	5–6	QBT3	0.998 (U)	—	8.53	6.21	—	—	—	0.000631 (J)	1.02 (U)
RE53-10-26425	53-612485	14–15	QBT3	0.933 (U)	—	26.2	7.42	—	—	—	—	0.961 (U)
RE53-10-26426	53-612486	0–1	QBT3	1.13 (U)	53.8 (J-)	—	23.8	12.7	—	1.52	—	1.15 (U)
RE53-10-26427	53-612486	4–5	QBT3	1.03 (U)	46.7 (J-)	7.37	13.1	—	—	1.58	—	1.14 (U)

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070).

[d] SSLs are for hexavalent chromium.

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

Table 7.4-3
Organic Chemicals Detected at SWMU 53-005

Sample ID	Location ID	Depth (ft)	Media	Acetone	Aroclor-1254	Aroclor-1260	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Butanone[2-]	Butylbenzene[sec-]	Dichloroethene[1,1-]	Isopropylbenzene	Isopropyltoluene[4-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene[1,2-]
Construction Worker SSL[a]				**263000**	**4.36**	**75.8**	**952000**[b]	**4760**	**148000**	**18000**	**1830**	**10300**	**10300**[c]	**10600**	**338**	**21100**	**64300**	**4600**	**688**[b]	**3100**[b]	**27500**
Industrial SSL[a]				**851000**	**8.26**	**8.26**	**2500000**[d]	**1370**	**369000**	**420**	**2220**	**14900**	**14900**[c]	**1090**	**36.4**	**57900**	**77100**	**253**	**260**[d]	**10000**[d]	**31500**
Residential SSL[a]				**67500**	**1.12**	**2.22**	**240000**[d]	**347**	**39600**	**110**	**618**	**3210**	**3210**[c]	**199**	**6.99**	**5570**	**21800**	**45.7**	**62**[d]	**780**[d]	**9550**
RE53-10-26417	53-612483	12.5–13.5	QBT3	0.0167 (J)	—[e]	—	—	—	0.0022 (J)	—	—	—	—	—	—	—	—	—	—	—	—
RE53-10-26418	53-612483	15–16	QBT3	0.00615 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.000718 (J)	—	—
RE53-10-26420	53-612484	2–3	QBT3	—	0.0157 (J)	—	0.582 (J)	0.106 (J)	—	—	0.00324	0.01	0.00738	—	0.00109 (J)	0.00109 (J)	0.0212	0.0825	0.0218	—	—
RE53-10-26421	53-612484	5–6	QBT3	—	—	—	0.372 (J)	—	0.00673	—	—	—	—	—	—	—	—	—	—	—	—
RE53-10-26422	53-612484	14–15	QBT3	0.0709	0.0713	—	—	0.116 (J)	0.0199	0.00614	—	—	0.0315	—	0.00115 (J)	—	—	0.0106	0.0113	0.128	0.00286
RE53-10-26423	53-612485	2–3	QBT3	—	—	0.0031 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE53-10-26424	53-612485	5–6	QBT3	—	—	0.003 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE53-10-26425	53-612485	14–15	QBT3	0.00276 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE53-10-26426	53-612486	0–1	QBT3	—	—	—	—	—	—	—	—	—	—	0.0024 (J)	—	—	0.000661 (J)	0.00293	0.000602 (J)	—	—

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

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

[b] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

[c] Isopropylbenzene was used as surrogate based on structural similarity.

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

[e] — = Not detected.

Table 7.4-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 53-005

Sample ID	Location ID	Depth (ft)	Media	Cesium-137
Qbt 2, 3, 4 BV[a]				**na[b]**
Construction Worker SAL[c]				**18**
Industrial SAL[c]				**23**
Residential SAL[c]				**5.6**
RE53-10-26418	53-612483	15–16	QBT3	0.114
RE53-10-26420	53-612484	2–3	QBT3	0.0885

Note: Results are in pCi/g.

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

[b] na = Not available.

[c] SALs are from LANL (2009, 107655).

Table 7.7-1
Samples Collected and Analyses Requested at SWMU 53-006(f)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Nitrate	Perchlorate	Cyanide (Total)	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Stronium-90	Tritium
RE53-10-22254	53-612487	0–1	QBT3	10-4297	10-4297	10-4297	10-4297	10-4296	10-4296	10-4296	10-4298	10-4298	10-4298	10-4298	10-4298
RE53-10-22255	53-612487	2–3	QBT3	10-4297	10-4297	10-4297	10-4297	10-4296	10-4296	10-4296	10-4298	10-4298	10-4298	10-4298	10-4298
RE53-10-22256	53-612487	8–9	QBT3	10-4297	10-4297	10-4297	10-4297	10-4296	10-4296	10-4296	10-4298	10-4298	10-4298	10-4298	10-4298
RE53-10-22257	53-612488	0–1	QBT3	10-4297	10-4297	10-4297	10-4297	10-4296	10-4296	10-4296	10-4298	10-4298	10-4298	10-4298	10-4298
RE53-10-22258	53-612488	2–3	QBT3	10-4297	10-4297	10-4297	10-4297	10-4296	10-4296	10-4296	10-4298	10-4298	10-4298	10-4298	10-4298
RE53-10-22259	53-612488	8–9	QBT3	10-4297	10-4297	10-4297	10-4297	10-4296	10-4296	10-4296	10-4298	10-4298	10-4298	10-4298	10-4298
RE53-10-22260	53-612489	0–1	QBT3	10-4297	10-4297	10-4297	10-4297	10-4296	10-4296	10-4296	10-4298	10-4298	10-4298	10-4298	10-4298
RE53-10-22261	53-612489	2–3	QBT3	10-4297	10-4297	10-4297	10-4297	10-4296	10-4296	10-4296	10-4298	10-4298	10-4298	10-4298	10-4298
RE53-10-22262	53-612489	8–9	QBT3	10-4297	10-4297	10-4297	10-4297	10-4296	10-4296	10-4296	10-4298	10-4298	10-4298	10-4298	10-4298

Table 7.7-2
Inorganic Chemicals Detected or Detected above BVs at SWMU 53-006(f)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Calcium	Chromium	Cobalt	Copper	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Selenium	Vanadium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**2200**	**7.14**	**3.14**	**4.66**	**11.2**	**1690**	**482**	**6.58**	**na**[b]	**na**	**0.3**	**17**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**na**	**449**[d]	**34.6**[e]	**12400**	**800**	**na**	**463**	**6190**	**496000**	**217**	**1550**	**1550**
Industrial SSL[c]				**1130000**	**454**	**224000**	**na**	**2920**[d]	**300**[f]	**45400**	**800**	**na**	**145000**	**22700**	**1820000**	**795**	**5680**	**5680**
Residential SSL[c]				**78100**	**31.3**	**15600**	**na**	**219**[d]	**23**[f]	**3130**	**400**	**na**	**10700**	**1560**	**125000**	**54.8**	**391**	**391**
RE53-10-22254	53-612487	0–1	QBT3	—g	1.01 (U)	105	4310	—	—	—	11.5	—	—	—	—	—	1.06 (U)	—
RE53-10-22255	53-612487	2–3	QBT3	—	1.1 (U)	—	—	—	—	—	—	—	—	—	—	—	1.11 (U)	—
RE53-10-22256	53-612487	8–9	QBT3	—	1.13 (U)	81.4	—	—	—	6.07	—	—	—	7.15	5.66	0.000769 (J)	1.1 (U)	—
RE53-10-22257	53-612488	0–1	QBT3	—	1.04 (U)	88.9	6520	7.61	—	6.01	—	1730 (J+)	—	—	2.89	—	1.09 (U)	—
RE53-10-22258	53-612488	2–3	QBT3	8230	1.06 (U)	114	2820	7.73	4.17	5.6	—	1780 (J+)	—	—	1.9	—	1.11 (U)	19.8
RE53-10-22259	53-612488	8–9	QBT3	9240	1.18 (U)	186	—	10.8	8.06	7.48	14	2030 (J+)	548	8.46	13	—	1.17 (U)	29.6
RE53-10-22260	53-612489	0–1	QBT3	—	1.07 (U)	76.2	2290	—	—	5.52	12.6	—	—	—	2.85	—	1.02 (U)	—
RE53-10-22261	53-612489	2–3	QBT3	—	1.08 (U)	—	—	—	—	—	—	—	—	—	6.81	—	1.1 (U)	—
RE53-10-22262	53-612489	8–9	QBT3	10400	1.14 (U)	123	2580	10.7	5.38	8.66	12	2360 (J+)	—	8.35	3.87	—	1.13 (U)	25.6

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

[a] BVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2009, 108070), unless otherwise noted.

[d] SSLs are for hexavalent chromium.

[e] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

[f] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

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

Table 7.7-3
Organic Chemicals Detected at SWMU 53-006(f)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260	Diethylphthalate
Construction Worker SSL[a]				**4.36**	**75.8**	**191000**
Industrial SSL[a]				**8.26**	**8.26**	**547000**
Residential SSL[a]				**1.12**	**2.22**	**48900**
RE53-10-22254	53-612487	0–1	QBT3	—[b]	0.0105 (J)	—
RE53-10-22255	53-612487	2–3	QBT3	0.0032 (J)	0.0035 (J)	—
RE53-10-22257	53-612488	0–1	QBT3	0.0094 (J)	0.0096 (J)	—
RE53-10-22260	53-612489	0–1	QBT3	0.0735	0.0663	—
RE53-10-22261	53-612489	2–3	QBT3	0.012	0.0057	0.103 (J)

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

[a] SSLs are from NMED (2009, 108070).

[b] — = Not detected.

Table 7.7-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 53-006(f)

Sample ID	Location ID	Depth (ft)	Media	Tritium
Qbt 2, 3, 4 BV[a]				**na**[b]
Construction Worker SAL[c]				**320000**
Industrial SAL[c]				**440000**
Residential SAL[c]				**750**
RE53-10-22256	53-612487	8–9	QBT3	0.0358453
RE53-10-22257	53-612488	0–1	QBT3	0.0257297
RE53-10-22258	53-612488	2–3	QBT3	0.0284914
RE53-10-22259	53-612488	8–9	QBT3	0.0581442
RE53-10-22262	53-612489	8–9	QBT3	0.0463953

Note: Results are in pCi/g.

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

[b] na = Not available.

[c] SALs from LANL (2009, 107655).

Table 7.9-1
Samples Collected and Analyses Requested at AOC 53-008

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Cyanide (Total)	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Tritium
RE53-10-22320	53-612507	0–1	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22321	53-612507	2–3	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22322	53-612508	0–1	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22323	53-612508	2–3	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22324	53-612509	0–1	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22325	53-612509	2–3	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22326	53-612510	0–1	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22327	53-612510	2–3	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22328	53-612511	0–1	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22329	53-612511	2–3	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153

Table 7.9-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Cyanide (Total)	PCBs	SVOCs	VOCs	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Tritium
RE53-10-22330	53-612512	0–1	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22331	53-612512	2–3	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22332	53-612513	0–1	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22333	53-612513	2–3	QBT3	10-4154	10-4154	10-4152	10-4152	10-4152	10-4153	10-4153	10-4153	10-4153
RE53-10-22334	53-612514	0–1	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22335	53-612514	2–3	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22336	53-612515	0–1	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22337	53-612515	2–3	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22338	53-612516	0–1	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22339	53-612516	2–3	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22340	53-612517	0–1	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22341	53-612517	2–3	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22342	53-612518	0–1	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22343	53-612518	2–3	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22344	53-612519	0–1	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22345	53-612519	2–3	QBT3	10-4160	10-4160	10-4159	10-4159	10-4159	10-4161	10-4161	10-4161	10-4161
RE53-10-22346	53-612520	0–1	QBT3	10-4207	10-4207	10-4206	10-4206	10-4206	10-4208	10-4208	10-4208	10-4208
RE53-10-22347	53-612520	2–3	QBT3	10-4207	10-4207	10-4206	10-4206	10-4206	10-4208	10-4208	10-4208	10-4208
RE53-10-22348	53-612521	0–1	QBT3	10-4207	10-4207	10-4206	10-4206	10-4206	10-4208	10-4208	10-4208	10-4208
RE53-10-22349	53-612521	2–3	QBT3	10-4207	10-4207	10-4206	10-4206	10-4206	10-4208	10-4208	10-4208	10-4208
RE53-10-22350	53-612522	0–1	QBT3	10-4207	10-4207	10-4206	10-4206	10-4206	10-4208	10-4208	10-4208	10-4208
RE53-10-22351	53-612522	2–3	QBT3	10-4207	10-4207	10-4206	10-4206	10-4206	10-4208	10-4208	10-4208	10-4208
RE53-10-22352	53-612523	0–1	QBT3	10-4207	10-4207	10-4206	10-4206	10-4206	10-4208	10-4208	10-4208	10-4208
RE53-10-22353	53-612523	2–3	QBT3	10-4207	10-4207	10-4206	10-4206	10-4206	10-4208	10-4208	10-4208	10-4208

Table 7.9-2
Inorganic Chemicals above BVs at AOC 53-008

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Lead	Magnesium	Mercury	Nickel	Selenium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**11.2**	**1690**	**0.1**	**6.58**	**0.3**
Construction Worker SSL[b]				**40700**	**124**	**65.4**	**4350**	**144**	**na**[c]	**449**[d]	**34.6**[e]	**12400**	**6190**	**800**	**na**	**92.9**[e]	**6190**	**1550**
Industrial SSL[b]				**1130000**	**454**	**17.7**	**224000**	**2260**	**na**	**2920**[d]	**300**[f]	**45400**	**22700**	**800**	**na**	**310**[f]	**22700**	**5680**
Residential SSL[b]				**78100**	**31.3**	**3.9**	**15600**	**156**	**na**	**219**[d]	**23**[f]	**3130**	**1560**	**400**	**na**	**23**[f]	**1560**	**391**
RE53-10-22320	53-612507	0–1	QBT3	—[g]	1.09 (U)	—	70.5	—	—	7.2	—	6.33	—	12.2	—	—	9.74 (J-)	1.08 (UJ)
RE53-10-22321	53-612507	2–3	QBT3	—	0.96 (U)	—	—	—	—	—	—	—	—	—	—	—	—	0.971 (UJ)
RE53-10-22322	53-612508	0–1	QBT3	—	1.03 (U)	—	54.3	—	—	—	—	4.83	—	11.6	—	—	—	1.02 (UJ)
RE53-10-22323	53-612508	2–3	QBT3	9160 (J+)	1.06 (U)	—	53.1	—	2430	10.7	—	—	—	—	2030 (J+)	—	—	1.08 (UJ)
RE53-10-22324	53-612509	0–1	QBT3	—	1.04 (U)	—	—	—	—	—	—	6.31	—	—	—	—	—	1.04 (UJ)
RE53-10-22325	53-612509	2–3	QBT3	—	1.08 (U)	—	102	—	2420	28	—	5.63	—	—	—	—	7.09 (J-)	1.08 (UJ)
RE53-10-22326	53-612510	0–1	QBT3	—	1.08 (U)	—	55.4	—	—	8	3.56	5.44	—	11.8	—	—	12.6 (J-)	1.08 (UJ)
RE53-10-22327	53-612510	2–3	QBT3	—	1.04 (U)	—	—	—	—	7.7	—	—	—	—	—	—	—	1 (UJ)
RE53-10-22328	53-612511	0–1	QBT3	—	1.03 (U)	—	—	—	3720	—	—	—	—	—	—	—	—	1.05 (UJ)
RE53-10-22329	53-612511	2–3	QBT3	—	0.97 (U)	—	—	—	2310	12.7	—	—	—	—	—	—	—	1 (UJ)
RE53-10-22330	53-612512	0–1	QBT3	—	1.03 (U)	—	—	—	—	—	—	—	—	—	—	—	—	1.02 (UJ)
RE53-10-22331	53-612512	2–3	QBT3	—	1.04 (U)	—	62.9	—	2970	9.6	—	—	—	—	—	—	—	1.03 (UJ)
RE53-10-22332	53-612513	0–1	QBT3	—	1.04 (U)	—	94	—	5580	—	—	5.2	—	11.9	—	—	—	1.04 (UJ)
RE53-10-22333	53-612513	2–3	QBT3	—	3.08	—	67.9	—	14700	150	—	4.94	—	—	—	—	11.7 (J-)	1.04 (UJ)
RE53-10-22334	53-612514	0–1	QBT3	—	0.967 (U)	—	52	—	—	—	—	—	—	12	—	—	—	0.977 (U)
RE53-10-22335	53-612514	2–3	QBT3	—	0.918 (U)	—	—	—	—	—	—	—	—	—	—	—	—	0.906 (U)
RE53-10-22336	53-612515	0–1	QBT3	—	0.943 (U)	—	51.7	—	5430	—	—	—	4.1 (J)	—	—	—	—	0.971 (U)
RE53-10-22337	53-612515	2–3	QBT3	—	1.06 (U)	—	60.1	—	3460	—	—	5.96 (J)	—	11.4	—	—	—	1.08 (U)
RE53-10-22338	53-612516	0–1	QBT3	—	0.948 (U)	—	—	—	—	—	—	—	—	—	—	—	—	1.04 (U)
RE53-10-22339	53-612516	2–3	QBT3	—	0.986 (U)	—	130	—	7260	31	—	4.97 (J)	4.07 (J)	—	—	—	18 (J+)	0.482 (J)
RE53-10-22340	53-612517	0–1	QBT3	—	1.07 (U)	—	49.4	—	—	—	—	—	—	12.3	—	—	—	1.03 (U)
RE53-10-22341	53-612517	2–3	QBT3	—	0.968 (U)	—	—	—	—	23.5	—	—	—	—	—	—	12.4 (J+)	1 (U)
RE53-10-22342	53-612518	0–1	QBT3	—	0.987 (U)	—	—	—	—	—	—	—	—	—	—	—	—	0.958 (U)
RE53-10-22343	53-612518	2–3	QBT3	—	0.973 (U)	—	144	—	5210	—	—	—	—	—	—	—	—	1.03 (U)
RE53-10-22344	53-612519	0–1	QBT3	—	0.961 (U)	—	77.6	—	—	—	3.61	5.59 (J)	14.9 (J)	14.1	—	—	—	0.986 (U)
RE53-10-22345	53-612519	2–3	QBT3	—	0.96 (U)	—	—	—	—	—	—	—	—	—	—	—	—	1.01 (U)
RE53-10-22346	53-612520	0–1	QBT3	—	1.04 (U)	—	68.8	—	3000	—	—	—	—	—	—	—	—	1.03 (U)
RE53-10-22347	53-612520	2–3	QBT3	—	1.04 (U)	—	—	—	2550	—	—	—	—	—	—	—	—	1.05 (U)

Table 7.9-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Lead	Magnesium	Mercury	Nickel	Selenium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**11.2**	**1690**	**0.1**	**6.58**	**0.3**
Construction Worker SSL[b]				**40700**	**124**	**65.4**	**4350**	**144**	**na**[c]	**449**[d]	**34.6**[e]	**12400**	**6190**	**800**	**na**	**92.9**[e]	**6190**	**1550**
Industrial SSL[b]				**1130000**	**454**	**17.7**	**224000**	**2260**	**na**	**2920**[d]	**300**[f]	**45400**	**22700**	**800**	**na**	**310**[f]	**22700**	**5680**
Residential SSL[b]				**78100**	**31.3**	**3.9**	**15600**	**156**	**na**	**219**[d]	**23**[f]	**3130**	**1560**	**400**	**na**	**23**[f]	**1560**	**391**
RE53-10-22348	53-612521	0–1	QBT3	—	1.01 (U)	—	90.5	—	—	7.66	3.4	6.38	—	14	—	—	7.41	1 (U)
RE53-10-22349	53-612521	2–3	QBT3	—	1.03 (U)	—	—	—	9420	—	—	—	—	—	—	—	—	1.04 (U)
RE53-10-22350	53-612522	0–1	QBT3	—	0.981 (U)	—	65.9	—	2560	—	—	5.34	—	13.1	—	—	—	1.05 (U)
RE53-10-22351	53-612522	2–3	QBT3	—	0.984 (U)	—	—	—	2730	—	—	—	—	—	—	—	—	1.04 (U)
RE53-10-22352	53-612523	0–1	QBT3	—	0.935 (U)	—	53.9	—	—	—	—	—	—	—	—	—	—	1.03 (U)
RE53-10-22353	53-612523	2–3	QBT3	—	1.06 (U)	5.64	184	1.35	24800	8.27	3.17	6.52	—	26.2	3720 (J+)	0.11	8.27	1.03 (J)

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

[a] BVs are from LANL (1998, 059730).

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

[c] na = Not available.

[d] SSLs are for hexavalent chromium.

[e] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

[f] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

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

Table 7.9-3
Organic Chemicals Detected at AOC 53-008

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1248	Aroclor-1254	Aroclor-1260	Benzoic Acid	Ethylbenzene	Methylene Chloride	Toluene	Xylene[1,3-]+Xylene[1,4-]
Construction Worker SSL[a]				**75.8**	**4.36**	**75.8**	**952000[b]**	**6630**	**10600**	**21100**	**3130[d]**
Industrial SSL[a]				**8.26**	**8.26**	**8.26**	**2500000[c]**	**385**	**1090**	**57900**	**3610[d]**
Residential SSL[a]				**2.22**	**1.12**	**2.22**	**240000[c]**	**69.7**	**199**	**5570**	**1090[d]**
RE53-10-22320	53-612507	0–1	QBT3	—[e]	—	—	—	—	0.00353 (J+)	—	—
RE53-10-22322	53-612508	0–1	QBT3	—	—	—	—	—	0.00224 (J+)	—	—
RE53-10-22324	53-612509	0–1	QBT3	—	—	0.0027 (J)	—	—	—	—	—
RE53-10-22326	53-612510	0–1	QBT3	—	—	0.0171	0.477 (J)	—	—	—	—
RE53-10-22327	53-612510	2–3	QBT3	—	—	—	—	—	0.00264 (J)	—	—
RE53-10-22328	53-612511	0–1	QBT3	—	—	—	—	—	0.00246 (J+)	0.000623 (J+)	0.000528 (J+)
RE53-10-22330	53-612512	0–1	QBT3	—	—	—	—	—	0.00274 (J)	—	—
RE53-10-22331	53-612512	2–3	QBT3	—	—	—	—	—	0.00334 (J)	—	—
RE53-10-22339	53-612516	2–3	QBT3	—	—	—	—	—	—	0.000346 (J)	—
RE53-10-22340	53-612517	0–1	QBT3	—	—	0.0034 (J)	—	—	—	—	—
RE53-10-22341	53-612517	2–3	QBT3	0.0195	0.0276	0.0033 (J)	—	—	—	0.000335 (J)	—
RE53-10-22344	53-612519	0–1	QBT3	—	—	0.0917	—	—	—	—	—
RE53-10-22349	53-612521	2–3	QBT3	—	—	—	—	0.0035	—	—	—
RE53-10-22352	53-612523	0–1	QBT3	—	—	—	—	0.000547 (J)	—	—	—

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

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

[b] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

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

[d] Xylenes used as surrogate based on structural similarity.

[e] — = Not detected.

Table 7.9-4
Radionuclides Detected or Detected above BVs/FVs at AOC 53-008

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Cobalt-60	Plutonium-239/240	Tritium	Uranium-235/236
Qbt 2, 3, 4 BV[a]				**na[b]**	**na**	**na**	**na**	**0.09**
Construction Worker SAL[c]				**18**	**4.1**	**36**	**320000**	**43**
Industrial SAL[c]				**23**	**5.1**	**210**	**440000**	**87**
Residential SAL[c]				**5.6**	**1.3**	**33**	**750**	**17**
RE53-10-22320	53-612507	0–1	QBT3	0.465	—[d]	0.0327	—	—
RE53-10-22321	53-612507	2–3	QBT3	—	—	—	0.00550913	—
RE53-10-22322	53-612508	0–1	QBT3	0.607	—	0.039	0.0104392	—
RE53-10-22323	53-612508	2–3	QBT3	—	—	—	0.0258976	—
RE53-10-22324	53-612509	0–1	QBT3	0.189	—	—	—	—
RE53-10-22325	53-612509	2–3	QBT3	—	—	0.068	—	—
RE53-10-22326	53-612510	0–1	QBT3	0.344	—	—	—	—
RE53-10-22328	53-612511	0–1	QBT3	0.507	—	—	0.0188789	—
RE53-10-22330	53-612512	0–1	QBT3	—	0.359	—	0.00762201	—
RE53-10-22331	53-612512	2–3	QBT3	—	—	—	0.027311	—
RE53-10-22332	53-612513	0–1	QBT3	0.337	—	0.0206	0.0193358	—
RE53-10-22333	53-612513	2–3	QBT3	—	—	—	0.00889474	—
RE53-10-22334	53-612514	0–1	QBT3	0.188	—	—	0.00789747	—
RE53-10-22335	53-612514	2–3	QBT3	—	—	0.388	0.0047502	—
RE53-10-22336	53-612515	0–1	QBT3	—	—	—	0.139873	—
RE53-10-22337	53-612515	2–3	QBT3	—	0.281	—	0.339521	—
RE53-10-22338	53-612516	0–1	QBT3	0.0924	0.717	—	0.0164326	—
RE53-10-22339	53-612516	2–3	QBT3	—	—	—	0.0330177	—
RE53-10-22340	53-612517	0–1	QBT3	0.603	0.144	—	—	—
RE53-10-22341	53-612517	2–3	QBT3	—	—	—	0.715034	—
RE53-10-22342	53-612518	0–1	QBT3	0.152	—	0.0392	—	—
RE53-10-22344	53-612519	0–1	QBT3	0.423	—	0.0467 (J+)	—	—
RE53-10-22345	53-612519	2–3	QBT3	—	—	—	0.00769812	—
RE53-10-22346	53-612520	0–1	QBT3	—	—	—	—	0.1
RE53-10-22347	53-612520	2–3	QBT3	—	—	—	0.526947	—
RE53-10-22349	53-612521	2–3	QBT3	—	—	—	0.0104463	—
RE53-10-22350	53-612522	0–1	QBT3	0.342	—	0.0252	0.0571034	—
RE53-10-22351	53-612522	2–3	QBT3	—	—	—	0.0535745	0.106
RE53-10-22352	53-612523	0–1	QBT3	0.414	—	0.0401	—	—

Note: Results are in pCi/g.

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

[b] na = Not available.

[c] SALs are from LANL (2009, 107655).

[d] — = Not detected.

Table 7.10-1
Samples Collected and Analyses Requested at AOC 53-009

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	PCBs	SVOCs	VOCs	TPH-DRO
RE53-06-73677	53-27007	2–2.5	FILL	—*	—	6242S	6242S	6242S
RE53-06-73678	53-27008	1.5–2	FILL	—	—	6242S	6242S	6242S
RE53-10-22363	53-612524	0–1	QBT3	10-4205	10-4204	10-4204	10-4204	—
RE53-10-22364	53-612524	2–3	QBT3	10-4205	10-4204	10-4204	10-4204	—
RE53-10-22365	53-612525	0–1	QBT3	10-4205	10-4204	10-4204	10-4204	—
RE53-10-22368	53-612525	2–3	QBT3	10-4205	10-4204	10-4204	10-4204	—
RE53-10-22367	53-612526	0–1	QBT3	10-4205	10-4204	10-4204	10-4204	—
RE53-10-22366	53-612526	2–3	QBT3	10-4205	10-4204	10-4204	10-4204	—
RE53-10-22369	53-612527	0–1	QBT3	10-4205	10-4204	10-4204	10-4204	—
RE53-10-22370	53-612527	2–3	QBT3	10-4205	10-4204	10-4204	10-4204	—
RE53-10-22371	53-612528	0–1	QBT3	10-4205	10-4204	10-4204	10-4204	—
RE53-10-22372	53-612528	2–3	QBT3	10-4205	10-4204	10-4204	10-4204	—
RE53-10-22373	53-612529	0–1	QBT3	10-4203	10-4202	10-4202	10-4202	—
RE53-10-22374	53-612529	2–3	QBT3	10-4203	10-4202	10-4202	10-4202	—
RE53-10-22375	53-612530	0–1	QBT3	10-4203	10-4202	10-4202	10-4202	—
RE53-10-22376	53-612530	2–3	QBT3	10-4203	10-4202	10-4202	10-4202	—
RE53-10-22377	53-612531	0–1	QBT3	10-4203	10-4202	10-4202	10-4202	—
RE53-10-22378	53-612531	2–3	QBT3	10-4203	10-4202	10-4202	10-4202	—
RE53-10-22379	53-612532	0–1	QBT3	10-4203	10-4202	10-4202	10-4202	—
RE53-10-22380	53-612532	2–3	QBT3	10-4203	10-4202	10-4202	10-4202	—

* — = Analysis not requested.

Table 7.10-2
Inorganic Chemicals above BVs at AOC 53-009

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Calcium	Chromium	Cobalt	Copper	Lead	Magnesium	Nickel	Selenium	Vanadium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**2200**	**7.14**	**3.14**	**4.66**	**11.2**	**1690**	**6.58**	**0.3**	**17**
Construction Worker SSL[b]				**124**	**4350**	**na**[c]	**449**[d]	**34.6**[e]	**12400**	**800**	**na**	**6190**	**1550**	**1550**
Industrial SSL[b]				**454**	**224000**	**na**	**2920**[d]	**300**[f]	**45400**	**800**	**na**	**22700**	**5680**	**5680**
Residential SSL[b]				**31.3**	**15600**	**na**	**219**[d]	**23**[f]	**3130**	**400**	**na**	**1560**	**391**	**391**
RE53-10-22363	53-612524	0–1	QBT3	1.03 (U)	224 (J)	3370 (J+)	—[g]	3.88	7.65	—	1710 (J)	—	0.959 (U)	29.6
RE53-10-22364	53-612524	2–3	QBT3	0.973 (U)	—	2790 (J+)	—	—	—	—	—	—	0.995 (U)	—
RE53-10-22365	53-612525	0–1	QBT3	0.972 (U)	—	3320 (J+)	—	—	—	—	—	—	0.974 (U)	—
RE53-10-22368	53-612525	2–3	QBT3	0.957 (U)	—	—	—	—	—	—	—	—	1.04 (U)	—
RE53-10-22367	53-612526	0–1	QBT3	1 (U)	—	5850 (J+)	—	—	—	—	—	—	0.959 (U)	20.7
RE53-10-22366	53-612526	2–3	QBT3	1.06 (U)	—	—	—	—	—	11.6	—	—	1.03 (U)	—
RE53-10-22369	53-612527	0–1	QBT3	1.01 (U)	233 (J)	2530 (J+)	8	3.94	7.41	—	1760 (J)	7.76	0.982 (U)	33.3
RE53-10-22370	53-612527	2–3	QBT3	1.05 (U)	—	—	—	—	—	17.9	—	—	1.05 (U)	—
RE53-10-22371	53-612528	0–1	QBT3	0.969 (U)	199 (J)	3070 (J+)	7.79	3.58	11.8	—	1740 (J)	—	0.96 (U)	27.8
RE53-10-22372	53-612528	2–3	QBT3	1.09 (U)	—	—	—	—	—	—	—	—	1.08 (U)	—
RE53-10-22373	53-612529	0–1	QBT3	1 (U)	—	—	—	—	—	—	—	—	1 (U)	—
RE53-10-22374	53-612529	2–3	QBT3	1.02 (U)	—	—	—	—	—	—	—	—	1.02 (U)	—
RE53-10-22375	53-612530	0–1	QBT3	0.977 (U)	47.9 (J)	8320 (J+)	—	—	—	—	—	—	0.966 (U)	22.4
RE53-10-22376	53-612530	2–3	QBT3	1.12 (U)	—	—	—	—	—	—	—	—	1.06 (U)	—
RE53-10-22377	53-612531	0–1	QBT3	1 (U)	250 (J)	3230 (J+)	9.16	4.24	8.84	—	1910 (J)	—	0.99 (U)	36
RE53-10-22378	53-612531	2–3	QBT3	1.07 (U)	—	—	7.36	—	—	—	—	—	0.984 (U)	—

Table 7.10-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Calcium	Chromium	Cobalt	Copper	Lead	Magnesium	Nickel	Selenium	Vanadium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**2200**	**7.14**	**3.14**	**4.66**	**11.2**	**1690**	**6.58**	**0.3**	**17**
Construction Worker SSL[b]				**124**	**4350**	**na[c]**	**449[d]**	**34.6[e]**	**12400**	**800**	**na**	**6190**	**1550**	**1550**
Industrial SSL[b]				**454**	**224000**	**na**	**2920[d]**	**300[f]**	**45400**	**800**	**na**	**22700**	**5680**	**5680**
Residential SSL[b]				**31.3**	**15600**	**na**	**219[d]**	**23[f]**	**3130**	**400**	**na**	**1560**	**391**	**391**
RE53-10-22379	53-612532	0–1	QBT3	0.788 (J)	77.1 (J)	20000 (J+)	14.9	3.29	7.07	201	—	9.5	0.959 (U)	17.5
RE53-10-22380	53-612532	2–3	QBT3	0.971 (U)	81.2 (J)	—	—	—	—	24.3	—	—	1.03 (U)	—

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

[a] BVs are from LANL (1998, 059730).

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

[c] na = Not available.

[d] SSLs are for hexavalent chromium.

[e] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

[f] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

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

Table 7.10-3
Organic Chemicals Detected at AOC 53-009

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1242	Aroclor-1254	Aroclor-1260	TPH-DRO
Construction Worker SSL[a]				**75.8**	**4.36**	**75.8**	**na**[b]
Industrial SSL[a]				**8.26**	**8.26**	**8.26**	**200**[c]
Residential SSL[a]				**2.22**	**1.12**	**2.22**	**200**[c]
RE53-06-73678	53-27008	1.5–2	FILL	NA[d]	NA	NA	4.35
RE53-10-22363	53-612524	0–1	QBT3	—[e]	0.0042	—	NA
RE53-10-22365	53-612525	0–1	QBT3	—	0.0292 (J)	0.0088	NA
RE53-10-22370	53-612527	2–3	QBT3	—	0.0033 (J)	0.0047	NA
RE53-10-22374	53-612529	2–3	QBT3	0.0053	0.0241	0.0109	NA
RE53-10-22378	53-612531	2–3	QBT3	—	0.0024 (J)	—	NA
RE53-10-22379	53-612532	0–1	QBT3	—	0.0191	0.0096 (J)	NA
RE53-10-22380	53-612532	2–3	QBT3	0.0034 (J)	0.0072	—	NA

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

[a] SSLs are from NMED (2009, 108070).

[b] na = Not available.

[c] Screening guidelines for unknown oil from NMED (2006, 094614).

[d] NA = Not analyzed.

[e] — = Not detected.

Table 7.11-1
Samples Collected and Analyses Requested at AOC 53-010

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	PCBs	SVOCs	VOCs
RE53-10-22390	53-612533	0–1	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22391	53-612533	3–4	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22392	53-612534	0–1	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22393	53-612534	3–4	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22394	53-612535	0–1	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22395	53-612535	3–4	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22396	53-612536	0–1	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22397	53-612536	3–4	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22398	53-612537	0–1	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22399	53-612537	3–4	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22400	53-612538	0–1	QBT3	10-4292	10-4291	10-4291	10-4291
RE53-10-22401	53-612538	3–4	QBT3	10-4292	10-4291	10-4291	10-4291

Table 7.11-2
Inorganic Chemicals above BVs at AOC 53-010

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Calcium	Chromium	Cobalt	Copper	Selenium	Vanadium
Qbt 2, 3, 4 BV[a]				**0.5**	**46**	**2200**	**7.14**	**3.14**	**4.66**	**0.3**	**17**
Construction Worker SSL[b]				**124**	**4350**	**na[c]**	**449[d]**	**34.6[e]**	**12400**	**1550**	**1550**
Industrial SSL[b]				**454**	**224000**	**na**	**2920[d]**	**300[f]**	**45400**	**5680**	**5680**
Residential SSL[b]				**31.3**	**15600**	**na**	**219[d]**	**23[f]**	**3130**	**391**	**391**
RE53-10-22390	53-612533	0–1	QBT3	1.15 (U)	71.8	—[g]	7.34 (J)	3.89	5.97	1.15 (U)	18.3 (J)
RE53-10-22391	53-612533	3–4	QBT3	0.935 (U)	—	—	—	—	—	1.01 (U)	—
RE53-10-22392	53-612534	0–1	QBT3	0.958 (U)	68.9	3150 (J)	—	3.48	—	1.05 (U)	17.3 (J)
RE53-10-22393	53-612534	3–4	QBT3	1.01 (U)	52.5	25600 (J)	—	—	—	1.01 (U)	—
RE53-10-22394	53-612535	0–1	QBT3	—	74.3	4130 (J)	—	3.37	4.83	1.02 (U)	—
RE53-10-22395	53-612535	3–4	QBT3	—	83.9	45800 (J)	16.2 (J)	—	—	1.01 (U)	—
RE53-10-22396	53-612536	0–1	QBT3	1.02 (U)	64.4	2560 (J)	—	3.2	4.78	1.13 (U)	—
RE53-10-22397	53-612536	3–4	QBT3	1.02 (U)	47.6	26400 (J)	—	—	—	0.982 (U)	—
RE53-10-22398	53-612537	0–1	QBT3	1.04 (U)	69.7	3280 (J)	—	3.16	5.04	1.08 (U)	—
RE53-10-22399	53-612537	3–4	QBT3	0.98 (U)	—	10600 (J)	—	—	—	0.983 (U)	—
RE53-10-22400	53-612538	0–1	QBT3	1.14 (U)	61	—	—	—	4.84	1.09 (U)	—
RE53-10-22401	53-612538	3–4	QBT3	1.02 (U)	—	—	—	—	—	0.941 (U)	—

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

[a] BVs are from LANL (1998, 059730).

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

[c] na = Not available.

[d] SSLs are for hexavalent chromium.

[e] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

[f] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

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

Table 7.11-3
Organic Chemicals Detected at AOC 53-010

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260	Benzo(b)fluoranthene	Diethylphthalate
Construction Worker SSL[a]				**4.36**	**75.8**	**213**	**191000**
Industrial SSL[a]				**8.26**	**8.26**	**23.4**	**547000**
Residential SSL[a]				**1.12**	**2.22**	**6.21**	**48900**
RE53-10-22395	53-612535	3–4	QBT3	—[b]	—	—	1.92
RE53-10-22396	53-612536	0–1	QBT3	0.0031 (J)	0.0031 (J)	—	—
RE53-10-22398	53-612537	0–1	QBT3	—	—	0.0185 (J)	—

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

[a] SSLs are from NMED (2009, 108070).

[b] — = Not detected.

Table 7.12-1
Samples Collected and Analyses Requested at AOC 53-012(e)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Cyanide (Total)	PCBs	Pesticides	SVOCs	VOCs	Pesticides/PCBs	TPH	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90
0253-95-0048	53-01086	0–0.33	SOIL	185	—	—	—		184	184	184	—*	—	—	—
0253-95-0051	53-01087	0–0.67	SOIL	185	—	—	—		184	184	184	—	—	—	—
0253-95-0054	53-01088	0–0.33	SOIL	185	—	—	—		184	184	184	—	—	—	—
RE53-10-22408	53-612539	0–1	SOIL	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22409	53-612539	2–3	QBT3	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22410	53-612540	0–1	SOIL	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22411	53-612540	1–2	QBT3	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22412	53-612541	0–1	SOIL	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22413	53-612541	3–4	QBT3	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22414	53-612542	0–1	SOIL	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22415	53-612542	3–4	QBT3	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22416	53-612543	1–2	SOIL	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22417	53-612543	3–4	QBT3	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22418	53-612544	1–2	SOIL	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295
RE53-10-22419	53-612544	2–3	QBT3	10-4294	10-4294	10-4293	10-4293	10-4293	10-4293	—	—	10-4295	10-4295	10-4295	10-4295

* — = Analysis not requested.

Table 7.12-2
Inorganic Chemicals above BVs at AOC 53-012(e)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Cadmium	Chromium	Copper	Cyanide (Total)	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Qbt 2, 3, 4 BV[a]				**0.5**	**1.63**	**7.14**	**4.66**	**0.5**	**11.2**	**0.1**	**6.58**	**0.3**	**1**	**1.1**	**63.5**
Soil BV[a]				**0.83**	**0.4**	**19.3**	**14.7**	**0.5**	**22.3**	**0.1**	**15.4**	**1.52**	**1**	**0.73**	**48.8**
Construction Worker SSL[b]				**124**	**309**	**449[c]**	**12400**	**6190**	**800**	**92.9[d]**	**6190**	**1550**	**1550**	**20.4**	**92900**
Industrial SSL[b]				**454**	**1120**	**2920[c]**	**45400**	**22700**	**800**	**310[e]**	**22700**	**5680**	**5680**	**74.9**	**341000**
Residential SSL[b]				**31.3**	**77.9**	**219[c]**	**3130**	**1560**	**400**	**23[e]**	**1560**	**391**	**391**	**5.16**	**23500**
0253-95-0048	53-01086	0–0.33	SOIL	2.3 (J)	1.2 (J)	23.5	267	NA[f]	38.6	0.27	27	—[g]	2.3 (J)	1.7 (U)	218
0253-95-0051	53-01087	0–0.67	SOIL	1.7 (J)	0.43 (J)	—	46.2	NA	—	0.11 (U)	—	—	1.5 (U)	1.5 (U)	87.4
0253-95-0054	53-01088	0–0.33	SOIL	1.6 (J)	1.2 (J)	—	46.2	NA	29.7	0.11 (U)	—	—	1.5 (U)	1.5 (U)	159
RE53-10-22408	53-612539	0–1	SOIL	1.2 (U)	—	—	—	—	—	—	—	—	—	—	—
RE53-10-22409	53-612539	2–3	QBT3	1.03 (U)	—	—	—	—	—	—	—	1.02 (UJ)	—	—	—
RE53-10-22410	53-612540	0–1	SOIL	1.1 (U)	—	—	—	—	—	—	—	—	—	—	—
RE53-10-22411	53-612540	1–2	QBT3	1.16 (U)	—	—	14.6	—	—	—	—	1.16 (UJ)	—	—	—
RE53-10-22412	53-612541	0–1	SOIL	1.37	0.69	—	25.3	—	—	—	—	—	—	—	150
RE53-10-22413	53-612541	3–4	QBT3	1.16 (U)	—	—	5.19	—	—	—	—	1.12 (UJ)	—	—	—
RE53-10-22414	53-612542	0–1	SOIL	1.32	—	—	14.9	—	24.7	—	—	—	—	—	55
RE53-10-22415	53-612542	3–4	QBT3	0.504 (J)	—	—	—	—	—	—	—	1.14 (UJ)	—	—	—
RE53-10-22416	53-612543	1–2	SOIL	1.16 (U)	—	—	—	—	—	—	—	—	—	—	—
RE53-10-22417	53-612543	3–4	QBT3	1.05 (U)	—	—	—	—	12.2	—	—	1.06 (UJ)	—	—	—

Table 7.12-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Cadmium	Chromium	Copper	Cyanide (Total)	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Qbt 2, 3, 4 BV[a]				**0.5**	**1.63**	**7.14**	**4.66**	**0.5**	**11.2**	**0.1**	**6.58**	**0.3**	**1**	**1.1**	**63.5**
Soil BV[a]				**0.83**	**0.4**	**19.3**	**14.7**	**0.5**	**22.3**	**0.1**	**15.4**	**1.52**	**1**	**0.73**	**48.8**
Construction Worker SSL[b]				**124**	**309**	**449[c]**	**12400**	**6190**	**800**	**92.9[d]**	**6190**	**1550**	**1550**	**20.4**	**92900**
Industrial SSL[b]				**454**	**1120**	**2920[c]**	**45400**	**22700**	**800**	**310[e]**	**22700**	**5680**	**5680**	**74.9**	**341000**
Residential SSL[b]				**31.3**	**77.9**	**219[c]**	**3130**	**1560**	**400**	**23[e]**	**1560**	**391**	**391**	**5.16**	**23500**
RE53-10-22418	53-612544	1–2	SOIL	—	—	—	18.1	2.96	—	—	—	—	—	—	—
RE53-10-22419	53-612544	2–3	QBT3	1.11 (U)	—	—	7.87	—	—	—	—	1.11 (UJ)	—	—	—

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

[a] BVs are from LANL (1998, 059730).

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

[c] SSLs are for hexavalent chromium.

[d] Construction worker SSLs were calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm), and the equation and parameters are from NMED (2009, 108070).

[e] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

[f] NA= Not analyzed.

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

Table 7.12-3
Organic Chemicals Detected at AOC 53-012(e)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1248	Aroclor-1254	Aroclor-1260	Bis(2-ethylhexyl)phthalate	Chlordane[alpha-]	Chlordane[gamma-]	Dieldrin	Endosulfan II	Endrin Aldehyde	Ethylbenzene	TPH
Construction Worker SSL[a]				**75.8**	**4.36**	**75.8**	**4760**	**135.4**[b]	**135.4**[b]	**10.3**	**1430**	**71.47**[c]	**6630**	**na**[d]
Industrial SSL[a]				**8.26**	**8.26**	**8.26**	**1370**	**71.87**[b]	**71.87**[b]	**1.2**	**4100**	**205.22**[c]	**385**	**200**[e]
Residential SSL[a]				**2.22**	**1.12**	**2.22**	**347**	**16.24**[b]	**16.24**[b]	**0.304**	**367**	**18.33**[c]	**69.7**	**200**[e]
0253-95-0048	53-01086	0–0.33	SOIL	0.76	0.351	—[f]	NA[g]	0.00804	0.00376	0.0156	0.00499	—	—	2000
0253-95-0051	53-01087	0–0.67	SOIL	0.0596	—	0.332	NA	—	—	—	0.00993	0.00584	—	2090
0253-95-0054	53-01088	0–0.33	SOIL	0.0474	—	0.335	NA	—	—	—	0.00979	0.00599	—	1150
RE53-10-22408	53-612539	0–1	SOIL	—	—	0.0246	—	—	—	—	—	—	—	NA
RE53-10-22410	53-612540	0–1	SOIL	—	0.0614 (J)	0.066 (J)	0.223 (J)	—	—	0.00201 (J)	—	—	—	NA
RE53-10-22411	53-612540	1–2	QBT3	—	0.0177 (J)	0.0171 (J)	—	—	—	—	—	—	—	NA
RE53-10-22412	53-612541	0–1	SOIL	—	—	0.0281	—	—	—	—	—	—	—	NA
RE53-10-22413	53-612541	3–4	QBT3	—	—	—	—	—	—	—	—	—	0.0014	NA
RE53-10-22414	53-612542	0–1	SOIL	—	0.0899	0.159	—	—	—	—	—	—	—	NA
RE53-10-22415	53-612542	3–4	QBT3	—	—	0.0236	—	—	—	—	—	—	—	NA
RE53-10-22416	53-612543	1–2	SOIL	—	—	0.0247	—	—	—	—	—	—	—	NA
RE53-10-22417	53-612543	3–4	QBT3	—	—	0.0179 (J)	—	—	—	—	—	—	—	NA

Table 7.12-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1248	Aroclor-1254	Aroclor-1260	Bis(2-ethylhexyl)phthalate	Chlordane[alpha-]	Chlordane[gamma-]	Dieldrin	Endosulfan II	Endrin Aldehyde	Ethylbenzene	TPH
Construction Worker SSL[a]				**75.8**	**4.36**	**75.8**	**4760**	**135.4**[b]	**135.4**[b]	**10.3**	**1430**	**71.47**[c]	**6630**	**na**[d]
Industrial SSL[a]				**8.26**	**8.26**	**8.26**	**1370**	**71.87**[b]	**71.87**[b]	**1.2**	**4100**	**205.22**[c]	**385**	**200**[e]
Residential SSL[a]				**2.22**	**1.12**	**2.22**	**347**	**16.24**[b]	**16.24**[b]	**0.304**	**367**	**18.33**[c]	**69.7**	**200**[e]
RE53-10-22418	53-612544	1–2	SOIL	—	0.0635	0.0718	—	—	—	—	—	—	—	NA
RE53-10-22419	53-612544	2–3	QBT3	—	0.0327	0.0363	—	—	—	—	—	—	—	NA

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

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

[b] Chlordane was used as surrogate based on structural similarity.

[c] Endrin was used as surrogate based on structural similarity.

[d] na = Not available.

[e] Screening guidelines for unknown oil are from NMED (2006, 094614).

[f] — = Not detected.

[g] NA = Not analyzed.

Table 7.12-4
Radionuclides Detected or Detected above BVs/FVs at AOC 53-012(e)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Plutonium-238	Plutonium-239/240	Uranium-235/236	Uranium-238
Qbt 2, 3, 4 BV[a]				**na[b]**	**na**	**na**	**0.09**	**1.93**
Soil BV[a]				**1.65**	**0.023**	**0.054**	**0.2**	**2.29**
Construction Worker SAL[c]				**18**	**40**	**36**	**43**	**160**
Industrial SAL[c]				**23**	**240**	**210**	**87**	**430**
Residential SAL[c]				**5.6**	**37**	**33**	**17**	**87**
RE53-10-22412	53-612541	0–1	SOIL	—[d]	0.027	—	—	—
RE53-10-22414	53-612542	0–1	SOIL	—	—	0.122	—	2.31
RE53-10-22415	53-612542	3–4	QBT3	0.137	—	—	0.102	—
RE53-10-22416	53-612543	1–2	SOIL	0.159	—	—	—	—
RE53-10-22417	53-612543	3–4	QBT3	—	—	—	0.112	—

Note: Results are in pCi/g.

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

[b] na = Not available.

[c] SALs are from LANL (2009, 107655).

[d] — = Not detected.

Table 7.13-1
Samples Collected and Analyses Requested at AOC 53-013

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	PCBs
RE53-10-22527	53-612546	0–1	QBT3	10-4784	—*
RE53-10-22528	53-612546	2–3	QBT3	10-4784	—
RE53-10-22529	53-612547	0–1	QBT3	10-4799	—
RE53-10-22530	53-612547	2–3	QBT3	10-4799	—
RE53-10-22531	53-612548	0–1	QBT3	10-4799	—
RE53-10-22532	53-612548	2–3	QBT3	10-4799	—
RE53-10-22533	53-612549	0–1	QBT3	10-4799	—
RE53-10-22534	53-612549	2–3	QBT3	10-4799	—
RE53-10-22535	53-612550	0–1	QBT3	10-4799	—
RE53-10-22536	53-612550	2–3	QBT3	10-4799	—
RE53-10-22537	53-612551	0–1	QBT3	10-4799	—
RE53-10-22538	53-612551	2–3	QBT3	10-4799	—
RE53-10-22539	53-612552	0–1	QBT3	10-4799	—
RE53-10-22540	53-612552	2–3	QBT3	10-4799	—
RE53-10-22542	53-612553	0–1	QBT3	10-4784	10-4784
RE53-10-22543	53-612553	2–3	QBT3	10-4784	10-4784
RE53-10-22544	53-612554	0–1	QBT3	10-4799	10-4799
RE53-10-22545	53-612554	2–3	QBT3	10-4799	10-4799
RE53-10-22546	53-612555	0–1	QBT3	10-4799	10-4799
RE53-10-22547	53-612555	2–3	QBT3	10-4799	10-4799
RE53-10-27065	53-613163	0–1	QBT3	11-12	—
RE53-10-27066	53-613163	2–3	QBT3	11-12	—
RE53-10-27067	53-613164	0–1	QBT3	11-12	—
RE53-10-27068	53-613164	2–3	QBT3	11-12	—
RE53-10-27069	53-613165	0–1	QBT3	11-12	—
RE53-10-27070	53-613165	2–3	QBT3	11-12	—
RE53-10-27071	53-613166	0–1	QBT3	11-12	—
RE53-10-27072	53-613166	2–3	QBT3	11-12	—
RE53-10-27073	53-613167	0–1	QBT3	11-12	—
RE53-10-27074	53-613167	2–3	QBT3	11-12	—
RE53-10-27075	53-613168	0–1	QBT3	11-12	—
RE53-10-27076	53-613168	2–3	QBT3	11-12	—

Table 7.13-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	PCBs
RE53-10-27077	53-613169	0–1	QBT3	11-12	—
RE53-10-27078	53-613169	2–3	QBT3	11-12	—
RE53-10-27079	53-613170	0–1	QBT3	11-13	11-13
RE53-10-27080	53-613170	2–3	QBT3	11-13	11-13
RE53-10-27081	53-613171	0–1	QBT3	11-13	11-13
RE53-10-27082	53-613171	2–3	QBT3	11-13	11-13
RE53-10-27083	53-613172	0–1	QBT3	11-13	11-13
RE53-10-27084	53-613172	2–3	QBT3	11-13	11-13

* = Analysis not requested.

Table 7.13-2
Inorganic Chemicals above BVs at AOC 53-013

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Lead	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**2.79**	**11.2**	**0.3**
Construction Worker SSL[b]				**124**	**65.4**	**800**	**1550**
Industrial SSL[b]				**454**	**17.7**	**800**	**5680**
Residential SSL[b]				**31.3**	**3.9**	**400**	**391**
RE53-10-22527	53-612546	0–1	QBT3	1.13 (U)	—c	—	1.11 (UJ)
RE53-10-22528	53-612546	2–3	QBT3	1.08 (U)	—	—	1.02 (UJ)
RE53-10-22529	53-612547	0–1	QBT3	1.05 (U)	—	—	1.06 (U)
RE53-10-22530	53-612547	2–3	QBT3	1.04 (U)	—	—	1.08 (U)
RE53-10-22531	53-612548	0–1	QBT3	1.04 (U)	—	21 (J)	1.08 (U)
RE53-10-22532	53-612548	2–3	QBT3	1.09 (U)	—	—	1.03 (U)
RE53-10-22533	53-612549	0–1	QBT3	—	—	—	1.02 (U)
RE53-10-22534	53-612549	2–3	QBT3	—	—	—	1.08 (U)
RE53-10-22535	53-612550	0–1	QBT3	1.1 (U)	—	—	0.979 (U)
RE53-10-22536	53-612550	2–3	QBT3	1.09 (U)	—	—	1.03 (U)
RE53-10-22537	53-612551	0–1	QBT3	1.08 (U)	3.17	34.5	1.04 (U)
RE53-10-22538	53-612551	2–3	QBT3	1 (U)	—	—	1.05 (U)
RE53-10-22539	53-612552	0–1	QBT3	0.581 (U)	—	—	1.02 (U)
RE53-10-22540	53-612552	2–3	QBT3	1.03 (U)	—	—	1.03 (U)
RE53-10-22542	53-612553	0–1	QBT3	1.1 (U)	—	—	1.01 (UJ)
RE53-10-22543	53-612553	2–3	QBT3	1.04 (U)	—	—	1.07 (UJ)

Table 7.13-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Lead	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**2.79**	**11.2**	**0.3**
Construction Worker SSL[b]				**124**	**65.4**	**800**	**1550**
Industrial SSL[b]				**454**	**17.7**	**800**	**5680**
Residential SSL[b]				**31.3**	**3.9**	**400**	**391**
RE53-10-22544	53-612554	0–1	QBT3	0.575 (U)	—	15.9 (J)	1.06 (U)
RE53-10-22545	53-612554	2–3	QBT3	—	—	—	0.981 (U)
RE53-10-22546	53-612555	0–1	QBT3	—	—	—	1.03 (U)
RE53-10-22547	53-612555	2–3	QBT3	—	—	—	1.05 (U)
RE53-10-27065	53-613163	0–1	QBT3	1.05 (U)	—	—	1.05 (U)
RE53-10-27066	53-613163	2–3	QBT3	—	—	—	1.08 (U)
RE53-10-27067	53-613164	0–1	QBT3	1.02 (U)	—	—	1.06 (U)
RE53-10-27068	53-613164	2–3	QBT3	—	—	—	1.05 (U)
RE53-10-27069	53-613165	0–1	QBT3	1.03 (U)	—	—	1.09 (U)
RE53-10-27070	53-613165	2–3	QBT3	1.09 (U)	—	—	1.11 (U)
RE53-10-27071	53-613166	0–1	QBT3	0.971 (U)	—	—	1.06 (U)
RE53-10-27072	53-613166	2–3	QBT3	1.06 (U)	—	—	1.06 (U)
RE53-10-27073	53-613167	0–1	QBT3	1.01 (U)	—	—	1.02 (U)
RE53-10-27074	53-613167	2–3	QBT3	1.02 (U)	—	—	1.06 (U)
RE53-10-27075	53-613168	0–1	QBT3	—	—	12.3 (J)	1.04 (U)
RE53-10-27076	53-613168	2–3	QBT3	1.02 (U)	—	14.6	1.07 (U)
RE53-10-27077	53-613169	0–1	QBT3	—	—	13.7	1.02 (U)
RE53-10-27078	53-613169	2–3	QBT3	1.03 (U)	—	—	1.04 (U)
RE53-10-27079	53-613170	0–1	QBT3	1.08 (U)	—	—	1.1 (U)
RE53-10-27080	53-613170	2–3	QBT3	1.05 (U)	—	—	1.05 (U)
RE53-10-27081	53-613171	0–1	QBT3	0.526 (U)	—	17.2	1.04 (U)
RE53-10-27082	53-613171	2–3	QBT3	1.07 (U)	—	—	1.04 (U)
RE53-10-27083	53-613172	0–1	QBT3	1.02 (U)	—	—	1.08 (U)
RE53-10-27084	53-613172	2–3	QBT3	1 (U)	—	—	0.999 (U)

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

[a] BVs are from LANL (1998, 059730).

[b] SSLs are from NMED (2009, 108070).

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

Table 7.13-3
Organic Chemicals Detected at AOC 53-013

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Construction Worker SSL[a]				**4.36**	**75.8**
Industrial SSL[a]				**8.26**	**8.26**
Residential SSL[a]				**1.12**	**2.22**
RE53-10-22542	53-612553	0–1	QBT3	0.0015 (J)	—[b]
RE53-10-27081	53-613171	0–1	QBT3	0.0624	0.0074
RE53-10-27082	53-613171	2–3	QBT3	0.0126	0.0014 (J)

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

[a] SSLs are from NMED (2009, 108070).

[b] — = Not detected.

Table 7.14-1
Samples Collected and Analyses Requested at AOC 53-014

Sample ID	Location ID	Depth (ft)	Media	TAL Metals
0253-97-0100	53-01506	0–0.5	SED	2969
0253-97-0101	53-01507	0–0.5	SED	2969
0253-97-0102	53-01508	0–0.5	SED	2969
0253-97-0103	53-01509	0–0.5	SED	2969
0253-97-0104	53-01510	0–0.5	SED	2969

Table 7.14-2
Inorganic Chemicals above BVs at AOC 53-014

Sample ID	Location ID	Depth (ft)	Media	Lead
Sediment BV[a]				**19.7**
Construction Worker SSL[b]				**800**
Industrial SSL[b]				**800**
Residential SSL[b]				**400**
0253-97-0100	53-01506	0–0.5	SED	20
0253-97-0101	53-01507	0–0.5	SED	20

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

[a] BVs are from LANL (1998, 059730).

[b] SSLs are from NMED (2009, 108070).

Table 10.1-1
Summary of Investigation Results and Recommendations

Consolidated Unit	SWMU/AOC	Brief Description	Extent Defined?	Potential Unacceptable Risk?	Recommendation
TA-20					
	SWMU 20-001(a)	Landfill	No	n/a*	Additional extent sampling
20-001(b)-00	SWMU 20-001(b)	Landfill	No	n/a	Additional extent sampling
	SWMU 20-002(c)	Former firing point	No	n/a	Additional extent sampling
	AOC 20-003(c)	Former U.S. Navy gun site	No	n/a	Additional extent sampling
20-001(c)-00	SWMU 20-001(c)	Landfill	No	n/a	Additional extent sampling
	SWMU 20-002(a)	Former firing pit	No	n/a	Additional extent sampling
	SWMU 20-002(b)	Former steel tanks (firing site)	No	n/a	Additional extent sampling
	SWMU 20-002(d)	Former firing site	No	n/a	Additional extent sampling
	AOC 20-003(b)	Former 20-mm gun-firing site	No	n/a	Additional extent sampling
	AOC 20-004	Septic system	No	n/a	Additional extent sampling
	SWMU 20-005	Septic system	No	n/a	Additional extent sampling
TA-53					
	SWMU 53-001(a)	Storage area	No	Yes	Excavation proposed; additional extent sampling
	SWMU 53-001(b)	Storage area	Yes	No	Corrective action complete
	SWMU 53-005	Former waste disposal pit	No	n/a	Additional extent sampling
53-006(b)-99	SWMU 53-006(b)	Underground storage tank	No	n/a	Delayed investigation
	SWMU 53-006(c)	Underground storage tank	No	n/a	Delayed investigation
53-006(d)-99	SWMU 53-006(d)	Underground storage tank	No	n/a	Delayed investigation
	SWMU 53-006(e)	Underground storage tank	No	n/a	Delayed investigation
	SWMU 53-006(f)	Underground storage tanks	No	n/a	Delayed investigation
	SWMU 53-007(a)	Aboveground treatment tank	No	n/a	Delayed investigation
	AOC 53-008	Storage area	No	n/a	Additional extent sampling

Table 10.1-1 (continued)

Consolidated Unit	SWMU/AOC	Brief Description	Extent Defined?	Potential Unacceptable Risk?	Recommendation
	AOC 53-009	Former storage area	No	n/a	Additional extent sampling
	AOC 53-010	Former storage area	No	n/a	Additional extent sampling
	AOC 53-012(e)	Drainline and outfall	No	n/a	Additional extent sampling
	AOC 53-013	Lead spill site	Yes	No	Corrective action complete
	AOC 53-014	Lead spill site	Yes	No	Corrective action complete
	SWMU 53-015	Wastewater treatment facility	No	n/a	Delayed investigation
TA-72					
	AOC 72-001	Small-arms firing rang	No	n/a	Delayed investigation

Note: Shading denotes consolidated unit.

*n/a = Not applicable.

Appendix A

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

A-1.0 ACRONYMS AND ABBREVIATIONS

asl	above sea level
AK	acceptable knowledge
AOC	area of concern
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	area use factor
bgs	below ground surface
BV	background value
CCV	continuing calibration verification
COC	chain of custody
Consent Order	Compliance Order on Consent
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
cpm	count per minute
D&D	decontamination and decommissioning
DAF	dilution attenuation factor
DGPS	differential global positioning system
DL	detection limit
DOE	Department of Energy (U.S.)
dpm	disintegrations per minute
DRO	diesel range organics
EC	effective concentration
EDL	estimated detection limit
Eh	oxidation-reduction potential
EPA	Environmental Protection Agency (U.S.)
EPC	exposure point concentration
EQL	estimated quantitation limit
ESL	ecological screening level
FV	fallout value
GC	gas chromatography
GCMS	gas chromatography mass spectrometry
GPR	ground-penetrating radar
HE	high explosives
HI	hazard index
HIR	historic investigation report
HQ	hazard quotient
HR	home range

ICS	interference check sample
ICV	initial calibration verification
I.D.	inside diameter
IDL	Instrument detection limit
IDW	investigation-derived waste
IS	internal standard
K_d	soil-water partition coefficient
K_{oc}	organic carbon-water partition coefficient
K_{ow}	octanol-water partition coefficient
LAL	lower acceptance limit
LAMPF	Los Alamos Meson Physics Facility
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LASL	Los Alamos Scientific Laboratory
LCS	laboratory control sample
LOAEL	lowest observed adverse effect level
LOEC	lowest observed effect concentration
MATC	maximum allowable toxicity concentration
MDC	minimum detectable concentration
MDL	method detection limit
mm Hg	millimeters of mercury
MS	matrix spike
MSD	matrix spike duplicate
NFA	no further action
NMED	New Mexico Environment Department
NMEID	New Mexico Environmental Improvement Division
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NPDES	National Pollutant Discharge Elimination System
%D	percent difference
%R	percent recovery
%RSD	percent relative standard deviation
PAH	polycyclic aromatic hydrocarbon
PAUF	population area use factor
PCB	polychlorinated biphenyl
PID	photoionization detector
QA	quality assurance
QC	quality control

RCRA	Resource Conservation and Recovery Act
RCT	radiation control technician
RfD	reference dose
RFI	RCRA facility investigation
RL	reporting limit
RME	reasonable maximum exposure
RLW	radioactive liquid waste
RLWTF	Radioactive Liquid Waste Treatment Facility
RPD	relative percent difference
SAL	screening action level
SCL	sample collection log
SF	slope factor
SMO	Sample Management Office
SOP	standard operating procedure
SOW	statement of work
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
T&E	threatened and endangered
TA	technical area
TAL	target analyte list
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
TPU	total propagated uncertainty
TRV	toxicity reference value
UAL	upper acceptance limit
UCL	upper confidence level
VCA	voluntary corrective action
VOC	volatile organic compound
WCSF	waste characterization strategy form
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

Field Methods

B-1.0 INTRODUCTION

This appendix summarizes the field methods used during the 2010 investigation of the Lower Sandia Canyon Aggregate Area at Los Alamos National Laboratory (LANL or Laboratory). Table B-1.0-1 presents a summary of the field methods used, and the following sections provide more detailed descriptions of these methods. All activities were conducted in accordance with approved subcontractor procedures that are technically equivalent to Laboratory standard operating procedures (SOPs) listed in Table B-1.0-2 and are available at http://www.lanl.gov/environment/all/qa.shtml.

B-2.0 EXPLORATORY DRILLING CHARACTERIZATION

No exploratory drilling characterization was conducted during the 2010 investigation.

B-3.0 FIELD-SCREENING METHODS

This section summarizes the field-screening methods used during the investigation activities. Field screening for organic vapors was performed as necessary for health and safety purposes. Field screening for radioactivity was performed on every sample submitted to the Sample Management Office (SMO). Field-screening results for all investigation activities are described in section 3.2.3 and are presented in Table 3.2-2 of the investigation report.

B-3.1 Field Screening for Organic Vapors

Field screening for organic vapors was conducted for all samples at all locations, except when the moisture content of the material exceeded instrument detection limits. Screening was conducted using a MiniRAE 2000 photoionization detector (PID) equipped with an 11.7-electron volt lamp. Screening was performed in accordance with the manufacturer’s specifications and SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector. Screening was performed on each sample collected, and screening measurements were recorded on the field sample collection logs (SCLs) and chain-of-custody (COC) forms, provided on DVD in Appendix F. The field-screening results are presented in Table 3.2-2 of the investigation report.

B-3.2 Field Screening for Radioactivity

All samples collected were field screened for radioactivity before they were submitted to the SMO, targeting alpha and beta/gamma emitters. A Laboratory radiation control technician (RCT) conducted radiological screening using an Eberline E-600 radiation meter with an SHP-380AB alpha/beta scintillation detector held within 1 in. of the sample. The Eberline E-600 with attachment SHP-380AB consists of a dual phosphor plate covered by two Mylar windows housed in a light-excluding metal body. The phosphor plate is a plastic scintillator used to detect beta and gamma emissions and is thinly coated with zinc sulfide to detect alpha emissions. The operational range varies from trace emissions to 1 million disintegrations per minute. Screening measurements were recorded on the SCLs and COC forms and are provided in Appendix F on DVD. The screening results are presented in Table 3.2-2 of the investigation report.

B-3.3 XRF Survey

A survey at Area of Concern (AOC) 53-013 was conducted using a field x-ray fluorescence (XRF) instrument to identify areas of elevated lead concentrations. The survey was conducted using a Niton XL3t 600 XRF analyzer having sufficient sensitivity (i.e., 100 mg/kg or less) to identify areas contaminated above the 800 mg/kg industrial soil screening level (SSL). The instrument was operated in accordance with the manufacturer’s instructions, including collection and preparation of samples and analysis of standard samples.

The survey areas were separated into two investigation areas: the AOC 53-013 XRF Survey North/South Yard and the AOC 53-013 XRF Survey East/West Yard (see Appendix C, Attachment C-2). Within each area, sampling locations were positioned approximately 20 ft apart. At locations where lead concentrations were detected above the industrial SSL (800 mg/kg) using XRF analysis, higher resolution coverage was completed using 10-ft spacing to determine the extent of excavation activities. Details of the XRF survey and the results are presented in Appendix C.

B-4.0 FIELD INSTRUMENT CALIBRATION

All instruments were calibrated before use. Calibration of the Eberline E-600 was conducted by the RCT. All calibrations were performed according to the manufacturers’ specifications and requirements.

B-4.1 MiniRAE 2000 Instrument Calibration

The MiniRAE 2000 PID was calibrated both to ambient air and a standard reference gas (100 ppm isobutylene). The ambient-air calibration determined the zero point of the instrument sensor calibration curve in ambient air. Calibration with the standard reference gas determined a second point of the sensor calibration curve. Each calibration was within 3% of 100 ppm isobutylene, qualifying the instrument for use.

The following calibration information was recorded daily on operational calibration logs:

- instrument identification number
- final span settings
- date and time
- concentration and type of calibration gas used (isobutylene at 100 ppm)

name of the personnel performing the calibration

All daily calibration procedures for the MiniRAE 2000 PID met the manufacturer’s specifications for standard reference gas calibration.

B-4.2 Eberline E-600 Instrument Calibration

The Eberline E-600 was calibrated daily by the RCT before local background levels for radioactivity were measured. The instrument was calibrated using plutonium-239 and chloride-36 sources for alpha and beta emissions, respectively. The following five checks were performed as part of the calibration procedures:

- calibration date
- physical damage

- battery
- response to a source of radioactivity
- background

All calibrations performed for the Eberline E-600 met the manufacturer's specifications; the requirements of SOP-5006, Control of Measuring and Test Equipment; and the applicable radiation detection instrument manual. Calibrations were recorded in daily activity logs.

B-4.3 Niton XL3t 600 XRF Analyzer Calibration

The XRF instrument was calibrated by the manufacturer and provided with a certification of calibration. The instrument was checked for proper function and calibration using standard aliquots of metals, including lead, as provided by the manufacturer.

B-5.0 SURFACE AND SUBSURFACE SAMPLING

This section summarizes the methods used to collect surface and subsurface samples, including soil, fill, tuff, and sediment samples, according to the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703).

B-5.1 Surface Sampling Methods

Surface samples were collected in former Technical Area 20 (TA-20) and TA-53 using either hand-auger or spade-and-scoop methods. Surface samples were collected in accordance with approved subcontractor procedures technically equivalent to SOP-06.10, Hand Auger and Thin-Wall Tube Sampler, or SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples. A hand auger or spade and scoop were used to collect material in approximately 6-in. increments. The sample material was placed in a stainless-steel bowl with a stainless-steel scoop, after which it was transferred to sterile sample collection jars or bags. Samples were preserved using coolers to maintain the required temperature and chemical preservatives, such as nitric acid, in accordance with an approved subcontractor procedure technically equivalent to SOP-5056, Sample Containers and Preservation.

Samples were appropriately labeled, sealed with custody seals, and documented before it was transported to the SMO. Samples were managed according to approved subcontractor procedures technically equivalent to SOP-5057, Handling, Packaging, and Transporting Field Samples, and SOP-5058, Sample Control and Field Documentation.

Sample collection tools were decontaminated (see section B-5.7) immediately before each sample was collected in accordance with a subcontractor procedure technically equivalent to SOP-5061, Field Decontamination of Equipment.

B-5.2 Borehole Logging

At all locations, the required sampling depths could be reached by hand augers, and a drill rig with a hollow-stem auger was not used to collect subsurface samples. Therefore, boreholes did not require logging.

B-5.3 Subsurface Tuff Sampling Methods

Subsurface samples were collected in accordance with approved subcontractor procedures technically equivalent to SOP-06.10, Hand Auger and Thin-Wall Tube Sampler, or SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials.

Samples retrieved from the subsurface were field screened for radioactivity and visually inspected. Samples were placed in a stainless-steel bowl, and the material was crushed, if necessary, with a decontaminated rock hammer and stainless-steel spoon to allow material to fit into the sample containers.

Samples for volatile organic compound (VOC) analysis were collected immediately to minimize the loss of subsurface VOCs during the sample-collection process. After collection of VOC samples, a stainless-steel scoop and bowl were used to transfer samples for the remaining analytical suites to sterile sample collection jars or bags for transport to the SMO. The sample collection tools were decontaminated immediately before each sample was collected (see section B-5.7) in accordance with an approved subcontractor procedure technically equivalent to SOP-5061, Field Decontamination of Equipment.

B-5.4 Quality Control Samples

Quality control (QC) samples were collected in accordance with an approved subcontractor procedure technically equivalent to SOP-5059, Field Quality Control Samples. The QC samples included field duplicates, field rinsate blanks, and field trip blanks. Field duplicate samples were collected from the same material as the regular investigation samples and submitted for the same analyses. Field duplicate samples were collected at a frequency of at least 1 duplicate sample for every 10 samples.

Field rinsate blanks were collected to evaluate field decontamination procedures. Rinsate blanks were collected by rinsing sampling equipment (i.e., auger buckets and sampling bowls and spoons) after decontamination with deionized water. The rinsate water was collected in a sample container and submitted to the SMO. Field rinsate blank samples were analyzed for target analyte list metals and were collected from sampling equipment at a frequency of at least 1 rinsate sample for every 10 solid samples.

Field trip blanks were also collected at a frequency of one per day when samples were being collected for VOC analysis. Trip blanks consisted of containers of certified clean sand opened and kept with the other sample containers during the sampling process. Trip blanks were analyzed for VOCs only.

B-5.5 Sample Documentation and Handling

Field personnel completed an SCL and COC form for each sample. Sample containers were sealed with signed custody seals and placed in coolers at approximately 4°C. Samples were handled in accordance with approved subcontractor procedures technically equivalent to SOP-5057, Handling, Packaging, and Transporting Field Samples, and SOP-5056, Sample Containers and Preservation. Swipe samples were collected from the exterior of sample containers and analyzed by the RCT before the sample containers were removed from the site. Samples were transported to the SMO for processing and shipment to off-site contract analytical laboratories. The SMO personnel reviewed and approved the SCLs and COC forms and accepted custody of the samples. The SCLs and COC forms are provided in Appendix F (on DVD).

B-5.6 Borehole Abandonment

No boreholes were drilled during the 2010 investigation. However, hand-auger sampling locations deeper than 15 ft below ground surface (bgs) were abandoned in accordance with an approved subcontractor procedure technically equivalent to SOP-5034, Monitor Well and RFI Borehole Abandonment, by filling the boreholes with bentonite chips up to 2–3 ft from the ground surface. The chips were hydrated and clean soil was placed on top. All cuttings were managed as investigation-derived waste (IDW) as described in Appendix G.

B-5.7 Decontamination of Sampling Equipment

The split-spoon core barrels and all other sampling equipment that came (or could have come) in contact with sample material were decontaminated after each core was retrieved and logged. Decontamination included wiping the equipment with Fantastik and paper towels. Residual material adhering to equipment was removed using dry decontamination methods such as the use of wire brushes and scrapers. Decontamination activities were performed in accordance with an approved subcontractor procedure technically equivalent to SOP-5061, Field Decontamination of Equipment. Decontaminated equipment was surveyed by an RCT before it was released from the site. Field rinsate blank samples were collected in accordance with an approved procedure technically equivalent to SOP-5059, Field Quality Control Samples.

B-5.8 Site Demobilization and Restoration

Drilling equipment was not used during the 2010 investigation. All temporary fencing and staging areas were dismantled and returned to preinvestigation conditions. All excavations were filled with base course to stabilize for erosion control and to prevent off-site transport.

B-6.0 GEODETIC SURVEYING

Geodetic surveys of all sampling locations were performed using a Trimble RTK 5700 differential global-positioning system (DGPS) referenced from published and monumented external Laboratory survey control points in the vicinity. All sampling locations were surveyed in accordance with an approved subcontractor procedure technically equivalent to SOP-5028, Coordinating and Evaluating Geodetic Surveys. Horizontal accuracy of the monumented control points is within 0.1 ft. The DGPS instrument referenced from Laboratory control points is accurate within 0.2 ft. The surveyed coordinates are presented in Table 3.2-1 of the investigation report.

B-7.0 IDW STORAGE AND DISPOSAL

All IDW generated during the field investigation was managed in accordance with an approved subcontractor procedure technically equivalent to SOP-5238, Characterization and Management of Environmental Program Waste. This procedure incorporates the requirements of all applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy orders, and Laboratory implementation requirements. IDW was also managed in accordance with the approved waste characterization strategy form and the IDW management appendix of the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). Details of IDW management for the Lower Sandia Canyon Aggregate Area investigation are presented in Appendix G.

B-8.0 DEVIATIONS FROM THE WORK PLAN

Deviations from the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703) are summarized below.

AOC 20-003(b): An additional sample from the depth of 20 to 21 ft bgs was inadvertently collected and analyzed at location 20-612490.

Solid Waste Management Unit 53-005: The VOC field-screening result for the deepest sample collected at location 53-612484 was elevated (25.1 ppm), but the borehole was not extended to collect a deeper sample. Additional samples will be collected at this location during the Phase II investigation.

B-9.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. 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.

LANL (Los Alamos National Laboratory), July 2009. "Investigation Work Plan for Lower Sandia Canyon Aggregate Area, Revision 1," Los Alamos National Laboratory document LA-UR-09-4329, Los Alamos, New Mexico. (LANL 2009, 106660.14)

NMED (New Mexico Environment Department), August 6, 2009. "Notice of Approval for the Response to the Notice of Disapproval for the Investigation Work Plan for Lower Sandia Canyon Aggregate Area and Revision 1," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2009, 106703)

Table B-1.0-1
Summary of Field Investigation Methods

Method	Summary
Spade and Scoop Collection of Soil Samples	This method was used to collect shallow (i.e., approximately 0-12 in.) soil or sediment samples. The spade-and-scoop method involved digging a hole to the desired depth, as prescribed in the approved work plan, and collecting a discrete grab sample. Each sample was placed in a clean stainless-steel bowl for transfer into various sample containers.
Hand Auger Sampling	This method is typically used for sampling soil or sediment at depths of less than 10–15 ft, but in some cases may be used to collect 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 that can be advanced to the desired sampling depth. When the desired depth was reached, the auger was decontaminated before advancing the hole through the sampling depth. The sample material was transferred from the auger bucket to a stainless-steel sampling bowl before the various required sample containers were filled.
Handling, Packaging, and Shipping of Samples	Field team members sealed and labeled samples before packing to ensure the sample and the transport containers were free of external contamination. Field team members packaged all samples to minimize the possibility of breakage during transport. After all environmental samples were collected, packaged, and preserved, a field team member transported them to the SMO. The SMO arranged to ship the samples to the analytical laboratories.
Sample Control and Field Documentation	The collection, screening, and transport of samples were documented on standard forms generated by the SMO. These included SCLs, COC forms, and sample container labels. SCLs were completed at the time of sample collection, and the logs were signed by the sampler and a reviewer who verified the logs for completeness and accuracy. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around each sample container. COC forms were completed and signed to verify that the samples were not left unattended.
Field Quality Control Samples	Field QC samples were collected as follows: *Field Duplicates*: At a frequency of 10%; collected at the same time as a regular sample and submitted for the same analyses *Equipment Rinsate Blank*: At a frequency of 10%; collected by rinsing sampling equipment with deionized water, which was collected in a sample container and submitted for laboratory analysis *Trip Blanks*: Required for all field events that include the collection of samples for VOC analysis. Trip blank containers of certified clean sand were opened and kept with the other sample containers during the sampling process
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination was used to minimize the generation of liquid waste. Dry decontamination included the use of a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by use of a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes.
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample were printed on the SCL provided by the SMO (size and type of container [e.g., glass, amber glass, or polyethylene]). All samples were preserved by placing them in insulated containers with ice to maintain a temperature of 4°C.

Table B-1.0-1 (continued)

Method	Summary
Coordinating and Evaluating Geodetic Surveys	Geodetic surveys focused on obtaining survey data of acceptable quality to use during project investigations. Geodetic surveys were conducted with a Trimble 5700 DGPS. The survey data conformed to Laboratory Information Architecture project standards IA-CB02, GIS Spatial Reference System, and IA-D802, Geospatial Positioning Accuracy Standards for A/E/C/ and Facility Management. All coordinates were expressed as State Plane Coordinate System 83, NM Central, U.S. feet. All elevation data were reported relative to the National Geodetic Vertical Datum of 1983.
Management of Environmental Restoration Project Waste, Waste Characterization	IDW was managed, characterized, and stored in accordance with an approved waste characterization strategy form that documents site history, field activities, and characterization approach for each waste stream managed. During the investigation, waste characterization complied with on- or off-site waste acceptance criteria. All stored IDW was marked with appropriate signage and labels. Drummed IDW was stored on pallets to prevent deterioration of containers. A waste storage area was established before waste was generated. Waste storage areas located in controlled areas of the Laboratory were monitored as needed to prevent inadvertent addition or management of wastes by unauthorized personnel. Each container of waste generated was individually labeled with waste classification, item identification number, and radioactivity (if applicable) immediately following containerization. All waste was segregated by classification and compatibility to prevent cross-contamination. Management of IDW is described in Appendix G.

Table B-1.0-2
SOPs Used for Investigation Activities Conducted at Lower Sandia Canyon Aggregate Area

SOP-5018, Integrated Fieldwork Planning and Authorization
SOP-5028, Coordinating and Evaluating Geodetic Surveys
SOP-5034, Monitor Well and RFI Borehole Abandonment
SOP-5238, Characterization and Management of Environmental Program Waste
SOP-5055, General Instructions for Field Investigations
SOP-5056, Sample Containers and Preservation
SOP-5057, Handling, Packaging, and Transporting Field Samples
SOP-5058, Sample Control and Field Documentation
SOP-5059, Field Quality Control Samples
SOP-5061, Field Decontamination of Equipment
SOP-5181, Notebook and Logbook Documentation for Environmental Directorate Technical and Field Activities
SOP-01.12, Field Site Closeout Checklist
SOP-06.09, Spade and Scoop Method for Collection of Soil Samples
SOP-06.10, Hand Auger and Thin-Wall Tube Sampler
SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials
SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector
EP-DIR-QAP-0001, Quality Assurance Plan for the Environmental Programs

Note: Procedures used were approved subcontractor procedures technically equivalent to the procedures listed.

Appendix C

X-ray Fluorescence and Geophysical Surveys

C-1.0 INTRODUCTION

This appendix summarizes the results of x-ray fluorescence (XRF) analyses and geophysical surveys conducted at sites investigated in the Lower Sandia Canyon Aggregate Area at Los Alamos National Laboratory (the Laboratory).

C-2.0 GEOPHYSICAL SURVEYS

ARM Geophysics performed a nonintrusive geophysical investigation at Solid Waste Management Unit (SWMU) 20-001(c), a landfill, and SWMU 53-005, a former waste disposal pit, from September 9 to 12, 2010. The objectives of the investigation were to delineate the lateral extent of the landfill and the disposal pit. To achieve these objectives, an integrated geophysical investigation was performed using a high-sensitivity metal detector (EM61), terrain conductivity (EM31), and ground penetrating radar geophysical techniques. The results of the surveys are included in Attachment C-1 (on CD).

C-3.0 XRF SURVEY

A Niton XL3t 600 XRF Analyzer was used to screen for hazardous concentrations of lead at Area of Concern (AOC) 53-013, a lead spill site, from September 23 to 29, 2010. The objectives of the investigation were to identify areas of lead contamination, remove soil containing lead to levels below the industrial soil screening level (SSL) (800 mg/kg) (NMED 2009, 108070), and conduct confirmation sampling to define the nature and extent of residual lead contamination.

Lead shot was present within two fenced areas, approximately 50 ft × 80 ft and 60 ft × 180 ft, that are used for storage and as staging areas for equipment used in beam experiments. The lead shot was used as radiation shielding for experiments conducted in building 53-10. The shot ranged from 1.5 mm to 4 mm in diameter and was mixed into the sandy soil present at the site. Both fenced areas are presently locked, and the westernmost area is posted as a radiological control area.

Based on results from the XRF field-screening survey and visible observation of lead shot, excavations of lead contaminated soil were conducted at AOC 53-013.

C-2.1 Methodology

The Niton XL3t 600 XRF Analyzer uses compact sealed-radioactive sources iron-55, cadmium-109, and americium-241 to identify and quantify certain inorganic chemicals. The instrument is equipped with a high-resolution mercury-12 detector connected to a sealed electronic module. The XRF soil samples collected were analyzed in accordance with the manufacturer’s specifications.

The investigation areas were separated into the AOC 53-013 XRF Survey North/South Yard and the AOC 53-013 XRF Survey East/West Yard (Attachment C-2 [on CD]). Within each area, sampling locations were positioned approximately 20 ft apart. At locations where lead concentrations were detected above the industrial SSL using XRF analysis, higher resolution coverage was completed using 10-ft spacing to determine the extent of excavation activities. Areas of elevated lead concentrations were excavated to a depth of 0.5 ft below ground surface, and confirmation samples were collected at the bottom of and below the excavation. Confirmation samples were collected and analyzed in accordance with applicable field methods described in Appendix B.

C-3.2 Results and Discussion

Lead was detected above the industrial SSL in surface soil samples collected from 14 locations at concentrations ranging from 802 to 34,000 ppm. The XRF screening results are presented in Attachment C-2 (on CD).

Based on results from the XRF field-screening survey and visible observation of lead shot on the ground surface in two areas at AOC 53-013, a total of eight areas around and between sampling locations with elevated levels of lead were excavated. Approximately 75 yd^3 of hazardous waste was generated and disposed of at an authorized off-site disposal facility. Management of waste generated from the excavation and removal of lead contaminated soil associated investigation-derived waste is described in Appendix G.

C-3.3 Conclusions

All objectives of the XRF survey at AOC 53-013 were met. Fourteen sampling locations with lead levels above the industrial SSL were identified. Soil was removed from eight areas around and between sampling locations with elevated lead levels to remediate the levels to below the industrial SSL. Confirmation sampling was conducted to define the nature and extent of residual lead contamination at AOC 53-013.

The results of confirmation samples are presented in section 7.13.4 of the investigation report and show that the lateral and vertical extent of lead are defined at AOC 53-013.

C-4.0 REFERENCE

The following list includes all documents cited in this appendix. 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 New Mexico Environment Department 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.

NMED (New Mexico Environment Department), December 2009. "Technical Background Document for Development of Soil Screening Levels, Revision 5.0," with revised Table A-1, New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2009, 108070)

Attachment C-1

Geophysical Surveys
(on CD included with this document)

Attachment C-2

X-ray Fluorescence Survey
(on CD included with this document)

Appendix D

Borehole Logs

No auger drilling occurred during the 2010 fieldwork activities in the Lower Sandia Canyon Aggregate Area at Los Alamos National Laboratory, and therefore, no borehole logs were prepared. All samples were collected by hand auger at all locations.

Appendix E

Analytical Program

E-1.0 INTRODUCTION

This appendix discusses the analytical methods and data-quality review for samples collected during investigations at the Lower Sandia Canyon Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). Additionally, this appendix summarizes the effects of data-quality issues on the acceptability of the analytical data.

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the Quality Assurance Project Plan Requirements for Sampling and Analysis (LANL 1996, 054609) and the Laboratory's statements of work (SOWs) for analytical laboratories (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962). The results of the QA/QC procedures were used to estimate the accuracy, bias, and precision of the analytical measurements. Samples for QC included method blanks, matrix spikes (MSs), laboratory control samples (LCSs), internal standards, initial calibration verifications (ICVs) and continuing calibration verifications (CCVs), surrogates, and tracers.

The type and frequency of laboratory QC analyses are described in the SOWs for analytical laboratories (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962). Other QC factors, such as sample preservation and holding times, were also assessed in accordance with the requirements outlined in Standard Operating Procedure (SOP) 5056, Sample Containers and Preservation.

The following SOPs, available at http://www.lanl.gov/environment/all/qa/adep.shtml, were used for data validation:

- SOP-5161, Routine Validation of Volatile Organic (VOC) Analytical Data
- SOP-5162, Routine Validation of Semivolatile Organic Compound (SVOC) Analytical Data
- SOP-5163, Routine Validation of Organochlorine Pesticides (PEST) and Polychlorinated Biphenyl (PCB) Analytical Data
- SOP-5164, Routine Validation of High Explosives (HE) Analytical Data
- SOP-5165, Routine Validation of Metals Analytical Data
- SOP-5166, Routine Validation of Gamma Spectroscopy, Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Analytical Data
- SOP-5168, Routine Validation of LC/MS/MS High Explosive Analytical Data
- SOP-5171, Routine Validation of Total Petroleum Hydrocarbons Gasoline Range Organics/Diesel Range Organics Analytical Data (Method 80151B)
- SOP-5191, Routine Validation of LC/MS/MS Perchlorate Analytical Data (SW-846 EPA Method 6850)

Routine data validation was performed for each data package (also referred to as request numbers), and analytical data were reviewed and evaluated based on U.S. Environmental Protection Agency (EPA) National Functional Guidelines, where applicable (EPA 1994, 048639; EPA 1999, 066649). As a result of the data validation and assessment efforts, qualifiers are assigned to the analytical records as appropriate. The data-qualifier definitions are provided in Appendix A. Sample collection logs (SCLs) and chain of custody (COC) forms are provided in Appendix F (on DVD). The analytical data, instrument printouts, and data validation reports are also provided in Appendix F.

E-2.0 ANALYTICAL DATA ORGANIZATION

Historical data evaluated in this report were collected during Resource Conservation and Recovery Act facility investigations, other corrective actions, and other investigations. All historical investigation samples were submitted to and analyzed by approved off-site laboratories. These data have been determined to be of sufficient quality for decision-making purposes and have been reviewed and revalidated to current QA standards.

E-3.0 INORGANIC CHEMICAL ANALYSES

A total of 392 samples (plus 36 field duplicates) collected within the Lower Sandia Canyon Aggregate Area were analyzed for inorganic chemicals. All 392 samples (plus 36 field duplicates) were analyzed for target analyte list (TAL) metals; 238 samples (plus 22 field duplicates) were analyzed for nitrate; 212 samples (plus 19 field duplicates) were analyzed for perchlorate; and 293 samples (plus 26 field duplicates) were analyzed for total cyanide. The analytical methods used for inorganic chemicals are listed in Table E-1.0-1.

Tables in the investigation report summarize all samples collected and the analyses requested for the investigation of the sites within the Lower Sandia Canyon Aggregate Area. All the analytical results are presented in Appendix F (on DVD).

E-3.1 Inorganic Chemical QA/QC Samples

The use of QA/QC samples is designed to produce measures of the reliability of the data. The results of the QA/QC analyses performed on a sample provide confidence about whether the analyte is present and whether the concentration reported is accurate. To assess the accuracy and precision of inorganic chemical analyses, LCSs, preparation blanks, MSs, laboratory duplicate samples, interference check samples (ICSs), and serial dilution samples were analyzed as part of the investigation. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962) and is described briefly in the sections below. The LCS serves as a monitor of the overall performance of each step during the analysis, including sample digestion. For inorganic chemicals in soil or tuff, LCS percent recoveries (%R) should fall within the control limits of 75%–125% (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962).

The preparation blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing; it is extracted and analyzed in the same manner as the corresponding environmental samples. Preparation blanks are used to measure bias and potential cross-contamination. All inorganic chemical results should be below the method detection limit (MDL).

MS samples assess the accuracy of inorganic chemical analyses. These samples are designed to provide information about the effect of the sample matrix on the sample preparation procedures and analytical technique. The MS acceptance criterion is 75%–125%, inclusive, for all spiked analytes (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962).

Laboratory duplicate samples assess the precision of inorganic chemical analyses. All relative percent differences (RPDs) between the sample and laboratory duplicate should be ±35% for soil (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962).

The ICSs assess the accuracy of the analytical laboratory’s interelement and background correction factors used for inductively coupled plasma emission spectroscopy. The ICS %R should be within the acceptance range of 80%–120%. The QC acceptance limits are ±20%.

Serial dilution samples measure potential physical or chemical interferences and correspond to a sample dilution ratio of 1:5. The chemical concentration in the undiluted sample must be at least 50 times the MDL (100 times for inductively coupled plasma mass spectroscopy) for valid comparison. For sufficiently high concentrations, the RPD should be within 10%.

E-3.2 Data Quality Results for Inorganic Chemicals

The majority of the analytical results for inorganic chemicals either were not assigned a qualifier or were qualified as not detected (U) because the analytes were not detected by the respective analytical methods. No quality issues are associated with the data presented in this report.

E-3.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples analyzed for inorganic chemicals (Appendix F).

E-3.2.2 Sample Documentation

All samples analyzed for inorganic chemicals were properly documented on SCL/COC forms in the field (Appendix F).

E-3.2.3 Sample Dilutions

Some samples were diluted for inorganic chemical analyses. No qualifiers were applied to any inorganic chemical sample results because of dilutions.

E-3.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for inorganic chemicals.

E-3.2.5 Holding Times

All inorganic chemical analyses were performed within prescribed holding time requirements. No qualifiers were applied to any inorganic chemical sample results because of holding time issues.

E-3.2.6 ICVs and CCVs

No qualifiers were applied to any inorganic chemical sample results because of ICV or CCV issues.

E-3.2.7 Interference Check Sample and/or Serial Dilutions

No qualifiers were applied to any inorganic chemical sample results because of interference check sample or serial dilution issues.

E-3.2.8 Laboratory Duplicate Samples

A total of 232 TAL metals results were qualified as estimated (J) because the sample and the duplicate sample results were greater than or equal to 5 times the reporting limit (RL) and the duplicate RPD was >35% for soil samples.

Seven total cyanide results were qualified as estimated (J) because the sample and the duplicate sample results were greater than or equal to 5 times the RL and the duplicate RPD was >35% for soil samples.

Five total cyanide results were qualified as estimated not detected (UJ) because the sample and the duplicate sample results were greater than or equal to 5 times the RL and the duplicate RPD was >35% for soil samples.

E-3.2.9 Blanks

Ten nitrate results and 217 TAL metals results were qualified as not detected (U) because the sample results were less than or equal to 5 times the concentration of the related analytes in the trip blank or equipment rinsate blank.

A total of 147 TAL metals results were qualified as estimated (J) because the sample results were less than 5 times the amount in the preparation blank.

Sixty-two TAL metals results were qualified as not detected (U) because the sample result was less than or equal to 5 times the concentration of the related analyte in the method blank.

A total of 101 TAL metals results were qualified as not detected (U) because the sample result was less than or equal to 5 times the concentration of the related analyte in the initial calibration blank/continuous calibration blank.

E-3.2.10 MS Samples

Two nitrate results and 83 TAL metals results were qualified as estimated not detected (UJ) because the associated MS recovery was less than the lower acceptance limit (LAL) but greater than 10%.

Fourteen TAL metals results were qualified as estimated not detected (UJ) because the associated MS recovery was greater than the upper acceptance limit (UAL).

A total of 186 TAL metals results were qualified as estimated and biased low (J-) because the associated MS recovery was less than the LAL but greater than 10%.

A total of 584 TAL metals results were qualified as estimated and biased high (J+) because the associated MS recovery was greater than the UAL.

Fourteen perchlorate results were qualified as estimated and biased high (J+) because the MS/MS duplicate (MSD) %R was greater than 125%.

E-3.2.11 LCS Recoveries

No qualifiers were applied to any inorganic chemical results because of LCS recovery issues.

E-3.2.12 Detection Limits

Sixty-nine TAL metals results were qualified as estimated (J) because the sample result was reported as detected between the instrument detection limit (IDL) and the estimated detection limit (EDL).

E-3.2.13 Rejected Results

Five lead results and five manganese results were qualified as rejected (R) because the associated MS recovery was <10%.

The rejected data were not used to determine the nature and extent of contamination or to assess the potential human and ecological risks. However, sufficient data of good quality are available to characterize the site(s). The results of other qualified data were used as reported and do not affect the usability of the data.

E-4.0 ORGANIC CHEMICAL ANALYSES

A total of 393 samples (plus 38 field duplicates) collected within the Lower Sandia Canyon Aggregate Area were analyzed for organic chemicals. A total of 231 samples (plus 23 field duplicates) were analyzed for volatile organic chemicals (VOCs); 222 samples (plus 23 field duplicates) were analyzed for semivolatile organic chemicals (SVOCs); 273 samples (plus 36 field duplicates) were analyzed for polychlorinated biphenyls (PCBs); 20 samples (plus 3 field duplicates) were analyzed for pesticides; 5 samples (plus 2 field duplicates) were analyzed for total petroleum hydrocarbon (TPH) diesel range organics (DRO); 9 samples were analyzed for undifferentiated TPH; and 179 samples (plus 16 field duplicates) were analyzed for explosives compounds. All QC procedures were followed as required by the analytical laboratory SOWs (LANL 1995, 049738; LANL 2000, 071233). The analytical methods used for organic chemicals are listed in Table E-1.0-1.

Tables within the investigation report summarize all samples collected from the Lower Sandia Canyon Aggregate Area and the analyses requested. All organic chemical results are provided in Appendix F (on DVD).

E-4.1 Organic Chemical QA/QC Samples

The use of QA/QC samples is designed to produce measures of the reliability of the data. The results of the QA/QC analyses performed on a sample provide confidence about whether the analyte is present and whether the concentration reported is accurate. Calibration verifications, LCSs, method blanks, MSs, surrogates, and internal standards (ISs) were analyzed to assess the accuracy and precision of organic chemical analyses. Each of these QA/QC sample types is defined in the analytical services SOW (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962) and is described briefly below.

Calibration verification is the establishment of a quantitative relationship between the response of the analytical procedure and the concentration of the target analyte. There are two aspects of calibration verification: initial and continuing. The initial calibration verifies the accuracy of the calibration curve as well as the individual calibration standards used to perform the calibration. The continuing calibration ensures that the initial calibration is still holding and correct as the instrument is used to process samples. The continuing calibration also serves to determine that analyte identification criteria such as retention times and spectral matching are being met.

The LCS is a sample of a known matrix that has been spiked with compounds that are representative of the target analytes, and it serves as a monitor of overall performance on a “controlled” sample. The LCS is the primary demonstration, on a daily basis, of the ability to analyze samples with good qualitative and quantitative accuracy. The LCS recoveries should within the method specific acceptance criteria.

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing; it is extracted and analyzed in the same manner as the corresponding environmental samples. Method blanks are used to assess the potential for sample contamination during extraction and analysis. All target analytes should be below the contract required detection limit in the method blank.

MS samples are used to measure the ability to recover prescribed analytes from a native sample matrix and consist of aliquots of the submitted samples spiked with a known concentration of the target analyte(s). Spiking typically occurs before sample preparation and analysis. The spike sample recoveries should be between the LAL and UAL.

A surrogate compound (surrogate) is an organic compound used in the analyses of target analytes that is similar in composition and behavior to the target analytes but not normally found in environmental samples. Surrogates are added to every blank, sample, and spike to evaluate the efficiency with which analytes are recovered during extraction and analysis. The recovery percentage of the surrogates must be within specified ranges or the sample may be rejected or assigned a qualifier.

ISs are chemical compounds added to every blank, sample, and standard extract at a known concentration. They are used to compensate for (1) analyte concentration changes that might occur during storage of the extract, and (2) quantitation variations that can occur during analysis. Internal standards are used as the basis for quantitation of target analytes. The %R for ISs should be within the range of 50%–200%.

E-4.2 Data Quality Results for Organic Chemicals

The majority of the analytical results for organic chemicals either were not assigned a qualifier or were qualified as not detected (U) because the analytes were not detected by the respective analytical methods. No quality issues are associated with the data presented in this report.

E-4.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples analyzed for organic chemicals (Appendix F).

E-4.2.2 Sample Documentation

All samples analyzed for organic chemicals were properly documented on the SCL/COC forms in the field (Appendix F).

E-4.2.3 Sample Dilutions

Some samples were diluted for organic chemical analyses. No qualifiers were applied to any organic chemical sample results because of dilutions.

E-4.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for organic chemicals.

E-4.2.5 Holding Times

Two VOC results were qualified as estimated and biased low (J-) because the extraction/analytical holding time was exceeded by less than 2 times the published method holding times.

A total of 308 VOC results were qualified as estimated not detected (UJ) because the extraction/analytical holding time was exceeded by less than 2 times the published method holding times.

E-4.2.6 ICVs and CCVs

One SVOC result and 13 VOC results were qualified as estimated (J) because the ICV and/or CCV were recovered outside the method-specific limits.

One SVOC result was qualified as estimated (J) because the ICV and/or CCV were not analyzed at the appropriate method frequency.

A total of 101 high explosives (HE) results, 3 PCB results, 40 pesticide results, 791 SVOC results, and 900 VOC results were qualified as estimated not detected (UJ) because the ICV and/or CCV were recovered outside the method-specific limits.

Eighteen PCB results and 1448 SVOC results were qualified as estimated not detected (UJ) because the ICV and/or CCV were not analyzed at the appropriate method frequency.

Fourteen VOC results were qualified as estimated not detected (UJ) because the associated percent relative standard deviation (%RSD)/percent difference (%D) exceeded criteria in the initial or continuing calibration standards.

E-4.2.7 Surrogate Recoveries

Five HE results and 55 PCB results were qualified as estimated not detected (UJ) because the surrogate recovery was less than the LAL but greater than or equal to 10%.

One PCB result was qualified as estimated and biased low (J-) because the surrogate recovery was less than the LAL but greater than or equal to 10%.

Five VOC results were qualified as estimated and biased high (J+) because the surrogate recovery was greater than the UAL.

E-4.2.8 IS Responses

A total of 183 VOC results were qualified as estimated not detected (UJ) because the quantitating IS area count was less than 10% of the expected value.

E-4.2.9 Blanks

Twenty-four VOC results were qualified as not detected (U) because the sample result was less than or equal to the concentration of the related analyte in the trip blank or equipment rinsate blank.

One PCB result was qualified as estimated (J) because the sample concentration was greater than 5 times the amount in the method blank.

Three PCB results were qualified as not detected (U) because the sample result was less than or equal to 5 times the concentration of the related analyte in the method blank.

Twenty-three VOC results were qualified as not detected (U) because the associated sample concentration was less than 5 times or 10 times the amount in the method blank.

E-4.2.10 MS Samples

Twenty-four HE results were qualified as estimated not detected (UJ) because the MS/MSD %R was greater than 10% but less than 70%.

A total of 141 HE results were qualified as estimated not detected (UJ) because the MS/MSD RPD was greater than 30%.

E-4.2.11 Laboratory Duplicate Samples

Laboratory duplicates collected for organic chemical analyses indicated acceptable precision for all samples.

E-4.2.12 LCS Recoveries

One SVOC result was qualified as estimated and biased high (J+) because the LCS %R was greater than the UAL.

Eleven SVOC results and nine VOC results were qualified as estimated not detected (UJ) because the LCS %R was less than the LAL but greater than 10%.

E-4.2.13 Rejected Data

Ten VOC results were qualified as rejected (R) because the affected analytes were analyzed with a relative response factor of less than 0.05 in the initial calibration and/or CCV.

The rejected data were not used to characterize the nature and extent of contamination or assess the potential human and ecological risks. However, sufficient data of good quality are available to characterize the site(s). The results of other qualified data were used as reported and do not affect the usability of the data.

E-5.0 RADIONUCLIDE ANALYSES

A total of 284 samples (plus 26 field duplicates) collected within the Lower Sandia Canyon Aggregate Area were analyzed for radionuclides. A total of 243 samples (plus 22 field duplicates) were analyzed for gamma-emitting radionuclides; 55 samples (plus 5 field duplicates) were analyzed for isotopic plutonium; 248 samples (plus 22 field duplicates) were analyzed for isotopic uranium; 43 samples (plus 4 field duplicates) were analyzed for tritium; and 135 samples (plus 11 field duplicate) were analyzed for strontium-90. The analytical methods used for radionuclides are listed in Table E-1.0-1.

Tables in the investigation report summarize all samples collected from the Lower Sandia Canyon Aggregate Area and the analyses requested. All radionuclide results are provided in Appendix F (on DVD).

E-5.1 Radionuclide QA/QC Samples

To assess the accuracy and precision of radionuclide analyses, LCSs, method blanks, MS samples, laboratory duplicate samples, and tracers were analyzed as part of the investigations. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962) and is described briefly below.

The LCS serves as a monitor of the overall performance of each step during the analysis, including sample digestion. For radionuclides in soil or tuff, LCS %R should fall between the control limits of 80%–120%.

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing; it is analyzed in the same manner as the corresponding environmental samples. Method blanks are used to assess the potential for sample contamination during analysis. All radionuclide results should be below the minimum detectable concentration (MDC).

MS samples assess the accuracy of inorganic chemical analyses. These samples are designed to provide information about the effect of the sample matrix on the sample preparation procedures and analytical technique. The MS acceptance criterion is 75%–125%.

Tracers are radioisotopes added to a sample for the purposes of monitoring losses of the target analyte. The tracer is assumed to behave in the same manner as the target analytes. The tracer recoveries should fall between the LAL and UAL.

Laboratory duplicate samples assess the precision of radionuclide analyses. All RPDs between the sample and laboratory duplicate should be ±35% for soil (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962).

E-5.2 Data-Quality Results for Radionuclides

The majority of the analytical results for radionuclides either were not assigned a qualifier or were qualified as not detected (U) because the analytes were not detected by the respective analytical methods. No quality issues are associated with the data presented in this report.

All procedures were followed as required by the analytical services SOWs (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962). Some sample results were qualified as not detected (U) because the associated sample concentration was less than or equal to the MDC. Some sample results were qualified as not detected (U) because the associated sample concentration was less than or equal to 3 times the total propagated uncertainty (TPU). This data qualification is related to detection status only, not to the quality of the data.

E-5.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples (Appendix F).

E-5.2.2 Sample Documentation

All samples were properly documented on the SCL/COC forms in the field (Appendix F).

E-5.2.3 Sample Dilutions

Some samples were diluted for radionuclide analyses. No qualifiers were applied to any radionuclide sample results because of dilutions.

E-5.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for radionuclides.

E-5.2.5 Holding Times

Holding-time criteria were met for all samples analyzed for radionuclides.

E-5.2.6 Method Blanks

Method blank criteria were met for all samples analyzed for radionuclides.

E-5.2.7 MS Samples

MS criteria were met for all samples analyzed for radionuclides.

E-5.2.8 Tracer Recoveries

One isotopic plutonium result was qualified as estimated and biased high (J+) because the tracer percent recovery was greater than the UAL.

E-5.2.9 LCS Recoveries

LCS recovery criteria were met for all samples analyzed for radionuclides.

E-5.2.10 Laboratory Duplicate Samples Recoveries

Laboratory duplicate sample recovery criteria were met for all samples analyzed for radionuclides.

E-5.2.11 Rejected Data

One cobalt-60 result, 172 cesium-134 results, and two cesium-137 results were qualified as rejected (R) because the MDC and/or TPU documentation was missing.

The rejected data were not used to determine the nature and extent of contamination or to assess the potential human and ecological risks. However, sufficient data of good quality are available to characterize the site(s). The results of other qualified data were used as reported and do not affect the usability of the data.

E-6.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. 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 New Mexico Environment Department 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.

EPA (U.S. Environmental Protection Agency), February 1994. “USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review,” EPA-540/R-94/013, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1994, 048639)

EPA (U.S. Environmental Protection Agency), October 1999. “USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review,” EPA540/R-99/008, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1999, 066649)

LANL (Los Alamos National Laboratory), July 1995. “Statement of Work (Formerly Called "Requirements Document") - Analytical Support, (RFP number 9-XS1-Q4257), (Revision 2 - July, 1995),” Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1995, 049738)

LANL (Los Alamos National Laboratory), March 1996. “Quality Assurance Project Plan Requirements for Sampling and Analysis,” Los Alamos National Laboratory document LA-UR-96-441, Los Alamos, New Mexico. (LANL 1996, 054609)

LANL (Los Alamos National Laboratory), December 2000. “University of California, Los Alamos National Laboratory (LANL), I8980SOW0-8S, Statement of Work for Analytical Laboratories,” Rev. 1, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2000, 071233)

LANL (Los Alamos National Laboratory), June 30, 2008. “Exhibit "D" Scope of Work and Technical Specifications, Analytical Laboratory Services for General Inorganic, Organic, Radiochemical, Asbestos, Low-Level Tritium, Particle Analysis, Bioassay, Dissolved Organic Carbon Fractionation, and PCB Congeners,” Los Alamos National Laboratory document RFP No. 63639-RFP-08, Los Alamos, New Mexico. (LANL 2008, 109962)

Table E-1.0-1
Inorganic Chemical, Organic Chemical, and Radionuclide Analytical Methods for Samples Collected in the Lower Sandia Canyon Aggregate Area

Analytical Method	Analytical Description	Analytical Suite
Inorganic Chemicals		
EPA 300.0	Ion chromatography	Anions (nitrate)
EPA SW-846: 6010/6010B	Inductively coupled plasma emission spectroscopy—atomic emission spectroscopy	Aluminum, antimony, arsenic, barium, beryllium, calcium, cadmium, cobalt, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, uranium, vanadium, and zinc (TAL metals)
EPA SW-846:6020	Inductively coupled plasma mass spectrometry	Aluminum, antimony, arsenic, barium, beryllium, calcium, cadmium, cobalt, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc (TAL metals)
EPA SW-846:9012A	Automated colorimetric/off-line distillation	Total cyanide
EPA SW-846:6850	Liquid chromatography–mass spectrometry/mass spectrometry	Perchlorate
EPA SW-846:7471A	Cold vapor atomic absorption	Mercury
Organic Chemicals		
EPA SW-846: 8082	Gas chromatography (GC)	PCBs
EPA SW-846:8240 EPA SW-846:8260 EPA SW-846:8260B	Gas chromatography mass spectrometry (GCMS)	VOCs
EPA SW-846:8270C	GCMS	SVOCs
EPA SW-846: 8321A _MOD	High performance liquid chromatography	Explosive compounds
EPA SW-846:8081A	GC	Pesticides
EPA SW-846:8080	GC	Pesticides/PCBs
EPA SW-846:8015M_EXTRACTABLE	GC/flame ionization detector	TPH-DRO
EPA:418.1	Infrared spectrophotometry	TPH unknown range Total recoverable petroleum hydrocarbons
Radionuclides		
EPA 901.1	Gamma spectroscopy	Americium-241, cesium-134, cesium-137, cobalt-60, europium-152, ruthenium-106, sodium-22, and uranium-235
HASL Method 300:ISOPU HASL Method 300:ISOU	Chemical separation alpha spectrometry	Isotopic plutonium Isotopic uranium
EPA 905.0	Gas proportional counting	Strontium-90
EPA 906.0	Liquid scintillation	Tritium

Appendix F

Analytical Suites and Results and Analytical Reports
(on DVD included with this document)

Appendix G

Investigation-Derived Waste Management

G-1.0 INTRODUCTION

This appendix contains the waste management records for the investigation-derived waste (IDW) generated during the implementation of the investigation work plan for the Lower Sandia Aggregate Area of Los Alamos National Laboratory (LANL or the Laboratory).

All IDW generated during the field investigation was managed in accordance with Standard Operating Procedure (SOP) 5238, Characterization and Management of Environmental Program (EP) Waste. This procedure incorporates the requirements of applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy orders, and Laboratory policies and procedures.

Consistent with Laboratory procedures, a waste characterization strategy form (WCSF) was prepared to address characterization approaches, on-site management, and final disposition options for wastes. Analytical data and information on wastes generated during previous investigations and/or acceptable knowledge (AK) were used to complete the WCSF. The WCSF is included in this appendix as Attachment G-1 (on CD).

The selection of waste containers was based on appropriate U.S. Department of Transportation requirements, waste types, and estimated volumes of IDW to be generated. Immediately following containerization, each waste container was individually labeled with a unique identification number and with information regarding waste classification, contents, and radioactivity, if applicable.

Wastes were staged in clearly marked, appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements were based on the type of IDW and its classification. Container and storage requirements were detailed in the WCSF and approved before waste was generated.

Investigation activities were conducted in a manner that minimized the generation of waste. Waste minimization was accomplished by implementing the most recent version of the “Los Alamos National Laboratory Hazardous Waste Minimization Report.”

G-2.0 WASTE STREAMS

The IDW streams generated and managed during the investigation of Lower Sandia Aggregate Area are described below and are summarized in Table G-2.0-1. The waste numbers correspond with those identified in the WCSF.

- WCSF Waste Stream #1: Drill cuttings consisted of sediment, soil, and rock removed during mechanical auger drilling. Approximately 0.75 yd3 of drill cuttings was generated during this investigation and stored in 55-gal. drum. The cuttings were characterized per the WCSF and met the criteria in ENV-RCRA-QP-11.2, Land Application of Drill Cuttings, and will be land applied.
- WCSF Waste Stream #2: Contact waste consisted of spent personal protective equipment, material used in dry decontamination of sampling equipment (e.g., paper towels), and sampling equipment and other materials that contacted, or potentially contacted, contaminated environmental media and could not be decontaminated. This waste included but was not limited to plastic sheeting (e.g., tarps and liners), gloves, paper towels, plastic and glass sample bottles, and disposable sampling supplies. These wastes were containerized at the point of generation and were characterized based on AK of the waste materials, the methods of generation, and

analytical data for the media with which they came into contact. Approximately 0.75 yd^3 of contact waste was generated and will be recycled through the Laboratory's Green-is-Clean program.

- WCSF Waste Stream #4: Excavation waste consisted of lead contaminated soil. Eight locations were excavated at Area of Concern 53-013 based on the results of an x-ray fluorescence field survey and visual observation (Appendix C). Approximately 75 yd^3 of hazardous waste generated, containerized, and stored within an approved area of contamination will be disposed of at an authorized off-site disposal facility
- WCSF Waste Streams #3, #5, #6, #7, and #8: No decontamination fluids were generated, no excavated man-made debris were generated, no municipal solid waste was generated, no petroleum-contaminated soils were found, and no excess samples were generated or returned.

Table G-2.0-1
Summary of IDW Generation and Management

Waste Stream	Waste Type	Volume	Characterization Method	On-Site Management	Disposition
Contact Waste	Industrial	0.3 yd^3	Direct sampling and use of analytical data from investigation samples	5 gal. poly container	Intended path: Recycle through Green-Is-Clean
Drill Cuttings	Industrial	0.3 yd^3	Direct container sampling.	55-gal. drum	Intended path: Land application
Excavation Waste	Hazardous	75 yd^3	Direct container sampling	20-yd^3 rolloff bins	Intended path: Authorized off-site disposal facility

Attachment G-1

Waste Characterization Strategy Form
(on CD included with this document)

Appendix H

Box Plots and Statistical Results

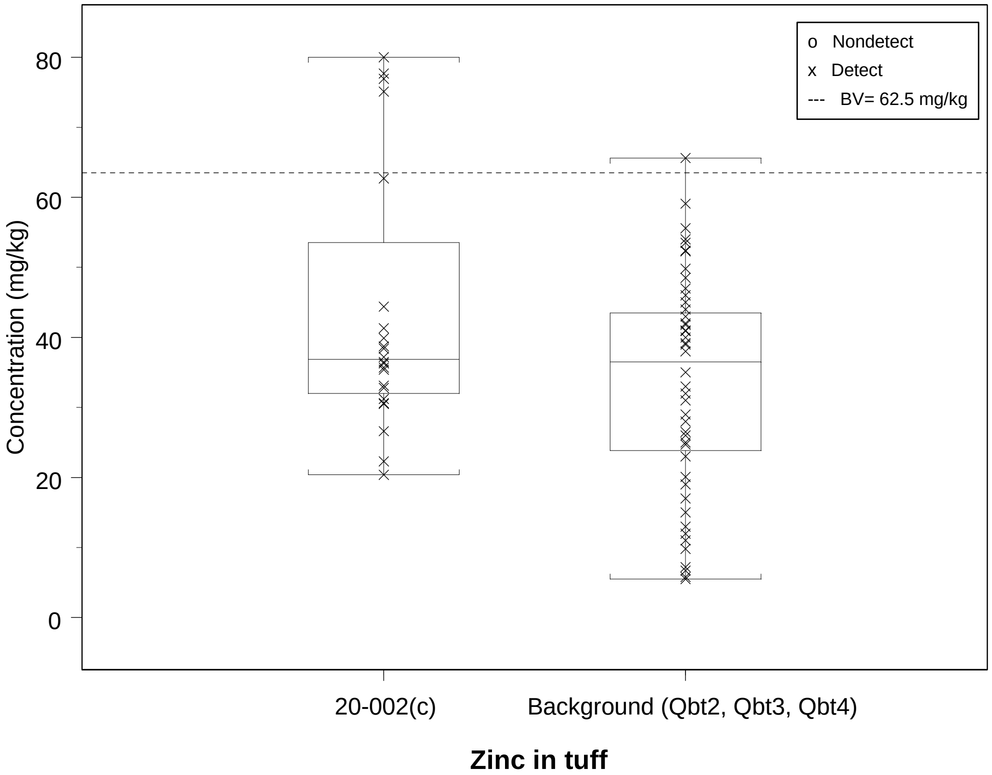


Figure H-1 Box plot for zinc in tuff at SWMU 20-002(c)

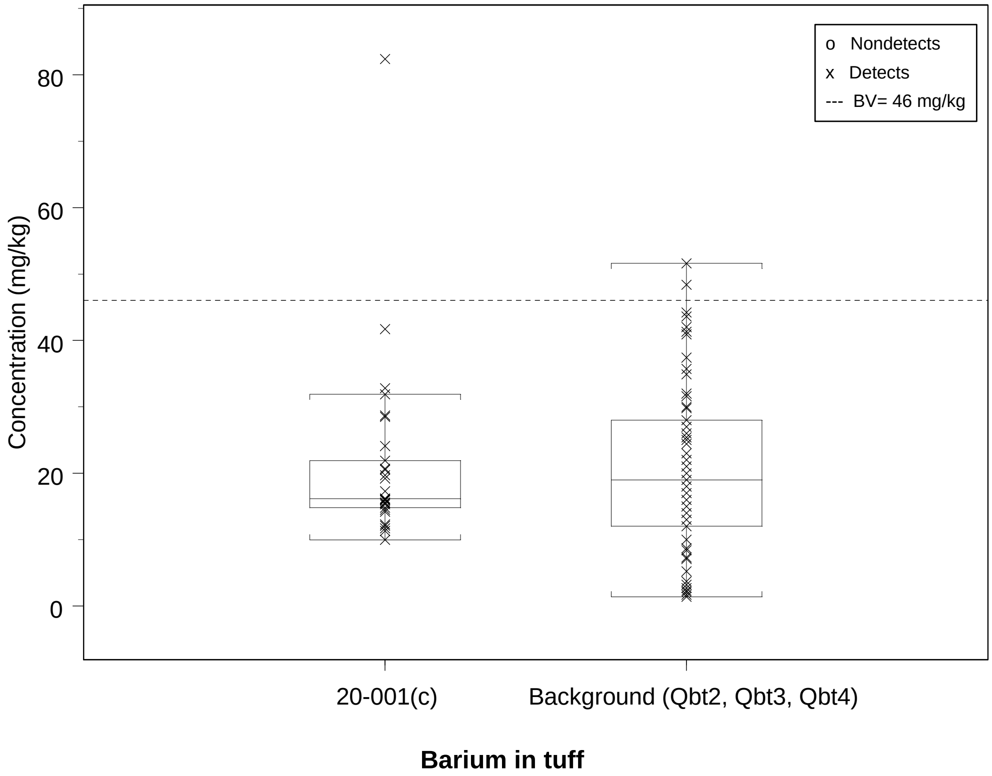


Figure H-2 Box plot for barium in tuff at SWMU 20-001(c)

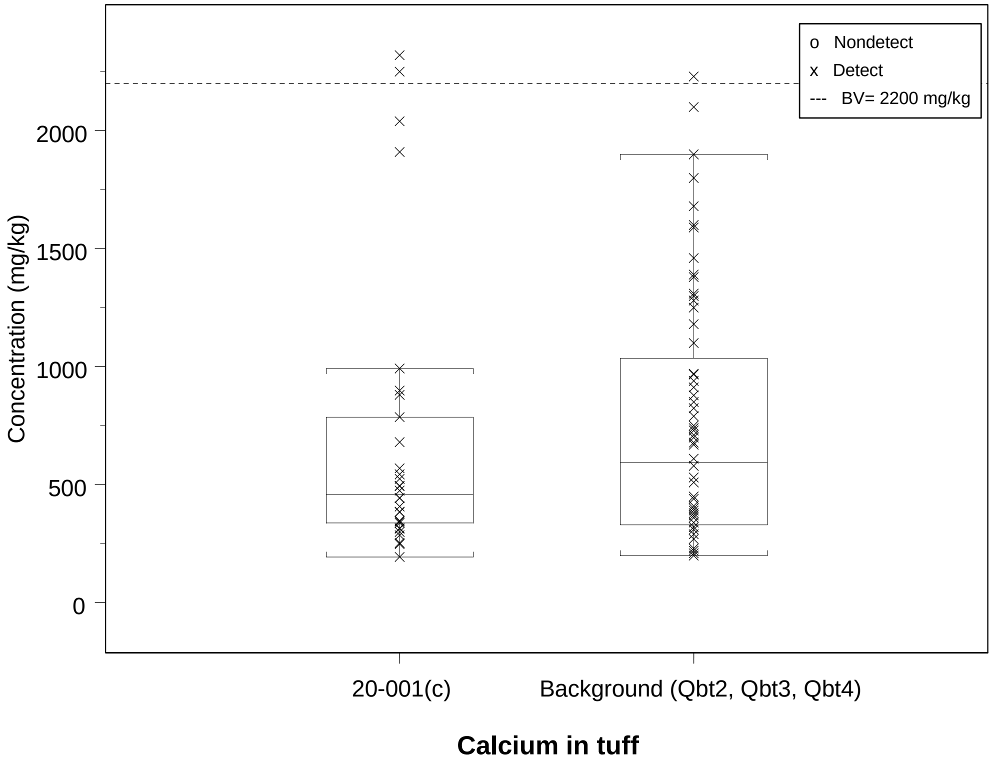


Figure H-3 **Box plot for calcium in tuff at SWMU 20-001(c)**

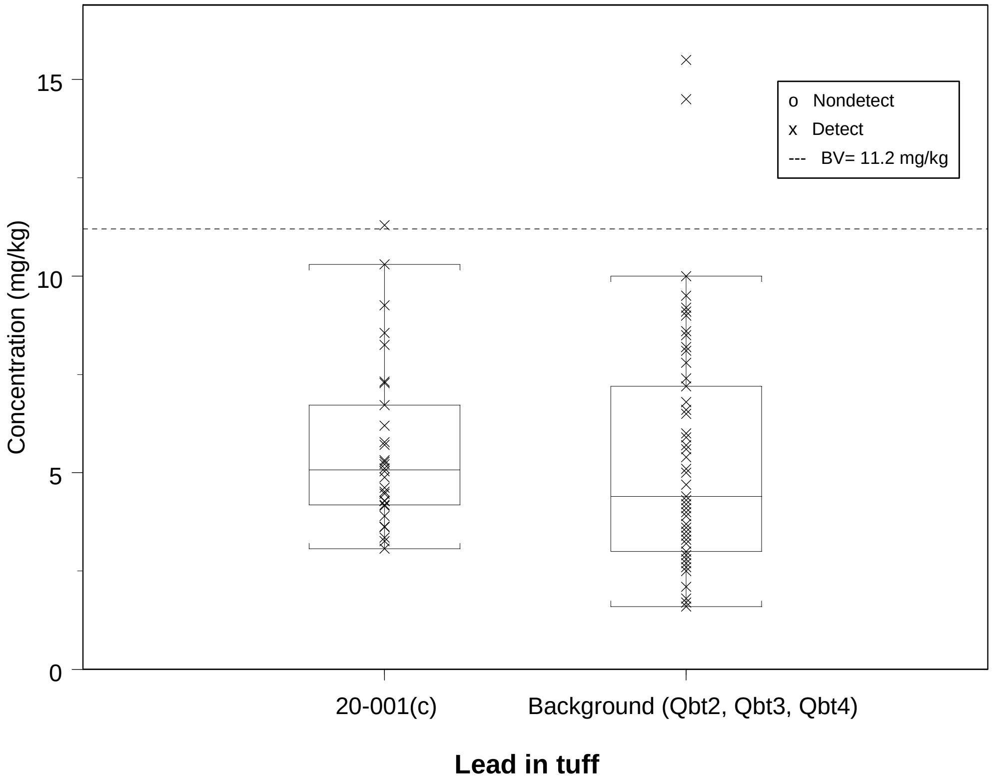


Figure H-4 **Box plot for lead in tuff at SWMU 20-001(c)**

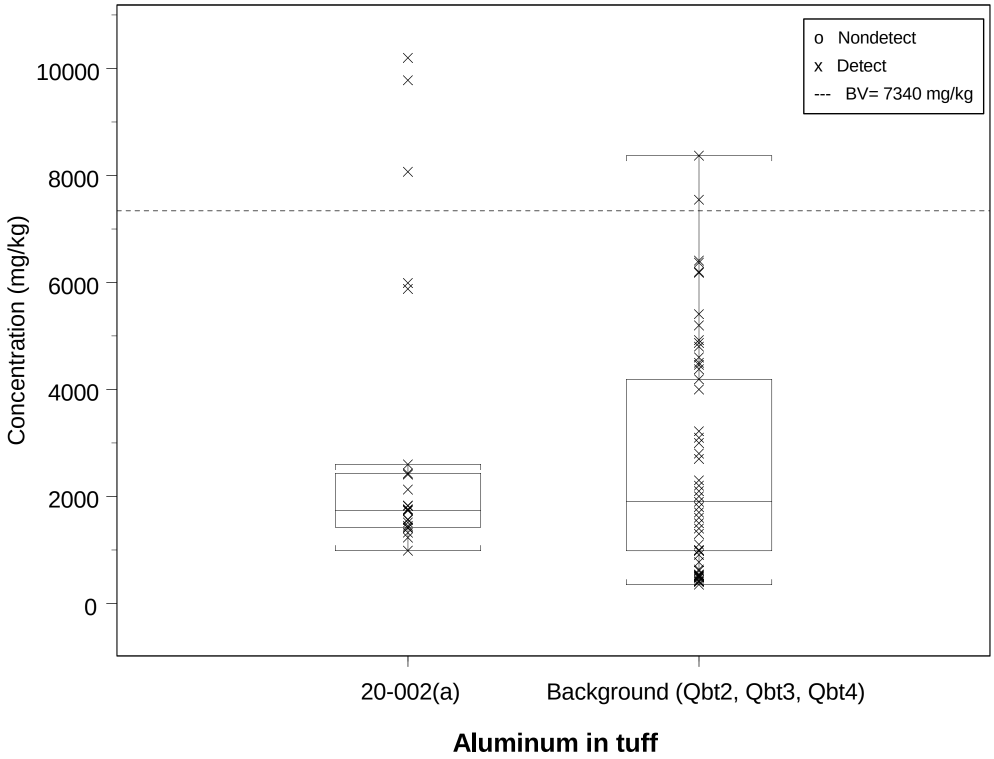


Figure H-5 Box plot for aluminum in tuff at SWMU 20-002(a)

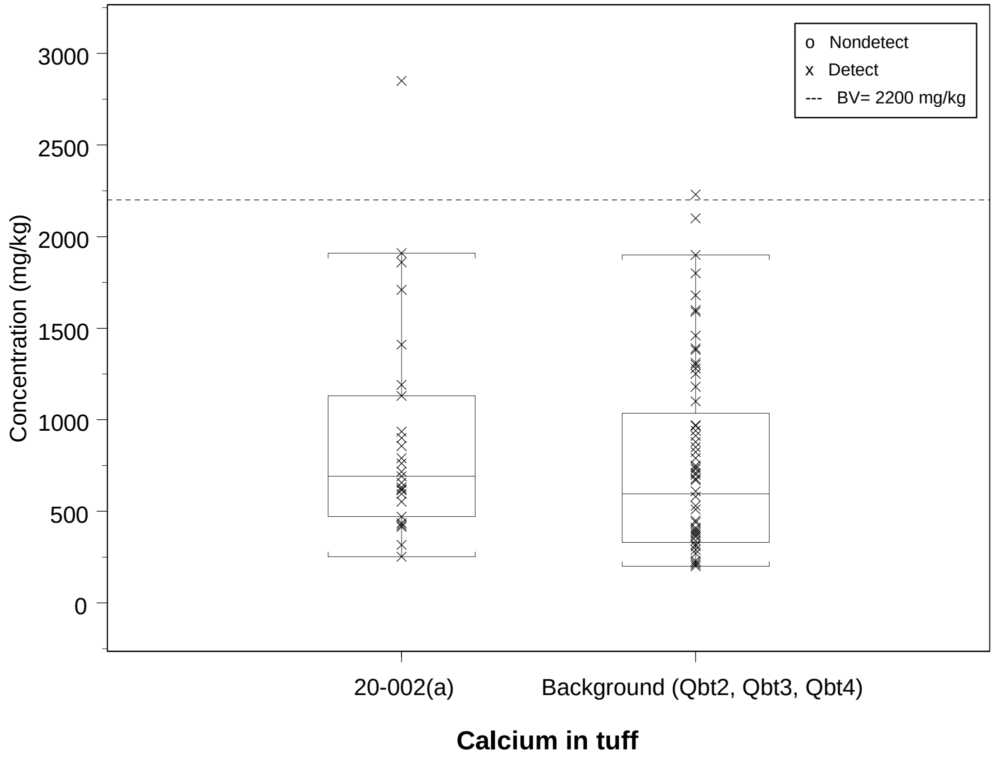


Figure H-6 Box plot for calcium in tuff at SWMU 20-002(a)

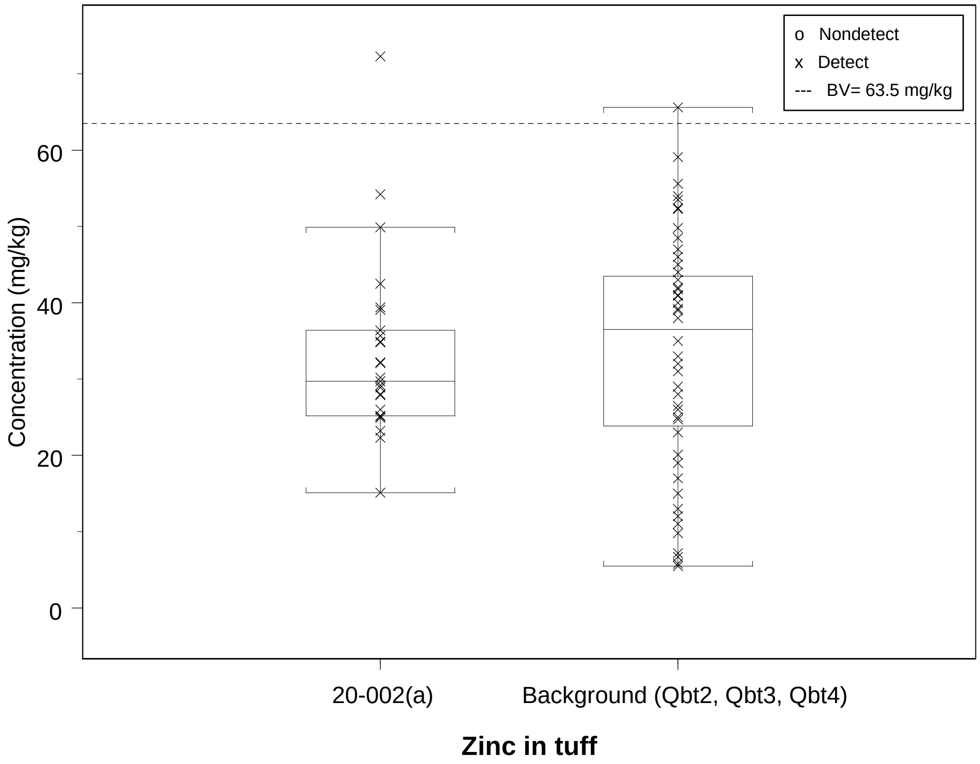


Figure H-7 **Box plot for zinc in tuff at SWMU 20-002(a)**

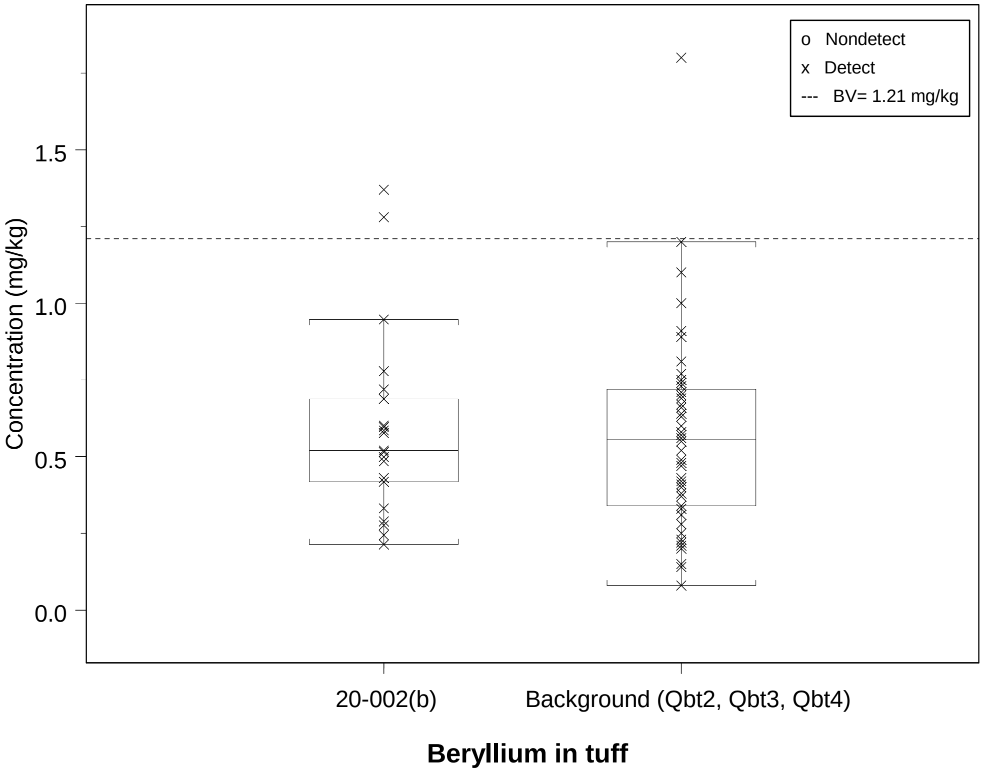


Figure H-8 **Box plot for beryllium in tuff at SWMU 20-002(b)**

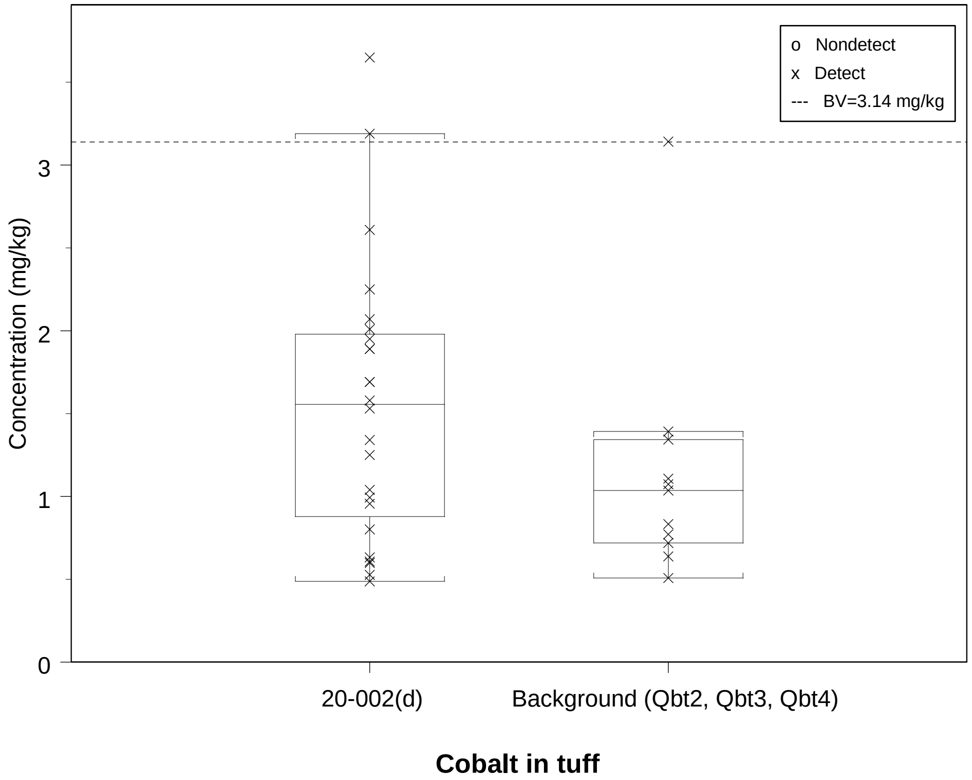


Figure H-9 **Box plot for cobalt in tuff at SWMU 20-002(d)**

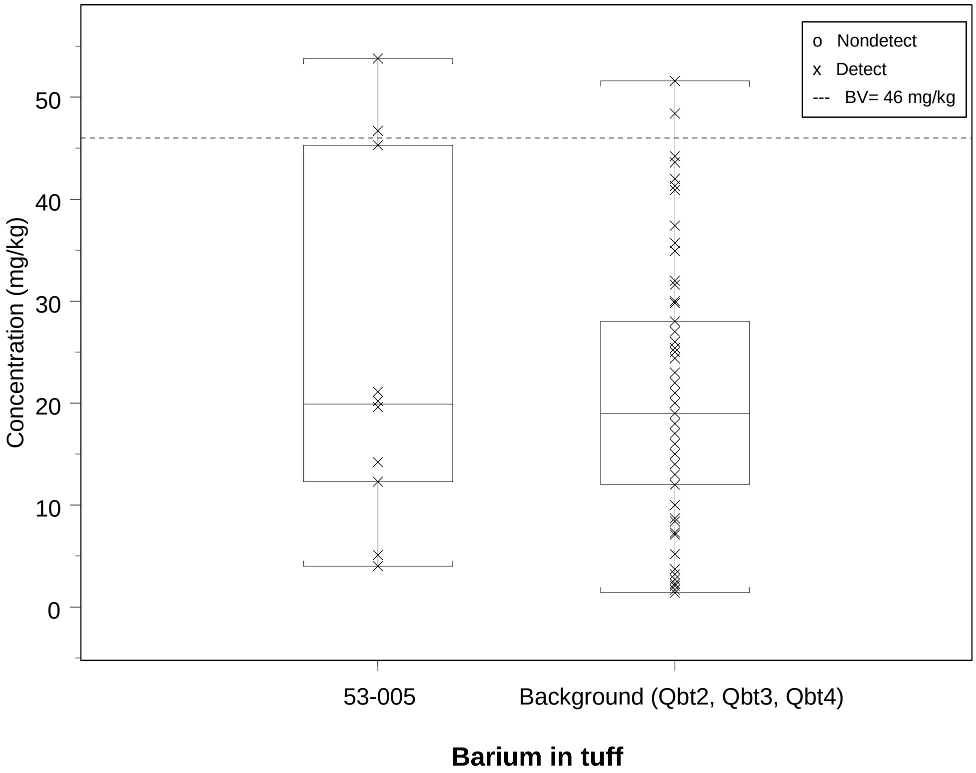


Figure H-10 **Box plot for barium in tuff at SWMU 53-005**

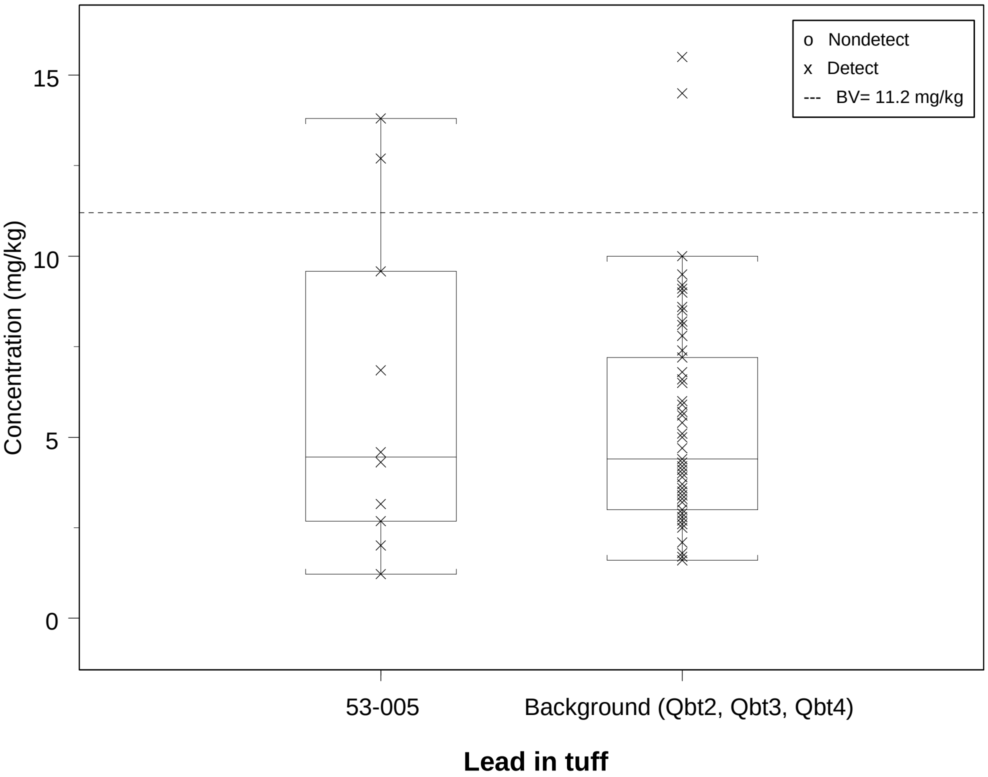


Figure H-11 Box plot for lead in tuff at SWMU 53-005

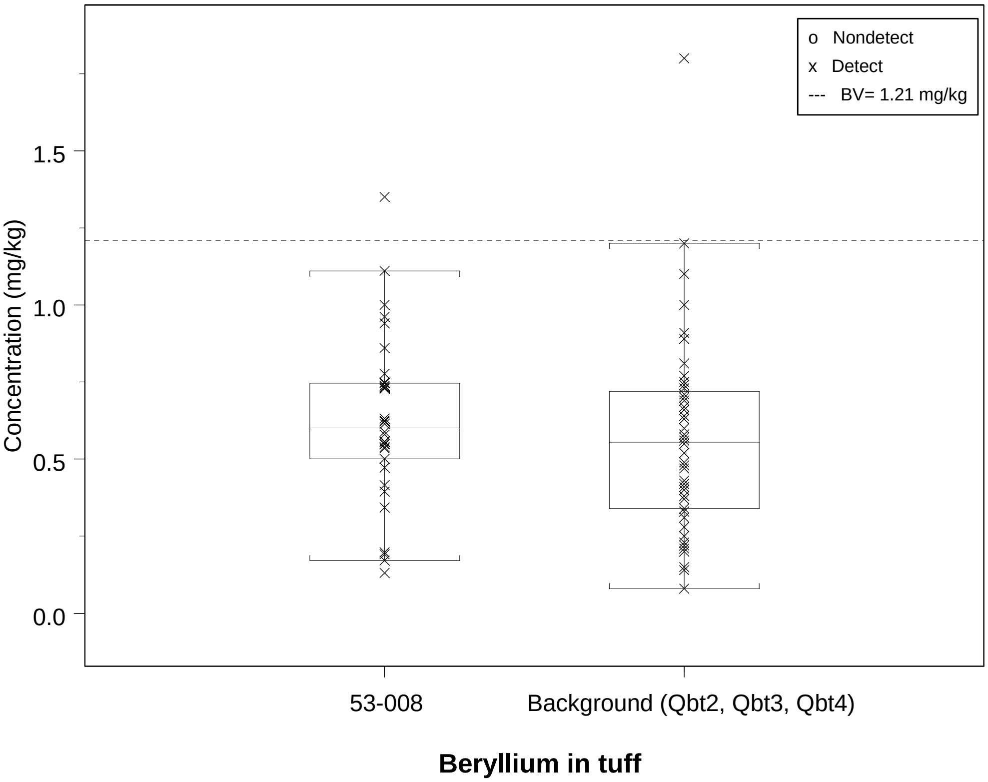


Figure H-12 Box plot for beryllium in tuff at AOC 53-008

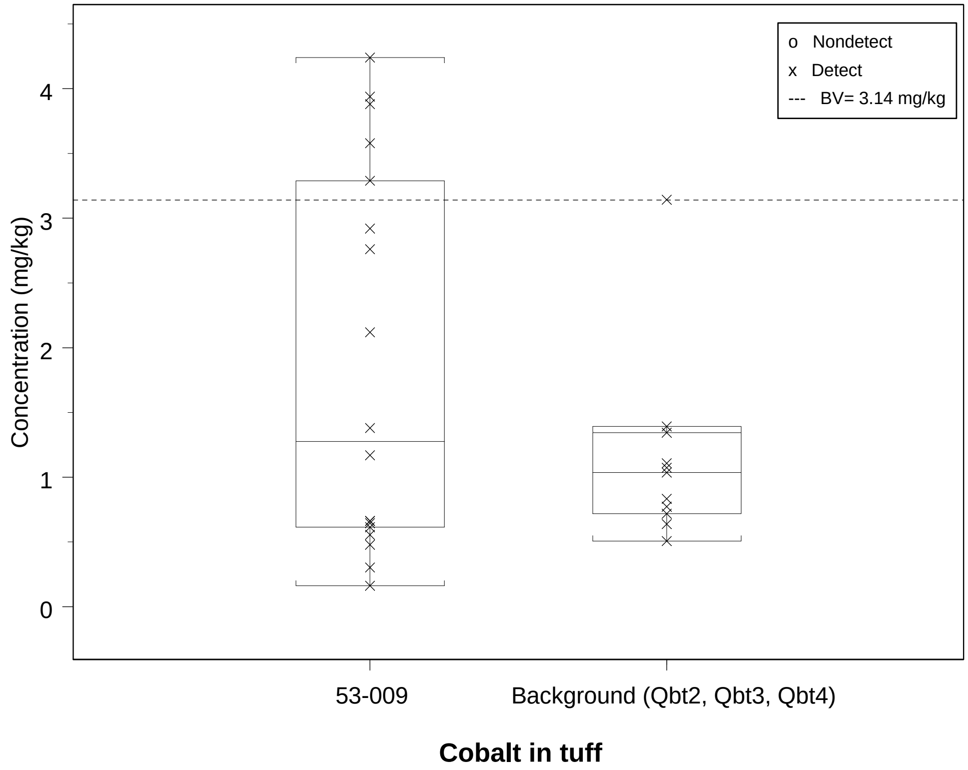


Figure H-13 Box plot for cobalt in tuff at AOC 53-009

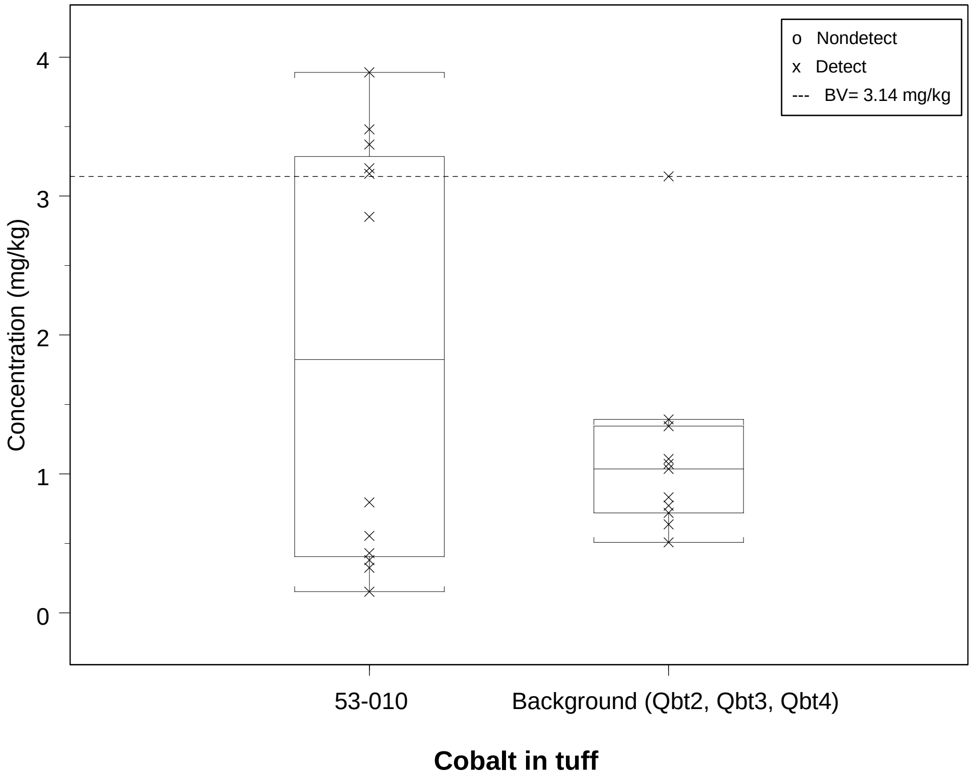


Figure H-14 Box plot for cobalt in tuff at AOC 53-010

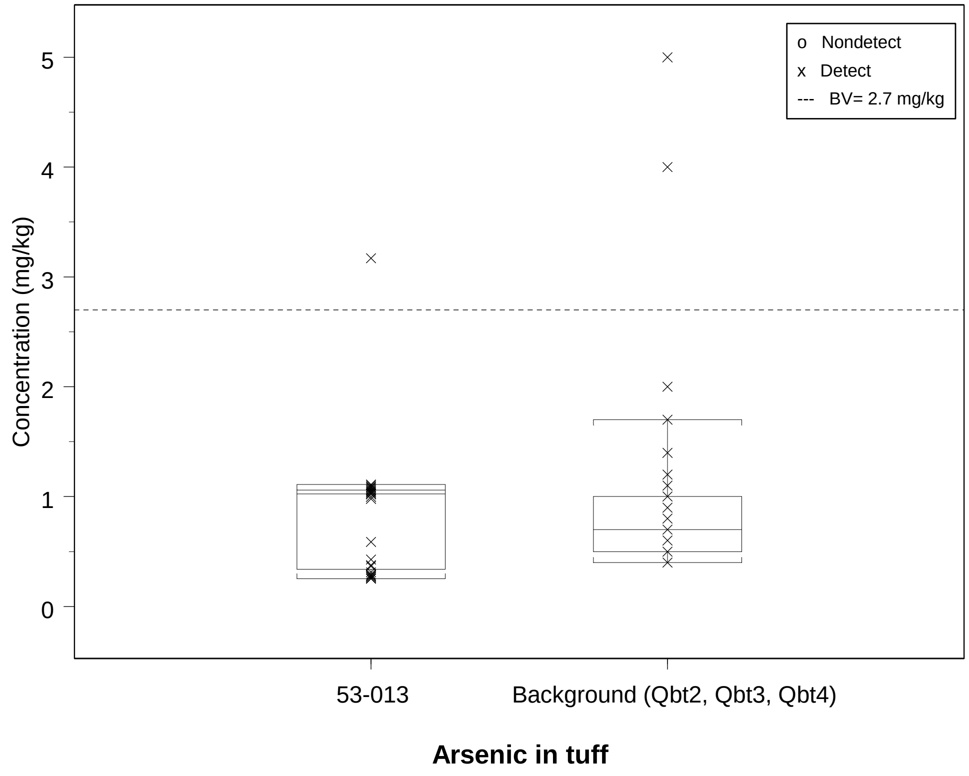


Figure H-15 Box plot for arsenic in tuff at AOC 53-013

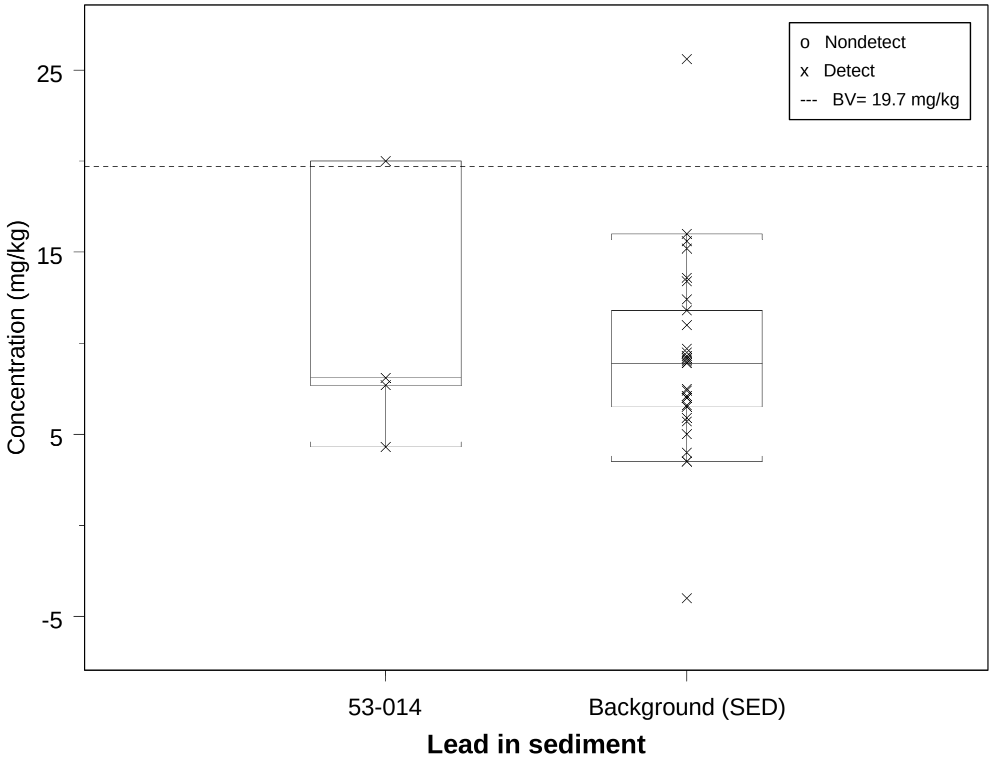


Figure H-16 Box plot for lead in sediment at AOC 53-013

Table H-1
Results of Statistical Tests for Inorganic Chemicals in Tuff at SWMU 20-002(c)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Zinc	1.39E-01	5.94E-01	n/a*	No

* n/a = Not applicable.

Table H-2
Results of Statistical Tests for Inorganic Chemicals in Tuff at SWMU 20-001(c)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Barium	6.93E-01	9.48E-01	n/a*	No
Calcium	4.03E-01	9.40E-01	n/a	No
Lead	1.66E-01	3.85E-01	n/a	No

* n/a = Not applicable.

Table H-3
Results of Statistical Tests for Inorganic Chemicals in Tuff at SWMU 20-002(a)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Aluminum	5.41E-01	8.21E-01	n/a*	No
Calcium	1.48E-01	4.73E-01	n/a	No
Zinc	4.68E-01	9.62E-01	n/a	No

* n/a = Not applicable.

Table H-4
Results of Statistical Tests for Inorganic Chemicals in Tuff at SWMU 20-002(b)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Beryllium	7.37E-01	6.70E-01	n/a*	No

* n/a = Not applicable.

Table H-5
Results of Statistical Tests for Inorganic Chemicals in Tuff at SWMU 20-002(d)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Cobalt	1.55E-01	8.90E-02	n/a*	No

* n/a = Not applicable.

Table H-6
Results of Statistical Tests for Inorganic Chemicals in Tuff at SWMU 53-005

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Barium	6.30E-01	2.82E-01	n/a*	No
Lead	9.49E-01	6.14E-01	n/a	No

* n/a = Not applicable.

Table H-7
Results of Statistical Tests for Inorganic Chemicals in Tuff at AOC 53-008

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Beryllium	2.02E-01	2.62E-01	n/a*	No

* n/a = Not applicable.

Table H-8
Results of Statistical Tests for Inorganic Chemicals in Tuff at AOC 53-009

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Cobalt	6.21E-01	2.68E-01	n/a*	No

* n/a = Not applicable.

Table H-9
Results of Statistical Tests for Inorganic Chemicals in Tuff at AOC 53-010

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Cobalt	8.06E-01	5.79E-01	n/a*	No

* n/a = Not applicable.

Table H-10
Results of Statistical Tests for Inorganic Chemicals and Radionuclides in Sediment at AOC 53-013

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Arsenic	n/a*	2.77E-02	n/a	Yes
Lead	n/a	1.02E-03	n/a	Yes

* n/a = Not applicable.

Appendix I

Risk Assessments

CONTENTS

Figures

Tables

I-1.0 INTRODUCTION

This appendix presents the results of the human health and ecological risk-screening assessments for the 2010 investigation activities at Technical Area (TA-53) in the Lower Sandia Canyon Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). The sites for which extent is defined include Solid Waste Management Unit (SWMU) 53-001(b) and Areas of Concern (AOCs) 53-013 and 53-014. No chemicals of potential concern (COPCs) were identified AOC 53-014.

I-2.0 BACKGROUND

TA-53 is located in the northeast portion of the Laboratory on Mesita de los Alamos, the mesa bounded by Los Alamos Canyon to the north and Sandia Canyon to the south (Plate 1). TA-53 is the location of the Los Alamos Neutron Science Center (LANSCE). The primary component of LANSCE is a 0.5-mi-long linear proton accelerator that produces subatomic particles for experimental physics activities and isotopes. TA-53 also contains office buildings, laboratories, and other facilities associated with the operation of the accelerator.

TA-53 was originally developed as the Los Alamos Meson Physics Facility (LAMPF). Construction of LAMPF began in 1967, and the facility became fully operational in 1974. The facility was renamed LANSCE to reflect the programs currently carried out at TA-53. LANSCE programs and activities are housed in a large complex (approximately 400 buildings), including the building housing the linear accelerator itself, experimental areas and laboratories, and experimental support operations and advanced technology programs. LANSCE is presently used for research in condensed-matter science and engineering, accelerator science, fundamental nuclear physics, and radiography.

I-2.1 Site Descriptions and Operational History

I-2.1.1 SWMU 53-001(b)

SWMU 53-001(b) is an outdoor storage area located on a concrete pad that rests on the asphalt parking lot on the south side of the TA-53 equipment test laboratory (building 53-2). Before 1990, this area consisted of drum racks used to store drums of products and wastes associated with maintenance activities conducted in building 53-2. Wastes included spent trichloroethene (TCE), Freon, other solvents, and acidic waste. Engineering drawings show the storage area was constructed in 1971. A photograph taken in 1989 shows the storage area contained drums, some of which were product and some of which were marked with hazardous waste labels. In addition, the photograph identifies no staining, indicating no spills or leakage occurred.

In 1990, the drum racks were removed and replaced with four lockable flammable-material storage cabinets. The site was inspected during preparation of the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan in 1993, and again no evidence of staining or releases was noted. The Laboratory’s current waste-site database indicates this storage location also contained a less-than-90-d storage area that was removed (i.e., taken out of service) in 1998. The site currently contains flammable-material storage cabinets, which are used for product storage but not for waste storage.

I-2.1.2 AOC 53-013

AOC 53-013 is a lead spill site located near the east end of TA-53, northeast of buildings 53-10 and 53-315, which are part of the LANSCE accelerator facility (Figure 7.13-1). Lead shot was present within two fenced areas, approximately 50 ft × 80 ft and 60 ft × 180 ft, that are used for storage and as staging areas for equipment used in beam experiments. The lead shot was used as radiation shielding for experiments conducted in building 53-10. The shot ranged from 1.5 mm to 4 mm in diameter and was mixed into the sandy soil present at the site. Previously, some of the shot was visible on the ground surface.

The shot was spilled at the site during assembly of components containing the shot and was also released from defective containers. The dates the shot was spilled onto the ground surface are not known but could date as far back as the late 1960s or the early 1970s, when accelerator operations began. Both areas are presently fenced and locked, and the westernmost area is posted as a radiological control area.

I-2.1.3 AOC 53-014

AOC 53-014, a lead spill site, is located at a paved storage area in TA-53 west of building 53-18. Lead shot was spilled on the paved surface, and stormwater washed the lead into an asphalt-lined channel that joins a drainage below an National Pollutant Discharge Elimination System–permitted outfall (03A113). The lead shot was observed at a number of locations in the channel but was not seen below a large catchment approximately 50 ft below the canyon rim.

I-2.2 Sampling Results and Determination of COPCs

The data used to identify COPCs and to evaluate potential risks to human health and the environment for SWMU 53-001(b) consist of all qualified results from three soil samples collected from two locations during the 1995 RFI and four tuff samples collected from two locations during the 2010 investigation. For AOC 53-013, the data consist of all qualified analytical results from 40 tuff samples collected in 2010 from 20 locations; no COPCs were identified at AOC 53-014. Only those data determined to be of decision-level quality following the data-quality assessment (Appendix E) are included in the data sets evaluated in this risk appendix. The data are present in Appendix F (on DVD).

Section 5.1 of the investigation report for Lower Sandia Canyon Aggregate Area summarizes the COPC identification process.

I-3.0 CONCEPTUAL SITE MODEL

The sites comprising the investigation are of two types. The first type is site the former storage area [SWMU 53-001(b)]. The second type of site is a lead-spill site (AOC 53-013). Both sites are surface soil contamination. COPCs may be found in surface material and may also have migrated into the subsurface.

I-3.1 Receptors and Exposure Pathways

The current and reasonably foreseeable future land use for the sites in the Lower Sandia Canyon Aggregate Area is industrial, the receptor being a Laboratory worker. However, the construction worker scenario may also be applicable for some sites. The recreational and residential scenarios are not current and reasonably foreseeable future land uses. However, the residential scenario is evaluated per the Consent Order.

The primary exposure pathway for human receptors is from surface and subsurface soil or tuff that may be brought to the surface through intrusive activities. Migration of contamination to groundwater through the vadose zone is not likely given the depth to groundwater (greater than 1000 ft below ground surface [bgs]) at the site. Human receptors may be exposed through direct contact with soil or suspended particulates by ingestion, inhalation, dermal contact, and external irradiation pathways. Direct contact exposure pathways from subsurface contamination to human receptors are complete for resident and construction worker. The exposure pathways are the same as those for surface soil. The sources, exposure pathways, and receptors are shown in the conceptual site model in Figure I-3.1-1.

The sites at TA-53 provide minimal potential habitat for ecological receptors because the area is highly developed. Exposure pathways to surface soil and tuff are complete for ecological receptors to a depth of 0–5 ft. Weathering of tuff is the only viable natural process that may result in the exposure of receptors to COPCs in tuff. However, because of the slow rate of weathering expected for tuff, exposure to COPCs in tuff is negligible, although it is included in the assessments. Exposure pathways to subsurface contamination below 5 ft are not complete unless contaminated soil or tuff were excavated and brought to the surface. The potential pathways are root uptake by plants, inhalation of vapors, inhalation of dust, dermal contact, incidental ingestion of soil, external irradiation, and food-web transport. Pathways from subsurface releases may be complete for plants. Surface water was not evaluated because of the lack of surface water features. The sources, exposure pathways, and receptors are shown in the conceptual site model in Figure I-3.1-1.

I-3.2 Environmental Fate and Transport

The evaluation of environmental fate addresses the chemical processes affecting the persistence of a chemical in the environment; the evaluation of transport addresses the physical processes affecting mobility of a contaminant along a migration pathway. Migration through soil and tuff depends on properties such as soil pH, rate of precipitation or snowmelt, soil moisture content, soil-tuff hydraulic properties, and properties of the COPCs. Migration into and through tuff also depends on the unsaturated flow properties of the tuff and the presence of joints and fractures.

The most important factor with respect to the potential for COPCs to migrate to groundwater is the presence of saturated conditions. Downward migration in the vadose zone is limited also by a lack of hydrostatic pressure as well as lack of a source for the continued release of contamination. Without sufficient moisture and a source, little or no potential migration of materials through the vadose zone to groundwater occurs.

Contamination at depth is addressed in the discussion of nature and extent presented in the report. Results from the deepest samples collected showed either no detected concentrations of COPCs or low or trace-level concentrations of only a few inorganic, radionuclide, and/or organic COPCs in tuff. The limited extent of contamination is related to the absence of the key factors that facilitate migration, as mentioned above. Given how long the contamination has been present in the subsurface, physical and chemicals properties of the COPCs, and the lack of saturated conditions, the potential for contaminant migration to groundwater is very low.

The New Mexico Environment Department (NMED) guidance (NMED 2009, 108070) contains screening levels that consider the potential for contaminants in soil to result in groundwater contamination. These screening levels consider equilibrium partitioning of contaminants among solid, aqueous, and vapor phases and account for dilution and attenuation in groundwater through the use of dilution attenuation factors (DAFs). These DAF soil screening levels (SSLs) can be used to identify chemical concentrations in soil that have the potential to contaminate groundwater (EPA 1996, 059902). However, screening contaminant concentrations in soil against the DAF SSLs does not provide an indication of the potential for contaminants to migrate to groundwater. The assumptions used in the development of these DAF SSLs include an assumption of uniform contaminant concentrations from the contaminant source to the water table (i.e., it is assumed that migration to groundwater has already occurred). Furthermore, this assumption is inappropriate where sampling has shown that contamination is vertically bounded near the surface and the distance from the surface to the water table is large. For these reasons, screening of contaminant concentrations in soil against the DAF SSLs was not performed.

The best indication of the potential for future contaminant migration to groundwater is the current vertical distribution of contaminants in the subsurface. The releases at the Lower Sandia Canyon Aggregate Area are historical (i.e., they occurred over decades ago). The regional aquifer beneath the aggregate area is greater than 1000 ft bgs. Therefore, for migration of contaminants to occur from shallow soil to the regional aquifer in a meaningful time frame (e.g., 100 to 1000 yr), significant vertical migration should have already occurred. Sampling has shown that this migration has not occurred, indicating a very low potential for future contaminant migration to groundwater.

The relevant release and transport processes of the COPCs are a function of chemical-specific properties that include the relationship between the physical form of the constituents and the nature of the constituent transport processes in the environment. Specific properties include the degree of saturation, the potential for ion exchange or sorption, and the potential for natural bioremediation. The chemical and physical properties of the COPCs at SWMU 53-001(b) and AOC 53-013 are presented in Tables I-3.2-1 and I-3.2-2.

The primary release and transport mechanisms that may lead to the potential exposure of receptors include:

- dissolution and/or particulate transport of surface contaminants from precipitation and runoff,
- airborne transport of contaminated surface soil or particulates,
- continued dissolution and advective/dispersive transport of chemical contaminants contained in subsurface soil and bedrock,
- biotic perturbation and/or translocation of contaminants in subsurface contaminated media, and
- uptake of contaminants from soil and water by biota.

Contaminant distributions at the sites indicate that after the initial deposition of contaminants from operational activities and historical remediation efforts, elevated levels of contaminants tend to remain concentrated near the original release points.

I-3.2.1 Inorganic Chemicals

Table I-3.2-1 presents the physical and chemical properties (soil-water partition coefficient [K_d] and solubility) of the inorganic COPCs identified. In general, and particularly in a semiarid climate such as that found at TA-53, inorganic chemicals are not highly soluble or mobile in the environment. The primary physical and chemical factors that determine and describe the distribution of inorganic COPCs within the soil and tuff are the water solubility of the inorganic chemical and K_d. Other factors besides the K_d values, such as speciation in soil and oxidation-reduction potential (Eh) and pH, also play a role in the likelihood that inorganic chemicals will migrate. The K_d values provide a general assessment of the potential for migration through the subsurface; chemicals with higher K_d values are less likely to be mobile than those with lower K_d values. Inorganic chemicals with K_d values greater than 40 are very unlikely to migrate through soil towards the water table (Kincaid et al. 1998, 093270). Based on this criterion, antimony, cadmium, chromium, lead, mercury, and zinc have a very low potential to mobilize and migrate through soil and the vadose zone. The K_d values for copper and selenium are less than 40 and may indicate that these inorganic chemicals have a greater potential to mobilize and migrate through soil and the vadose zone. Information about the fate and transport properties of this inorganic chemical was obtained from the individual chemical profile published by the Agency for Toxic Substances and Disease Registry (ATSDR) (ATSDR 1997, 056531). Information is also available from the ATSDR website at http://www.atsdr.cdc.gov/toxpro2.html.

- Copper movement in soil is determined by physical and chemical interactions with the soil components. Most copper deposited in soil is strongly adsorbed and remains in the upper few centimeters. Copper will adsorb to organic matter, carbonate minerals, clay minerals, hydrous iron, and manganese oxides. In most temperate soil, pH, organic matter, and ionic strength of the soil solutions are the key factors affecting adsorption. Copper binds to soil much more strongly than other divalent cations, and the distribution of copper in the soil solution is less affected by pH than other metals. Copper is expected to be bound to the soil and move in the system by way of transport of soil particles by water as opposed to movement as dissolved species. The average soil pH is 8.3, so leaching of copper is unlikely.
- Selenium is not often found in the environment in its elemental form but is usually combined with sulfide minerals or with silver, copper, lead, and nickel minerals. In soil, pH and Eh are determining factors in the transport and partitioning of selenium. In soil with a pH of greater than 7.5, selenates, which have high solubility and a low tendency to adsorb onto soil particles, are the major selenium species and are very mobile. The average soil pH at TA-53 is 8.3, which indicates that selenium might have a potential to migrate. However, selenium was not detected in samples collected at either site.

I-3.2.2 Organic Chemicals

Table I-3.2-2 presents the physical and chemical properties (organic carbon-water partition coefficient [K_{oc}], logarithm to the base 10 octanol-water partition coefficient [log K_{ow}], solubility, and vapor pressure) of the organic COPCs identified. Physical and chemical properties of organic chemicals are important when evaluating their fate and transport. The following information illustrates some aspects of the fate and transport tendencies of these COPCs. The information is summarized from Ney (1995, 058210).

Water solubility may be the most important chemical characteristic used to assess the mobility of organic chemicals. The higher the water solubility of a chemical, the more likely it is to be mobile and the less likely it is to accumulate, bioaccumulate, volatilize, or persist in the environment. The lower the water solubility of a chemical, especially below 10 mg/L, the more likely it will be immobilized by adsorption. Chemicals with lower water solubilities are more likely to accumulate or bioaccumulate and persist in the environment, to be slightly prone to biodegradation, and to be metabolized in plants and animals. Aroclor-1254 and Aroclor-1260 have water solubilities less than 10 mg/L.

Vapor pressure is a chemical characteristic used to evaluate the tendency of organic chemicals to volatize. Chemicals with vapor pressure greater than 0.01 millimeters of mercury (mm Hg) are likely to volatilize, and therefore, concentrations at the site are reduced over time; vapors of these chemicals are more likely to travel toward the atmosphere and not migrate toward groundwater. Chemicals with vapor pressures less than 0.000001 mm Hg are less likely to volatilize and, therefore, tend to remain immobile. Aroclor-1254 and Aroclor-1260 have vapor pressures between 0.01–0.000001 mm Hg.

The K_{ow} is an indicator of a chemical's potential to bioaccumulate or bioconcentrate in the fatty tissues of living organisms. The unit less K_{ow} value is an indicator of water solubility, mobility, sorption, and bioaccumulation. A K_{ow} of less than 500 indicates high water solubility, high mobility, little to no affinity for bioaccumulation, and degradability by microbes, plants, and animals. Aroclor-1254 and Aroclor-1260 have K_{ow} values less than 500.

The K_{oc} measures the tendency of a chemical to adsorb to organic carbon in soil. K_{oc} values above 500 L/kg indicate a strong tendency to adsorb to soil, leading to low mobility (NMED 2006, 092513). Aroclor-1254 and Aroclor-1260 have K_{oc} values above 500 L/kg, indicating a very low potential to migrate toward groundwater.

In summary, Aroclor-1254 and Aroclor-1260 have low mobility and are likely to bioaccumulate. Because these COPCs were detected at low concentrations and the extent is defined, they are not likely to migrate to groundwater.

I-3.2.3 Radionuclides

Radionuclides were not analyzed for at SWMU 53-001(b) and AOC 53-013.

I-3.3 Exposure Point Concentration Calculations

The exposure point concentrations (EPCs) represent upper bound concentrations of COPCs. For comparison to risk-screening levels, the upper confidence level (UCL) of the arithmetic mean of a set of concentrations was calculated when possible and used as the EPC. If an appropriate UCL of the mean could not be calculated or if the UCL exceeded the maximum concentration, the maximum detected concentration of the COPC was used as the EPC.

Calculation of the UCLs of the mean concentration was done using the U.S. Environmental Protection Agency (EPA) ProUCL 4.00.05 software (EPA 2010, 109944), which is based on EPA guidance (EPA 2002, 085640). The ProUCL software performs distributional tests on the data set for each COPC and calculates the most appropriate UCL based on the distribution of the data set. The ProUCL program calculates 95%, 97.5%, and 99% UCLs and recommends a distribution and a value for UCL. The UCL calculated via the recommended distribution was used as the EPC. Environmental data may have a normal, lognormal, or gamma distribution but are often nonparametric (no definable shape to the distribution). The input and output data files for ProUCL calculations for each site are provided in Attachment I-1 (on CD).

For SWMU 53-001(b) and AOC 53-013, the EPC for each COPC for the industrial, ecological, residential, and construction worker risk-screening assessments and the distributions used for the calculations are presented in Tables I-3.3-1 through I-3.3-6.

I-4.0 HUMAN HEALTH RISK-SCREENING ASSESSMENTS

Human health and ecological risk assessments were conducted for SWMU 53-001(b) and AOC 53-013. Both sites were screened using the industrial, construction worker, and residential scenarios.

The risk-screening assessment(s) for a site included all COPCs detected within the depth interval relevant for each exposure scenario. The depth intervals are

- 0–10 ft bgs for the residential and construction worker scenarios, and
- 0–1 ft bgs for the industrial scenario.

The COPCs evaluated for each scenario may differ depending on the depth at which the COPC was detected. Because sampling depths often overlapped during multiple investigations, all samples with a starting depth less than the lower bound of the interval for each scenario were included in the risk assessment.

I-4.1 SSLs

Human health risk-screening assessments were conducted for inorganic and organic COPCs using the residential, industrial, and construction worker SSLs from NMED guidance (NMED 2009, 108070) or EPA regional screening tables (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm). The EPA SSLs for carcinogens were multiplied by 10 to adjust from a 10^{-6} cancer risk level to the NMED target cancer risk level of 10^{-5}. Exposure parameters used to calculate the SSLs for all three scenarios are presented in Table I-4.1-1. Radionuclides were not analyzed for at SWMU 53-001(b) and AOC 53-013.

I-4.2 Results of the Human Health Risk-Screening Assessments

The EPC of each COPC was compared with the SSL for the appropriate scenario.

- For a carcinogenic COPC, the EPC was divided by the SSL and then multiplied by 1×10^{-5}. The cancer risks were summed for a site, and the sum was compared with the NMED target cancer risk level of 1×10^{-5} (NMED 2009, 108070).
- For a noncarcinogenic COPC, a hazard quotient (HQ) was calculated by dividing the EPC by the SSL. The HQs were summed for a site to obtain a hazard index (HI). The HI was compared with the NMED target HI of 1 (NMED 2009, 108070).

The results of the human health screening evaluations are presented in Tables I-4.2-1 to I-4.2-12.

I-4.2.1 SWMU 53-001(b)

The total excess cancer risk for the industrial scenario is 3×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 0.1, which is below the NMED target HI of 1 (NMED 2009, 108070).

The total excess cancer risk for the construction worker scenario is 1×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 0.3, which is below the NMED target HI of 1 (NMED 2009, 108070).

The total excess cancer risk for the residential scenario is approximately 5×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is approximately 1, which is equivalent to the NMED target HI of 1 (NMED 2009, 108070).

I-4.2.2 AOC 53-013

The total excess cancer risk for the industrial scenario is 9×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 0.02, which is below the NMED target HI of 1 (NMED 2009, 108070).

The total excess cancer risk for the construction worker scenario is 1×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 0.03, which is below the NMED target HI of 1 (NMED 2009, 108070).

The total excess cancer risk for the residential scenario is approximately 3×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 0.1, which is below the NMED target HI of 1 (NMED 2009, 108070).

I-4.3 Uncertainty Analysis

The human health risk-screening assessments are subject to varying degrees and types of uncertainty. Aspects of data evaluation and COPC identification, exposure assessment, toxicity assessment, and the additive approach all contribute to uncertainties in the risk assessment process. Each or all of these uncertainties may affect the evaluation results.

I-4.3.1 Data Evaluation and COPC Identification Process

A primary uncertainty associated with the COPC identification process is the possibility that a chemical may be inappropriately identified as a COPC when it is actually not a COPC or that a chemical may not be identified as a COPC when it actually should be identified as a COPC. Inorganic chemicals are appropriately identified as COPCs because only those chemicals either detected or with detection limits above background are retained for further analysis. However, established background values (BVs) may not accurately represent certain subunits of the Bandelier Tuff (e.g., fractured, clay-rich material) that may be encountered during sampling because such data are not included in the background data set. Some inorganic chemicals and radionuclides may also have been retained as COPCs that are not site-related. All detected organic chemicals are identified as COPCs and are retained for further analysis.

Other uncertainties may include errors in sampling, laboratory analysis, and data analysis. However, because some concentrations used in the risk-screening assessments are less than detection or quantitation limits, data evaluation uncertainties are expected to have little effect on the risk-screening results.

I-4.3.2 Exposure Assessment

The following exposure assessment uncertainties were identified for the risk assessment: (1) the applicability of the standard scenarios, (2) the assumptions underlying the exposure pathways, and (3) the derivation of EPCs.

An individual may be subject to exposures in a different manner than the exposure assumptions used to derive the SSLs/SALs. For the sites evaluated, individuals might not be on-site at present or in the future for that frequency and duration. The assumptions for the industrial SSLs are that the potentially exposed individual is outside on-site for 8 h/d, 225 d/yr, and 25 yr (NMED 2009, 108070), while the construction worker SSLs are based on exposure of 8 h/d, 250 d/yr, and 1 yr (NMED 2009, 108070). The residential SSLs are based on exposure of 24 h/d, 350 d/yr, and 30 yr (NMED 2009, 108070). As a result, the industrial, construction worker, and residential scenarios evaluated at these sites likely overestimate the exposure and risk.

A number of assumptions are made relative to exposure pathways, including input parameters, whether or not a given pathway is complete, the contaminated media to which an individual may be exposed, and intake rates for different routes of exposure. In the absence of site-specific data, the exposure assumptions used were consistent with default values (NMED 2009, 108070). When several upper-bound values (as are found in NMED 2009, 108070) are combined to estimate exposure for any one pathway, the resulting risk can exceed the 99th percentile and, therefore, can exceed the range of risk that may be reasonably expected. Also, the assumption that residual concentrations of chemicals in the tuff are available and result in exposure overestimates the potential risk to receptors.

Uncertainty is introduced in the concentration aggregation of data for estimating the EPCs at a site. The use of a UCL is intended to provide a protective upper-bound estimate of the COPC concentration and is assumed to be representative of average exposure to a COPC across the entire site. Potential risk and exposure from a single location or area with relatively high COPC concentrations may be overestimated if a representative, site-wide value is used. The use of the maximum detected concentration for the EPC overestimates the exposure to contamination because receptors are not consistently exposed to the maximum detected concentration across the site.

Lead

The lead SSLs are based on a blood level of 10 µg/dL using EPA's Integrated Exposure Uptake Biokinetic model. Lead is a COPC at both sites evaluated for risk. The ratios of the lead EPCs to the SSLs were approximately 0.2 or less and the HIs were all less than or equivalent to 1 for all scenarios evaluated. The HI for SWMU 53-001(b) is several tenths above 1 with a lead HQ of 0.2. However, without lead the HI for SWMU 53-001(b) is reduced to 1.1. Thus, lead concentrations do not exceed a blood lead level of 10 µg/dL and the HIs without lead are less than or equivalent to 1.

I-4.3.3 Toxicity Assessment

The primary uncertainty associated with the screening values is related to the derivation of toxicity values used in their calculation. Toxicity values (slope factors [SFs] and reference doses [RfDs]) were used to derive the screening values used in this screening evaluation (NMED 2009, 108070). Uncertainties were identified in four areas with respect to the toxicity values: (1) extrapolation from animals to humans, (2) interindividual variability in the human population, (3) the derivation of SFs and RfDs, and (4) the chemical form of the COPC.

Extrapolation from Animals to Humans

The SFs and RfDs are often determined by extrapolation from animal data to humans, which may result in uncertainties in toxicity values because differences exist between other animals and humans in chemical absorption, metabolism, excretion, and toxic response. Differences in body weight, surface area, and pharmacokinetic relationships between animals and humans are taken into account to address these uncertainties in the dose-response relationship. However, conservatism is usually incorporated into each of these steps, resulting in the overestimation of potential risk.

Individual Variability in the Human Population

For noncarcinogenic effects, the degree of human variability in physical characteristics is important in determining the risks that can be expected at low exposures and in determining the no observed adverse effect level (NOAEL). The NOAEL uncertainty factor approach incorporates a factor of 10 to reflect the possible interindividual variability in the human population that can contribute to uncertainty in the risk evaluation. This factor of 10 is generally considered to result in a conservative estimate of risk to noncarcinogenic COPCs.

Derivation of SFs and RfDs

The SFs and RfDs for different chemicals are derived from experiments conducted by different laboratories that may have different accuracy and precision that could lead to an over- or underestimation of the risk. The uncertainty associated with the toxicity factors for noncarcinogens is measured by the uncertainty factor, the modifying factor, and the confidence level. For carcinogens, the weight of evidence classification indicates the likelihood that a contaminant is a human carcinogen. Toxicity values with high uncertainties may change as new information is evaluated.

Chemical Form of the COPC

COPCs may be bound to the environmental matrix and not available for absorption into the human body. However, the exposure scenarios default to the assumption that the COPCs are 100% bioavailable. This assumption can lead to an overestimation of the total risk.

I-4.3.4 Additive Approach

For noncarcinogens, the effects of exposure to multiple chemicals are generally not known, and possible interactions could be synergistic or antagonistic, resulting in either an overestimation or underestimation of the potential risk. Additionally, RfDs used in the risk calculations typically are not based on the same endpoints with respect to severity, effects, or target organs. Therefore, the potential for noncarcinogenic effects may be overestimated for individual COPCs that act by different mechanisms and on different target organs but are addressed additively.

I-4.4 Interpretation

I-4.4.1 SWMU 53-001(b)

The total excess cancer risks are 3×10^{-6}, 1×10^{-7}, and 5×10^{-6}, for the industrial, construction worker, and residential scenarios, respectively. The total excess cancer risks are below the NMED target risk level of 1×10^{-5}.

The HIs are 0.1, 0.3, and 1 for the industrial, construction worker, and residential scenarios, respectively. The HIs are below or equivalent to the NMED target HI of 1.

Based on the risk-screening assessment results, no potential unacceptable risks exist for the industrial, construction worker, and residential scenarios at SWMU 53-001(b).

I-4.4.1 AOC 53-013

The total excess cancer risks are 9×10^{-8}, 1×10^{-9}, and 3×10^{-8} for the industrial, construction worker, and residential scenarios, respectively. The total excess cancer risks are below the NMED target risk level of 1×10^{-5}.

The HIs are 0.02, 0.03, and 0.1 for the industrial, construction worker, and residential scenarios, respectively. The HIs are below the NMED target HI of 1.

Based on the risk-screening assessment results, no potential unacceptable risks exist for the industrial, construction worker, and residential scenarios at AOC 53-013.

I-5.0 ECOLOGICAL RISK-SCREENING ASSESSMENT

The approach for conducting ecological risk-screening assessments is described in the “Screening Level Ecological Risk Assessment Methods, Revision 2” (LANL 2004, 087630). The assessment consists of the following four parts: (1) a scoping evaluation, (2) a screening evaluation, (3) an uncertainty analysis, and (4) an interpretation of the results.

I-5.1 Scoping Evaluation

The scoping evaluation establishes the breadth and focus of the screening assessment. The ecological scoping checklist is a useful tool for organizing existing ecological information (Attachment I-2). The information in the scoping checklists is used to determine whether ecological receptors may be affected, identify the types of receptors that may be present, and develop the ecological conceptual site model for each site. The areas surrounding the sites are developed with pavement overlying the sites. The storage area [SWMU 53-001(b)] was located on top of a concrete pad. AOC 53-013 is located on bare ground and is presently fenced. The portions on the hillsides provide some habitat for ecological receptors. However, because of operating facilities, the quality of the habitat is minimal.

The scoping portion of the assessment indicated that terrestrial receptors were appropriate for evaluating the concentrations of contaminants in tuff samples. Aquatic receptors were not evaluated because no aquatic communities and no aquatic habitat or perennial source of water exist at either SWMU 53-001(b) or AOC 53-013. The depth of the regional aquifer (greater than 1000 ft bgs) and the semiarid climate limit transport to groundwater. The potential exposure pathways for terrestrial receptors in tuff are root uptake, inhalation, soil ingestion, dermal contact, external irradiation, and food-web transport (Figure I-3.1-1). The weathering of tuff is the only viable natural process that may result in the exposure of receptors to contaminants in tuff. Because of the slow rate of weathering expected for tuff, exposure in tuff is negligible, although it is included in the assessment. Plant exposure in tuff is largely limited to fractures near the surface, which does not produce sufficient biomass to support an herbivore population. Consequently, the contaminants in tuff are unavailable to receptors.

Potential risk was evaluated in the risk-screening assessments for the following ecological receptors representing several trophic levels:

- a plant,
- soil-dwelling invertebrates (represented by the earthworm),
- the deer mouse (mammalian omnivore),
- the montane shrew (mammalian insectivore),
- the desert cottontail (mammalian herbivore),
- the red fox (mammalian carnivore),
- the American robin (avian insectivore, avian omnivore, and avian herbivore), and
- the American kestrel [avian intermediate carnivore and avian carnivore, surrogate for threatened and endangered (T&E) species].

The rationale for these receptors is presented in “Screening Level Ecological Risk Assessment Methods, Revision 2.4” (LANL 2004, 087630). The ecological screening levels (ESLs) are derived for each of these receptors where information is available. The ESLs are based on similar species and are derived from experimentally determined NOAELs, lowest observed adverse effect levels (LOAELs), or doses determined lethal to 50% of the test population. Information relevant to the calculate ESLs, including concentration equations, dose equations, bioconcentration factors, transfer factors, and toxicity reference values (TRVs) are presented in the ECORISK Database, Version 2.5 (LANL 2010, 110846).

I-5.2 Assessment Endpoints

An assessment endpoint is an explicit expression of the environmental value to be protected. These endpoints are ecologically relevant and help sustain the natural structure, function, and biodiversity of an ecosystem or its components (EPA 1998, 062809). In a screening-level assessment, assessment endpoints are attributes of ecological receptors that may be adversely affected by exposure to hazardous wastes from past operations (EPA 1997, 059370), wherein receptors are populations and communities (EPA 1999, 070086).

The ecological screening assessment is designed to protect populations and communities of biota rather than individual organisms, except for listed or candidate T&E species or treaty-protected species (EPA 1999, 070086). The protection of individual organisms within these designated protected species could also be achieved at the population level; the populations of these species tend to be small, and the loss of an individual adversely affects the species.

In accordance with this guidance, the Laboratory developed generic assessment endpoints to ensure that values at all levels of the food chain are considered in the ecological screening process (LANL 1999, 064137). These general assessment endpoints can be measured using impacts on reproduction, growth, and survival to represent categories of effects that may adversely impact populations. In addition, specific receptor species were chosen to represent each functional group. The receptor species were chosen because of their presence at the site, their sensitivity to the COPCs, and their potential for exposure to those COPCs. These categories of effects and the chosen receptor species were used to select the types of effects seen in toxicity studies considered in the development of the TRVs. Toxicity studies used in the development of TRVs included only those in which the evaluated adverse effect affected reproduction, survival, and/or growth.

The selection of receptors and assessment endpoints are designed to be protective of both the representative species used as screening receptors and the other species within their feeding guilds and the overall food web for the terrestrial and aquatic ecosystems. Focusing the assessment endpoints on the general characteristics of species that affect populations (rather than the biochemical and behavioral changes that may affect only the studied species) also ensures applicability to the ecosystem of concern.

I-5.3 Screening Evaluation

The ecological risk-screening assessments identify chemicals of potential ecological concern (COPECs) from 0–5 ft bgs based on the comparison of EPCs with ESLs in accordance with Laboratory guidance (LANL 2004, 087630). The ESLs were obtained from the ECORISK Database, Version 2.5 (LANL 2010, 110846) and are presented in Table I-5.3-1 for all COPCs and receptors evaluated.

The risk-screening assessments involve the following steps (LANL 2004, 087630).

- The HQs are calculated as the ratios of the EPCs (UCLs, maximum detected concentrations, or maximum detection limits) to the ESLs. The minimum ESL for each COPC is used in the initial screening, and HQs greater than 0.3 are identified as COPECs.

- The COPECs are evaluated by receptor with individual HQs for a receptor summed to produce an HI. An HI greater than 1.0 requires further assessment to determine if exposure to multiple COPECs results in potential adverse impacts to a given receptor population.
- COPCs without ESLs are retained as COPECs and evaluated further in the uncertainty section.

For the purposes of the ecological screening, it is assumed nonradionuclides have common toxicological effects. The HQ and HI analysis is a conservative indication of potential adverse effects and is designed to minimize the potential of overlooking possible COPECs at the site.

I-5.3.1 SWMU 53-001(b)

The results of the minimum ESL comparisons are presented in Table I-5.3-2. Antimony, cadmium, chromium, copper, lead, mercury, selenium, Aroclor-1254, and Aroclor-1260 are retained as COPECs because the HQs are greater than 0.3.

Table I-5.3-3 presents the HQs and HIs for each receptor/COPEC at SWMU 53-001(b). The HI analysis indicates that the HIs were greater than 1 for all receptors. The COPECs and receptors are discussed in the uncertainty section.

I-5.3.2 AOC 53-013

The results of the minimum ESL comparisons are presented in Table I-5.3-4. Antimony, lead, selenium, and Aroclor-1254 are retained as COPECs because the HQs are greater than 0.3.

Table I-5.3-5 presents the HQs and HIs for each receptor/COPEC at AOC 53-013. The HI analysis indicates that herbivorous robin, omnivorous robin, insectivorous robin, shrew, deer mouse, and plant have HIs greater than 1. The COPECs and receptors are discussed in the uncertainty section.

I-5.4 Uncertainty Analysis

The uncertainty analysis describes the key sources of uncertainty related to the screening evaluations. This analysis can result in either adding or removing chemicals from the list of COPECs. This following is a qualitative uncertainty analysis of the issues relevant to evaluating potential ecological risk at each site.

I-5.4.1 Chemical Form

The assumptions used in the ESL derivations are conservative and not necessarily representative of actual conditions. These assumptions include maximum chemical bioavailability, maximum receptor ingestion rates, minimum body weight, and additive effects of multiple COPECs. These factors tend to result in conservative ESL estimates, which may lead to an overestimation of the potential risk. The assumption of additive effects for multiple COPECs may result in an over- or underestimation of the potential risk to receptors.

The chemical form of the individual COPCs was not determined as part of the investigation. Toxicological data are typically based on the most toxic and bioavailable chemical species, which are not typically found in the environment. Inorganic, organic, and radionuclide COPECs are generally not 100% bioavailable to receptors in the natural environment because of interference from other natural processes, such as the adsorption of chemical constituents to matrix surfaces (e.g., soil) or rapid oxidation or reduction changes that render harmful chemical forms unavailable to biotic processes. The ESLs were calculated to ensure a conservative indication of potential risk (LANL 2004, 087630), and the values are biased toward overestimating the potential risk to receptors.

I-5.4.2 Exposure Assumptions

The EPCs used in the calculations of HQs are the UCLs, maximum detected concentrations, or maximum detection limits in the soil/fill/tuff to depths of 5 ft bgs and are conservative estimates of exposure to each COPEC. The sampling efforts focused on areas of known contamination, and receptors were assumed to ingest 100% of their food and spend 100% of their time at the site. These exposure assumptions for terrestrial receptors at SWMU 53-001(b) and AOC 53-013 are likely to overestimate potential ecological exposure and risk.

I-5.4.3 Toxicity Values

The HQs were calculated using ESLs, which are based on NOAELs as threshold effect levels; actual risk for a given COPEC/receptor combination occurs at a higher level, somewhere between the NOAEL-based threshold and the threshold based on the LOAEL. The use of NOAELs leads to an overestimation of potential risk to ecological receptors. ESLs are based on laboratory studies requiring extrapolation to wildlife receptors. Laboratory studies are typically based on artificial and maintained populations with genetically similar individuals and are limited to single chemical exposures in isolated and controlled conditions using a single exposure pathway. Wild species are concomitantly exposed to a variety of chemical and environmental stressors, potentially rendering them more susceptible to chemical stress. On the other hand, wild populations are probably more genetically diverse than laboratory populations, making wild populations, as a whole, less sensitive to chemical exposure than laboratory populations. The uncertainties associated with the ESLs tend to lead to an overestimation of potential risk.

I-5.4.4 Comparison with Background Concentrations

The UCL is intended to represent the average concentration of a contaminant and the reasonable maximum exposure (RME) over time for a receptor at a site. The RME is the maximum exposure that is reasonably expected to occur at a site and represents the average concentration that is contacted over the exposure period. Although the RME concentration does not reflect the maximum concentration that could be contacted at any one time, it is regarded as a reasonable estimate of the concentration that could be contacted over time. This is because an assumption of long-term contact with the maximum concentration is generally not reasonable. Whether some concentrations are elevated and reflect site releases is incorporated into the UCL calculations.

If the EPC is similar to the range(s) of background concentrations, the RME across the site is indistinguishable from background. Therefore, the receptor is exposed to an average concentration, which is comparable with naturally occurring levels across the site. For example, if the chromium EPC is 15 mg/kg and the ranges of background concentrations are 1.9 mg/kg to 36.5 mg/kg for soil and 0.25 mg/kg to 13 mg/kg for tuff (Qbt 2, Qbt 3, Qbt 4), then the EPC is not a true reflection of potential toxicity. It is also an indication that site concentrations are not substantially different from background concentrations. Therefore, a conclusion that inorganic chemicals with EPCs similar to the range of background concentrations are contributing risk overestimates the potential risk and does not reflect actual exposure and risk.

SWMU 53-001(b)

The ecological screening assessment is based on the exposure of ecological receptors to contamination to a depth of 5 ft bgs. The EPCs for some of the inorganic COPECs are similar to the range of background concentrations, indicating exposure to these inorganic chemicals across the site is similar to background (Table I-5.4-1). Cadmium, chromium, mercury, and selenium are eliminated as COPECs because their EPCs are similar to the range of background concentrations. Antimony, copper, lead, and zinc are retained as COPECs.

AOC 53-013

The ecological screening assessment is based on the exposure of ecological receptors to contamination to a depth of 5 ft bgs. The EPCs for some of the inorganic COPECs are similar to the range of background concentrations, indicating exposure to these inorganic chemicals across the site is similar to background (Table I-5.4-2). The EPC for antimony and lead are eliminated as COPECs because the EPCs are similar to background concentrations for tuff .Selenium is retained as a COPEC.

I-5.4.5 Area Use Factors

In addition to the direct comparison of the EPC with the ESLs, area use factors (AUFs) are used to account for the amount of time a receptor is likely to spend within the contaminated areas based on the size of the receptor's home range (HR). The AUFs for individual organisms were developed by dividing the size of the site by the HR for that receptor. Because T&E species must be assessed on an individual basis (EPA 1999, 070086), the AUF is used for the Mexican spotted owl based on an HR of 366 ha. The kestrel (top carnivore) is used as the surrogate receptor for the Mexican spotted owl.

The site area for SWMU 53-001(b) is 0.0011 ha, which results in an AUF of 0.000003 for the Mexican spotted owl (Table I-5.4-3). Application of the AUF to the HI for the kestrel (top carnivore) results in an adjusted HI 0.00002. Therefore, there are no potential adverse impacts to the Mexican spotted owl.

The site area for AOC 53-013 is 0.14 ha, which results in an AUF of 0.0004 for the Mexican spotted owl (Table I-5.4-4). Application of the AUF to the HI for the kestrel (top carnivore) results in an adjusted HI 0.0001. Therefore, there are no potential adverse impacts to the Mexican spotted owl.

I-5.4.6 Population Area Use Factors

EPA guidance is to manage the ecological risk to populations rather than to individuals, with the exception of T&E species (EPA 1999, 070086). One approach to addressing the potential effects on populations is to estimate the spatial extent of the area inhabited by the local population that overlaps with the contaminated area. The population area for each receptor is based on the individual receptor home range and its dispersal distance (Bowman et al. 2002, 073475). Bowman et al. (2002, 073475) estimate that the median dispersal distance for mammals is 7 times the linear dimension of the HR (i.e., the square root of the HR area). If only the dispersal distances for the mammals with HRs within the range of the screening receptors are used, the median dispersal distance becomes 3.6 times the square root of the HR ($R^2 = 0.91$) (Bowman et al. 2002, 073475). If it is assumed that the receptors can disperse over the same distance in any direction, the population area is circular and the dispersal distance is the radius of the circle. Therefore, the population area for each receptor can be derived by $\pi(3.6\sqrt{HR})^2$ or approximately 40HR.

The population area use factor (PAUF) is calculated by dividing the site area by the population area of the receptor (Tables I-5.4-3 and I-5.4-4). The HQs are adjusted by multiplying by the PAUFs for each remaining COPEC for each receptor after background comparison. The HQs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs. The adjusted HQs and HIs for SWMU 53-001(b) and AOC 53-013 are presented in Tables I-5.4-5 and I-5.4-6, respectively.

I-5.4.7 LOAEL Analysis

SWMU 53-001(b) has adjusted HIs greater than 1 for the earthworm from zinc and for the plant from antimony, copper, lead, and zinc. AOC 53-013 has an adjusted HI greater than 1 for the plant from selenium. To address the HIs and the associated uncertainties, LOAEL analyses were conducted using ESLs calculated based on a LOAEL rather than a NOAEL. The LOAEL-based ESLs were calculated based on toxicity information in the ECORISK Database, Version 2.5, and are presented in Table I-5.4-7 along with the basis for the LOAELs used in the ESL calculations. The analyses address some of the uncertainties and conservativeness of the ESLs used in the initial screening assessments. The HI analyses were conducted using the LOAEL-based ESLs. The HIs calculated using the LOAEL-based ESLs for SWMU 53-001(b) and AOC 53-013 are presented in Tables I-5.4-8 and I-5.4-9, respectively.

I-5.4.8 Site Discussions

SWMU 53-001(b)

The adjusted HIs for SWMU 53-001(b) are less than 1 for all the ecological receptors, except for the earthworm and plant (Table I-5.4-5). The elevated HIs are primarily from zinc for the earthworm and antimony for the plant.

The LOAEL analysis results in HIs of 0.2 for the earthworm and 9 for the plant (Table I-5.4-8). The antimony EPC is based on one detection above background and overestimates the potential risk to the plant receptor. In addition, field observations made during the site visit found no indication of adverse effects on the plant community (Attachment I-2). Because the plant community does not appear to be affected by COPECs, the earthworm population is also probably not affected. There were no field observations indicating adverse effects of any kind and there appears to be functioning ecological habitat for all terrestrial receptors, including plants, invertebrates, birds, and mammals. Therefore, the HIs are not consistent with field observations and do not indicate potential risks to these receptors.

AOC 53-013

The adjusted HIs are less than 1 for all the ecological receptors, except for the plant (Table I-5.4-6). The HI for the plant is from selenium.

The LOAEL analysis results in an HI of 0.3 for the plant (Table I-5.4-9). Therefore, the HI does not indicate potential risk to the plant.

I-5.5 Interpretation

I-5.5.1 Receptor Lines of Evidence

Based on the ecological risk-screening assessments, several COPECs were identified at SWMU 53-001(b) and AOC 53-013. Receptors were evaluated using several lines of evidence: minimum ESL comparisons, HI analyses, comparison to background concentrations, potential effects to populations (individuals for T&E species), and LOAEL analyses.

Kestrel (Top Carnivore)

- Initial screening using the minimum ESLs eliminated Aroclor-1260 as a COPEC at AOC 53-013 because the HQs for all of the receptors, including the kestrel (top carnivore), were less than 0.3.
- The HI analysis indicated that the HI for the kestrel (top carnivore) was less than 1 at AOC 53-013.
- Several COPECs were eliminated because their EPCs were similar to background concentrations.
- The HIs were adjusted by the PAUFs, which is the ratio of the site area to the kestrel population area. The adjusted HIs were less than 1 for the kestrel at both sites.
- The kestrel (top carnivore) is a surrogate for the Mexican spotted owl. The HIs were adjusted by the AUF, which is the ratio of the site area to the individual home range. The adjusted HIs were less than 1.

These lines of evidence support the conclusion that no potential ecological risk to the kestrel (top carnivore) or the Mexican spotted owl exists at SWMU 53-001(b) and AOC 53-013.

Kestrel (Intermediate Carnivore)

- Initial screening using the minimum ESLs eliminated Aroclor-1260 as a COPEC at AOC 53-013 because the HQs for all of the receptors, including the kestrel (intermediate carnivore), were less than 0.3.
- The HI analysis indicated that the HI for the kestrel (intermediate carnivore) was less than 1 at AOC 53-013.
- Several COPECs were eliminated because their EPCs were similar to background concentrations.
- The HIs were adjusted by the PAUF, which is the ratio of the site area to the kestrel population area. The adjusted HIs were less than 1 for the kestrel.

These lines of evidence support the conclusion that no potential ecological risk to the kestrel (intermediate carnivore) exists at SWMU 53-001(b) and AOC 53-013.

Robin (All Feeding Guilds)

- Initial screening using the minimum ESLs eliminated Aroclor-1260 as a COPEC at AOC 53-013 because the HQs for all of the receptors, including the robin, were less than 0.3.
- Several COPECs were eliminated because their EPCs were similar to background concentrations.
- The HIs were adjusted by the PAUF, which is the ratio of the site area to the robin population area. The adjusted HIs were less than 1 for the robin.

These lines of evidence support the conclusion that no potential ecological risk to the robin exists at SWMU 53-001(b) and AOC 53-013.

Deer Mouse (Omnivore)

- Initial screening using the minimum ESLs eliminated Aroclor-1260 as a COPEC at AOC 53-013 because the HQs for all of the receptors, including the deer mouse, were less than 0.3.
- Several COPECs were eliminated because their EPCs were similar to background concentrations.
- The HIs were adjusted by the PAUF, which is the ratio of the site area to the deer mouse population area. The adjusted HIs were less than 1.

These lines of evidence support the conclusion that no potential ecological risk to the deer mouse exists at SWMU 53-001(b) and AOC 53-013.

Desert Cottontail (Herbivore)

- Initial screening using the minimum ESLs eliminated Aroclor-1260 as a COPEC at AOC 53-013 because the HQs for all of the receptors, including the cottontail, were less than 0.3.
- The HI analysis indicated that the HI for the cottontail was less than 1 at AOC 53-013.
- Several COPECs were eliminated because their EPCs were similar to background concentrations.
- The HIs were adjusted by the PAUF, which is the ratio of the site area to the cottontail population area. The adjusted HIs were less than 1.

These lines of evidence support the conclusion that no potential ecological risk to the desert cottontail exists at SWMU 53-001(b) and AOC 53-013.

Montane Shrew (Insectivore)

- Initial screening using the minimum ESLs eliminated Aroclor-1260 as a COPEC because the HQs for all of the receptors, including the shrew, were less than 0.3.
- Several COPECs were eliminated because their EPCs were similar to background concentrations.
- The HIs were adjusted by the PAUF, which is the ratio of the site area to the shrew population area. The adjusted HIs were less than 1.

These lines of evidence support the conclusion that no potential ecological risk to the montane shrew exists at SWMU 53-001(b) and AOC 53-013.

Red Fox (Carnivore)

- Initial screening using the minimum ESLs eliminated Aroclor-1260 as a COPEC at AOC 53-013 because the HQs for all of the receptors, including the red fox, were less than 0.3.
- The HI analysis indicated that the HI for the red fox was less than 1 at AOC 53-013.
- Several COPECs were eliminated because their EPCs were similar to background concentrations.
- The HIs were adjusted by the PAUF, which is the ratio of the site area to the red fox population area. The adjusted HIs were less than 1.

These lines of evidence support the conclusion that no potential ecological risk to the red fox exists at SWMU 53-001(b) and AOC 53-013.

Earthworm (Invertebrate)

- Initial screening using the minimum ESLs eliminated Aroclor-1260 as a COPEC at AOC 53-013 because the HQs for all of the receptors, including the earthworm, were less than 0.3.
- The HI analysis indicated that the HI for the earthworm was less than 1 at AOC 53-013.
- Several COPECs were eliminated because their EPCs were similar to background concentrations.
- The LOAEL analysis resulted in an HI less than 1 for the earthworm at SWMU 53-001(b).

These lines of evidence support the conclusion that no potential ecological risk to the earthworm exists at SWMU 53-001(b) and AOC 53-013.

Plant

- Initial screening using the minimum ESLs eliminated Aroclor-1260 as a COPEC at AOC 53-013 because the HQs for all of the receptors, including the earthworm, were less than 0.3.
- Several COPECs were eliminated because their EPCs were similar to background concentrations.
- The LOAEL analyses resulted in an HI less than at AOC 53-013 and an HI greater than 1 at SWMU 53-001(b). The elevated HI at SWMU 53-001(b) is substantially overestimated by the EPC for antimony, which is the only detected concentration. This condition is unlikely to result in adverse effects to the plant population.
- The plant communities were evaluated during the site visit. No evidence of adverse impacts of contamination to the plant community based on field observations was found during site visits; the plant community is typical of the surrounding area and appears healthy. Field observations indicated no adverse effects of any kind, and there appears to be functioning ecological habitat for all terrestrial receptors, including plants, invertebrates, birds, and mammals.

These lines of evidence support the conclusion that no potential ecological risk to the plant exists at SWMU 53-001(b) and AOC 53-013.

I-6.0 CONCLUSIONS AND RECOMMENDATIONS

I-6.1 Human Health

The human health risk-screening assessments indicated no potential unacceptable risks from COPCs for the industrial, construction worker, and residential scenarios at SWMU 53-001(b) and AOC 53-013.

The total excess cancer risks were below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070) and the HIs were less than the NMED target HI of 1 (NMED 2009, 108070) for all scenarios at both sites.

I-6.2 Ecology

No potential ecological risks were found for any receptor based on minimum ESL comparisons, HI analyses, comparisons to background concentrations, potential effects to populations (individuals for T&E species), and LOAEL analyses. These lines of evidence, discussed above for each receptor, support the conclusion that no potential ecological risks exist at SWMU 53-001(b) and AOC 53-013.

I-7.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. 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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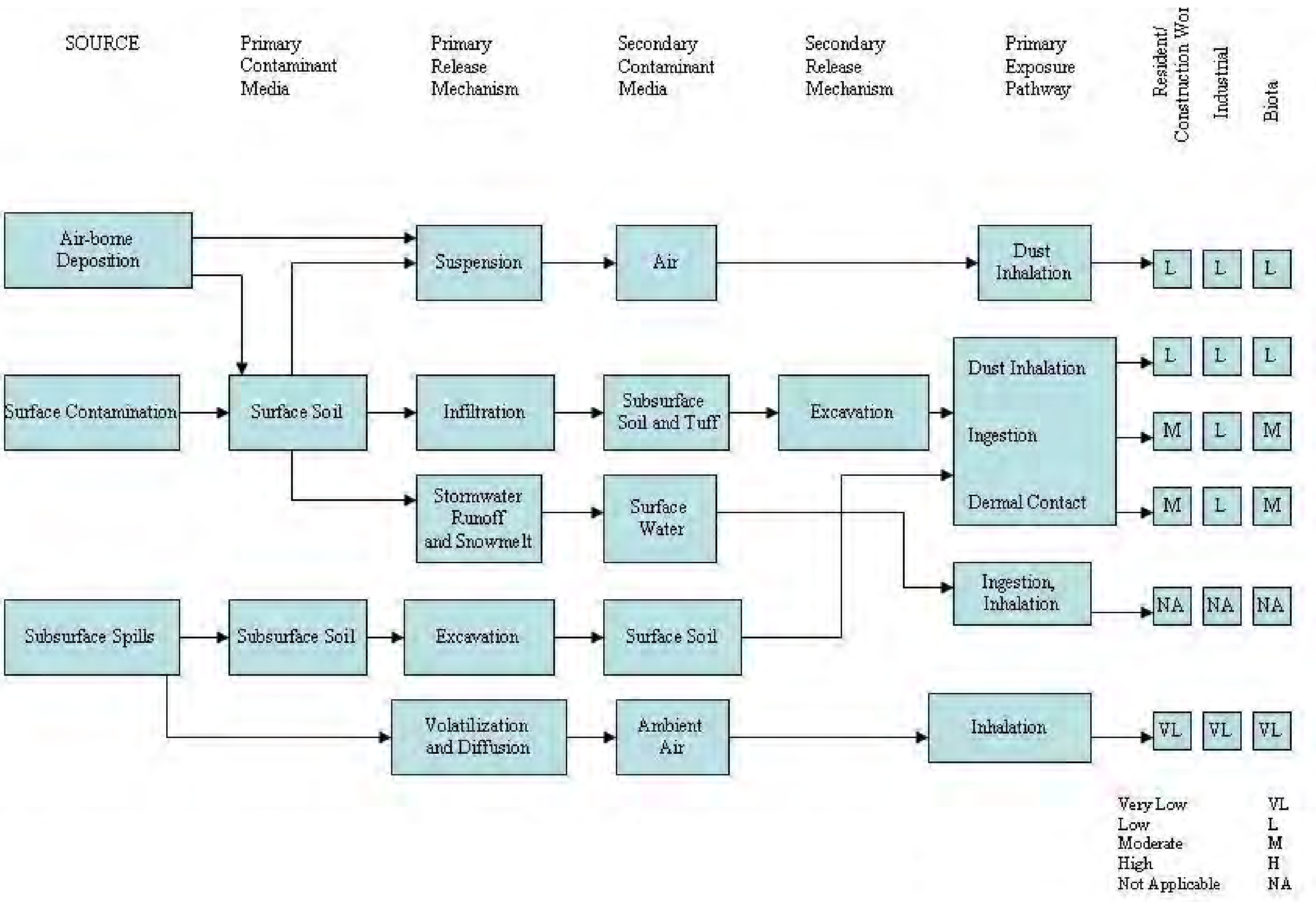


Figure I-3.1-1 Conceptual site model for Lower Sandia Canyon Aggregate Area

Table I-3.2-1
Physical and Chemical Properties of Inorganic COPCs

COPC	Kd[a] (cm^3/g)	Water Solubility[a,b] (g/L)
Antimony	45	Insoluble
Cadmium	75	Insoluble
Chromium	850	Insoluble
Copper	35	Insoluble
Lead	900	Insoluble
Mercury	52	Insoluble
Selenium	5	Insoluble
Zinc	62	Insoluble

[a] Information from http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=nrad.

[b] Information from http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm.

Table I-3.2-2
Physical and Chemical Properties of Organic COPCs

COPC	Water Solubility[a] (mg/L)	Organic Carbon Coefficient K_{oc}[b] (L/kg)	Log Octanol-Water Partition Coefficient K_{ow}[a]	Vapor Pressure[a] (mm Hg at 25°C)
Aroclor-1254	3.40E-03	5.30E+05	6.79E+00	6.53E-06
Aroclor-1260	2.84E-04	5.30E+05	8.27E+00	4.05E-05

[a] Information from http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm.

[b] Information from NMED (2009, 108070).

Table I-3.3-1
EPCs at SWMU 53-001(b) for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	4	1	1.11(U)	6.1(U)	n/a[a]	4.19[b]	Maximum detected concentration
Cadmium	4	4	0.442	1.67	n/a	1.67	Maximum detected concentration
Chromium	4	4	6.3	17.7	n/a	17.7	Maximum detected concentration
Copper	4	4	12.6	41	n/a	41	Maximum detected concentration
Lead	4	4	16.4	71.1	n/a	71.1	Maximum detected concentration
Mercury	4	2	0.0161	0.25(U)	n/a	0.0334[b]	Maximum detected concentration
Selenium	4	0	0.48(U)	1.34(U)	n/a	1.34(U)	Maximum detection limit
Zinc	4	4	49.8	148	n/a	148	Maximum detected concentration
Organic Chemicals (mg/kg)							
Aroclor-1254	4	2	0.0406(U)	0.95	n/a	0.95	Maximum detected concentration
Aroclor-1260	4	2	0.0406(U)	1.06	n/a	1.06	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

[a] n/a = Not applicable.

[b] The maximum concentration of the data set is a nondetect (U or UJ), and thus the maximum detected concentration is less than the maximum concentration.

Table I-3.3-2
EPCs at SWMU 53-001(b) for the Ecological Receptors

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	7	1	1.03(U)	6.1(U)	n/a[a]	4.19[b]	Maximum detected concentration
Cadmium	7	7	0.237	1.67	n/a	1.67	Maximum detected concentration
Chromium	7	7	1.72	17.7	n/a	17.7	Maximum detected concentration
Copper	7	7	2.28	41	n/a	41	Maximum detected concentration
Lead	7	7	4.08	71.1	n/a	71.1	Maximum detected concentration
Mercury	7	3	0.0134(U)	0.25(U)	n/a	0.0334[b]	Maximum detected concentration
Selenium	7	0	0.45(U)	1.34(U)	n/a	1.34(U)	Maximum detection limit
Zinc	7	7	29.6	148	n/a	148	Maximum detected concentration
Organic Chemicals (mg/kg)							
Aroclor-1254	7	4	0.0073	0.95	n/a	0.95	Maximum detected concentration
Aroclor-1260	7	4	0.0114	1.06	n/a	1.06	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

[a] n/a = Not applicable.

[b] The maximum concentration of the data set is a nondetect (U or UJ), and thus the maximum detected concentration is less than the maximum concentration.

Table I-3.3-3
EPCs at SWMU 53-001(b) for the Residential and Construction Worker Scenarios

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	7	1	1.03(U)	6.1(U)	n/a[a]	4.19[b]	Maximum detected concentration
Cadmium	7	7	0.237	1.67	n/a	1.67	Maximum detected concentration
Chromium	7	7	1.72	17.7	n/a	17.7	Maximum detected concentration
Copper	7	7	2.28	41	n/a	41	Maximum detected concentration
Lead	7	7	4.08	71.1	n/a	71.1	Maximum detected concentration
Mercury	7	3	0.0134(U)	0.25(U)	n/a	0.0334[b]	Maximum detected concentration
Selenium	7	0	0.45(U)	1.34(U)	n/a	1.34(U)	Maximum detection limit
Zinc	7	7	29.6	148	n/a	148	Maximum detected concentration
Organic Chemicals (mg/kg)							
Aroclor-1254	7	4	0.0073	0.95	n/a	0.95	Maximum detected concentration
Aroclor-1260	7	4	0.0114	1.06	n/a	1.06	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

[a] n/a = Not applicable.

[b] The maximum concentration of the data set is a nondetect (U or UJ) and thus the maximum detected concentration is less than the maximum concentration.

Table I-3.3-4
EPCs at AOC 53-013 for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	20	2	0.361	1.13(U)	n/a[a]	0.465[b]	Maximum detected concentration
Lead	20	20	3.7	34.5	Gamma	13.09	95% Approximate Gamma
Selenium	20	0	0.979(U)	1.11(UJ)	n/a	1.11(UJ)	Maximum detection limit
Organic Chemicals (mg/kg)							
Aroclor-1254	6	2	0.0015	0.0624	n/a	0.0624	Maximum detected concentration
Aroclor-1260	6	1	0.00358(U)	0.0074	n/a	0.0074	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

[a] n/a = Not applicable.

[b] The maximum concentration of the data set is a nondetect (U or UJ) and thus the maximum detected concentration is less than the maximum concentration.

Table I-3.3-5
EPCs at AOC 53-013 for the Ecological Receptors

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	40	4	0.361	1.13(U)	n/a[a]	0.465[b]	Maximum detected concentration
Lead	40	39	2.85	34.5	Lognormal	9.69	95% H-UCL
Selenium	40	0	0.979(U)	1.11(UJ)	n/a	1.11(UJ)	Maximum detection limit
Organic Chemicals (mg/kg)							
Aroclor-1254	12	3	0.0015	0.0624	n/a	0.0624	Maximum detected concentration
Aroclor-1260	12	2	0.0014	0.0074	n/a	0.0074	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

[a] n/a = Not applicable.

[b] The maximum concentration of the data set is a nondetect (U or UJ) and thus the maximum detected concentration is less than the maximum concentration.

Table I-3.3-6
EPCs at AOC 53-013 for the Residential and Construction Worker Scenarios

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	40	4	0.361	1.13(U)	n/a[a]	0.465[b]	Maximum detected concentration
Lead	40	39	2.85	34.5	Lognormal	9.69	95% H-UCL
Selenium	40	0	0.979(U)	1.11(UJ)	n/a	1.11(UJ)	Maximum detection limit
Organic Chemicals (mg/kg)							
Aroclor-1254	12	3	0.0015	0.0624	n/a	0.0624	Maximum detected concentration
Aroclor-1260	12	2	0.0014	0.0074	n/a	0.0074	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

[a] n/a = Not applicable.

[b] The maximum concentration of the data set is a nondetect (U or UJ) and thus the maximum detected concentration is less than the maximum concentration.

Table I-4.1-1
Exposure Parameter Values Used to Calculate Chemical SSLs for the Residential, Industrial, and Construction Worker Scenarios

Parameter	Residential Value	Industrial Value	Construction Worker Value
Target HQ	1	1	1
Target cancer risk	10^{-5}	10^{-5}	10^{-5}
Averaging time (carcinogen)	70 yr × 365 d	70 yr × 365 d	70 yr × 365 d
Averaging time (noncarcinogen)	Exposure duration × 365 d	Exposure duration × 365 d	Exposure duration × 365 d
Skin absorption factor	SVOC[a] = 0.1	SVOC = 0.1	SVOC = 0.1
	Chemical-specific	Chemical-specific	Chemical-specific
Adherence factor–child	0.2 mg/cm^2	n/a[b]	n/a
Body weight–child	15 kg (0–6 yr of age)	n/a	n/a
Cancer slope factor–oral (chemical-specific)	(mg/kg-d)$^{-1}$	(mg/kg-d)$^{-1}$	(mg/kg-d)$^{-1}$
Cancer slope factor–inhalation (chemical-specific)	(mg/kg-d)$^{-1}$	(mg/kg-d)$^{-1}$	(mg/kg-d)$^{-1}$
Exposure frequency	350 d/yr	225 d/yr	250 d/yr
Exposure duration–child	6 yr	n/a	n/a
Age-adjusted ingestion factor	114 mg-yr/kg-d	n/a	n/a
Age-adjusted inhalation factor	11 m^3-yr/kg-d	n/a	n/a
Inhalation rate–child	10 m^3/d	n/a	n/a
Soil ingestion rate–child	200 mg/d	n/a	n/a
Particulate emission factor	6.61 × 10^9 m^3/kg	6.61 × 109 m^3/kg	2.1 × 106 m^3/kg
Reference dose–oral (chemical-specific)	(mg/kg-d)	(mg/kg-d)	(mg/kg-d)
Reference dose–inhalation (chemical-specific)	(mg/kg-d)	(mg/kg-d)	(mg/kg-d)
Exposed surface area–child	2800 cm^2/d	n/a	n/a
Age-adjusted skin contact factor for carcinogens	361 mg-yr/kg-d	n/a	n/a
Volatilization factor for soil (chemical-specific)	(m^3/kg)	(m^3/kg)	(m^3/kg)
Body weight–adult	70 kg	70 kg	70 kg
Exposure durationc	30 yr	25 yr	1 yr
Adherence factor–adult	0.07 mg/cm^2	0.2 mg/cm^2	0.3 mg/cm^2
Soil ingestion rate–adult	100 mg/d	100 mg/d	330 mg/d
Exposed surface area–adult	5700 cm^2/d	3300 cm^2/d	3300 cm^2/d
Inhalation rate–adult	20 m^2/d	20 m^2/d	20 m^2/d

Note: Parameter values are from NMED (2009, 108070).

[a] SVOC = Semivolatile organic compound.

[b] n/a = Not applicable.

[c] Exposure duration for lifetime resident is 30 yr. For carcinogens, the exposures are combined for child (6 yr) and adult (24 yr).

Table I-4.2-1
Industrial Carcinogenic Screening for SWMU 53-001(b)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	Cancer Risk
Aroclor-1254	0.95	8.26	1.2E-06
Aroclor-1260	1.06	8.26	1.3E-06
		Total Excess Cancer Risk	**3E-06**

* SSLs from NMED (2009, 108070).

Table I-4.2-2
Industrial Noncarcinogenic Screening Evaluation for SWMU 53-001(b)

COPC	EPC (mg/kg)	Industrial SSL[a] (mg/kg)	HQ
Antimony	4.19	454	9.2E-03
Cadmium	1.67	1120	1.5E-03
Chromium	17.7	2920[b]	6.1E-03
Copper	41	45400	9.0E-04
Lead	71.1	800	8.9E-02
Mercury	0.0334	310[c]	1.1E-04
Selenium	1.34(U)	5680	2.4E-04
Zinc	148	341000	4.3E-04
		HI	**0.1**

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

[b] SSL for hexavalent chromium.

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

Table I-4.2-3
Construction Worker Carcinogenic Screening for SWMU 53-001(b)

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	Cancer Risk
Aroclor-1260	1.06	75.8	1.4E-07
		Total Excess Cancer Risk	**1E-07**

* SSLs from NMED (2009, 108070).

Table I-4.2-4
Construction Worker Noncarcinogenic Screening Evaluation for SWMU 53-001(b)

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	HQ
Antimony	4.19	124	3.4E-02
Cadmium	1.67	309	5.4E-03
Chromium	17.7	449[b]	3.9E-02
Copper	41	12400	3.3E-03
Lead	71.1	800	8.9E-02
Mercury	0.0334	92.9[c]	3.6E-04
Selenium	1.34(U)	1550	8.7E-04
Zinc	148	92900	1.6E-03
Aroclor-1254	0.95	4.36	2.2E-01
		HI	**0.3**

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

[b] SSL for hexavalent chromium.

[c] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm) and equation and parameters from NMED (2009, 108070).

Table I-4.2-5
Residential Carcinogenic Screening for SWMU 53-001(b)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	Cancer Risk
Aroclor-1260	1.06	2.22	4.77E-06
		Total Excess Cancer Risk	**5E-06**

* SSLs from NMED (2009, 108070).

Table I-4.2-6
Residential Noncarcinogenic Screening Evaluation for SWMU 53-001(b)

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	HQ
Antimony	4.19	31.3	1.3E-01
Cadmium	1.67	77.9	2.1E-02
Chromium	17.7	219[b]	8.1E-02
Copper	41	3130	1.3E-02
Lead	71.1	400	1.8E-01
Mercury	0.0334	23[c]	1.5E-03
Selenium	1.34(U)	391	3.4E-03
Zinc	148	23500	6.3E-03
Aroclor-1254	0.95	1.12	8.5E-01
		HI	**1**

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

[b] SSL for hexavalent chromium.

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

Table I-4.2-7
Industrial Carcinogenic Screening for AOC 53-013

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	Cancer Risk
Aroclor-1254	0.0624	8.26	7.6E-08
Aroclor-1260	0.0074	8.26	9.0E-09
		Total Excess Cancer Risk	**9E-08**

* SSLs from NMED (2009, 108070).

Table I-4.2-8
Industrial Noncarcinogenic Screening Evaluation for AOC 53-013

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	HQ
Antimony	0.465	454	1.0E-03
Lead	13.09	800	1.6E-02
Selenium	1.11(U)	5680	1.9E-04
		HI	**0.02**

* SSLs from NMED (2009, 108070).

Table I-4.2-9
Construction Worker Carcinogenic Screening for AOC 53-013

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.0074	75.8	9.8E-10
		Total Excess Cancer Risk	**1E-09**

* SSLs from NMED (2009, 108070).

Table I-4.2-10
Construction Worker Noncarcinogenic Screening Evaluation for AOC 53-013

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	HQ
Antimony	0.465	124	3.8E-03
Lead	9.69	800	1.2E-02
Selenium	1.11(UJ)	1550	7.2E-04
Aroclor-1254	0.0624	4.36	1.4E-02
		HI	**0.03**

* SSLs from NMED (2009, 108070).

Table I-4.2-11
Residential Carcinogenic Screening for AOC 53-013

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.0074	2.22	3.3E-08
		Total Excess Cancer Risk	**3E-08**

* SSLs from NMED (2009, 108070).

Table I-4.2-12
Residential Noncarcinogenic Screening Evaluation for AOC 53-013

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	HQ
Antimony	0.465	31.3	1.3E-02
Lead	9.69	400	2.4E-02
Selenium	1.11(UJ)	391	2.8E-03
Aroclor-1254	0.0624	1.12	5.6E-02
		HI	**0.1**

* SSLs from NMED (2009, 108070).

Table I-5.3-1
ESLs for Terrestrial Receptors

Analyte	Red Fox	Carnivorous Kestrel	Omnivorous Kestrel	Herbivorous Robin	Omnivorous Robin	Insectivorous Robin	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Inorganic Chemicals (mg/kg)											
Antimony	45	na*	na	na	na	na	2.9	0.26	0.48	78	0.05
Cadmium	510	580	2	4.4	0.54	0.29	9.9	0.27	0.51	140	32
Chromium	30000	37000	7700	1900	1100	830	13000	750	1900	2.3	2.4
Copper	3800	1600	110	38	22	15	270	38	64	80	70
Lead	3700	810	120	21	16	14	370	72	120	1700	120
Mercury	46	0.28	0.082	0.07	0.022	0.013	22	1.7	3	0.05	34
Selenium	84	97	5.6	1	0.87	0.75	2.1	0.66	0.83	4.1	0.52
Zinc	6000	2400	320	350	85	48	1800	98	170	120	160
Organic Chemicals (mg/kg)											
Aroclor-1254	0.15	0.22	0.17	1.3	0.08	0.041	52	0.44	0.88	na	160
Aroclor-1260	0.14	4.6	3.7	46	1.7	0.88	3000	10	20	na	na

Note: Values from ECORISK Database, Version 2.5 (LANL 2010, 110846).

* na = Not available.

Table I-5.3-2
Minimum ESL Comparison for SWMU 53-001(b)

COPCs	EPC	Minimum ESL	Receptor	HQ	COPEC
Inorganic Chemicals (mg/kg)					
Antimony	4.19	0.05	Plant	**83.8**	Yes
Cadmium	1.67	0.27	Shrew	**6.19**	Yes
Chromium	17.7	2.3	Earthworm	**7.7**	Yes
Copper	41	15	Insectivorous Robin	**2.73**	Yes
Lead	71.1	14	Insectivorous Robin	**5.08**	Yes
Mercury	0.0334	0.013	Insectivorous Robin	**2.57**	Yes
Selenium	1.34(U)	0.52	Plant	**2.58**	Yes
Zinc	148	48	Insectivorous Robin	**3.08**	Yes
Organic Chemicals (mg/kg)					
Aroclor-1254	0.95	0.04	Insectivorous Robin	**23.8**	Yes
Aroclor-1260	1.06	0.14	Red fox	**7.6**	Yes

Note: Bolded values indicate HQ greater than 0.3.

Table I-5.3-3
HI Analysis for COPECs at SWMU 53-001(b)

COPECs	EPC (mg/kg)	Red Fox	Carnivorous Kestrel	Omnivorous Kestrel	Herbivorous Robin	Omnivorous Robin	Insectivorous Robin	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Antimony	4.19	0.0931	na*	na	na	na	na	**1.44**	**16.1**	**8.73**	0.0537	**83.8**
Cadmium	1.67	0.00327	0.00288	**0.835**	**0.38**	**3.09**	**5.76**	0.169	**6.19**	**3.27**	0.0119	0.0522
Chromium	17.7	0.00059	0.00048	0.0023	0.00932	0.0161	0.0213	0.00136	0.0236	0.00932	**7.70**	**7.38**
Copper	41	0.0108	0.0256	**0.373**	**1.08**	**1.86**	**2.73**	0.152	**1.08**	**0.641**	**0.513**	**0.586**
Lead	71.1	0.0192	0.0878	**0.593**	**3.39**	**4.44**	**5.08**	0.192	**0.988**	**0.592**	0.0418	**0.593**
Mercury	0.0334	0.00073	0.119	**0.407**	**0.477**	**1.52**	**2.57**	0.00152	0.0197	0.0111	**0.668**	0.00098
Selenium	1.34(U)	0.016	0.0138	**0.239**	**1.34**	**1.54**	**1.79**	**0.638**	**2.03**	**1.61**	**0.327**	**2.577**
Zinc	148	0.0247	0.0617	**0.463**	**0.423**	**1.74**	**3.08**	0.0822	**1.51**	**0.871**	**1.23**	**0.925**
Aroclor-1254	0.95	**6.33**	**4.32**	**5.588**	**0.731**	**11.9**	**23.8**	0.0183	**2.16**	**1.08**	na	0.00594
Aroclor-1260	1.06	**7.57**	0.230	0.286	0.0230	**0.624**	**1.20**	0.00035	0.106	0.053	na	na
HI		**14**	**5**	**9**	**8**	**27**	**46**	**3**	**30**	**17**	**11**	**96**

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0.

* na = Not available.

Table I-5.3-4
Minimum ESL Comparison for AOC 53-013

COPCs	EPC	Minimum ESL	Receptor	HQ	COPEC
Inorganic Chemicals (mg/kg)					
Antimony	0.465	0.05	Plant	**9.3**	**Yes**
Lead	9.69	14	Insectivorous Robin	**0.69**	**Yes**
Selenium	1.11(UJ)	0.52	Plant	**2.13**	**Yes**
Organic Chemicals (mg/kg)					
Aroclor-1254	0.0624	0.04	Insectivorous Robin	**1.56**	**Yes**
Aroclor-1260	0.0074	0.14	Red fox	0.05	No

Note: Bolded values indicate HQ greater than 0.3.

Table I-5.3-5
HI Analysis for COPECs at AOC 53-013

COPECs	EPC (mg/kg)	Red Fox	Carnivorous Kestrel	Omnivorous Kestrel	Herbivorous Robin	Omnivorous Robin	Insectivorous Robin	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Antimony	0.465	0.0103	na*	na	na	na	na	0.160	**1.79**	**0.969**	0.00596	**9.3**
Lead	9.69	0.00262	0.0119	0.0808	**0.461**	**0.606**	**0.692**	0.0262	0.135	0.0807	0.0057	0.0808
Selenium	1.11(UJ)	0.0132	0.0114	0.198	**1.11**	**1.28**	**1.48**	**0.529**	**1.68**	**1.34**	0.271	**2.13**
Aroclor-1254	0.0624	**0.416**	0.283	**0.367**	0.048	0.78	**1.56**	0.0012	0.142	0.071	na	0.00039
	HI	0.4	0.3	0.6	**2**	**3**	**4**	0.7	**4**	**2**	0.3	**12**

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0.

* na = Not available.

Table I-5.4-1
Comparison of EPCs to Background Concentrations for Inorganic COPECs SWMU 53-001(b)

COPECs	EPC (mg/kg)	Soil Background Concentrations (mg/kg)	Tuff Background Concentrations (mg/kg)
Antimony	4.19	0.1–1	0.05–0.4
Cadmium	1.67	0.2–2.6	0.1–5
Chromium	17.7	1.9–36.5	0.25–13
Copper	41	0.25–16	0.25–6.2
Lead	71.1	2–28	1.6–15.5
Mercury	0.0334	0.05–0.1	0.1*
Selenium	1.34(U)	0.1–1.7	0.3*
Zinc	148	14–75.5	5.5-65.6

Note: From LANL (1998, 059730). Bolded inorganic chemicals retained as COPECs.

* Value is the BV.

Table I-5.4-2
Comparison of EPCs to Background Concentrations for Inorganic COPECs AOC 53-013

COPECs	EPC (mg/kg)	Tuff Background Concentrations (mg/kg)
Antimony	0.465	0.5*
Lead	9.69	1.6–15.5
Selenium	1.11(UJ)	0.3*

Note: From LANL (1998, 059730). Bolded inorganic chemicals retained as COPECs.

* Value is the BV.

Table I-5.4-3
PAUFs and AUFs for Ecological Receptors for SWMU 53-001(b)

Receptor	HR[a] (ha)	Population Area[a] (ha)	PAUF SWMU 53-001(b) Site area = 0.0011 ha
Red fox	1038	41,520	3E-08
American kestrel	106	4240	3E-07
American robin	0.42	16.8	7E-05
Desert cottontail	3.1	124	9E-06
Montane shrew	0.39	15.6	7E-05
Deer mouse	0.077	3.08	4E-04
Mexican spotted owl[b]	366	n/a[c]	3E-06

Note: PAUF is calculated as the area of the site divided by the population area. No PAUF is calculated for earthworm or plants.

[a] Values from EPA (1993, 059384).

[b] Value for Mexican spotted owl is the AUF based on individual HR.

[c] n/a = Not applicable.

Table I-5.4-4
PAUFs and AUFs for Ecological Receptors

Receptor	HR[a] (ha)	Population Area[a] (ha)	PAUF AOC 53-013 Site area = 0.14 ha
Red fox	1038	41,520	3E-06
American kestrel	106	4240	3E-05
American robin	0.42	16.8	8E-03
Desert cottontail	3.1	124	1E-03
Montane shrew	0.39	15.6	9E-03
Deer mouse	0.077	3.08	5E-02
Mexican spotted owl[b]	366	n/a[c]	4E-04

Note: PAUF is calculated as the area of the site divided by the population area. No PAUF is calculated for earthworm or plants.

[a] Values from EPA (1993, 059384).

[b] Value for Mexican spotted owl is the AUF based on individual HR.

[c] n/a = Not applicable.

Table I-5.4-5
Adjusted HQs and HIs at SWMU 53-001(b)

COPECs	EPC (mg/kg)	Red Fox	Carnivorous Kestrel	Omnivorous Kestrel	Herbivorous Robin	Omnivorous Robin	Insectivorous Robin	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Antimony	4.19	2E-09	na*	na	na	na	na	1E-05	1E-03	3E-03	5E-02	**84**
Copper	41	3E-10	7E-09	1E-07	7E-05	1E-04	2E-04	1E-06	8E-05	2E-04	**0.51**	**0.59**
Lead	71.1	5E-10	2E-08	2E-07	2E-04	3E-04	3E-04	2E-06	7E-05	2E-04	4E-02	**0.59**
Zinc	148	7E-10	2E-08	1E-07	3E-05	1E-04	2E-04	7E-07	1E-04	3E-04	**1.2**	**0.93**
Aroclor-1254	0.95	2E-07	1E-06	1E-06	5E-05	8E-04	2E-03	2E-07	2E-04	4E-04	na	6E-03
Aroclor-1260	1.06	2E-07	6E-08	7E-08	2E-06	4E-05	8E-05	3E-09	7E-06	2E-05	na	na
Adjusted HI		0.0000004	0.000001	0.000002	0.0004	0.001	0.002	0.00002	0.002	0.004	**2**	**86**

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0.

* na = Not available.

Table I-5.4-6
Adjusted HQs and HIs at AOC 53-013

COPECs	EPC (mg/kg)	Red Fox	Carnivorous Kestrel	Omnivorous Kestrel	Herbivorous Robin	Omnivorous Robin	Insectivorous Robin	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Selenium	1.11(UJ)	4E-08	4E-07	6E-06	9E-03	1E-02	1E-02	6E-04	1E-02	6E-02	0.3	**2.13**
Aroclor-1254	0.0624	1E-06	9E-06	1E-05	4E-04	7E-03	1E-02	1E-06	1E-03	3E-03	na	0.0001
Adjusted HI		0.000001	0.000009	0.00002	0.009	0.02	0.02	0.0006	0.01	0.06	0.3	**2**

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0.

* na = Not available.

Table I-5.4-7
Summary of LOAEL-Based ESL for Terrestrial Receptors

COPEC	Receptor	LOAEL-Based TRV	TRV Unit	LOAEL–Based ESL (mg/kg soil)	Approach to Deriving the LOAELs/LOECs*
Antimony	Plant	0.5	mg/kg	5.0E-01	The lowest observed effect concentration (LOEC) is derived from a LOEC with an unspecified exposure duration by applying an uncertainty factor of 0.1. The no observed effect concentration (NOEC) was derived from the same LOEC, except an uncertainty factor of 0.01 was applied.
Copper	Earthworm	530	mg/kg soil	5.3E+02	LOEC is extrapolated from EPA geometric mean NOEC data set (http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_copper.pdf). Applied an uncertainty factor of 5 for maximum allowable toxicity concentrations (MATCs) and 10 for effective concentrations (EC)20s and calculated the geometric mean.
	Plant	497	mg/kg soil	4.97E+02	LOEC is extrapolated from EPA geometric mean NOEC data set (http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_copper.pdf). Applied an uncertainty factor of 5 for MATCs and 10 for EC20s and calculated the geometric mean.
Lead	Earthworm	8400	mg/kg soil	8.4E+03	LOEC from the geometric mean of the other EPA effect level data set (http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_lead.pdf) by applying an appropriate uncertainty factor to each value in the data set and then calculating the geometric mean of these extrapolated values. An uncertainty factor of 5 is applied to MATC values and an uncertainty factor of 10 to EC20 and EC10 values.
	Plant	576	mg/kg soil	5.7E+02	LOEC is extrapolated from EPA geometric mean NOEC data set (http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_lead.pdf). Applied an uncertainty factor of 5 for MATCs and calculated the geometric mean.
Zinc	Earthworm	930	mg/kg soil	9.3E+02	LOEC from the geometric mean of the other EPA effect level data set (http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_zinc.pdf) by applying an appropriate uncertainty factor to each value in the data set and then calculating the geometric mean of these extrapolated values. An uncertainty factor of 5 is applied to MATC values and an uncertainty factor of 10 to EC20 and EC10 values.
	Plant	810	mg/kg	8.1E+02	LOEC is extrapolated from EPA geometric mean NOEC data set (http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_zinc.pdf). Applied an uncertainty factor of 5 for MATCs and calculated the geometric mean.
Selenium	Plant	3.4	mg/kg soil	3.4E+00	LOEC is extrapolated from EPA geometric mean NOEC data set (http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_selenium.pdf). Applied an uncertainty factor of 5 for MATCs and 10 for EC20s and calculated the geometric mean.

Note: Some COPECs (e.g., inorganic chemicals from EPA Eco-SSL documents) do not have LOAELs or LOECs. In these cases, an uncertainty factor of 10 was applied to the NOAEL/NOEC (i.e., EC10 and EC20) data in accordance with the acknowledged uncertainty between the LOAEL/LOEC and NOAEL/NOEC in Dourson and Stara (1983, 073474), Calbrese and Baldwin (1993, 110405), and EPA (http://www.epa.gov/epawaste/hazard/tsd/td/combust/ecorisk.htm). In the cases where EPA used MATCs for the NOAEL/NOEC data, an uncertainty factor of 5 was used to adjust to the LOAEL/LOEC because the MATC is between the NOAEL/NOEC and the LOAEL/LOEC.

Table I-5.4-8
HI Analysis Using LOAEL-Based ESL for SWMU 53-001(b)

COPECs	EPC (mg/kg)	Earthworm	Plant
Antimony	4.19	n/a*	**8.4**
Copper	41	0.0774	0.0825
Lead	71.1	0.00846	0.123
Zinc	148	0.159	0.183
	HI	0.2	**9**

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.

* n/a = Not applicable.

Table I-5.4-9
HI Analysis Using LOAEL-Based ESL for AOC 53-013

COPECs	EPC (mg/kg)	Plant
Selenium	1.11(UJ)	**0.33**
	HI	0.3

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0.

Attachment I-1

ProUCL Files
(on CD included with this document)

Attachment I-2

Ecological Scoping Checklist for
Lower Sandia Canyon Aggregate Area

Part A—Scoping Meeting Documentation

Site ID	SWMU 53-001(b) and AOC 53-013
Form of site releases (solid, liquid, vapor). Describe all relevant known or suspected mechanisms of release (spills, dumping, material disposal, outfall, explosive testing, etc.) and describe potential areas of release. Reference locations on a map as appropriate.	Area of Concern (AOC) 53-013 is a lead spill site located near the east end of Technical Area 53 (TA-53) in the northeast portion of Los Alamos National Laboratory (the Laboratory) on Mesita de los Alamos, and bounded by Los Alamos Canyon to the north and Sandia Canyon to the south. The form of site release at this site is solid lead shot spilled or stored on the ground surface. Potential areas of release are surface and shallow subsurface media. Solid Waste Management Unit (SWMU) 53-001(b) is an outdoor storage area located on a concrete pad that rests on the asphalt parking lot on the south side of an equipment test laboratory (building 53-2). Before 1990, this area consisted of drum racks used to store drums of products and wastes associated with maintenance activities. Wastes included spent trichloroethene, Freon, other solvents, and acidic waste. In 1990, the drum racks were removed and replaced with four lockable flammable-material storage cabinets. The Laboratory's waste-site database indicates this storage location also contained a less-than-90-d storage area that was removed in 1998. The site currently contains flammable-material storage cabinets, which are used for product storage but not for waste storage. No indications of spills or leakage exist. Potential areas of release are surface and shallow subsurface media.
List of Primary Impacted Media **(Indicate all that apply.)**	**Surface soil** – X **Surface water/sediment** – Not applicable **Subsurface** – X **Groundwater –** Not applicable **Other, explain** – Not applicable
FIMAD vegetation class based on Arcview vegetation coverage **(Indicate all that apply.)**	**Water –** Not applicable **Bare Ground/Unvegetated** – X **Spruce/fir/aspen/mixed conifer** – Not applicable **Ponderosa pine** – Not applicable **Piñon juniper/juniper savannah** – Not applicable **Grassland/shrubland** – Not applicable **Developed** – X
Is T&E Habitat Present? **If applicable, list species known or suspected to use the site for breeding or foraging.**	No threatened and endangered (T&E) species habitat is present.
Provide list of Neighboring/ Contiguous/ Up-gradient sites, include a brief summary of COPCs and form of releases for relevant sites and reference map as appropriate. **(Use information to evaluate need to aggregate sites for screening.)**	There are no upgradient sites from SWMU 53-001(b) and AOC 53-013.
Surface Water Erosion Potential	Surface water transport and erosion potential on the mesa top is considered low because of the relatively flat terrain (<10% slope). Runoff terminates in Sandia Canyon.

Part B—Site Visit Documentation for SWMU 53-001(b)

Site ID	SWMU 53-001(b)
Date of Site Visit	01/20/2011
Site Visit Conducted by	John Branch

Receptor Information:

Estimate cover	**Relative vegetative cover (high, medium, low, none)** = none **Relative wetland cover (high, medium, low, none)** = none **Relative structures/asphalt, etc. cover (high, medium, low, none)** = high
Field notes on the FIMAD vegetation class to assist in ground-truthing the Arcview information	The SWMU exhibits a moderate amount of vegetative cover in locations near the asphalt parking lot boundary and along the hillside downgradient of the site. The vegetative class is from a transitional zone between the piñon-juniper and ponderosa pine zone. The locations also exhibit a moderate amount of native bunch grasses and shrub species.
Field notes on T&E Habitat, if applicable. Consider the need for a site visit by a T&E subject matter expert to support the use of the site by T&E receptors.	There is no T&E habitat.
Are ecological receptors present at the site? **(yes/no/uncertain)** **Describe the general types of receptors present at the site (terrestrial and aquatic), and make notes on the quality of habitat present at the site.**	Yes. There are plant and animal present in and around SWMU 53-001(b). The general types of receptors are terrestrial biota such as reptiles, small mammals, invertebrate insects, birds, and plants. The habitat around the site has a significant amount of development; therefore, the quality of habitat for ecological receptors is minimal.

Contaminant Transport Information:

Surface water transport **Field notes on the erosion potential, including a discussion of the terminal point of surface water transport (if applicable).**	Surface water transport and erosion potential on the mesa top is considered low because of the relatively flat terrain (<10% slope).
Are there any off-site transport pathways (surface water, air, or groundwater)? **(yes/no/uncertain)** **Provide explanation**	Yes. Storm events may produce runoff downgradient. No air or groundwater transport pathways exist. Groundwater is greater than 1000 ft below ground surface (bgs).
Interim action needed to limit off-site transport? **(yes/no/uncertain)** **Provide explanation/ recommendation to project lead for IA SMDP.**	No.

Ecological Effects Information:

Physical Disturbance **(Provide list of major types of disturbances, including erosion and construction activities, review historical aerial photos where appropriate.)**	SWMU 53-001(b) includes a significant amount of physical disturbance resulting from the industrial development including buildings and roads at TA-53.
Are there obvious ecological effects? **(yes/no/uncertain)** **Provide explanation and apparent cause (e.g., contamination, physical disturbance, other).**	No.
Interim action needed to limit apparent ecological effects? **(yes/no/uncertain)** **Provide explanation and recommendations to mitigate apparent exposure pathways to project lead for IA SMDP.**	No.

No Exposure/Transport Pathways:

If there are no complete exposure pathways to ecological receptors onsite and no transport pathways to offsite receptors, the remainder of the checklist should not be completed. Stop here and provide additional explanation/justification for proposing an ecological No Further Action recommendation (if needed). At a minimum, the potential for future transport should include likelihood that future construction activities could make contamination more available for exposure or transport.

Not Applicable.

Adequacy of Site Characterization:

Do existing or proposed data provide information on the nature, rate and extent of contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if the maximum value was captured by existing sample data.)**	The Lower Sandia Canyon Aggregate Area investigation gathered data to provide information on the nature and extent of contamination for SWMU 53-001(b). The nature and extent of contamination were defined for this site.
Do existing or proposed data for the site address potential transport pathways of site contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if other sites should aggregated to characterize potential ecological risk.)**	Yes. The data includes locations downgradient of the SWMU to address potential off-site transport.

Part B—Site Visit Documentation for AOC 53-013

Site ID	AOC 53-013
Date of Site Visit	**01/20/2011**
Site Visit Conducted by	**John Branch**

Receptor Information:

Estimate cover	**Relative vegetative cover (high, medium, low, none) =** low **Relative wetland cover (high, medium, low, none)** = none **Relative structures/asphalt, etc. cover (high, medium, low, none)** = high
Field notes on the FIMAD vegetation class to assist in ground-truthing the Arcview information	The AOC exhibits a moderate amount of variable vegetative cover in isolated locations near the fence boundary and along the hill side upgradient of the site. The vegetative class is from a transitional zone between the piñon-juniper and ponderosa pine zone. The locations also exhibit a moderate amount of native bunch grasses and shrub species.
Field notes on T&E Habitat, if applicable. Consider the need for a site visit by a T&E subject matter expert to support the use of the site by T&E receptors.	There is no T&E habitat.
Are ecological receptors present at the site? **(yes/no/uncertain)** **Describe the general types of receptors present at the site (terrestrial and aquatic), and make notes on the quality of habitat present at the site.**	Yes. plants and animals are present in and around AOC 53-013. The general types of receptors are terrestrial biota such as reptiles, small mammals, invertebrate insects, birds, and plants. The habitat around the site has a significant amount of development; therefore, the quality of habitat for ecological receptors is minimal.

Contaminant Transport Information:

Surface water transport **Field notes on the erosion potential, including a discussion of the terminal point of surface water transport (if applicable).**	AOC 53-013 contains moderate vegetation, resulting in greater stability of the media at the site. In addition, AOC 53-013 is located in the central area of the mesa, decreasing the likelihood of surface-water transport. The only areas where a slight possibility of surface-water transport exists are areas near the mesa edge that consist of bare ground and short, spotty bunch grasses. The transport of surface water terminates at the bottom of Sandia Canyon.
Are there any off-site transport pathways (surface water, air, or groundwater)? **(yes/no/uncertain)** **Provide explanation**	No other off-site transport pathways exist. Groundwater is greater than 1000 ft bgs.
Interim action needed to limit off-site transport? **(yes/no/uncertain)** **Provide explanation/ recommendation to project lead for IA SMDP.**	No. The site has been remediated.

Ecological Effects Information:

Physical Disturbance **(Provide list of major types of disturbances, including erosion and construction activities, review historical aerial photos where appropriate.)**	AOC 53-013 includes a significant amount of physical disturbance resulting from the development of buildings and roads at TA-53.
Are there obvious ecological effects? **(yes/no/uncertain)** **Provide explanation and apparent cause (e.g., contamination, physical disturbance, other).**	No.
Interim action needed to limit apparent ecological effects? **(yes/no/uncertain)** **Provide explanation and recommendations to mitigate apparent exposure pathways to project lead for IA SMDP.**	No. The site has been remediated.

No Exposure/Transport Pathways:

If there are no complete exposure pathways to ecological receptors onsite and no transport pathways to offsite receptors, the remainder of the checklist should not be completed. Stop here and provide additional explanation/justification for proposing an ecological No Further Action recommendation (if needed). At a minimum, the potential for future transport should include likelihood that future construction activities could make contamination more available for exposure or transport.

Not Applicable.

Adequacy of Site Characterization:

Do existing or proposed data provide information on the nature, rate and extent of contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if the maximum value was captured by existing sample data.)**	The Lower Sandia Canyon Aggregate Area project remediated the site and gathered data to provide information on the nature and extent of contamination for AOC 53-013.
Do existing or proposed data for the site address potential transport pathways of site contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if other sites should aggregated to characterize potential ecological risk.)**	Yes. The data include locations downgradient of the AOC to address potential off-site transport.

Part C—Ecological Pathways Conceptual Exposure Model

Question A:

Could soil contaminants reach receptors via vapors?

- **Volatility of the hazardous substance (volatile chemicals generally have Henry's Law constant >10^{-5} atm-me/mol and molecular weight <200 g/mol).**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Volatile organic compounds were not analyzed in samples collected at SWMU 53-001(b) and AOC 53-013.

Question B:

Could the soil contaminants reach receptors through fugitive dust carried in air?

- **Soil contamination would have to be on the actual surface of the soil to become available for dust.**
- **In the case of dust exposures to burrowing animals, the contamination would have to occur in the depth interval where these burrows occur.**

Answer (likely/unlikely/uncertain): Likely

Provide explanation: Low percentage of vegetative cover makes the likelihood of soil contaminants reaching receptors through fugitive dust likely.

Question C:

Can contaminated soil be transported to aquatic ecological communities (use SOP 2.01 run-off score and terminal point of surface water runoff to help answer this question)?

- **If the SOP 2.01 run-off score* for each SWMU included in the site is equal to zero, this suggests that erosion at the site is not a transport pathway. (* Note that the runoff score is not the entire erosion potential score, rather it is a subtotal of this score with a maximum value of 46 points).**
- **If erosion is a transport pathway, evaluate the terminal point to see if aquatic receptors could be affected by contamination from this site.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: There are no aquatic ecological communities on or within close proximity to the sites and there is limited runoff from the sites.

Question D:

Is contaminated groundwater potentially available to biological receptors through seeps or springs or shallow groundwater?

- **Known or suspected presence of contaminants in groundwater.**
- **The potential for contaminants to migrate via groundwater and discharge into habitats and/or surface waters.**

- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone (~1 m depth).**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: There are no seeps, springs, or perched groundwater present on or near the sites. The depth of ground water is greater than 1000 ft bgs.

Question E:

Is infiltration/percolation from contaminated subsurface material a viable transport and exposure pathway?

- **Suspected ability of contaminants to migrate to groundwater.**
- **The potential for contaminants to migrate via groundwater and discharge into habitats and/or surface waters.**
- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone (~1 m depth).**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Contaminants are unlikely to migrate to the regional aquifer given the depth to groundwater. The lack of a significant hydraulic driver (e.g., no standing surface water) facilitating infiltration also mitigates the potential for contaminants reaching groundwater.

Question F:

Might erosion or mass wasting events be a potential release mechanism for contaminants from subsurface materials or perched aquifers to the surface?

- **This question is only applicable to release sites located on or near the mesa edge.**
- **Consider the erodability of surficial material and the geologic processes of canyon/mesa edges.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: There are no perched aquifers on or near these sites. There is no evidence of mass wasting events in the area, and the erosion potential is minimal.

Question G:

Could airborne contaminants interact with receptors through respiration of vapors?

- **Contaminants must be present as volatiles in the air.**
- **Consider the importance of inhalation of vapors for burrowing animals.**
- **Foliar uptake of organic vapors is typically not a significant exposure pathway.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: Volatile organic compounds were not analyzed in samples collected at SWMU 53-001(b) and AOC 53-013.

Question H:

Could airborne contaminants interact with plants through deposition of particulates or with animals through inhalation of fugitive dust?

- **Contaminants must be present as particulates in the air or as dust for this exposure pathway to be complete.**
- **Exposure via inhalation of fugitive dust is particularly applicable to ground-dwelling species that would be exposed to dust disturbed by their foraging or burrowing activities or by wind movement.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 2

Terrestrial Animals: 2

Provide explanation: Low vegetative ground cover, along with the burrowing activities of ground-dwelling terrestrial animals, may create a minor pathway for fugitive dust in air to reach receptors.

Question I:

Could contaminants interact with plants through root uptake or rain splash from surficial soils?

- **Contaminants in bulk soil may partition into soil solution, making them available to roots.**
- **Exposure of terrestrial plants to contaminants present in particulates deposited on leaf and stem surfaces by rain striking contaminated soils (i.e., rain splash).**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 2

Provide explanation: Low concentrations of chemicals of potential concern were detected in surficial soil.

Question J:

Could contaminants interact with receptors through food web transport from surficial soils?

- **The chemicals may bioaccumulate in animals.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2

Provide explanation: Some bioaccumulating contaminants are present but at low enough concentrations so the transport pathway through the food webs to receptors is minimal.

Question K:

Could contaminants interact with receptors via incidental ingestion of surficial soils?

- **Incidental ingestion of contaminated soil could occur while animals grub for food resident in the soil, feed on plant matter covered with contaminated soil or while grooming themselves clean of soil.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2

Provide explanation: Chemicals of potential concern in surface soil are at low levels.

Question L:

Could contaminants interact with receptors through dermal contact with surficial soils?

- **Significant exposure via dermal contact would generally be limited to organic contaminants that are lipophilic and can cross epidermal barriers.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2

Provide explanation: Lipophilic chemicals were detected at low concentrations.

Question M:

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: Radionuclides were not analyzed at SWMU 53-001(b) and AOC 53-013.

<u>Question N:</u>

Could contaminants interact with plants through direct uptake from water and sediment or sediment rain splash?

- **Contaminants may be taken-up by terrestrial plants whose roots are in contact with surface waters.**
- **Terrestrial plants may be exposed to particulates deposited on leaf and stem surfaces by rain striking contaminated sediments (i.e., rain splash) in an area that is only periodically inundated with water.**
- **Contaminants in sediment may partition into soil solution, making them available to roots.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Provide explanation: There are no aquatic environments on-site.

<u>Question O:</u>

Could contaminants interact with receptors through food web transport from water and sediment?

- **The chemicals may bioconcentrate in food items.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: There are no aquatic environments on-site.

<u>Question P:</u>

Could contaminants interact with receptors via ingestion of water and suspended sediments?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial receptors may incidentally ingest sediments.**
- **Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a drinking water source.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: There are no aquatic environments on-site.

<u>Question Q:</u>

Could contaminants interact with receptors through dermal contact with water and sediment?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial species may be dermally exposed during dry periods.**
- **Terrestrial organisms may be dermally exposed to water-borne contaminants as a result of wading or swimming in contaminated waters.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: There are no aquatic environments on-site.

<u>Question R:</u>

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: There are no aquatic environments on-site.

<u>Question S:</u>

Could contaminants bioconcentrate in free floating aquatic, attached aquatic plants, or emergent vegetation?

- **Aquatic plants are in direct contact with water.**
- **Contaminants in sediment may partition into pore water, making them available to submerged roots.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Plants/Emergent Vegetation: 0

Provide explanation: There are no aquatic environments on-site.

Question T:

Could contaminants bioconcentrate in sedimentary or water column organisms?

- **Aquatic receptors may actively or incidentally ingest sediment while foraging.**
- **Aquatic receptors may be directly exposed to contaminated sediments or may be exposed to contaminants through osmotic exchange, respiration, or ventilation of sediment pore waters.**
- **Aquatic receptors may be exposed through osmotic exchange, respiration, or ventilation of surface waters.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Animals: 0

Provide explanation: There are no aquatic environments on-site.

Question U:

Could contaminants bioaccumulate in sedimentary or water column organisms?

- **Lipophilic organic contaminants and some metals may concentrate in an organism's tissues**
- **Ingestion of contaminated food items may result in contaminant bioaccumulation through the food web.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Animals: 0

Provide explanation: There are no aquatic environments on-site.

Question V:

Could contaminants interact with aquatic plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma emitting radionuclides.**
- **The water column acts to absorb radiation, thus external irradiation is typically more important for sediment dwelling organisms.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

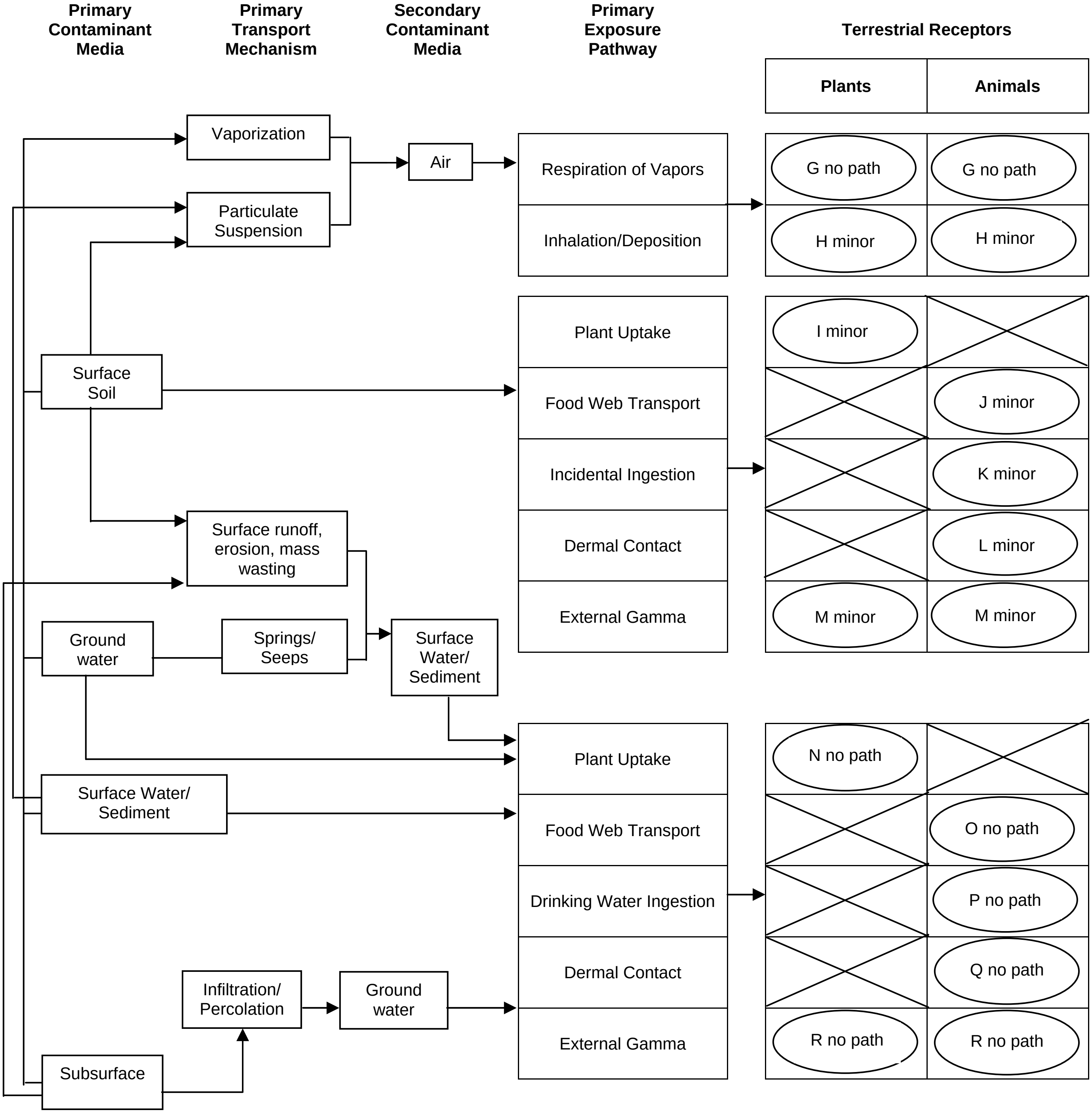
Aquatic Plants: 0

Aquatic Animals: 0

Provide explanation: There are no aquatic environments on-site.

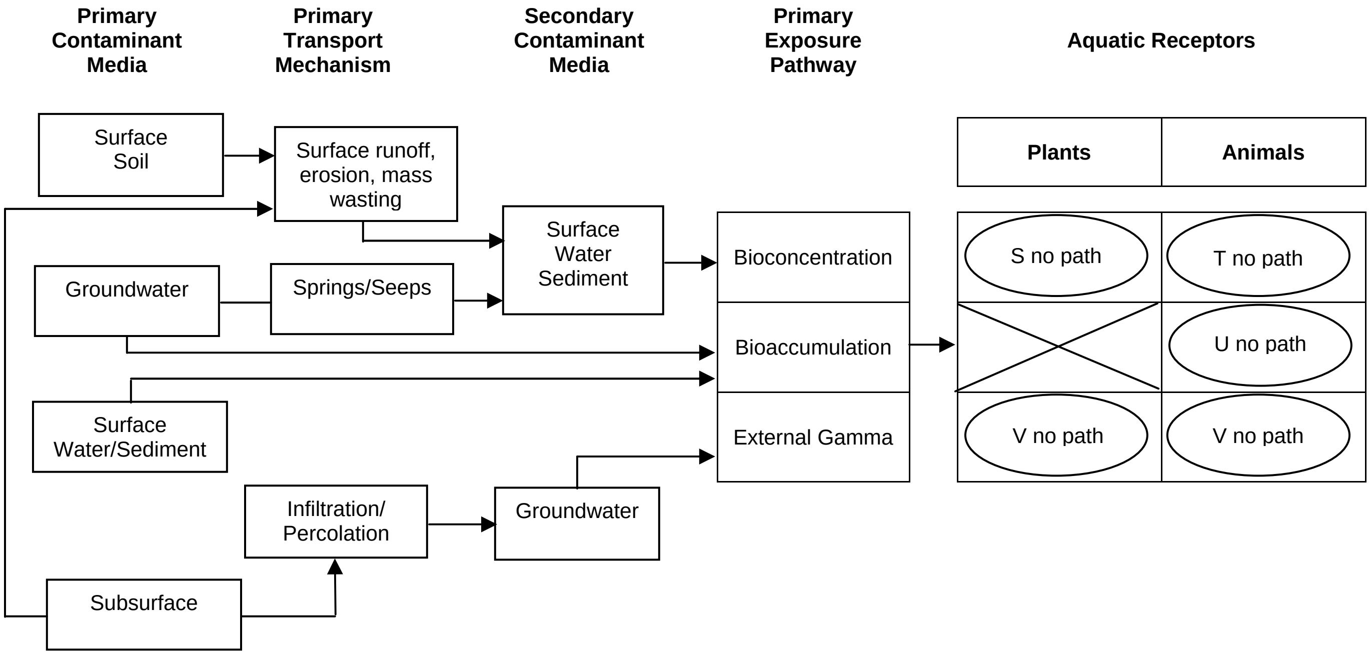
NOTE:
Letters in circles refer to questions on the Scoping Checklist

Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model



Ecological Scoping Checklist
Aquatic Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the Scoping Checklist



Signatures and certifications:

Checklist completed by (provide name, organization and phone number):

Name (printed): John P. Branch
Name (signature): John Branch
Organization: Los Alamos Technical Associates
Phone number: 505-662-1822
Date Completed: January 24, 2011

Verification by another party (provide name, organization and phone number):

Name (printed): Richard Mirenda
Name (signature): Richard Mirenda
Organization: Los Alamos National Laboratory, EP-ET-ER
Phone number: 505-665-6953